

Shelter from Extreme Natural Disasters: Climate Risk Diversification through M&A

Zizheng Zhao, Chinmoy Ghosh, Jaideep Shenoy

School of Business, University of Connecticut, Storrs, CT, USA

Abstract

Extreme natural disasters have become more frequent in recent years, exerting significant pressure on corporate decision-making. This paper demonstrates that firms facing higher physical climate risk, as measured by exposure to billion-dollar natural disaster events, are more likely to engage in mergers and acquisitions (M&As) and to select targets with substantially lower climate risk. High-risk acquirers are also more likely to pursue out-of-state deals, particularly those in related industries. Further analysis reveals that within these two deal types, announcement-period wealth effects are stronger when the climate risk gap between the acquirer and the target is larger. Finally, climate risk diversifying M&As, defined as high-risk acquirers taking over low-risk targets, are followed by improved operating performance and measurable reductions in subsequent disaster risk.

Keywords: physical climate risk, billion-dollar events, mergers and acquisitions, risk diversification

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Abstract: Extreme natural disasters have become more frequent in recent years, exerting significant pressure on corporate decision-making. This paper demonstrates that firms facing higher physical climate risk, as measured by exposure to billion-dollar natural disaster events, are more likely to engage in mergers and acquisitions (M&As) and to select targets with substantially lower climate risk. High-risk acquirers are also more likely to pursue out-of-state deals, particularly those in related industries. Further analysis reveals that within these two deal types, announcement-period wealth effects are stronger when the climate risk gap between the acquirer and the target is larger. Finally, climate risk diversifying M&As, defined as high-risk acquirers taking over low-risk targets, are followed by improved operating performance and measurable reductions in subsequent disaster risk.

1. Introduction

According to the Food and Agriculture Organization of the United Nations, the number of natural disasters in the 2010s was more than three times that in the 1970s and 1980s. Many famous extreme disasters have occurred in recent decades, including Hurricane Katrina in 2005, Winter Storm Uri in Texas in 2021, and the Southern California wildfires in 2020. These extreme natural disasters have caused significant losses among residents and businesses in the area. For example, Katrina caused more than \$160 billion in damage; the population of New Orleans fell by 29 percent between the fall of 2005 and 2011; and the financial losses from Uri are estimated to range from \$80 billion to \$130 billion. Prior studies on the disruptions caused by disasters document that firms experiencing direct damage from extreme weather face immediate capital losses, higher credit needs, increased investment pressure, and operational disruptions (Benincasa et al., 2024; Brown et al., 2021; Ginglinger and Moreau, 2023). Such acute climate risks also ripple through supply chains, elevating trade risks and decreasing the sourcing value of vulnerable supply bases (Shu and Fan, 2024).

The escalation of acute physical climate risk raises the question: how do firms manage exposures that are increasingly systemic rather than isolated incidents? Previous studies provide evidence on how firms respond to natural disasters. For example, firms traditionally address these events by utilizing bank credit lines or adjusting their capital structures (Brown et al., 2021; Ginglinger & Moreau, 2023). However, these approaches can become increasingly constrained over time. To elaborate, higher leverage resulting from repeated reliance on bank credit to manage climate-induced liquidity disruptions can increase the firm's financial risk. Such a short-term response to a mega-disaster event is not sustainable in an environment of escalating natural disasters. While insurance is a straightforward way to shield businesses and properties from damage, Kousky (2019) suggests that it can enhance recovery outcomes but may limit risk reduction.

In view of these limitations, firms have the incentive to adopt more structural and proactive measures to diversify climate risk. In this paper, we examine whether mergers and acquisitions (M&A) are a particularly suitable and strategic mechanism. By acquiring or merging with firms in less vulnerable areas, companies can reduce their overall exposure to localized physical climate risks, stabilizing their cash flows and reducing the need for costly financial interventions. Additionally, through mergers and acquisitions (M&As), firms gain greater operational flexibility. Shu and Fan (2024) show that firms face significant operational and sourcing risks from climate-vulnerable supply bases. Acquisitions of suppliers or strategic integration across supply chains can mitigate such risks by reducing dependency on external vulnerable entities and enhancing the overall resilience of operations. As a case in point, the 2011 floods in Thailand had a severe impact on the manufacturing sector. Automobile makers, such as Honda, which suffered significant production losses, subsequently diversified their manufacturing bases through acquisitions and

joint ventures in other Southeast Asian countries. Ford also emphasized the importance of integrating crisis contingency plans with their supplier network after the floods.

In this paper, we investigate whether firms engage in mergers and acquisitions to manage and diversify away the physical climate risk associated with natural disasters that cause damage exceeding \$1 billion, and whether these strategies generate positive synergies and wealth effects for these firms. Specifically, we posit that firms are more likely to be acquirers after a major natural disaster and preferentially acquire target firms that are not contemporaneously affected by a billion-dollar natural disaster event. We further hypothesize that acquirers with high physical climate risk seek out-of-state targets or out-of-state-related acquisitions to reduce exposure to operations in disaster-prone regions and to maintain future business continuity. Finally, we conjecture that these acquisitions induce positive wealth effects, especially in out-of-state transactions, and they lead to improved operating performance and reduced climate risk for the acquiring firms.

To test these hypotheses, we first investigate the relationship between a firm's likelihood of becoming an acquirer and its associated physical climate risk. We argue that firms are more inclined to be acquirers when they have higher physical climate risk. Following Huynh and Xia (2023), we proxy for physical climate risk using an indicator variable that equals one if the firm experienced a mega natural disaster in the prior year, defined as an event with damages exceeding \$1 billion. Following Bena and Li (2014), we match pseudo acquirers from the same industry and in the same year, and of similar size, to form the control group. The results show that firms with increased physical climate risks are significantly more inclined to be acquirers than their pseudo-acquirer counterparts.

Second, to assess whether high-climate-risk-prone acquirers are more likely to acquire targets with low climate-risk exposure, we conduct analyses at the merger-pair level. Like the previous test, we proxy each firm's physical climate risk using (i) an indicator for whether it experienced a prior-year billion-dollar event, and (ii) the maximum disaster damage it faced among all its establishments. We then compute the acquirer–target risk difference as the difference between the acquirer's and the target's climate risk. Our results indicate that a greater climate risk difference is associated with a higher likelihood of a proper merger pair occurring.

Third, we analyze all public-to-public M&A transactions to determine whether acquirers with higher physical climate risk are more likely to pursue out-of-state targets, particularly those in related industries. We restrict our analysis to public-to-public merger pairs for which firm characteristics are available. To determine whether an acquisition crosses state lines, we compare the headquarters locations of the acquiring and target firms. We identify related industry acquisitions as those in which the two firms share the same two-digit SIC code. Consistent with our hypothesis, acquirer firms facing greater physical climate risk are significantly more likely to make both out-of-state acquisitions and out-of-state related-industry acquisitions. This result suggests that acquirers shift M&A activity away from disaster-prone regions to improve their operations in the event of future natural-disaster shocks.

Next, we investigate the relationship between deal cumulative abnormal returns (CAR) around the merger announcement date and the relative physical climate risk levels of both acquirers and targets. Specifically, we investigate whether the market rewards firms that make acquisitions following a major natural disaster, and whether there is a positive wealth effect when they acquire targets with lower physical climate risk. Our results show that deal CAR increases significantly with the acquirer's own risk exposure. Interestingly, the combined CAR is high when the target

has also endured a major disaster in the previous year. We argue that when a disaster simultaneously affects the acquirer and target firms, acquirers have a bargaining advantage that enables them to negotiate a lower purchase price. This interpretation is supported by our subsequent tests on deal premiums and acquirer's CAR. We replicate these analyses for out-of-state and out-of-state-related acquisitions. We find that greater risk differentials between the acquirer and target firms lead to significantly higher combined CARs. We further find that investors value acquisitions that reduce exposure to physical climate risk, especially in out-of-state deals and out-of-state deals involving related industries.

Finally, we assess whether firms' operating performance and physical climate risk improve following climate-risk-diversifying M&As—that is, acquisitions by acquirers that face high physical climate risk and target firms with low physical climate risk in the previous year. Consistent with our expectations, we find that post-merger operating performance and cash flows are significantly better for acquirers that undertake such climate-risk-diversifying deals. Moreover, these firms achieve a significant reduction in their subsequent physical climate risk levels.

This study makes several contributions to the literature. First, it broadens our understanding of how firms respond to acute physical climate risks. Prior studies have documented how markets, fund managers, and firms respond to acute physical climate events. For instance, Choi, Gao, and Jiang (2019) demonstrate that heat waves, as evidenced by increased Google search volume for climate change, prompt retail investors to shift away from high-emissions firms, resulting in lower returns for these companies, even though institutional investors' holdings remain largely unaffected. Alok, Kumar, and Wermers (2019) find that disasters lead to a post-disaster decrease in the portfolio weights of disaster-zone stocks for all funds, with a significantly larger drop for closed-end funds. Dessaint and Matray (2017) find that, following a hurricane, managers of

companies in affected areas, even when not directly impacted, tend to retain additional cash. Brown, Gustafson, and Ivanov (2021) demonstrate that extreme winter weather increases operating costs and prompts firms, particularly solvent small-bank borrowers, to use credit lines to manage cash-flow volatility. Our paper is related to Bai et al. (2024), who show that companies may use M&A to diversify away from certain chronic physical climate risks, such as sea-level rise. In the current environment of an increasing frequency of extreme climate events, this study is the first to provide evidence on how firms operate in the market for corporate control to mitigate acute physical climate risks.

Additionally, our paper contributes to the extensive literature on the determinants of mergers and acquisitions. A series of prior studies show that the target firm's attractiveness derives from various factors including strong patent abilities (Bena and Li, 2014; Ransbotham and Mitra, 2010), research and development (R&D) capabilities (Heeley, King, and Covin, 2006; Ruckman, 2005), and environmental capabilities (Berchicci, Dowell, and King, 2012). Also, acquirers prefer to choose targets with similar resources and R&D (Schildt and Laamanen, 2006; Yu, Umashankar, and Rao, 2016), with complementary capabilities (Kaul and Wu, 2016), with related human capital (K. Lee, Mauer, and Xu, 2018), with geographically overlaps (Chen, Kale, and Hoskisson, 2018; Ramos and Shaver, 2013), and with network synergies (Hernandez and Shaver, 2019). We contribute to this literature by identifying a strategic attribute preferred by acquirers—the target company's low physical climate risk.

2. Hypothesis Development

In this study, we focus on billion-dollar events for several reasons. First, such natural disasters cause economic losses exceeding \$1 billion, significantly disrupting local businesses and potentially resulting in human injuries and fatalities. Excluding relatively small natural disasters

ensures that events that pose minimal or no business risk to firms are removed from the analysis. Second, the effects of billion-dollar events are comprehensively documented due to their substantial impacts, ensuring detailed records of the value of damage, affected geographic areas, and other critical disaster-related information are available. Third, given the extensive damage caused by billion-dollar events, these events are often perceived as unexpected, making them particularly suitable for investigating whether firms implement diversification strategies in response to such unanticipated natural disasters. Finally, the literature utilizes billion-dollar events to illustrate the impact of major natural disasters on firms. For example, Barrot and Sauvagnat (2016) treat billion-dollar events as plausibly idiosyncratic shocks and show that disruptions at affected suppliers spread through production networks. Additionally, Huynh and Xia (2023) find that investors overreact when firms are affected by such disasters, leading to a short-term decline in bond and stock prices.

As noted earlier, major natural disasters have become increasingly frequent. Indeed, Wylie et al. (2025) indicate that the difference in risk level between the safest and riskiest places is expected to increase by 2050. In this context, management teams have strong incentives to consider strategies to reduce or even altogether avoid potential losses from similar disasters in the future. As Figure 1 shows, certain counties repeatedly experience billion-dollar disasters. Given the strong geographic concentration of such natural disasters, one potential approach to address geographic vulnerability is to acquire another firm in a different geographic area, thereby gaining the capability to conduct business in diverse locations that are likely to be less affected by natural-disaster risk. This leads to our first hypothesis:

H1: The likelihood of a firm becoming an acquirer is positively related to the firm's physical climate risk.

Next, we argue that acquirers seeking to mitigate future physical climate risk tend to select targets from regions with lower disaster exposure than their own. Ideally, they choose locations with little or no such risk. For example, a firm in the Northeast U.S. that often encounters heavy winter snowstorms would tend to avoid similarly exposed targets. This reasoning leads to our second hypothesis:

H2: The likelihood of two firms forming a merger pair is positively correlated with the physical climate risk gap between these two firms.

If the acquirer and target firms are in the same state, they face a higher risk of exposure to the same hazard type, and even a billion-dollar event may occur simultaneously. As such, if firms aim to change their physical climate risk exposure through mergers and acquisitions (M&As), they are more likely to acquire targets outside their state. In addition, because these deals are intended to mitigate disaster-induced operational disruptions and losses, acquirers are expected to prefer targets in related industries, where integration can better preserve business continuity. Based on these considerations, we state the following two hypotheses:

H3A: The likelihood of an out-of-state M&A deal is positively correlated with the acquirer's physical climate risk.

H3B: The likelihood of out-of-state related industry M&A deals is positively correlated with the acquirer's physical climate risk.

Building on the three hypotheses above, we expect investors to view these transactions as value-enhancing. When acquirers face higher physical climate risk, they pursue mergers and acquisitions (M&A) to reduce their exposure. Out-of-state deals help reduce exposure to operations from local hazards. Out-of-state and related industry deals further support business continuity by aligning operations. Together, these choices signal an effort to limit disaster-related losses. This leads to the following hypothesis:

H4: Deals involving acquirers with a higher physical climate risk will have higher combined cumulative abnormal returns. The risk gap between acquirers and targets is positively related to the combined cumulative abnormal return.

H4a: Among out-of-state deals, the combined cumulative abnormal return is positively related to the physical climate risk of acquirers and the risk gap between acquirers and targets.

H4b: Among out-of-state and related industry deals, the combined cumulative abnormal return is positively related to the physical climate risk of acquirers and the risk gap between acquirers and targets.

Finally, we posit that acquirers derive operational benefits from climate-risk-diversifying M&A transactions. By reducing climate risk exposure, these firms should exhibit stronger operating performance improvement relative to comparable firms in subsequent years. In addition, their physical climate risk is expected to improve more than that of other firms. Accordingly, we have the following hypotheses:

H5: Following diversifying M&A, acquirers show larger operating performance improvements and more significant decreases in physical climate risk than control firms.

3. Data and sample selection

3.1 Billion-dollar disaster events sample

Following Barrot and Sauvagnat (2016) and Huynh and Xia (2023), we obtain information on physical climate risk in the U.S. based on billion-dollar events in the SHELDDUS (Spatial Hazard and Loss Database for the United States) database, maintained by Arizona State University. Following Huynh and Xia (2023), we use two methods to estimate physical climate risk. The first is an indicator variable that equals 1 if a firm experienced a billion-dollar event in the past year and 0 otherwise. For the second method, we use the natural logarithm of property damage as the

measure of physical climate risk. At the firm level, we employed two separate methods to measure a company's exposure to natural disasters. For the main test, we use the locations of firms' establishments to determine whether a firm has experienced a mega-natural-disaster event at any of these locations. Relying solely on headquarters locations may lead to inaccuracies and the omission of significant impacts. As a robustness check, we also use a firm's corporate headquarters address to verify that the results remain consistent.

For disaster data, we primarily focus on billion-dollar events to ensure that the disaster is likely to impact firms' operations and strategies. Billion-dollar events are large-scale, high-impact events documented in the Billion Dollar Weather and Climate Disasters dataset maintained by the National Centers for Environmental Information (NCEI, formerly NCDC). Figure 1 illustrates the frequency of billion-dollar events throughout U.S. history. According to the SHELDUS dataset on billion-dollar events, from 1962 to 2021, 3,107 counties in the United States (3,143 counties in total) experienced natural disasters that resulted in losses exceeding \$1 billion. Among them, only 190 counties—or 6% of the sample—experienced such major natural disasters only once. In contrast, as many as 1,709 counties experienced more than \$10 billion in such events, accounting for 55% of the counties that experienced such events. During our sample period of 1997–2019, 3,038 counties were affected by billion-dollar events, and more than 20% of counties experienced a billion-dollar natural disaster at least once every two years. Figure 2 displays the annual number of counties experiencing a billion-dollar natural disaster. We observe that in more than 60% of years, more than 500 counties (about 15% of the total) in the United States experienced a billion-dollar event. Overall, the data indicate that a considerable number of firms in certain regions repeatedly experience natural disasters, resulting in more than \$1 billion in damage.

To ensure data reliability, we follow the approach outlined in Huynh and Xia (2023) for handling billion-dollar events. Specifically, we select only those disasters that last no more than 30 days. Since we also use the establishment-level data for firms, we further require that an establishment's county sustain total estimated damages exceeding \$10 million (in 2015 constant dollars) for the establishment to be identified as exposed to billion-dollar events.

2.2 Firm and deal-level data

The main tests in this study are based on establishment-level firm location data obtained from the Your-economy Time Series (YTS) database, provided by the Business Dynamics Research Consortium (BDRC) at the University of Wisconsin. The YTS dataset covers the period from 1997 to 2019. We obtain merger and acquisition data from the Thomson Reuters Financial Securities Data Company (SDC) database, spanning the period from 1997 to 2019. As a robustness check, we determine firm locations based on the zip codes of company headquarters available in the Compustat database.

In our analysis, the merger and acquisition data are from 1997 to 2019. Our sample period is restricted by the data availability in YTS database. The selection criteria for M&A deals requires that: (1) the acquirer must hold less than 15% ownership of the target firm's shares at the time of announcement and more than 50% after the transaction; (2) the form of transaction must not fall into the categories "Acquisition of remaining interest", "Acquisition of Assets", "Acquisition of Certain Assets", "Recapitalization", "Buyback", and "Exchange Offer"; and, (3) all public acquirers and targets in our tests need to be firms that appear in the YTS database to obtain county level location information. All the financial data are retrieved from Compustat North America Fundamentals Annually database.

After filtering the full sample for publicly traded US acquirers and ensuring that all firms in the sample are covered in the YTS database, we obtain a sample with 14,821 deals. When we filter for deals in which both the acquirer and the target are publicly traded U.S. companies, we obtain a sample of 1,271 deals. Following this, we employ the methodology of Bena and Li (2014), in which, for each test, acquirers and targets were matched within the same industry and similar size, yielding two matched samples.

The first set involves a match for acquirers, where each publicly traded acquirer is paired with five firms of similar industry and size. To match firms by industry and size, we use propensity score matching (PSM) to construct the sample. First, matching is implemented by identifying firms within the same four-digit SIC code and with similar firm sizes. If fewer than five suitable matches are obtained, the matching criteria are adjusted to include firms within the same three-digit SIC code and those of similar size. If this procedure yields fewer than five matches, the criteria are adjusted to include firms within the same two-digit SIC code with comparable firm sizes.

The second set involved a match for each merger pair. Each true acquirer and actual target are matched with five pseudo-acquirers and pseudo-targets, respectively. Then, each pseudo-acquirer (target) is paired with its corresponding actual target (acquirer) to form a pseudo-merger pair. The result is that each true merger pair is matched with ten pseudo merger pairs.

Table 1 presents the descriptive statistics for the matched sample, including the acquirer and the merger pair. We report statistics for real acquirers and matched acquirers in panel A, and for real merger pairs and pseudo-merger pairs in panel B. From panel B, we find that, in general, acquirers are more exposed to physical climate risk than target firms. For example, the average billion-dollar event indicator is 0.513 for acquirers and 0.267 for targets, and the average natural logarithm of property damage for acquirers is 9.901 and 5.033 for targets, respectively. The firm

characteristics are similar to those of other studies (Bena and Li (2014), Bai et al. (2024)). In panel C, we report the deal-level characteristics for all publicly traded acquirers and targets. For the wealth effect tests in section 5, we calculate the cumulative abnormal returns (CARs) for (-1, +1), and (-2, +2) day windows centered on the initial announcement of the merger and acquisition (day 0) using the market-adjusted model and the market model estimated over the days -46 to -255. We then calculate the value-weighted combined CARs for all deals. The CARs for acquirers and targets are comparable to those documented in prior literature. (Bena and Li, 2014; Bai et al., 2024).

4. Merger likelihood test

4.1 Acquirer likelihood test

In this section, we investigate whether the incidence of extreme physical climate shocks affects the likelihood that firms become acquirers. We propose that firms aiming to mitigate business risks associated with natural disasters pursue acquisitions of other firms as a strategy to diversify such risks. Hence, we anticipate that as the physical climate risk in a location increases, firms in that area are more inclined to become acquirers.

$$M\&A\ Firm_{i,t} = \alpha + \beta_1 Phy_Climate_Risk_{i,t-1} + \beta_2 Firm\ Controls_{i,t-1} + Fixed\ Effects_t + \varepsilon_{i,t}$$

$M\&A\ Firm_{i,t}$ the dependent variable, is an indicator variable, which equals 1 when the firm is a true acquirer, and zero if this is a matched firm. Our primary independent variable, $Phy_Climate_Risk_{i,t-1}$ is the physical climate risk for a specific firm in the year prior to the M&A. We define this variable in two ways: one, we set $Phy_Climate_Risk_{i,t-1}$ as an indicator which equals 1 if any establishment of firm i is located in a county that experienced a billion-dollar event in year (t-1), and 0 otherwise; two, for each firm, we measure an establishment's physical climate

risk with the natural logarithm of prior-year county-level property damage. At the firm level, we define physical climate risk as the maximum of this establishment-level proxy across all of the firm's establishments.¹. Our control variables include Firm Size, Cash, Market-to-book (M/B), Leverage, ROA, R&D. Firm Size is the natural logarithm of the total assets; Cash is the ratio of cash and cash equivalents of the firms to the total assets; Market-to-book Ratio is the ratio of the market value to the book value; R&D is the ratio of R&D expenditure to the total assets of the firm; Leverage is the ratio of long-term debt plus short-term debt to total book assets; ROA is the ratio of operating income before depreciation to total book assets. We include deal fixed effects in our tests. Following Bena and Li (2014), we cluster the standard errors at the deal level. We also include year fixed effects and industry fixed effects results in the robustness check.

Table 2 presents the results of estimations exploring the relationship between the extent of physical climate risk exposure and the likelihood of becoming an acquirer. The first four columns present results for the acquirer likelihood test, using the existence of a billion-dollar event one year prior to the merger announcement date. The results indicate that firms are more likely to become acquirers under both conditional logit and OLS estimations, with or without firm control variables, and all coefficients are significant at the 1% level. In terms of economic magnitude, we find from the conditional logit model results in column (2) that firms exposed to physical climate risk are about 4% more likely to become acquirers than otherwise similar unexposed firms.

Columns 5-8 in Table 2 present the results using physical damage as the primary independent variable. The results show that firms are more likely to become acquirers when they suffer greater damage from the billion-dollar event. From the conditional logit model results in

¹ We also proxy risk by the establishment employment-weighted average damage at the firm level, and the findings remain the same.

column (6), we find that a one-standard-deviation increase in damage is associated with a 3.2% increase in the likelihood of the firm becoming an acquirer. These results are consistent with our hypothesis 1 and show a significantly positive relationship between the likelihood of a firm becoming an acquirer and its physical climate risk.

4.2 Merger pair likelihood test

In this section, we examine whether differences in physical climate risk between the two merging firms affect the likelihood that they will form a merger pair. Since firms have incentives to diversify their climate risks through M&A, we propose that the greater the difference in physical climate risk between the two merging firms, the more likely they are to form a merger pair than control firm pairs of similar size and industry.

$$\begin{aligned}
 &Merger\ pair_{i,j,t} \\
 &= \alpha + \beta_1 \Delta Phy_Climate_Risk_{i,j,t-1} + \beta_2 Firm\ Controls_{i,j,t-1} \\
 &+ Fixed\ Effects_t + \varepsilon_{i,j,t}
 \end{aligned}$$

The dependent variable $Merger\ pair_{i,j,t}$ is an indicator variable which equals 1 when firm i and firm j is a true merger pair at time t, 0 if firm i and firm j form a matched pseudo merger pair based on industry and firm size. Consistent with the previous method, for the main independent variable, we employ two approaches to estimate disparities in physical climate risks. First, we set indicator variable for both true acquirer firm and target firm as 1 if the firms experience a billion-dollar event 1 year before the merger announcement date and then calculate the difference to get the final $\Delta Phy_Climate_Risk_{i,j,t-1}$ which is also a categorical variable, which takes values of -1, 0, or 1. When the acquirer experienced a billion-dollar event in (t-1) but the target did not, the value is 1; when the acquirer did not experience a billion-dollar event in (t-1) but the target did,

the value is -1; and when they both experienced a billion-dollar event or neither firm did, the value is 0. Second, we calculate both acquirer's and target's physical climate risk in year (t-1) using the damage caused in year (t-1) and then take the difference between them to get the $\Delta Phy_Climate_Risk_{i,j,t-1}$. In this test, the control variables and fixed effects remain unchanged from the previous test. We include the year fixed effect and industry fixed effect results in the robustness check.

The results for the estimation are presented in Table 3. Columns 1-4 show the results using a categorical variable as the primary independent variable. Regardless of whether the firm control variables are included or not, the results remain positive and significant at the 1% level, indicating that the greater the difference in physical climate risk between two companies, the more likely they are to form a merger pair. In terms of economic magnitude, based on the conditional logit model results, a firm subject to physical climate risk is 1% more likely to acquire a firm without physical climate risk. Columns 5-8 show the same results using the magnitude of the disasters. The likelihood that two firms will form a merger pair is positively related to the damage gap they experience from mega natural disasters. All the results are significant at 5% level. These results are consistent with hypothesis 2 that firms are more likely to become a merger pair when they have a larger physical climate risk gap.

4.3 Acquirer targeting preferences

In this section, we test whether, among public-to-public merger pairs, deals are more likely to involve out-of-state targets when the acquirer's physical climate risk is higher. Furthermore, we examine whether greater acquirer physical climate risk increases the likelihood of out-of-state and related industry acquisitions. As Figure 1 illustrates, physical climate risk recurs in specific locations. Based on this persistent pattern, we conjecture that firms are more likely to consider out-

of-state targets when planning acquisitions. Additionally, the business risk associated with mega events primarily stems from operational suspensions and shutdowns. Taken together, these points lead us to hypothesize that acquirers facing higher physical climate risk are more likely to pursue out-of-state targets in related industries. To test this hypothesis, we estimate the following model:

$$\begin{aligned}
 &Special\ deal_{i,j,t} \\
 &= \alpha + \beta_1 Phy_Climate_Risk_{i,t-1} + \beta_2 Firm\ Controls_{i,j,t-1} + Fixed\ Effects_t \\
 &+ \varepsilon_{i,j,t}
 \end{aligned}$$

For this test, we define the dependent variable in two ways. In our first test, $Special\ deal_{i,j,t}$ is an indicator variable that equals 1 when acquirer i purchases target j headquartered in a different state in year t , and 0 otherwise. For our second test, $Special\ deal_{i,j,t}$ equals 1 if the target is headquartered in a different state from the acquirer, and both firms share the same two-digit SIC code, and 0 otherwise. $Phy_Climate_Risk_{i,t-1}$, our primary independent variable, is the physical climate risk for the acquirer in the year prior to the M&A announcement date. Consistent with prior sections, we use two proxies for acquirer physical climate risk: an indicator equal to one when a billion-dollar event occurs in $(t-1)$ year and zero otherwise, and the natural logarithm of the acquirer's maximum county-level property damage in $(t-1)$ year. We use the same set of control variables as in the earlier likelihood tests. We also include year fixed effects and industry fixed effects to control for time shocks and sector differences.

Table 4 reports the results of the two tests. In Panel A, acquirers with higher physical climate risk are more likely to acquire targets outside their state. Columns (1) and (2) show that acquirers exposed to a mega natural disaster in the prior year are more likely to purchase out-of-state targets. In terms of economic magnitude, exposure increases the likelihood by about 8.6%.

Columns (3) and (4) show that greater prior-year damage is likewise associated with out-of-state acquisitions. A one-standard-deviation increase in damage raises the likelihood by roughly 4.6%.

Panel B shows that acquirers with higher physical climate risk are also more likely to undertake industry-related acquisitions, even when those acquisitions are out of state. Like Panel A, columns (1) and (2) indicate that acquirers exposed to a billion-dollar event in the prior year are more likely to target out-of-state firms in related industries. With respect to economic magnitude, exposure increases the likelihood by approximately 7.3%. Columns (3) and (4) show that greater prior-year damage is likewise associated with out-of-state and related industry firms, and a one-standard-deviation increase in damage raises the likelihood by roughly 4.3%. Overall, all the results are consistent with our hypothesis 3.

5. Wealth effects

Based on our results so far, it appears that physical climate risk plays a significant role in firms' decisions about engaging in a merger deal. In this section, we examine how the stock market responds to acquisition announcements that are expected to mitigate physical climate risk. To test this hypothesis, we calculate the cumulative abnormal returns (CARs) for (-1, +1) and (-2, +2) day windows centered on the initial announcement of the merger and acquisition (day 0). We use the market-adjusted model and the market model estimated over the days -46 to -255. Then, we calculate the value-weighted combined CARs for all the deals.

5.1 Wealth effects of mergers and acquisitions: Univariate tests

Next, we analyze whether these combined CARs are associated with the acquirer's physical climate risk and the difference in physical climate risk between the acquirer and the target firms. Table 5 presents the univariate results for the CAR tests. In Panel A, we divide all public-to-public

deals into four subsamples: high-risk acquirer with low-risk target, high-risk acquirer with high-risk target, low-risk acquirer with low-risk target, and low-risk acquirer with high-risk target. The High-risk group includes acquirers or targets that experienced a billion-dollar event in the year ($t-1$). In contrast, the low-risk group comprises firms that did not experience a mega natural disaster in the year ($t-1$). We find that in groups in which both the acquirer and the target are high-risk, the combined CAR is highest, at approximately 2.6% in both the three-day and five-day windows under the market model. On the other hand, for the other three groups, the combined CARs under the market model are lower, about 1.6% over a three-day window and 1.8% over a five-day window. This pattern is not fully aligned with our hypothesis. We return to this result in Section 6, where we relate the acquirer CAR to the deal premium.

In Panels B-D, we split the M&A sample into high- and low-risk acquirers. Panel B provides a baseline test: across all public-to-public deals, we ask whether the market treats acquisitions by higher-risk acquirers as value-creating. The high-risk group exhibits a higher combined CAR, but the difference between the high and low-risk groups is not statistically significant. In panel C, we restrict the sample to out-of-state transactions. Within this subset, deals by high-risk acquirers again show higher combined CARs. Moreover, when combined CAR is measured over a three-day window using the market model, the difference between the high- and low-risk groups is positive and statistically significant at the 10% level. In Panel D, we further restrict the sample to out-of-state acquisitions in related industries. Within this subset, transactions by high-risk acquirers exhibit higher combined CARs, and in most groups, the difference relative to the low-risk group is significantly positive. In particular, within the $(-1, +1)$ window, deals with high-risk acquirers have a CAR that is, on average, 1.16% higher than those with low-risk acquirers;

this difference is significant at the 5% level. This evidence indicates that the market values acquisitions by high-risk acquirers when the target is both out of state and in a related industry.

Overall, deals with high-risk acquirers have a higher average CAR compared to those with low-risk acquirers. Additionally, focusing on out-of-state and related industry deals, transactions by high-risk acquirers have significantly higher combined CARs than those by low-risk acquirers. It appears that the market encourages firms with high physical climate risk to diversify their exposures through out-of-state mergers and acquisitions (M&A), particularly in related industries.

5.2 Wealth effects of mergers and acquisitions: Multivariate tests

In this section, we control for deal-level characteristics and estimate a regression of the combined cumulative abnormal returns (CARs) to assess whether investors perceive risk diversification as value-creating. The regression equation we use for the test is:

$$CAR_{i,t} = \alpha + \beta_1 phy_climate_Risk_{i,j,t-1} + \beta_2 FirmControl_{i,t-1} + \beta_3 Deal\ Character_{m,t-1} + Fixed\ Effects_t + \varepsilon_{im,t}$$

Here, the dependent variable is the combined CAR around the announcement date, calculated using both the market model and the market-adjusted model. We use the same methods to define the primary independent variable $phy_climate_Risk_{i,j,t-1}$ as we used in the likelihood test. In the first test, we used the acquirer's physical climate risk as the independent variable. In the second test, we used the difference in physical climate risk between the acquirer and the target firms to examine whether the CAR is correlated with the risk gap. We include the same firm-level control variables as in the previous tests. For deal-specific characteristics, we use the variable *Hostile*, which equals 1 if the deal is hostile as identified in the SDC Platinum database; *Relative Size*, which equals the ratio of target's market capital to acquirer's market capital; *All Cash Deal*, which

equals 1 if the transaction is fully paid in cash; and *Deal Value*, which is the natural logarithm of the deal value. We also include industry and year fixed effects in these estimations.

Table 6 presents the results. In Panel A, all coefficients are positive; however, they are significant at the 10% level only in Models 1 and 3. In Panel B, we obtain positive coefficients, but significance is achieved only for the $(-1, +1)$ window with the market-adjusted model. This result may be driven by the univariate finding that combined CAR is highest when both the acquirer and the target are high risk. In Section 6, we propose a mechanism to account for this pattern.

Next, as in the univariate approach, we separately test within out-of-state deals and out-of-state, related-industry deals to assess whether the market views diversifying transactions as value-creating. The results are presented in Tables 7 and 8. Table 7 focuses on out-of-state deals. In Panel A, we regress the combined CAR on the acquirer's physical climate risk. Columns (1)-(4) use an indicator variable identifying a prior year billion-dollar event as the risk proxy, and columns (5)-(8) use the natural log of damage as the climate risk proxy. In both the $(-1, +1)$ and $(-2, +2)$ windows, higher acquirer risk is associated with higher combined CAR, and the estimates are statistically significant. In terms of magnitude, the coefficient in column (1) implies that exposure to a billion-dollar event raises combined CAR by 1.46% among out-of-state deals. In contrast, column (5) indicates that a one-standard-deviation increase in damage raises combined CAR by 0.78%. Panel B examines whether combined CAR is positively related to the difference in physical climate risk between the acquirer and the target firms. Using the prior year's billion-dollar event indicator, we find only weak evidence of a market reward for out-of-state deals that clearly diversify risk. Columns (5) to (8) show a positive coefficient between the combined CAR and the difference in damage. Overall, in out-of-state deals, higher acquirer risk is associated with higher

combined CAR. More specifically, larger risk gaps between the acquirer and the target firms are also associated with higher combined CAR, consistent with Hypothesis 4a

Table 8 presents the corresponding results for out-of-state and related-industry deals. As in the out-of-state analysis, Panel A examines the relation between combined CAR and the acquirer's physical climate risk, while Panel B focuses on the stricter measure based on the risk difference between the acquirer and the target. The results in panel A, columns (1)-(8), indicate that the combined CAR increases when the acquirer's physical climate risk is higher. Specifically, column (1) indicates that exposure to a prior year's billion-dollar event is associated with a 1.9% increase in the three-day combined CAR, which is significant at the 5% level. From column (8), when the acquirer's damage from major events rises by one standard deviation, the 3-day combined CAR rises about 1%, and the result is significant at 5% level. Further, in panel B, the results indicate that when the risk gap between the acquirer and the target is higher, the combined CAR is also higher. All the results are statistically significant at the 10% level. Overall, the evidence suggests that investors favor out-of-state, related industry mergers and acquisitions (M&A) aimed at diversifying climate risk. This is consistent with our Hypothesis 4b.

6. Physical climate risk and bargaining power

In the previous sections, we show that combined CAR is highest when both the acquirer and the target have high physical climate risk. This pattern is also evident in the multivariate tests, in which we found a positive association between the risk difference and CAR. However, it was not statistically significant at conventional levels. In this section, we examine one potential mechanism driving these relationships. We argue that when the acquirer recognizes that the target has high physical climate risk, it perceives a bargaining advantage, which enables it to secure price concessions, pay a lower premium, and purchase at a discount. We test this mechanism using two

approaches: one involves analyzing the relationship between deal premiums and acquirer CAR, using the same empirical design as before; two, we also document the converse case - when the acquirer does not experience a significant disaster in the prior year, it tends to overlook the climate risk when engaging in M&As, and such neglect is penalized by investors.

To test the above proposition, we divide the sample into two groups: acquirers that experienced a billion-dollar event in the prior year and those that did not. Intuitively, firms exposed to a significant disaster are expected to be more sensitive to its consequences for firm value. Prior research documents short-term declines in value following such events (Huynh and Xia, 2023; Seetharam, 2017). Given this evidence, we argue that when a major disaster strikes a potential target, likely acquirers recognize an additional bargaining opportunity and seek pricing advantages. Indeed, according to Huynh and Xia (2023) and Seetharam (2017), the market marks down the target's value in the short term after a disaster. As such, the scope for price concessions should increase with the target's risk exposure, implying that deal premiums decrease as the target's (perceived or real) physical climate risk rises. However, if investors already factor in the disaster's impact on the target, they would anticipate that the acquirer will price and structure the deal accordingly, taking into account the target's physical climate risk. Consequently, the acquirer's CAR would not relate to the physical climate risk of the target in this group.

On the other hand, an acquirer that has not experienced a recent major disaster may underestimate the target's physical climate risk and misprice an M&A deal. To elaborate, if the acquirer fails to recognize the target's exposure to physical climate risk, it may not actively negotiate a lower offer price. Accordingly, if the deal premium does not reflect the target's risk, it would be lower than its "true" value, or higher relative to the target's disaster risk. If investors

recognize and penalize this neglect, the acquirer's CAR would decrease as the target's physical climate risk increases.

Table 9 exhibits the univariate and cross-sectional results for the deal premium PM4WK, measured as the percentage difference between the offer price and the target's closing stock price four weeks before the original announcement date. In Panel A, we report the mean deal premium for high-risk and low-risk target deals, separately by whether the acquirer experienced a major natural disaster in the prior year. We find that when the acquirer experienced physical climate risk in the prior year, the mean deal premium is significantly lower for high-risk target deals than for low-risk target deals. By contrast, when the acquirer was not hit by physical climate risk in the previous year, the difference between the two target-risk groups is not statistically significant. In Panel B, we regress the deal premium on the target's physical climate risk, estimating separate models for each scenario where the acquirer experienced a significant event in the prior year. In columns (1)-(2), where the acquirer faced a prior-year disaster, the deal premium falls as the target's physical climate risk increases. This is consistent with the view that an acquirer that recognizes the target's climate risk gains bargaining power and negotiates a lower offer price. In contrast, in columns (3)-(4), where the acquirer did not experience a prior-year disaster, the coefficient is positive, meaning premiums rise with the target's risk. This result suggests that acquirers without recent disaster experience overlook the risk factor and consequently pay higher premiums.

We now turn to the acquirer CAR tests to get additional evidence for our hypothesis. For this analysis, we split the sample by whether the acquirer experienced a prior-year major event and test whether the acquirer's CAR changes as the target's climate risk increases. Table 10 reports both univariate and multivariate results for the acquirer's CAR. Panel A restricts the sample to

acquirers that experienced a major natural disaster in the prior year. For this subsample, the acquirer's CAR does not differ significantly between deals involving the high-risk and low-risk target groups. Across all windows, acquirer CARs for the high-risk target group do not differ significantly from those for the low-risk target group, and the estimated differences are close to zero. The multivariate test confirms this pattern. In Panel C, we restrict the sample to deals in which the acquirers experienced prior physical climate risk, and regress the acquirers' CAR on the target's physical climate risk. In all models, the coefficient on target risk is economically small and statistically insignificant. This result is consistent with the notion that acquirers with climate-risk exposure recognize the impact of climate risk and incorporate it into target pricing. As a result, investors are indifferent to the target's climate risk level, and the acquirer's CAR does not differ across target-risk groups.

Next, we examine the subsample in which the acquirer did not experience a major natural disaster in the year preceding the acquisition. As shown in Panel B, acquirer CARs are more negative for high-risk targets than for low-risk targets. The difference ranges from 1.8% to 2.2% across specifications and attains statistical significance at the 10% level in the $(-2, +2)$ window under both the market model and the market-adjusted models. The results show that when the target's physical climate risk is higher, the acquirer's CAR is lower. Turning to Panel D, the regression models point to the same conclusion. In the subsample in which the acquirer experienced no prior-year natural disaster, acquirer CAR declines as the target's physical climate risk increases. The coefficient on the target's physical climate risk is negative in all four models and reaches 10% significance in the $(-2, +2)$ window. The univariate and multivariate tests indicate that acquirers with no prior-year climate risk exposure tend to overlook targets' climate risk. The market responds negatively to this propensity, and acquirer CAR declines with higher target risk.

Overall, these findings align with results from deal-premium tests, indicating that investors penalize acquirers who do not fully price in physical climate risk.

7. Risk diversification through M&A and Synergies

In this section, we examine whether climate-risk-diversifying M&As deliver substantive benefits to acquirers, specifically in terms of synergistic gains, including improvements in operating performance and reductions in physical climate risk. We define diversifying M&As as deals in which the acquirer uses M&A to reduce its physical climate risk exposure. Acquirers executing such deals form the treatment group, and all other firms in Your-economy Time Series (YTS) database serve as the control group in a difference-in-differences (DiD) framework. We hypothesize that, following a diversifying M&A, the acquirer's physical climate risk would decline relative to the pre-deal period. Further, by reducing business interruptions caused by disasters and avoiding additional capital expenditures to cover losses, such transactions would also improve operating cash flow.

$$Synergy_{i,t} = \alpha + \beta_1 Acquirer\ Dummy \times \Delta Phy_Climate_Risk_{i,j,t-1} + \beta_2 Firm\ Controls_{i,t-1} + Fixed\ Effects_t + \varepsilon_{i,j,t}$$

The primary independent variable in the above model, $Acquirer\ Dummy \times \Delta Phy_Climate_Risk_{i,j,t-1}$ is the interaction between the acquirer indicator and the risk difference between acquirers and targets. The risk difference between acquirers and targets is the same independent variable we defined in section 4.2. When firm i is an acquirer in year t and the physical climate risk difference between this firm and the target is 1, the interaction is 1. If firm i is an acquirer in year t and the physical climate risk difference between firm i and the target is -1, the interaction term is -1. Otherwise, the interaction is 0. In Table 11, panel A, we measure synergy as the change in the firm's operating cash flow. For each acquirer, we calculate the change in

operating performance in the first, second, and third fiscal years following the deal completion, compared to the fiscal year immediately preceding the deal. We scale these changes by the average total assets. The calculation of operating cash flow is detailed in the Appendix. The regression models include the same control variables as above, along with year and industry fixed effects. The results report DID estimates of post-deal operating cash flow. In each window, the operating cash flow difference indicates that diversifying M&A is associated with better operating performance, which is significant at the 1% level. Economically, acquirers undertaking such deals realize OCF improvements that are roughly 3.27% larger than those of other firms.

In Panel B, we construct firm-level physical climate risk following Huynh and Xia (2023). For each firm-year, we assign the county's property-damage estimate to each firm establishment and compute an employment-weighted average across establishments. This weighted average is the firm's risk for that year. For each deal, we then measure risk in years +1, +2, and +3 and compute the log change relative to the year preceding the deal. These Δ Damage measures serve as the dependent variables in a DiD design that compares treated acquirers (diversifying M&A) with control firms to test whether diversifying M&As reduces physical climate risk. The result shows that diversifying M&A reduces firm-level physical climate risk. The treatment coefficient is negative and statistically significant in all windows. Because the dependent variable is the log change in employment weighted county damage relative to the pre-deal year, these negative estimates indicate that treated acquirers experienced larger post-deal declines in risk compared to control firms, with the most significant reduction occurring three years after the deal. Overall, the results in Table 11 show that diversifying M&A deals help acquirers achieve operating performance improvements and reduced physical climate risk.

8. Robustness tests

In this section, we re-examine the likelihood test by using the company's headquarters location. Previously, we evaluated a company's physical climate risk based on the physical climate risk of the location of each company's establishment. Here, we focus solely on the physical climate risk of the county where the company's headquarters are located and use that value as an estimation of the company's physical climate risk. Table 12, Panel A, presents the relationship between a firm's likelihood of becoming an acquirer and its physical climate risk. The control variables and fixed effects are the same as those previously used. The results indicate that as a firm's physical climate risk increases, its likelihood of becoming an acquirer also increases. Moreover, all the results are statistically significant at the 1% level. In terms of economic magnitude, a firm exposed to physical climate risk is approximately 3% more likely to become an acquirer. All the findings align with the results presented earlier.

Panel B illustrates the relationship between the likelihood of two firms forming a merger pair and the gap in their physical climate risks. Consistent with the tests conducted earlier, we employ the same control variables and fixed effects. The results indicate that as the difference in physical climate risk between the two firms increases, their probability of forming a merger pair also rises, and all results remain statistically significant even after including all control variables. In Table 13, we run the likelihood test using year fixed effects and industry fixed effects instead of the deal fixed effects. The results still hold for both the acquirer likelihood test and the merger-pair likelihood test.

9. Conclusions

Climate risk is recognized as one of the most important problems for society in the 21st century [CITATIONS FOR THIS?]. Natural disasters, a crucial consequence for climate risk, are happening more often these days, bringing larger damage to individuals and firms. Even for

extreme and highly destructive billion-dollar events, approximately 55% of the counties have experienced more than ten such disasters over the past few decades. Prior studies, when discussing the relationship between firms and extreme natural disasters, have primarily focused on the changes that occur in companies after such events. For example, Brown, Gustafson, and Ivanov (2021) present that companies tend to reduce operating cash flow following winter weather events, and Ginglinger and Moreau (2023) show that companies decrease their leverage after major natural disasters. However, the literature has yet to examine whether firms have incentives to proactively diversify their physical climate risk through corporate mergers and acquisitions (M&As) and the resultant value implications of these decisions.

In this paper, we explore the proposition that firms engage in mergers and acquisitions as a strategic response to the business risks posed by mega natural disasters. Firms with higher exposure to severe natural disasters are significantly more likely to become acquirers. This finding suggests that acute physical climate risk catalyzes M&A activity, as vulnerable firms seek to reposition themselves through mergers and acquisitions. Additionally, companies facing high climate risk tend to acquire targets with substantially lower risk profiles. We find that the probability of two firms forming a merger pair increases as the disparity in their disaster risk grows, implying that acquirers actively seek out safer geographic areas or industries to mitigate future disaster-related losses. Correspondingly, acquirers with higher climate risk tend to pursue out-of-state deals in related industries to maximize the benefits of climate risk diversification.

Diversifying M&As create value and improve resilience. Investors react positively to diversification-motivated deals. In the years following the merger, treated acquirers also show enhanced operating performance and physical climate risk outcomes. We observe significantly larger post-deal improvements in operating cash flow and return on assets for acquirers that

diversified their risk via M&A. At the same time, these firms experience a measurable reduction in physical climate risk exposure relative to control firms. In sum, diversifying acquisitions not only protect against future disaster losses but also confer performance gains to the acquiring firms.

Overall, our findings establish mergers and acquisitions (M&A) as a crucial strategy for risk diversification in the face of escalating climate threats. By proactively rebalancing their geographic and operational risk exposure through acquisitions, companies can better shield themselves from the financial and operational fallout of extreme natural disasters.

Appendix A. Description of Main Variables

Variables	Descriptions	Definition
Firm-level control variables		
Firm Size	The natural logarithm of total assets	$\log(AT)$
Cash	Ratio of cash holdings to assets	CHE/AT
Market-to-book Ratio	Ratio of market assets to book assets	$(PRCC_F * CSHO) / CEQ$
R&D	Ratio of research and development expenses to assets. If R&D expenditure is missing, the value is set to zero.	XRD/AT
Leverage	Ratio of long-term debt plus short-term debt to total book assets	$(DLTT + DLC) / AT$
ROA	Ratio of operating income before depreciation to total book assets	$OIBDP/AT$
OCF	Ratio of operating cash flow to total book assets	$(SALE - COGS - XSGA - (ACT - CHE - LCT)) / AT$
Deal-level Variables		
Hostile	Indicator variable equals 1 if the deal attitude is hostile	
Relative Size	Ratio of target's market capital to acquirer's market capital	
All Cash Deal	Indicator variable equals 1 if the transaction is fully paid in cash	
Deal Value	The natural logarithm of the deal value	
PM4WK	Premium 4 Weeks Prior to Announcement Date: Premium of offer price to target closing stock price 4 weeks prior to the original announcement date, expressed as a percentage	$(\text{Offer price} - \text{target price 4 weeks before announcement date}) / (\text{target price 4 weeks before announcement date})$

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Figure 1. Frequency of Billion-Dollar Disaster Exposure Across Counties

This figure shows how many counties experienced a given number of billion-dollar events. The horizontal axis represents the number of events a county may experience, while the vertical axis represents the number of counties that experienced that corresponding number of events. For instance, the first bar indicates that 1,709 counties experienced more than 10 events between 1962 and 2021.

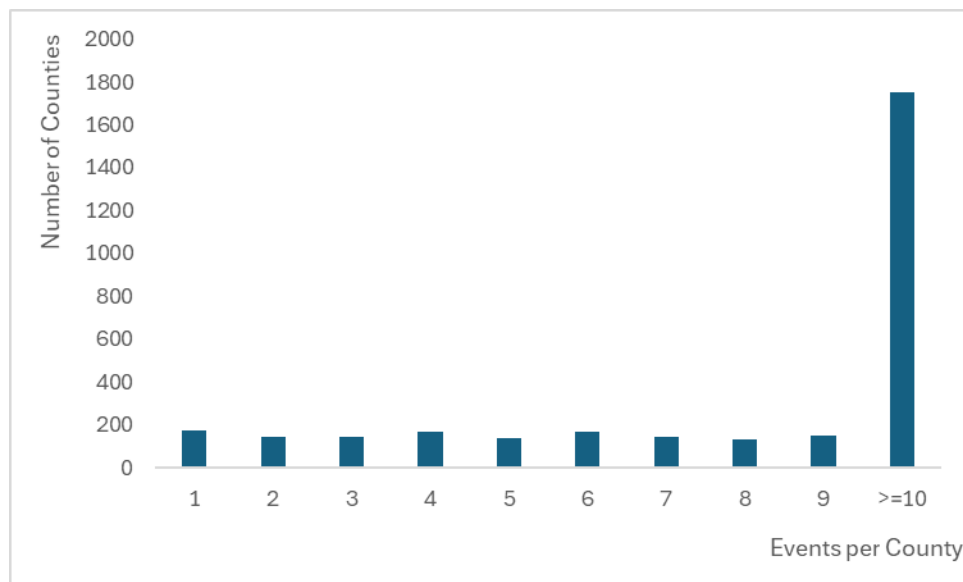


Figure 2. Number of Counties Experiencing Billion-Dollar Disasters

This figure shows how many counties experienced billion-dollar natural disaster events from 1960s to 2020s. The horizontal axis represents the decades, while the vertical axis represents the number of counties that experienced billion-dollar natural disaster events in that year.

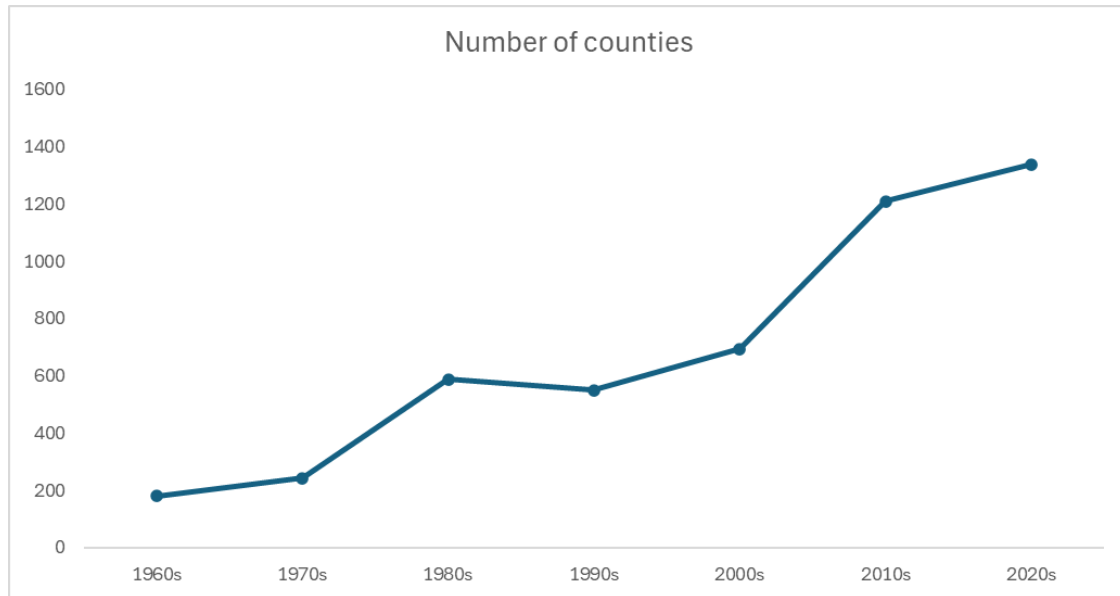


Table 1. Summary statistics

This table presents all the summary statistics of firm-level characteristics for the likelihood tests and deal-level characteristics for CAR tests. In panel A and B, matched firms are formed based on the same industry and similar firm size. Billion-Dollar Event is a indicator variable that equals 1 if a firm experienced a billion-dollar event in the previous year and is set to 0 if no billion-dollar natural disaster events in that year. Damage presents the weighted average (by employee count) of the natural logarithm of property damage from billion-dollar events that occurred at each establishment in the previous year. Firm-level characteristics include Firm Size, Cash, Market-to-book Ratio, R&D, Leverage, and ROA. Firm Size is the natural logarithm of the total assets; Cash is the ratio of cash and cash equivalents of the firms to the total assets; Market-to-book Ratio is the ratio of the market value to the book value; R&D is the ratio of R&D expenditure to the total assets of the firm; Leverage is the ratio of long-term debt plus short-term debt to total book assets; ROA is the ratio of operating income before depreciation to total book assets. In panel C, Hostile equals 1 if the deal attitude is hostile; Relative Size equals the ratio of target's market capital to acquirer's market capital; All Cash Deal equals 1 if the transaction is fully paid in cash; and Deal Value is the natural logarithm of the deal value. Here, we also show the cumulative abnormal return of acquirers, targets, and deals for three windows, (-1, +1), (-2, +2), and (-5, +5), calculated using market model and market adjusted model.

Panel A: Acquirer likelihood test variables									
Acquirer	N	Mean	Std. Dev	Median	Matched firms	N	Mean	Std. Dev	Median
Physical climate risk					Physical climate risk				
Billion-dollar event	14,821	0.503	0.500	1.000	Billion-dollar event	46,818	0.371	0.483	0.000
Damage (Max)	14,821	9.692	9.716	16.213	Damage (Max)	46,818	6.474	9.031	0.000
Firm-level characteristics					Firm-level characteristics				
Firm Size	14,821	7.448	2.539	7.390	Firm Size	46,818	6.434	2.126	6.501
Cash	14,821	0.163	0.194	0.083	Cash	46,807	0.194	0.227	0.093
Market-to-book Ratio	14,529	3.658	4.819	2.419	Market-to-book Ratio	41,850	3.162	5.004	1.967
R&D	14,821	0.033	0.072	0.000	R&D	46,818	0.045	0.092	0.000
Leverage	14,767	0.216	0.193	0.180	Leverage	46,627	0.224	0.233	0.158
ROA	14,734	0.079	0.164	0.098	ROA	46,181	0.055	0.195	0.085
Panel B: Merger-pair likelihood test variables									
True Merger-pair									
Acquirer	N	Mean	Std. Dev	Median	Matched Acquirer	N	Mean	Std. Dev	Median
Physical climate risk					Physical climate risk				
Billion-dollar event	1,271	0.513	0.500	1.000	Billion-dollar event	8,698	0.473	0.499	0.000

Damage (Max)	1,271	9.901	9.742	16.368	Damage (Max)	8,602	8.931	9.633	0.000
Firm-level characteristics					Firm-level characteristics				
Firm Size	1,271	8.435	2.133	8.445	Firm Size	8,698	7.955	2.105	7.929
Cash	1,271	0.126	0.166	0.053	Cash	8,698	0.139	0.181	0.058
Market-to-book Ratio	1,259	3.292	3.926	2.253	Market-to-book Ratio	8,306	3.118	3.945	2.092
R&D	1,271	0.025	0.057	0.000	R&D	8,698	0.028	0.061	0.000
Leverage	1,268	0.219	0.172	0.192	Leverage	8,673	0.221	0.190	0.181
ROA	1,265	0.085	0.118	0.079	ROA	8,648	0.080	0.124	0.078
Target					Matched Target				
Physical climate risk					Physical climate risk				
Billion-dollar event	1,271	0.267	0.442	0.000	Billion-dollar event	8,698	0.264	0.441	0.000
Damage (Max)	1,271	5.033	8.399	0.000	Damage (Max)	8,556	4.720	8.196	0.000
Firm-level characteristics					Firm-level characteristics				
Firm Size	1,271	6.264	1.916	6.264	Firm Size	8,698	6.043	1.862	6.133
Cash	1,269	0.173	0.223	0.064	Cash	8,693	0.178	0.224	0.070
Market-to-book Ratio	1,259	2.420	4.272	1.698	Market-to-book Ratio	8,147	2.626	4.666	1.677
R&D	1,271	0.046	0.102	0.000	R&D	8,698	0.046	0.101	0.000
Leverage	1,268	0.200	0.203	0.144	Leverage	8,677	0.198	0.211	0.132
ROA	1,267	0.028	0.194	0.033	ROA	8,660	0.026	0.200	0.034

Panel C: Deal-level Characteristics							
Variable	N	Mean	Std. Dev	p25	p50	p75	
Hostile	1,259	0.006	0.074	0.000	0.000	0.000	0.000
Relative Size	1,258	0.260	0.326	0.033	0.129	0.366	
All Cash Deal	1,259	0.301	0.459	0.000	0.000	1.000	
Deal Value	1,254	6.000	1.891	4.592	5.782	7.311	
Deal Premium (4 week)	1,201	42.04%	41.95%	18.61%	33.25%	53.96%	
Market Model (acq)							
(-1, +1)	1,252	-1.19%	7.62%	-4.32%	-0.85%	1.83%	
(-2, +2)	1,252	-1.12%	8.25%	-4.64%	-0.93%	2.43%	
Market Adjusted Model (acq)							

(-1, +1)	1,252	-1.06%	7.59%	-4.27%	-0.72%	1.80%
(-2, +2)	1,252	-0.91%	8.26%	-4.36%	-0.90%	2.59%
Market Model (tgt)						
(-1, +1)	1,256	24.81%	28.33%	8.05%	19.04%	34.74%
(-2, +2)	1,256	25.53%	28.56%	8.01%	20.08%	35.11%
Market Adjusted Model (tgt)						
(-1, +1)	1,256	24.80%	28.31%	8.08%	19.38%	34.78%
(-2, +2)	1,256	25.55%	28.49%	8.22%	20.44%	35.99%
Market Model (Combined)						
(-1, +1)	1,248	1.82%	6.66%	-1.75%	0.89%	4.85%
(-2, +2)	1,248	2.00%	7.32%	-2.05%	1.03%	5.26%
Market Adjusted Model (Combined)						
(-1, +1)	1,248	1.94%	6.64%	-1.60%	1.04%	5.00%
(-2, +2)	1,248	2.16%	7.32%	-1.84%	1.19%	5.35%

Table 2. Acquirer likelihood test following billion-dollar events

$$M\&A\ Firm_{i,t} = \alpha + \beta_1 Phy_Climate_Risk_{i,t-1} + \beta_2 Firm\ Controls_{i,t-1} + Fixed\ Effects_t + \varepsilon_{i,t}$$

This table shows the impact of physical climate risk on the likelihood of firms becoming acquirers. The dependent variable is the acquirer indicator variable equals 1 when this firm is a true acquirer firm in year t, and 0 if this firm is a matched firm. Two different variables are used for independent variable *Phy_Climate_Risk_{i,t-1}*. In column (1)-(4), *Phy_Climate_Risk_{i,t-1}* is Billion-Dollar Event which is a indicator variable that equals 1 if a firm experienced a billion-dollar event in year (t-1) and is set to 0 if no billion-dollar natural disaster events in that year. In column (5)-(8), *Phy_Climate_Risk_{i,t-1}* is Damage which presents the weighted average (by employee count) of the natural logarithm of property damage from billion-dollar events that occurred at each establishment in year (t-1). Firm control variables include Firm Size, Cash, Market-to-book Ratio, R&D, Leverage, and ROA. Firm Size is the natural logarithm of the total assets; Cash is the ratio of cash and cash equivalents of the firms to the total assets; Market-to-book Ratio is the ratio of the market value to the book value; R&D is the ratio of R&D expenditure to the total assets of the firm; Leverage is the ratio of long-term debt plus short-term debt to total book assets; ROA is the ratio of operating income before depreciation to total book assets. Column (1), (2), (5), and (6) show the prediction from conditional logit models, and column (3), (4), (7), and (8) show the prediction from the linear models. We control deal fixed effects in all the tests. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Dependent Variable:	Acquirer Indicator							
	(1) Conditional Logit	(2) Conditional Logit	(3) OLS	(4) OLS	(5) Conditional Logit	(6) Conditional Logit	(7) OLS	(8) OLS
Billion-Dollar Event	0.316*** (12.81)	0.240*** (8.749)	0.0627*** (12.74)	0.0471*** (8.706)				
Damage					0.0279*** (20.86)	0.0190*** (12.85)	0.00562*** (20.86)	0.00384*** (13.08)
Firm Size		2.073*** (53.13)		0.417*** (56.57)		2.061*** (52.68)		0.414*** (56.03)
Cash		-0.351*** (-4.458)		-0.0644*** (-4.631)		-0.324*** (-4.110)		-0.0595*** (-4.276)
Market-to-book Ratio		0.0227*** (9.632)		0.00444*** (9.495)		0.0226*** (9.592)		0.00444*** (9.493)
R&D		-0.628*** (-2.905)		-0.0884** (-2.477)		-0.613*** (-2.833)		-0.0854** (-2.394)

Leverage		-0.663***		-0.115***		-0.649***		-0.112***
		(-9.343)		(-9.279)		(-9.137)		(-9.063)
ROA		0.172*		0.0263		0.160*		0.0244
		(1.778)		(1.577)		(1.657)		(1.467)
Deal FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	59,045	51,515	61,639	55,549	59,045	51,515	61,639	55,549
R-squared	0.004	0.078	0.003	0.062	0.012	0.081	0.009	0.064

Table 3: Merger-pair likelihood test with physical climate risk difference

$$Merger\ pair_{i,j,t} = \alpha + \beta_1 \Delta Phy_Climate_Risk_{i,j,t-1} + \beta_2 Firm\ Controls_{i,j,t-1} + Fixed\ Effects_t + \varepsilon_{i,j,t}$$

This table shows the impact of physical climate risk difference between two firms on the likelihood of these firms becoming merger pairs. *Merger pair*_{*i,j,t*} is an indicator variable which equals 1 when firm *i* and firm *j* is a true merger pair at time *t*, 0 if firm *i* and firm *j* is a matched pseudo merger pair based on industry and firm size. I use two measures for the main independent variable $\Delta Phy_Climate_Risk_{i,j,t-1}$. (1) *Event_diff* is a categorical variable that is set to 1 if acquirer firm experiences a billion-dollar event in year (*t*-1) but the target firm does not; -1 if target firm experiences a billion-dollar event but acquirer firm does not; 0 otherwise. (2) *Damage_gap* is the gap between the physical climate risk of acquirer and target, measuring with damage. The firm control variables include Firm Size, Cash, Market-to-book Ratio, R&D, Leverage, and ROA. Firm Size is the natural logarithm of the total assets; Cash is the ratio of cash and cash equivalents of the firms to the total assets; Market-to-book Ratio is the ratio of the market value to the book value; R&D is the ratio of R&D expenditure to the total assets of the firm; Leverage is the ratio of long-term debt plus short-term debt to total book assets; ROA is the ratio of operating income before depreciation to total book assets. Column (1), (2), (5), and (6) show the prediction from conditional logit models, and column (3), (4), (7), and (8) show the prediction from the linear models. We control deal fixed effects in all the tests. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Dependent Variable:								
	Merger Pair Dummy							
	(1) Conditional Logit	(2) Conditional Logit	(3) OLS	(4) OLS	(5) Conditional Logit	(6) Conditional Logit	(7) OLS	(8) OLS
Event_diff	0.117*** (2.736)	0.101** (2.028)	0.0133*** (2.750)	0.0119** (2.075)				
Damage_gap					0.00546** (2.313)	0.00449* (1.679)	0.000632** (2.324)	0.000532* (1.705)
Firm Size (acq)		2.201*** (17.95)		0.231*** (22.11)		2.190*** (17.77)		0.232*** (21.89)
Cash (acq)		-0.184 (-0.715)		-0.0137 (-0.574)		-0.201 (-0.778)		-0.0148 (-0.614)
Market-to-book Ratio (acq)		0.0134* (1.708)		0.00141* (1.730)		0.0140* (1.786)		0.00148* (1.799)
R&D (acq)		1.627** (2.073)		0.153** (2.053)		1.538* (1.943)		0.145* (1.925)

Leverage (acq)		-0.0834		-0.00396		-0.106		-0.00610
		(-0.410)		(-0.200)		(-0.519)		(-0.304)
ROA (acq)		0.101		0.00398		0.0966		0.00362
		(0.285)		(0.118)		(0.272)		(0.106)
Firm Size (tgt)		0.487***		0.0701***		0.472***		0.0682***
		(4.874)		(4.840)		(4.620)		(4.582)
Cash (tgt)		-0.0846		-0.0113		-0.103		-0.0136
		(-0.423)		(-0.438)		(-0.515)		(-0.518)
Market-to-book Ratio (tgt)		-0.0196***		-0.00243***		-0.0199***		-0.00251***
		(-2.645)		(-2.894)		(-2.633)		(-2.884)
R&D (tgt)		1.951***		0.243***		1.939***		0.245***
		(3.672)		(3.618)		(3.652)		(3.599)
Leverage (tgt)		0.0389		0.00630		0.0359		0.00588
		(0.222)		(0.267)		(0.204)		(0.245)
ROA (tgt)		-0.129		-0.0173		-0.139		-0.0180
		(-0.550)		(-0.582)		(-0.591)		(-0.591)
Deal FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,902	8,755	9,969	8,915	9,661	8,638	9,731	8,801
R-squared	0.001	0.033	0.000	0.017	0.001	0.032	0.000	0.017

Table 4: Determinants of Out-of-State and Out-of-State Related Industry Acquisition Likelihood

$$Special\ deal_{i,j,t} = \alpha + \beta_1 Phy_Climate_Risk_{i,t-1} + \beta_2 Firm\ Controls_{i,j,t-1} + Fixed\ Effects_t + \varepsilon_{i,j,t}$$

This table shows the impact of physical climate risk of acquirers on the likelihood of these firms doing out-of-state or out-of-state related industry acquisitions. In panel A, *Special deal*_{*i,j,t*} is a dummy variable which equals 1 when acquirer *i* purchases target *j* headquartered in a different state in year *t*, and 0 otherwise. In panel B, *Special deal*_{*i,j,t*} equals 1 if the target is headquartered in a different state from the acquirer and both firms share the same two-digit SIC code, and 0 otherwise. *Phy_Climate_Risk*_{*i,t-1*} is the physical climate risk for the acquirer in the year prior to the M&A announcement date. The firm control variables include Firm Size, Cash, Market-to-book Ratio, R&D, Leverage, and ROA. Firm Size is the natural logarithm of the total assets; Cash is the ratio of cash and cash equivalents of the firms to the total assets; Market-to-book Ratio is the ratio of the market value to the book value; R&D is the ratio of R&D expenditure to the total assets of the firm; Leverage is the ratio of long-term debt plus short-term debt to total book assets; ROA is the ratio of operating income before depreciation to total book assets. Column (1), and (3) show the prediction from conditional logit models, and column (2), and (4) show the prediction from the linear models. We control deal fixed effects in all the tests. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Out-of-state deal likelihood				
Dependent Variable:	Out-of-state Deal Dummy			
	(1)	(2)	(3)	(4)
	Logit	OLS	Logit	OLS
Billion-Dollar Event (acq)	0.477*** (3.123)	0.0836** (2.612)		
Damage (acq)			0.0256*** (2.971)	0.00436** (2.388)
Firm Size (acq)	0.304** (2.355)	0.0445* (1.857)	0.299** (2.382)	0.0439* (1.884)
Cash (acq)	0.333 (0.442)	0.0475 (0.332)	0.326 (0.432)	0.0453 (0.318)
Market-to-book Ratio (acq)	0.00926 (0.545)	0.00149 (0.570)	0.00933 (0.549)	0.00147 (0.564)
R&D (acq)	-5.228** (-2.111)	-0.979** (-2.069)	-5.194** (-2.110)	-0.976** (-2.068)
Leverage (acq)	0.852 (1.136)	0.123 (1.117)	0.850 (1.140)	0.122 (1.115)
ROA (acq)	-1.347 (-1.575)	-0.177 (-1.361)	-1.327 (-1.554)	-0.174 (-1.336)
Firm Size (tgt)	-0.288*** (-5.130)	-0.0405*** (-4.094)	-0.287*** (-5.171)	-0.0403*** (-4.055)
Cash (tgt)	-0.753 (-1.024)	-0.0681 (-0.534)	-0.748 (-1.015)	-0.0659 (-0.514)
Market-to-book Ratio (tgt)	-0.00717 (-0.421)	-0.00223 (-0.940)	-0.00726 (-0.424)	-0.00224 (-0.942)
R&D (tgt)	-0.165 (-0.133)	-0.0158 (-0.0930)	-0.158 (-0.127)	-0.0141 (-0.0818)
Leverage (tgt)	0.667* (1.767)	0.108* (1.975)	0.657* (1.738)	0.106* (1.938)

ROA (tgt)	1.174**	0.156**	1.168**	0.156**
	(2.407)	(2.337)	(2.383)	(2.314)
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	1,060	1,234	1,060	1,234
R-squared	0.185	0.252	0.185	0.252

Panel B: Out-of-state and related industry deal likelihood

Dependent Variable:	Out-of-state and Related Industry Deal Dummy			
	(1)	(2)	(3)	(4)
	Logit	OLS	Logit	OLS
Billion-Dollar Event (acq)	0.348***	0.0675**		
	(2.728)	(2.026)		
Damage (acq)			0.0204***	0.00388**
			(2.949)	(2.166)
Firm Size (acq)	0.0706	0.0133	0.0629	0.0120
	(0.496)	(0.464)	(0.446)	(0.426)
Cash (acq)	-0.274	-0.0661	-0.280	-0.0671
	(-0.407)	(-0.439)	(-0.420)	(-0.449)
Market-to-book Ratio (acq)	-0.0158	-0.00208	-0.0163	-0.00212
	(-1.301)	(-0.847)	(-1.335)	(-0.870)
R&D (acq)	-0.649	-0.0783	-0.656	-0.0790
	(-0.366)	(-0.205)	(-0.371)	(-0.208)
Leverage (acq)	0.445	0.0734	0.451	0.0742
	(0.673)	(0.550)	(0.684)	(0.558)
ROA (acq)	0.763	0.174	0.766	0.175
	(0.975)	(1.073)	(0.974)	(1.078)
Firm Size (tgt)	-0.0559	-0.00712	-0.0551	-0.00695
	(-0.922)	(-0.639)	(-0.909)	(-0.625)
Cash (tgt)	-0.832*	-0.168	-0.822*	-0.166
	(-1.901)	(-1.632)	(-1.855)	(-1.596)
Market-to-book Ratio (tgt)	0.00496	0.000415	0.00503	0.000430
	(0.343)	(0.150)	(0.347)	(0.155)
R&D (tgt)	-0.844	-0.172	-0.815	-0.168
	(-0.893)	(-1.055)	(-0.860)	(-1.029)
Leverage (tgt)	-0.120	-0.00999	-0.126	-0.0110
	(-0.311)	(-0.136)	(-0.324)	(-0.149)
ROA (tgt)	-0.254	-0.0737	-0.255	-0.0739
	(-0.572)	(-0.827)	(-0.572)	(-0.830)
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	1,107	1,234	1,107	1,234
R-squared	0.131	0.236	0.131	0.236

Table 5. Combined cumulative abnormal returns for sub-sample of mergers and acquisitions

We construct cumulative abnormal returns around each of these dates using both the market returns model and the market adjusted model. The value-weighted market return from CRSP is estimated over the days -46 to -255. To find the group level CAR, the combined returns from the two firms in one deal are aggregated on an value-weighting basis. Panel A presents the univariate results of CAR for deals with different risk level acquirers and targets. Panel B present the univariate results of CAR for deals with high-risk acquirers and low-risk acquirers, using the market model and market adjusted model. Panel C and D present the univariate results of CAR for deals with high-risk acquirers and low-risk acquirers in out-of-state deals and out-of-state related industry deals respectively. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Announcement period combined abnormal return using market model and market adjusted model								
	High Risk Acquirer & Low Risk Target		High Risk Acquirer & High Risk Target		Low Risk Acquirer & Low Risk Target		Low Risk Acquirer & High Risk Target	
	N	Mean % (t-statistic)	N	Mean % (t-statistic)	N	Mean % (t-statistic)	N	Mean % (t-statistic)
MM CAR (-1, +1)	371	1.59%*** (5.42)	270	2.59%*** (6.13)	539	1.6%*** (5.30)	68	1.71%* (1.86)
MM CAR (-2, +2)	371	1.79%*** (5.51)	270	2.64%*** (5.76)	539	1.85%*** (5.47)	68	1.82%* (1.95)
MAR CAR (-1, +1)	371	1.65%*** (5.60)	270	2.56%*** (6.16)	539	1.83%*** (6.06)	68	1.86%** (2.00)
MAR CAR (-2, +2)	371	1.84%*** (5.72)	270	2.67%*** (5.97)	539	2.14%*** (6.27)	68	1.96%** (2.04)

Panel B: Announcement period combined abnormal return using market model and market adjusted model					
	High Risk Acquirer		Low Risk Acquirer		
	N	Mean % (t-statistic)	N	Mean % (t-statistic)	Difference (t-statistic)
MM CAR (-1, +1)	641	2.01%*** (8.16)	607	1.62%*** (5.62)	0.40% (1.05)
MM CAR (-2, +2)	641	2.15%*** (7.97)	607	1.84%*** (5.82)	0.30% (0.74)
MAR CAR (-1, +1)	641	2.03%*** (8.30)	607	1.83%*** (6.38)	0.20% (0.52)

MAR CAR (-2, +2)	641	2.19%*** (8.26)	607	2.21%*** (6.60)	0.07% (0.16)
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Panel C: Out-of-state deals' CAR using market model and market adjusted model

	High Risk Acquirer		Low Risk Acquirer		
	N	Mean % (t-statistic)	N	Mean % (t-statistic)	Difference (t-statistic)
MM CAR (-1, +1)	503	2.11%*** (7.48)	358	1.34%*** (3.59)	0.76%* (1.66)
MM CAR (-2, +2)	503	2.20%*** (7.15)	358	1.50%*** (3.64)	0.70% (1.39)
MAR CAR (-1, +1)	503	2.13%*** (7.65)	358	1.56%*** (4.20)	0.58% (1.27)
MAR CAR (-2, +2)	503	2.24%*** (7.51)	358	1.83%*** (4.41)	0.41% (0.82)

Panel D: Out-of-state and related industry deals' CAR using market model and market adjusted model

	High Risk Acquirer		Low Risk Acquirer		
	N	Mean % (t-statistic)	N	Mean % (t-statistic)	Difference (t-statistic)
MM CAR (-1, +1)	323	2.38%*** (6.26)	272	1.22%*** (3.00)	1.16%** (2.09)
MM CAR (-2, +2)	323	2.50%*** (6.13)	272	1.26%*** (2.75)	1.24%** (2.02)
MAR CAR (-1, +1)	323	2.37%*** (6.33)	272	1.42%*** (3.55)	0.96%* (1.74)
MAR CAR (-2, +2)	323	2.48%*** (6.30)	272	1.62%*** (3.53)	0.86% (1.43)

Table 6. Wealth Effects of Merger and Acquisitions

$$CAR_{i,t} = \alpha + \beta_1 phy_climate_Risk_{i,j,t-1} + \beta_2 FirmControl_{i,t-1} + \beta_3 Deal\ Character_{m,t-1} + Fixed\ Effects_t + \varepsilon_{im,t}$$

This table presents the regression of initial announcement returns over (-1, +1), and (-2, +2) windows against the acquirer's physical climate risk in Panel A, and the physical climate risk difference between acquirer and target firms in Panel B. In Panel A, the main independent variable Billion-Dollar Event (acq) is a dummy variable that equals 1 if the acquirer experienced a billion-dollar event in year (t-1) and is set to 0 if no billion-dollar natural disaster events in that year. In Panel B, the main independent variable Event_diff is a categorical variable that is set to 1 if acquirer firm experiences a billion-dollar event in year (t-1) but the target firm does not; -1 if target firm experiences a billion-dollar event but acquirer firm does not; 0 otherwise. Hostile equals 1 if the deal attitude is hostile; Relative Size equals the ratio of target's market capital to acquirer's market capital; All Cash Deal equals 1 if the transaction is fully paid in cash; and Deal Value is the natural logarithm of the deal value. For all the regressions, acquirer and target control variables are included. Industry fixed effects and year fixed effects are included. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Multivariate test with acquirer's physical climate risk								
	Market Model		Market Adjusted Model		Market Model		Market Adjusted Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)
Billion-Dollar Event (acq)	0.00954*	0.00924	0.00936*	0.00817				
	(1.830)	(1.604)	(1.844)	(1.440)				
Damage (acq)					0.000443*	0.000403	0.000430*	0.000339
					(1.737)	(1.488)	(1.725)	(1.249)
Hostile	0.0136	0.0117	0.0158	0.0175	0.0139	0.0121	0.0161	0.0179
	(0.452)	(0.322)	(0.562)	(0.504)	(0.461)	(0.332)	(0.573)	(0.514)
Relative Size	0.0223*	0.0165	0.0199	0.0122	0.0221*	0.0164	0.0197	0.0120
	(1.769)	(1.073)	(1.491)	(0.734)	(1.749)	(1.057)	(1.473)	(0.720)
All Cash Deal	0.0298***	0.0213***	0.0287***	0.0205***	0.0298***	0.0213***	0.0287***	0.0206***
	(6.581)	(4.422)	(5.583)	(4.186)	(6.556)	(4.429)	(5.566)	(4.196)
Deal Value	0.00198	0.00310	0.00357	0.00565	0.00199	0.00311	0.00358	0.00565
	(0.501)	(0.753)	(0.855)	(1.293)	(0.500)	(0.750)	(0.853)	(1.288)
Acquirer Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Target Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES

Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,228	1,228	1,228	1,228	1,228	1,228	1,228	1,228
R-squared	0.221	0.188	0.221	0.193	0.221	0.187	0.220	0.192

Panel B: Multivariate test with physical climate risk difference								
	Market Model		Market Adjusted Model		Market Model		Market Adjusted Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)
Event_diff	0.00572 (1.566)	0.00621 (1.585)	0.00588* (1.724)	0.00575 (1.477)				
Damage_gap					0.000285 (1.488)	0.000294 (1.429)	0.000293 (1.636)	0.000266 (1.301)
Hostile	0.0147 (0.489)	0.0125 (0.340)	0.0167 (0.601)	0.0181 (0.519)	0.0146 (0.487)	0.0125 (0.341)	0.0167 (0.600)	0.0182 (0.519)
Relative Size	0.0219* (1.728)	0.0161 (1.042)	0.0194 (1.455)	0.0118 (0.710)	0.0219* (1.725)	0.0161 (1.039)	0.0194 (1.452)	0.0118 (0.708)
All Cash Deal	0.0301*** (6.731)	0.0215*** (4.512)	0.0290*** (5.681)	0.0207*** (4.268)	0.0300*** (6.724)	0.0215*** (4.508)	0.0290*** (5.678)	0.0207*** (4.266)
Deal Value	0.00214 (0.540)	0.00329 (0.797)	0.00374 (0.895)	0.00582 (1.335)	0.00213 (0.538)	0.00327 (0.792)	0.00374 (0.894)	0.00580 (1.330)
Acquirer Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Target Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,228	1,228	1,228	1,228	1,228	1,228	1,228	1,228
R-squared	0.220	0.187	0.220	0.193	0.220	0.187	0.220	0.192

Table 7. Wealth Effects of Out-of-State M&A

$$CAR_{i,t} = \alpha + \beta_1 phy_cliamte_Risk_{i,j,t-1} + \beta_2 FirmControl_{i,t-1} + \beta_3 Deal\ Character_{m,t-1} + Fixed\ Effects_t + \varepsilon_{im,t}$$

This table presents the regression of initial announcement returns over (-1, +1), and (-2, +2) windows against the acquirer's physical climate risk for out-of-state deals in Panel A, and the physical climate risk difference between acquirer and target firms for out-of-state deals in Panel B. In Panel A, the main independent variable Billion-Dollar Event (acq) is a dummy variable that equals 1 if the acquirer experienced a billion-dollar event in year (t-1) and is set to 0 if no billion-dollar natural disaster events in that year. In Panel B, the main independent variable Event_diff is a categorical variable that is set to 1 if acquirer firm experiences a billion-dollar event in year (t-1) but the target firm does not; -1 if target firm experiences a billion-dollar event but acquirer firm does not; 0 otherwise. Hostile equals 1 if the deal attitude is hostile; Relative Size equals the ratio of target's market capital to acquirer's market capital; All Cash Deal equals 1 if the transaction is fully paid in cash; and Deal Value is the natural logarithm of the deal value. For all the regressions, acquirer and target control variables are included. Industry fixed effects and year fixed effects are included. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Out-of-state deals' combined CAR with acquirer's physical climate risk								
	Market Model		Market Adjusted Model		Market Model		Market Adjusted Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)
Billion-Dollar Event (acq)	0.0146*** (2.874)	0.0123** (2.514)	0.0145*** (2.923)	0.0113** (2.353)				
Damage (acq)					0.000687** (2.479)	0.000531** (2.092)	0.000673** (2.478)	0.000467* (1.891)
Hostile	0.0226 (0.614)	0.00573 (0.123)	0.0257 (0.747)	0.00883 (0.200)	0.0227 (0.613)	0.00588 (0.126)	0.0258 (0.748)	0.00902 (0.204)
Relative Size	0.0132 (0.810)	0.0144 (0.778)	0.0111 (0.701)	0.00885 (0.481)	0.0130 (0.792)	0.0142 (0.765)	0.0109 (0.683)	0.00868 (0.469)
All Cash Deal	0.0266*** (5.183)	0.0192*** (3.766)	0.0264*** (5.411)	0.0194*** (3.992)	0.0266*** (5.159)	0.0193*** (3.734)	0.0264*** (5.384)	0.0195*** (3.952)
Deal Value	0.00145 (0.445)	0.00226 (0.693)	0.00254 (0.754)	0.00437 (1.196)	0.00147 (0.446)	0.00225 (0.685)	0.00256 (0.751)	0.00435 (1.184)
Acquirer Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Target Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Observations	851	851	851	851	851	851	851	851
R-squared	0.271	0.234	0.273	0.242	0.270	0.233	0.272	0.241

Panel B: Out-of-state deals' combined CAR with physical climate risk difference

	Market Model		Market Adjusted Model		Market Model		Market Adjusted Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)
Event_diff	0.00531*	0.00612*	0.00499*	0.00563				
	(1.764)	(1.690)	(1.759)	(1.599)				
Damage_gap					0.000251	0.000276	0.000232	0.000244
					(1.527)	(1.451)	(1.484)	(1.342)
Hostile	0.0234	0.00610	0.0265	0.00917	0.0234	0.00608	0.0265	0.00919
	(0.629)	(0.130)	(0.764)	(0.206)	(0.625)	(0.129)	(0.761)	(0.206)
Relative Size	0.0128	0.0141	0.0108	0.00856	0.0128	0.0141	0.0108	0.00858
	(0.776)	(0.757)	(0.668)	(0.463)	(0.776)	(0.757)	(0.668)	(0.463)
All Cash Deal	0.0269***	0.0196***	0.0267***	0.0198***	0.0269***	0.0196***	0.0267***	0.0197***
	(5.162)	(3.709)	(5.388)	(3.959)	(5.148)	(3.690)	(5.377)	(3.930)
Deal Value	0.00151	0.00240	0.00258	0.00450	0.00148	0.00236	0.00255	0.00444
	(0.454)	(0.730)	(0.755)	(1.230)	(0.445)	(0.717)	(0.745)	(1.216)
Acquirer Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Target Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	851	851	851	851	851	851	851	851
R-squared	0.267	0.232	0.268	0.240	0.267	0.232	0.268	0.240

Table 8. Determinants of announcement-period abnormal returns of mergers and acquisition

$$CAR_{i,t} = \alpha + \beta_1 phy_cliamte_Risk_{i,j,t-1} + \beta_2 FirmControl_{i,t-1} + \beta_3 Deal\ Character_{m,t-1} + Fixed\ Effects_t + \varepsilon_{im,t}$$

This table presents the regression of initial announcement returns over (-1, +1), and (-2, +2) windows against the acquirer's physical climate risk for out-of-state and related industry deals in Panel A, and the physical climate risk difference between acquirer and target firms for out-of-state and related industry deals in Panel B. In Panel A, the main independent variable Billion-Dollar Event (acq) is a dummy variable that equals 1 if the acquirer experienced a billion-dollar event in year (t-1) and is set to 0 if no billion-dollar natural disaster events in that year. In Panel B, the main independent variable Event_diff is a categorical variable that is set to 1 if acquirer firm experiences a billion-dollar event in year (t-1) but the target firm does not; -1 if target firm experiences a billion-dollar event but acquirer firm does not; 0 otherwise. Hostile equals 1 if the deal attitude is hostile; Relative Size equals the ratio of target's market capital to acquirer's market capital; All Cash Deal equals 1 if the transaction is fully paid in cash; and Deal Value is the natural logarithm of the deal value. For all the regressions, acquirer and target control variables are included. Industry fixed effects and year fixed effects are included. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Out-of-state and related industry deals' combined CAR with acquirer's physical climate risk difference								
	Market Model		Market Adjusted Model		Market Model		Market Adjusted Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)
Billion-Dollar Event (acq)	0.0189** (2.318)	0.0157* (1.933)	0.0190** (2.362)	0.0147* (1.870)				
Damage (acq)					0.000936** (2.136)	0.000753* (1.703)	0.000928** (2.161)	0.000685 (1.624)
Hostile	0.0125 (0.365)	-0.00239 (-0.0554)	0.0163 (0.504)	-0.000323 (-0.00770)	0.0123 (0.358)	-0.00262 (-0.0607)	0.0160 (0.496)	-0.000547 (-0.0130)
Relative Size	0.00377 (0.212)	0.00490 (0.245)	0.00404 (0.234)	0.00126 (0.0642)	0.00352 (0.196)	0.00469 (0.233)	0.00379 (0.218)	0.00107 (0.0541)
All Cash Deal	0.0252*** (3.903)	0.0236*** (3.929)	0.0253*** (4.019)	0.0243*** (4.081)	0.0253*** (3.907)	0.0237*** (3.929)	0.0254*** (4.019)	0.0244*** (4.077)
Deal Value	-0.000366 (-0.0806)	0.000574 (0.134)	0.000961 (0.215)	0.00263 (0.588)	-0.000278 (-0.0608)	0.000638 (0.149)	0.00104 (0.232)	0.00268 (0.597)
Acquirer Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Target Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES

Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	589	589	589	589	589	589	589	589
R-squared	0.257	0.224	0.263	0.233	0.256	0.223	0.261	0.231

Panel B: Out-of-state and related industry deals' combined CAR with physical climate risk difference

	Market Model		Market Adjusted Model		Market Model		Market Adjusted Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)
Event_diff	0.00863*	0.00898*	0.00865*	0.00865*				
	(1.983)	(1.944)	(1.959)	(1.801)				
Damage_gap					0.000421*	0.000438*	0.000415*	0.000412
					(1.778)	(1.738)	(1.729)	(1.598)
Hostile	0.0130	-0.00180	0.0168	0.000262	0.0126	-0.00225	0.0163	-0.000188
	(0.379)	(-0.0416)	(0.518)	(0.00623)	(0.365)	(-0.0520)	(0.503)	(-0.00446)
Relative Size	0.00355	0.00471	0.00382	0.00108	0.00361	0.00478	0.00388	0.00115
	(0.195)	(0.233)	(0.215)	(0.0545)	(0.198)	(0.235)	(0.218)	(0.0577)
All Cash Deal	0.0255***	0.0238***	0.0255***	0.0246***	0.0255***	0.0239***	0.0255***	0.0246***
	(3.919)	(3.956)	(4.031)	(4.119)	(3.913)	(3.947)	(4.029)	(4.106)
Deal Value	-0.000137	0.000862	0.00119	0.00291	-0.000161	0.000836	0.00116	0.00288
	(-0.0293)	(0.195)	(0.259)	(0.639)	(-0.0344)	(0.190)	(0.252)	(0.633)
Acquirer Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Target Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	589	589	589	589	589	589	589	589
R-squared	0.250	0.221	0.255	0.230	0.250	0.221	0.254	0.230

Table 9. Target Physical Climate Risk and Pre-Announcement Premiums

This table examines the relation between deal premium and the target's physical climate risk, conditional on the whether the acquirer experienced a prior-year billion-dollar event. The deal premium is measured four weeks prior to the announcement. Panel A reports univariate comparisons, and Panel B reports multivariate regressions. Firm Size is the natural logarithm of the total assets; Hostile equals 1 if the deal attitude is hostile; All Cash Deal equals 1 if the transaction is fully paid in cash; For all the regressions, industry fixed effects and year fixed effects are included. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Deal Premium (4 Weeks Prior to Announcement)					
	High Risk Target		Low Risk Target		
	N	Mean % (t-statistic)	N	Mean % (t-statistic)	Difference (t-statistic)
Acquirer climate risk = 1	261	0.375*** (16.78)	357	0.464*** (21.34)	-0.089*** (-2.80)
Acquirer climate risk = 0	67	0.372*** (8.26)	516	0.419*** (20.91)	-0.047 (-0.82)
Panel B: Deal Premium (4 Weeks Prior to Announcement)					
	Acquirer climate risk = 1		Acquirer climate risk = 0		
	(1) PM4WK	(2) PM4WK	(3) PM4WK	(4) PM4WK	
Damage (tgt)	-0.341* (-1.685)		0.562* (1.735)		
Billion-Dollar Event (tgt)		-5.764 (-1.469)		9.956* (1.658)	
Firm Size (tgt)	-4.481*** (-3.264)	-4.562*** (-3.304)	-4.472*** (-2.754)	-4.421*** (-2.741)	
Hostile	17.99* (1.798)	18.03* (1.801)	18.51 (0.218)	18.57 (0.219)	
All Cash Deal	4.992 (1.147)	5.030 (1.154)	8.801 (1.491)	8.805 (1.492)	
Year FE	YES	YES	YES	YES	
Industry FE	YES	YES	YES	YES	
Observations	618	618	583	583	
R-squared	0.364	0.363	0.295	0.295	

Table 10. Target Physical Climate Risk on Acquirer CARs

This table presents the univariate and multivariate relationship between acquirer's initial announcement returns over (-1, +1), and (-2, +2) windows and the target's physical climate risk. Panels A and B report univariate results for subsamples that acquirer has and doesn't have physical climate risk, respectively. Panels C and D present the corresponding multivariate regressions for the high-risk and no-risk acquirer subsamples. Hostile equals 1 if the deal attitude is hostile; Relative Size equals the ratio of target's market capital to acquirer's market capital; All Cash Deal equals 1 if the transaction is fully paid in cash; and Deal Value is the natural logarithm of the deal value. For all the regressions, acquirer and target control variables are included. Industry fixed effects and year fixed effects are included. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Acquirer CAR (Acquirer climate risk = 1)					
	High Risk Target		Low Risk Target		Difference
	N	Mean (t-statistic)	N	Mean (t-statistic)	
MM Acquirer CAR (-1,+1)	270	-0.49% (-1.13)	372	-0.56%* (-1.86)	0.07% (0.14)
MM Acquirer CAR (-2,+2)	270	-0.61% (-1.38)	372	-0.42% (-1.22)	-0.19% (-0.34)
MAR Acquirer CAR (-1,+1)	270	-0.49% (-1.14)	372	-0.48% (-1.59)	-0.01% (-0.01)
MAR Acquirer CAR (-2,+2)	270	-0.47% (-1.09)	372	-0.30% (-0.87)	-0.17% (-0.32)
Panel B: Acquirer CAR (Acquirer climate risk = 0)					
	High Risk Target		Low Risk Target		Difference
	N	Mean (t-statistic)	N	Mean (t-statistic)	
MM Acquirer CAR (-1,+1)	68	-3.46%*** (-2.68)	542	-1.68%*** (-4.66)	-1.78% (-1.60)
MM Acquirer CAR (-2,+2)	68	-3.60%*** (-2.89)	542	-1.56%*** (-3.89)	-2.05%* (-1.69)
MAR Acquirer CAR (-1,+1)	68	-3.27%** (-2.48)	542	-1.48%*** (-4.11)	-1.79% (-1.61)
MAR Acquirer CAR (-2,+2)	68	-3.44%*** (-2.65)	542	-1.24%*** (-3.09)	-2.19%* (-1.79)

Panel C: Acquirer CAR & target climate risk (Acquirer climate risk = 1)								
	Market Model		Market Adjusted Model		Market Model		Market Adjusted Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)
Billion-Dollar Event (tgt)	0.00117	-0.00135	-1.39e-05	-0.00129				
	(0.182)	(-0.193)	(-0.00219)	(-0.185)				
Damage (tgt)					9.11e-05	-2.46e-05	2.39e-05	-1.86e-05
					(0.258)	(-0.0644)	(0.0686)	(-0.0489)
Hostile	0.0167	0.0290	0.0183	0.0388**	0.0167	0.0290	0.0183	0.0388**
	(0.620)	(1.264)	(0.725)	(2.096)	(0.620)	(1.256)	(0.726)	(2.076)
Relative Size	-0.000543	0.000910	-0.00580	-0.00516	-0.000498	0.000919	-0.00578	-0.00515
	(-0.0263)	(0.0428)	(-0.282)	(-0.240)	(-0.0241)	(0.0433)	(-0.281)	(-0.240)
All Cash Deal	0.0169**	0.00586	0.0157**	0.00299	0.0170**	0.00587	0.0157**	0.00300
	(2.219)	(0.755)	(2.125)	(0.397)	(2.220)	(0.757)	(2.125)	(0.399)
Deal Value	-0.00119	-0.00204	-0.000427	-0.000266	-0.00117	-0.00200	-0.000406	-0.000223
	(-0.259)	(-0.355)	(-0.0966)	(-0.0440)	(-0.254)	(-0.348)	(-0.0919)	(-0.0369)
Acquirer Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Target Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	628	628	628	628	628	628	628	628
R-squared	0.306	0.298	0.320	0.298	0.306	0.298	0.320	0.298

Panel D: Acquirer CAR & target climate risk (Acquirer climate risk = 0)								
	Market Model		Market Adjusted Model		Market Model		Market Adjusted Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)	(-1, +1)	(-2, +2)
Billion-Dollar Event (tgt)	-0.0191	-0.0213	-0.0190	-0.0228*				
	(-1.526)	(-1.599)	(-1.510)	(-1.741)				
Damage (tgt)					-0.00104	-0.00116*	-0.00103	-0.00124*
					(-1.576)	(-1.661)	(-1.563)	(-1.814)

Hostile	-0.0391 (-0.964)	-0.0895 (-1.519)	-0.0277 (-0.678)	-0.0830 (-1.500)	-0.0388 (-0.955)	-0.0892 (-1.510)	-0.0274 (-0.669)	-0.0827 (-1.490)
Relative Size	0.0107 (0.310)	-0.00471 (-0.133)	0.00711 (0.206)	-0.0116 (-0.324)	0.0104 (0.302)	-0.00502 (-0.142)	0.00684 (0.198)	-0.0119 (-0.334)
All Cash Deal	0.0443*** (4.695)	0.0371*** (3.433)	0.0413*** (4.355)	0.0352*** (3.214)	0.0443*** (4.692)	0.0371*** (3.432)	0.0413*** (4.353)	0.0352*** (3.213)
Deal Value	-0.0126 (-1.166)	-0.0114 (-1.002)	-0.00982 (-0.914)	-0.00734 (-0.643)	-0.0126 (-1.167)	-0.0114 (-1.003)	-0.00983 (-0.914)	-0.00735 (-0.644)
Acquirer Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Target Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	603	603	603	603	603	603	603	603
R-squared	0.279	0.256	0.268	0.253	0.279	0.256	0.268	0.253

Table 11. Firm-level test of operating performance change and physical climate risk change following diversifying M&A

$$Synergy_{i,t} = \alpha + \beta_1 Acquirer\ Dummy \times \Delta Phy_Climate_Risk_{i,j,t-1} + \beta_2 Firm\ Controls_{i,t-1} + Fixed\ Effects_t + \varepsilon_{i,j,t}$$

Panel A presents the results examining the regression of operating performance against the indicator of diversifying M&A. The dependent variable is the change in operating cash flow in the first, second, and third fiscal years after the deal compared to the fiscal year immediately before the deal, and scale by average total assets. The main independent variable $Acquirer\ Dummy \times \Delta Phy_Climate_Risk$ is an interaction term between the acquirer dummy and the risk difference between acquirers and targets. It is 1 when the firm do a diversifying M&A in the year, -1 when firm acquire a firm with higher risk, 0 otherwise. The firm control variables are the same as tests before. In Panel B, the dependent variable is the change in physical climate risk after the M&A. Main independent variable is the same variable shown in panel A. For this regression, year fixed effects are included. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Operating performance improvement			
Dependent Variable:	ΔOCF		
	(1) (-1, +1)	(2) (-1, +2)	(3) (-1, +3)
M&A Dummy x Risk Diff	0.0327*** (5.077)	0.0347*** (4.931)	0.0363*** (4.523)
Firm Size	-0.00504*** (-4.104)	-0.00775*** (-5.844)	-0.00922*** (-6.609)
Cash	-0.195*** (-11.59)	-0.189*** (-10.56)	-0.185*** (-10.00)
Market-to-book Ratio	0.000921** (2.063)	0.000622 (1.267)	0.000985* (1.881)
R&D	0.165*** (4.171)	0.114*** (2.687)	0.0736* (1.681)
Leverage	-0.0177 (-1.274)	-0.0539*** (-3.590)	-0.0791*** (-5.076)
ROA	-0.149*** (-17.25)	-0.154*** (-16.75)	-0.158*** (-16.50)
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Observations	95,033	89,310	84,093
R-squared	0.111	0.095	0.090

Panel B: Climate risk improvement			
Dependent Variable:	Δ Damage		
	(1)	(2)	(3)
	(-1, +1)	(-1, +2)	(-1, +3)
M&A Dummy x Risk Diff	-1.557** (-2.318)	-1.144* (-1.645)	-2.006*** (-2.791)
Year FE	YES	YES	YES
Observations	102,788	92,018	82,218
R-squared	0.122	0.127	0.135

Table 12. Likelihood test using headquarter location

Panel A shows the impact of physical climate risk on the likelihood of firms becoming acquirers using the headquarter location to estimate physical climate risk. Panel B shows the impact of physical climate risk on the likelihood of firms becoming merger pairs using the headquarter location to estimate physical climate risk. The dependent variable is the acquirer dummy variable equals 1 when this firm is a true acquirer firm in year t, and 0 if this firm is a matched firm. The main independent variable, Billion-Dollar Event, is a dummy variable that equals 1 if a firm's headquarter experienced a billion-dollar event in year (t-1) and is set to 0 if no billion-dollar natural disaster events in that year. Firm control variables include Firm Size, Cash, Market-to-book Ratio, R&D, Leverage, and ROA. Firm Size is the natural logarithm of the total assets; Cash is the ratio of cash and cash equivalents of the firms to the total assets; Market-to-book Ratio is the ratio of the market value to the book value; R&D is the ratio of R&D expenditure to the total assets of the firm; Leverage is the ratio of long-term debt plus short-term debt to total book assets; ROA is the ratio of operating income before depreciation to total book assets. Column (1) and (2) show the prediction from conditional logit models, and column (3) and (4) show the prediction from the linear models. We control deal fixed effects in all the tests. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Acquirer Likelihood using headquarter location				
Dependent Variable:	Acquirer Dummy			
	(1) Logit	(2) Logit	(3) OLS	(4) OLS
Billion_dollar_event	0.137*** (7.009)	0.144*** (6.958)	0.0253*** (6.965)	0.0264*** (6.963)
Firm Size		1.366*** (50.60)		0.252*** (52.01)
Cash		0.0197 (0.354)		0.00359 (0.379)
Market-to-book Ratio		0.000249 (1.569)		2.19e-05*** (3.024)
R&D		-0.578*** (-3.877)		-0.0597*** (-3.771)
Leverage		-0.425*** (-8.291)		-0.0593*** (-7.372)
ROA		0.0133 (0.214)		0.000856 (0.0889)
Constant			0.187*** (147.0)	-1.319*** (-44.62)
Observations	93,813	85,057	95,003	89,048
R-squared			0.001	0.021
Number of deal_number			18,748	18,658

Panel B: Merger Pair Likelihood using headquarter location				
Dependent Variable:	Merger Pair Dummy			
	(1) Logit	(2) Logit	(3) OLS	(4) OLS
event_diff	0.0439** (2.436)	0.0555*** (2.885)	0.00451** (2.438)	0.00575*** (2.858)
Firm Size (acq)		1.290*** (28.95)		0.131*** (31.40)
Cash (acq)		0.210** (2.362)		0.0204** (2.449)
Market-to-book Ratio (acq)		0.000166 (0.988)		1.56e-05 (0.843)
R&D (acq)		-0.00141 (-0.0146)		0.000699 (0.0735)
Leverage (acq)		-0.222*** (-2.915)		-0.0185*** (-3.226)
ROA (acq)		-0.00815 (-0.0804)		-0.00160 (-0.161)
Firm Size (tgt)		0.505*** (12.34)		0.0577*** (12.44)
Cash (tgt)		-0.153* (-1.859)		-0.0170* (-1.952)
Market-to-book Ratio (tgt)		-0.000124 (-0.852)		-1.23e-05 (-1.169)
R&D (tgt)		0.273** (2.126)		0.0322** (2.368)
Leverage (tgt)		-0.00489 (-0.0662)		0.000162 (0.0194)
ROA (tgt)		-0.0805 (-1.068)		-0.00957 (-1.176)
Constant			0.105*** (15,861)	-1.111*** (-26.62)
Deal FE	YES	YES	YES	YES
Observations	41,657	38,047	41,714	38,677
R-squared			0.000	0.007
Number of deal_number			4,418	4,374

Table 13. Likelihood test using year and industry fixed effects

Panel A shows the impact of physical climate risk of firms on the likelihood of these firms becoming acquirers. Panel B shows the impact of physical climate risk difference between two firms on the likelihood of these firms becoming merger pairs. $Merger\ pair_{i,j,t}$ is a dummy variable which equals 1 when firm i and firm j is a true merger pair at time t, 0 if firm i and firm j is a matched pseudo merger pair based on industry and firm size. We use two measures for the main independent variable $\Delta Phy_Climate_Risk_{i,j,t-1}$. (1) $Event_diff$ is a categorical variable that is set to 1 if acquirer firm experiences a billion-dollar event in year (t-1) but the target firm does not; -1 if target firm experiences a billion-dollar event but acquirer firm does not; 0 otherwise. (2) $Damage_gap$ is the gap between the physical climate risk of acquirer and target, measuring with damage. The firm control variables include Firm Size, Cash, Market-to-book Ratio, R&D, Leverage, and ROA. Firm Size is the natural logarithm of the total assets; Cash is the ratio of cash and cash equivalents of the firms to the total assets; Market-to-book Ratio is the ratio of the market value to the book value; R&D is the ratio of R&D expenditure to the total assets of the firm; Leverage is the ratio of long-term debt plus short-term debt to total book assets; ROA is the ratio of operating income before depreciation to total book assets. Column (1), (2), (5), and (6) show the prediction from logit models, and column (3), (4), (7), and (8) show the prediction from the linear models. We control year fixed effects and industry fixed effects in all the tests. T statistics in parentheses *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Acquirer Likelihood with year FE and Industry FE								
Dependent Variable:	Acquirer Dummy							
	(1) Logit	(2) Logit	(3) OLS	(4) OLS	(5) Logit	(6) Logit	(7) OLS	(8) OLS
Billion-Dollar Event	0.612*** (31.48)	0.224*** (9.558)	0.108*** (31.06)	0.0421*** (10.04)				
Damage					0.0424*** (40.99)	0.0189*** (15.08)	0.00746*** (40.40)	0.00350*** (15.62)
Firm Size		0.251*** (53.22)		0.0456*** (52.92)		0.238*** (49.71)		0.0431*** (49.55)
Cash		-0.405*** (-5.947)		-0.0653*** (-6.243)		-0.373*** (-5.486)		-0.0598*** (-5.726)
Market-to-book Ratio		0.0264*** (12.95)		0.00439*** (12.11)		0.0263*** (12.89)		0.00439*** (12.09)
R&D		-0.308 (-1.640)		-0.0283 (-1.070)		-0.283 (-1.507)		-0.0246 (-0.928)
Leverage		-0.803*** (-13.23)		-0.126*** (-13.48)		-0.790*** (-13.01)		-0.123*** (-13.27)

ROA		-0.391*** (-5.163)		-0.0846*** (-7.488)		-0.386*** (-5.118)		-0.0830*** (-7.354)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	61,207	55,127	61,639	55,547	61,207	55,127	61,639	55,547
R-squared	0.030	0.064	0.056	0.092	0.039	0.066	0.065	0.094

Panel B: Merger Pair Likelihood with year FE and Industry FE

Dependent Variable:	Merger Pair Dummy							
	(1) Logit	(2) Logit	(3) OLS	(4) OLS	(5) Logit	(6) Logit	(7) OLS	(8) OLS
Event_diff	0.126*** (4.145)	0.0292 (0.827)	0.0132*** (4.115)	0.00315 (0.786)				
Damage_gap					0.00676*** (4.128)	0.00100 (0.525)	0.000713*** (4.093)	0.000108 (0.495)
Firm Size (acq)		0.113*** (12.57)		0.0132*** (12.26)		0.116*** (12.48)		0.0137*** (12.23)
Cash (acq)		-0.190 (-1.363)		-0.0160 (-1.129)		-0.202 (-1.435)		-0.0174 (-1.207)
Market-to-book Ratio (acq)		0.0121*** (2.756)		0.00146*** (2.883)		0.0121*** (2.725)		0.00147*** (2.852)
R&D (acq)		0.369 (0.825)		0.0330 (0.728)		0.337 (0.747)		0.0303 (0.658)
Leverage (acq)		-0.192* (-1.702)		-0.0208* (-1.717)		-0.199* (-1.761)		-0.0219* (-1.791)
ROA (acq)		0.0462 (0.269)		0.00155 (0.0860)		0.0403 (0.232)		0.000781 (0.0423)
Firm Size (tgt)		0.0155 (1.303)		0.00163 (1.161)		0.0132 (1.091)		0.00138 (0.959)
Cash (tgt)		0.00824 (0.0576)		0.000951 (0.0602)		-0.0130 (-0.0908)		-0.00124 (-0.0775)
Market-to-book Ratio (tgt)		-0.0123**		-0.00127**		-0.0123**		-0.00129**

R&D (tgt)								
Leverage (tgt)								
ROA (tgt)								
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,923	8,869	9,968	8,913	9,684	8,755	9,729	8,799
R-squared			0.040	0.046			0.040	0.046