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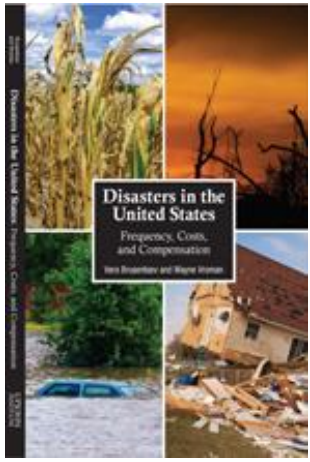
Setting the Scene:
A Guide to This Volume



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Setting the Scene

A Guide to This Volume

A disaster occurs when natural phenomena cause physical damage, injury or loss of life and assets, environmental degradation, disruption in the livelihoods and services of individuals and communities, and interruptions in social and economic activity. The Federal Emergency Management Agency (FEMA) of the U.S. Department of Homeland Security administers the primary system for recording disasters in the United States.[1] Major disaster declarations are listed with "DR" followed by a sequence number, emergency declarations with "EM," and fire management assistance declarations with "FM." In 2015, FEMA recorded a total of 79 natural disasters. The first major disaster declaration of 2015 was made on January 7 for the *Mississippi Severe Storms and Tornadoes* (DR–4205). By the end of 2015, FEMA had issued 43 major disaster declarations, with the *Oklahoma Severe Storms and Tornadoes* (DR–4247), declared on December 29, as the final one of the year.[2] Thirteen major disaster declarations were declared in 1953, the first year recorded in the FEMA system.

Are disasters becoming more frequent, as the FEMA declarations and everyday media reports suggest? Today, most disasters are broadcast around the world in real time, through the Internet, radio, television, and social networks. Perhaps the frequency of disasters has not necessarily increased, but our methods of tracking potential disastrous events have improved so that experts notice them more frequently than in the past. Certainly advanced technology has allowed meteorologists to better predict weather-related events. Meteorological organizations around the world are better equipped to provide increasingly accurate hazard assessments on which to base warnings, and early warning systems can effectively activate community-based emergency plans to respond to these warnings. Furthermore, our ability to communicate information has risen, especially with the widespread use of social media.

The initial answer to the question posed above is in the affirmative: Yes, disasters are increasing in frequency throughout the world.[3] This

response prompts another important question: Is the frequency of natural hazards increasing? Natural hazards are defined as natural phenomena with the potential to cause destruction. They can be classified into several broad categories: biological, climatological, geological, hydrological, and meteorological.[4] These natural hazards have been operating throughout history, but they only become noticeable when they negatively affect human populations. Disasters often follow natural hazards: they occur when households and assets are both exposed and vulnerable to natural hazards. Exposure refers to the people, assets, and systems present in hazard zones that are subject to potential losses, whereas vulnerability refers to the characteristics and circumstances of an asset, community, or system that make it susceptible to the damaging effects of a hazard.[5] Exposure is largely fixed by the location of prior investments in infrastructure, economic development, and urbanization, and by cultural and social attachment to place.

When a hazard has a negative effect on humans and overwhelms their ability to cope (that is, resilience), then it is termed a disaster.[6] The Intergovernmental Panel on Climate Change (2007) finds that climate change contributes to more frequent, severe, and unpredictable weather-related hazards, such as droughts, floods, heat waves, and tropical cyclones.[7] Resilience with respect to a hazard is determined by the degree to which a community has the necessary resources available and is capable of organizing itself both prior to the potential hazard occurring and during the incidence of the phenomenon. A disaster causes significant destruction, including loss of life, damage to property and infrastructure, a reduction in economic production, the loss of employment and income, and hardship and suffering caused by the event. The severity of a disaster is commonly measured in the number of deaths (mortality) or the total dollar amount of the destruction it causes.[8] Given that natural hazards have occurred throughout history and will always be with us, the increase in the frequency of disasters indicates that something else has changed. Moreover, while natural hazards are becoming better understood, the increasing losses associated with them indicate that contemporary society still finds it difficult to prevent hazards from becoming disaster risks.

What can account for the increase in the frequency of disasters? A recent study finds that the increase in global temperatures since preindustrial times significantly increased the probability of heavy precipi-

tation and high heat extremes throughout the world (Fischer and Knutti 2015).[9] Rising temperatures and more intense precipitation contribute to the severity of disasters. The weight of scientific evidence finds that the increase in the frequency of disasters is due to both anthropogenic (manmade) and natural phenomena. Evidence also suggests that weather-related disasters are becoming more frequent compared to disasters such as earthquakes and volcanic eruptions. One explanation is that with an increase in human population, exposure and vulnerability to hazards rise because more people will be affected. In addition, development and urbanization in regions susceptible to natural hazards can increase the likelihood that flash floods and coastal floods will cause a disaster. Examples include building on floodplains or on coastlines susceptible to tropical cyclones and tsunamis. And human activity can increase the frequency or severity of a disaster. Deforestation or overgrazing, for example, leads to more severe erosion from floods and landslides.

Every year, the World Economic Forum asks a group of about 1,000 experts from academia, business, government, and not-for-profit organizations about the likelihood of 30–50 perceived risks (both likelihood and severity in the next 10 years) of human interaction with the environment. The perspectives of these experts are published in the *Global Risks* report that highlights the most significant long-term risks worldwide (World Economic Forum 2015). The second most likely perceived risk worldwide is extreme-weather events. Howard Kunreuther, an academic advisor for *Global Risks 2015*, notes that:

> Experts and the general public are now much more concerned with weather-related events than they were ten years ago because of the increasing losses from natural disasters around the world. 'Extreme weather events' is ranked as the second most likely global risk, and the failure of climate change adaptations is in the top five global risks in terms of potential impact. . . . [T]here are now efforts underway . . . to focus on long-term strategies currently being undertaken by communities to reduce the likelihood of severe catastrophes and to cope with disasters more effectively should they occur.

The United States has developed official definitions of disasters in order to classify and respond to them. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (hereafter, the Stafford Act)

authorizes five categories of committed action either prior to a potential hazard occurring or in response to a disaster.[10] Three types of declarations may be made before a disaster occurs: fire management assistance declarations, the provision of defense resources before a major disaster is declared, and the decision to pre-position resources and supplies. The president of the United States has the authority to issue two types of declarations after a disaster overwhelms the combined resources of local, county, and state jurisdictions: major disaster and emergency.

This book focuses on three disaster-related categories: major disaster declarations, emergency declarations, and fire management assistance declarations. We utilize these official definitions to draw inferences about the frequency, geographic patterns, trends, and financial costs related to disasters. After receiving a request from the governor of an affected state for a major disaster declaration, the president may take one of three possible actions for federal relief and recovery assistance: issue either a major disaster declaration or an emergency declaration, or decline the request. The Disaster Relief Act of 1974 firmly established the process of presidential disaster declarations. A major disaster is considered to be the result of a natural hazard or of an explosion, fire, or flood, regardless of the cause.[11] Once a president makes a major disaster declaration, federal resources are assembled for emergency relief and long-term recovery. An emergency declaration is more limited in scope, and certain long-term federal recovery programs are not provided. Fire management assistance grants are provided when a fire is determined to pose a "threat of major disaster."

Since a major disaster declaration involves a request from a governor to the president, could the election cycle be linked to these declarations? As statewide elections mostly occur in the same years as presidential elections, it is possible that more disasters are declared in election years. In an exploratory investigation of the likelihood, we test for a possible linkage between major disaster declarations and elections using regression analysis. While there is a positive association between major disaster declarations and election years, the results are not statistically significant. Hence, the data for FEMA-designated disaster declarations do not support the election cycle hypothesis.[12]

Overall, from 1953 through the end of 2013 the cumulative total number of declarations in the 50 states and the District of Columbia is as follows: 2,046 major disaster (1953–2013), 355 emergency (1974–

2013), and 1,050 fire management (1970–2013).[13] The geographic entity used in the reporting system is the state/tribal government, and each declaration identifies the affected counties within that state. For natural disasters that extend across state boundaries, declarations are made for each state.

The increase in the occurrence of disasters requires ever-increasing taxpayer dollars to finance the agencies responsible for improving "our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards."[14] Concern over the size of federal budget deficits and the national debt has made policymakers more cognizant of the amount of funding the federal government provides to state and local governments for disaster assistance and the processes the federal government uses to provide it. Disaster assistance for large-scale destructive events has usually been financed by funds appropriated outside traditional budget constraints, which implies that taxpayers cover a large proportion of disaster-related costs.

In March 2011, President Obama issued Presidential Policy Directive 8: National Preparedness (PPD-8) aiming to strengthen the security and resilience of the United States to devastating events. The policy directive is a national platform for disaster risk reduction; that is, a mechanism for coordination and policy guidance on disaster risk reduction that is interdisciplinary and multisectoral with public, private, and civil society participation. It is the national instrument for implementing the United Nations International Strategy for Disaster Reduction (UNISDR). The goal of PPD-8 is to be achieved through systematic preparation for the events that could pose the greatest risk to the security of the nation.[15] This book examines a number of major disasters that pose some of the greatest risks to the United States and discusses some of the complex issues associated with mitigation efforts. While the adverse effects of hazards often cannot be completely prevented, their scale or severity can be substantially reduced through disaster risk management.

Our exploration of disasters, however, is limited in scope. First, our investigation is restricted to the United States, despite the fact that disaster risk is a global issue. We are aware of the global component to the topic. It is most comprehensively represented by the UNISDR (n.d.), which states that "[T]here is no such thing as a 'natural' disaster, only natural hazards." The focus of this multilateral strategy is disas-

ter risk reduction: ". . . the concept and practice of reducing disaster risks through systematic efforts to analyse and reduce the causal factors of disasters. Reducing exposure to hazards, lessening vulnerability of people and property, wise management of land and the environment, and improving preparedness and early warning for adverse events are all examples of disaster risk reduction."

On March 18, 2015, United Nations member-states adopted the *Sendai Framework for Disaster Relief Reduction*. It is a 15-year, voluntary, nonbinding agreement that recognizes the primary role of the government in reducing disaster risk but also recognizes that this responsibility should be shared with other stakeholders. Hence, this book should be of interest to U.S. policymakers, researchers, and stakeholders who are interested in reducing disaster risk.

Second, our empirical analysis is exploratory. As stated previously, the costs of disasters can be measured in terms of mortality or the total dollar amount of destruction. In this book, we focus on financial costs, not mortality. The conceptual and practical issues in measuring these costs and the direct and indirect effects from a disaster are not addressed.[16] Instead, we use publicly available databases: one from the FEMA reporting system and two developed by the National Oceanic and Atmospheric Administration (NOAA). The first is the *U.S. Billion–Dollar Weather and Climate Disaster* data of the National Climatic Data Center (NCDC) and the second is National Weather Service data.[17] Using annual, state-level data we utilize ordinary least squares (OLS) estimation to draw inferences that can provide useful background information for increasing our understanding of disasters. This estimation technique is one of the most basic and most commonly used prediction methods, with applications in fields as diverse as economics, medicine, psychology, and statistics. It is a technique that is relatively easy to analyze and understand, and it produces solutions that can be easily interpreted. Practically speaking, OLS regression makes efficient use of the data, and we can obtain good results with relatively small sample sizes. The technique, however, does not imply a causal relationship: it only shows an association between the variables of interest. More sophisticated statistical methods are appropriate to use with a larger and richer data set, particularly if the focus of the investigation is at the substate level. This point is important to note as most disasters are local events. We refer the interested reader to the extensive literature on

specific disasters, some of which is referenced in subsequent chapters of this book.

Third, we separate the analysis of disasters according to different hazard categories. The UNISDR (2009) classifies hazards on the basis of the originating phenomenon type: biological, geological, hydrometeorological, and technological. Biological hazards are of organic origin or conveyed by biological vectors, such as bacteria, toxins, and viruses, that may cause injury or loss of life to humans and animals, crop failure, damage to assets and property, social and economic disruption, and environmental degradation. Geological hazards include geophysical phenomena arising from such internal processes of the earth as earthquakes and volcanic eruptions, which humans cannot usually predict; and geophysical phenomena that are the result of such external processes of the earth as landslides, mudslides, and sometimes flooding that could be avoided. Disasters originating from external earth processes are often related to anthropogenic alterations to the environment. Hydrometeorological hazards are associated with changes in air and ocean temperature that are responsible for the formation of weather phenomena, such as hurricanes and tornadoes, and climate and precipitation variation that sometimes cause drought, flooding, storm surges, and other hydrological phenomena. The fourth hazard type originates from technological or industrial conditions, including accidents, dangerous procedures, infrastructure failures, or specific human activities that lead to detrimental effects. Disasters that originate from technological hazards can be avoided and prevented.

Classification makes it possible to systematize information on disasters, identify patterns in their impact, and consider their consequences. We look at a subset of all hazards: natural hazards. According to the World Meteorological Organization, hazards related to weather, climate, and water account for nearly 90 percent of all disasters.[18] Natural hazard events can be characterized according to their magnitude or intensity, speed of onset, duration, and area of extent. For example, droughts are slow to develop and dissipate and often affect large regions, whereas earthquakes have short durations and usually affect a relatively small area. Among the disasters considered in this book are droughts, floods, hurricanes, tornadoes, and wildfires, which are discussed in separate chapters. This approach would be of interest to state or regional policymakers, who may be interested in particular types of

disasters as they relate to their own geographic regions. We also briefly examine earthquakes, tsunamis, and volcanic eruptions in addition to anthropogenic hazards, combining this discussion into one chapter. Our decision to combine geological with anthropogenic hazards is informed by the data we use.

We address six questions:

1) What do we know about disasters in the United States?
2) Has there been an increase in their frequency?
3) What are the financial costs associated with disasters?
4) What compensation is available to survivors?
5) Where is each type of disaster likely to occur?
6) How can disasters be mitigated?

There are nine remaining chapters in this book. Chapter 2 utilizes the reporting systems used in the United States for classifying disasters to examine the aggregate trends over time. We find that even though annual data are highly variable, extreme-weather events are occurring with increasing frequency. And there are definite geographic trends in disaster declarations. In our presentation of geographic patterns, we use the classification of the U.S. Census Bureau whereby the United States is divided into four regions: Northeast, Midwest, South, and West. Each of the four census regions is divided into two or more census divisions. The Northeast, the Midwest, and the West have two census divisions while the South has three. The two divisions in the Northeast region are the New England division and the Middle Atlantic division; the East North Central division and the West North Central division form the Midwest region; and the two divisions in the West region are the Mountain division and the Pacific division. The three divisions in the South region are the South Atlantic division, the East South Central division, and the West South Central division.

In Chapter 2, we also consider the association between population density and disasters and the possible linkages of disasters to climate. Our analysis shows that the declaration of disasters has increased at a much faster rate than the rate of population growth, and there is a statistically significant association between disasters and the increase in temperature. The association between disasters and precipitation, however, is not statistically significant.

Those affected by disasters receive compensation in many ways.[19] Chapter 3 introduces the costs associated with the destructive effects of disasters. The returns to capital and the earnings of individuals attached to the labor market both decrease when a disaster interrupts production. Since labor compensation exceeds half of the value added in most industries, reduced earnings are an important element in disaster-related economic losses. Our discussion does not cover, however, the loss of life. Chapter 3 also discusses programs for survivors in disaster -affected areas. Effectively assisting survivors requires government action beforehand: establishing a response to a disaster, instituting a recovery process, and alleviating the damage and hardship of disaster survivors through compensation programs. Those affected by a catastrophe may receive compensation in many ways, both from private arrangements and public disaster assistance programs. Some of the assistance programs are specific to a disaster situation; other programs are more general and are provided by organizations either in disaster situations or delivered to meet regular service requirements.

Among the major disaster declarations between 1953 and 2013, hurricanes stand out for their large-scale destructive effects. While they accounted for about 10 percent of the 2,046 FEMA-designated major disaster declarations, they comprised nearly half of the adverse cost estimates in the NCDC data on billion-dollar disasters. In Chapter 4, we provide a more detailed discussion of hurricanes. All states along the Atlantic and Gulf coasts were affected by several hurricanes between 1953 and 2013. The 15 states with extensive coastlines extending from Massachusetts to Texas accounted for 82 percent of the hurricane-related major disasters during these 61 years. As a consequence, the losses attributable to hurricanes dominate the various programs that provide support to disaster survivors. Hurricanes also have obvious labor market effects: higher total unemployment and increased payments of unemployment insurance (UI) benefits. Similarly, hurricanes figure prominently in the losses of the Disaster Unemployment Assistance (DUA) program.

Between 1953 and 2013, 62 percent of the major disaster declarations in the United States involved flooding. Chapter 5 examines floods, the most frequent of all disasters. States located along major rivers and their tributaries have extensive experiences with river flooding. Coastal floods, northeasters (also nor'easters), storm surges, and tsunamis also

cause flooding.[20] We examine the extent of flood insurance coverage and the frequency of compensation paid by the National Flood Insurance Program. The labor market effects of floods are also examined. Unemployment increases considerably with disastrous flooding. Our analysis suggests that the UI benefits paid as a result of flooding represent a significant increment to the benefits paid directly by the DUA program.

Chapter 6 discusses tornadoes. Tornadoes were present in 441 of the 2,046 major disaster declarations between 1953 and 2013. While present in the majority of geographical areas, the most common and most severe tornadoes occur in the Midwest region of the United States. Generally, while tornadoes are responsible for much smaller aggregate destruction compared to hurricanes, drought, and river floods, there is some evidence that tornadoes are having larger damaging effects in recent years.

Of the eight largest billion-dollar disasters, four were hurricanes and three were droughts. Hurricanes and droughts dominate the cost estimates of the billion-dollar disasters, accounting for 72 percent of the NCDC's overall total. Chapter 7 examines drought. The FEMA disaster -designated classification affecting agricultural producers includes floods, hail, severe storms, and winter freezes, but not drought. There is an important contrast between the onset and duration of drought compared to other disasters, which span one or a few days. Drought, in contrast, extends over several months or even years, and drought-related agricultural and other economic losses also accumulate over longer periods.

Drought often contributes to the severity of wildland fires, examined in Chapter 8. Most wildfires occur in the West region of the United States. While wildland fires have always been an integral and natural part of forest and prairie ecosystems, new climatic conditions and increasing human development are changing the scale of wildfires and the length of the wildfire season. More people build homes in and near wildfire-prone areas, exposing individuals and families to greater risks from fires and causing increased fire suppression and recovery costs. A distinguishing feature of our societal arrangements to combat wildfires is that they occur with such regular frequency that we maintain an ongoing capacity to fight wildfires with permanent staffing at federal and state agencies. Hence, the fire management assistance declarations made by FEMA represent only a small fraction of the annual number

of formally recognized wildfires that occur. These wildfire activities are separate from the actions of local fire departments.

Chapter 9 considers geological and technological hazards that occur as a result of human interaction with the environment. Anthropogenic disasters discussed in this chapter include the *Oklahoma Explosion at Federal Courthouse in Oklahoma City* (DR–1048) on April 26, 1995, and the *New York Terrorist Attack* (DR–1391) on September 11, 2001. The likelihood of a geological hazard such as the 1906 San Francisco earthquake occurring is extremely rare and the associated losses would be devastating. It is a catastrophic hazard: a low-probability, high-consequence event. We recognize that looking at the last six decades of disaster experience does not capture such extreme risks.

Chapter 10 examines the role of private insurance and private–public partnerships in providing coverage for adverse events and outlines some of the problems. We emphasize the critical role of incentives (both private and public), institutional arrangements, and the possibilities and limits to governmental actions. Catastrophic risk and the insurance market is more than just the demand, supply, and the market-clearing price for risk. Individuals, economic agents and governments can limit or mitigate the worst effects of catastrophic risk through an intelligent combination of insurance and prevention. The chapter highlights selected findings from this volume and offers some suggestions for national disaster policies, including proposals for legislation and administrative practices to improve planning and responses to disasters. There are many steps one can take to prepare for potential disasters and to respond to them when they occur. A key part of preparedness is the prediction of a potential natural hazard. Forecasts and early warnings of such hazards can help prevent and mitigate disasters, save lives, and reduce damage to property and to the environment. Decision makers can foster the design and installation of warning systems to alert people of extreme-weather events that may be about to occur. Steps need to be taken to increase resilience. For instance, one can develop and enforce building codes requiring that buildings be able to withstand earthquakes, floods, or high winds. Increasing resilience to natural hazards requires a greater understanding of them.

Disasters impose a massive toll of human suffering. Generally speaking, fewer people are dying in disasters but the resulting destruction is more costly. The damage and losses do not originate from the

forces of nature but, rather, from the interaction of natural forces and the misguided choices of humans. The scale of the destruction depends on the choices we make about our lives and our environment, and these choices make us more susceptible to disasters or more resilient to them. While damage and losses from disasters have risen, their increase has been slower than the growth in population, which indicates that appropriate prevention measures and effective emergency preparedness are proving to be successful.

We trust that this book will provide useful information on disasters in the United States as well as highlight some of the issues that need to be addressed. We believe this volume could serve as a basis and inspiration for continuing work on disasters.

Notes

1. Prior to the creation of FEMA, state/tribal and local governments worked with many separate disaster-related federal agencies. In 1979, President Carter centralized the federal emergency functions into one agency. In 2003, FEMA became part of the U.S. Department of Homeland Security.
2. See https://www.fema.gov/disasters/grid/year/2015?field_disaster_type_term_tid_1=All (accessed July 27, 2016). The incident period for DR-4205 was from December 23, 2014, to December 24, 2014, with the major disaster declaration declared on January 7, 2015. The incident period for DR-4247 was from November 27, 2015, to November 29, 2015, with the declaration made on December 29, 2015. We use the FEMA-designated system for recording extreme events as the basis of our investigation of disasters in the United States. One can obtain further information about each event from the agency website.
3. See http://maps.grida.no/go/graphic/trends-in-natural-disasters (accessed July 27, 2016). GRID-Arendal works in partnership with the United Nations Environment Programme (UNEP) to support informed decision making and to raise awareness of environmental issues. The World Bank and the United Nations (2010) and the United Nations (2015) also report an increase in global disasters.
4. This classification is the one used by the Emergency Events Database of the Centre for Research on the Epidemiology of Disasters (EM-DAT/CRED), with disasters further divided into 12 types and 30 subtypes. The database has the advantage of providing greater differentiation of disasters that have very different consequences. See Guha-Sapir, Below, and Hoyois (n.d.).
5. See UNISDR (2009). There are many facets of vulnerability, which are a result of various economic, environmental, physical, and social factors. Examples include disregard for prudent environmental management, inadequate protection of assets, lack of public awareness and information, limited official recognition of risks and

preparedness measures, and unsuitable design and construction of buildings and infrastructure.

6. For a brief explanation of the distinction between a *hazard* and a *disaster*, see World Bank and the United Nations (2010, p. 25, Box 1.2); for formal definitions of disaster-related terminology, see UNISDR (2009).
7. Climate change is defined by the UNISDR (2009) as changes in climate that may be due to natural phenomena or to persistent anthropogenic changes in atmosphere or in land use. The United Nations Framework Convention on Climate Change (1992, p. 3) definition focuses on anthropogenic alterations: "A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods." The Intergovernmental Panel on Climate Change (2007) finds that climate change is gradually altering average temperature, the timing and amount of precipitation, and sea levels. There is the potential for more severe changes if carbon emissions are not successfully limited and reduced.
8. In the assessment of disasters, the literature distinguishes between *damages* and *losses*. The term *damages* refers to the destruction of assets, both human and physical, caused by a disaster. The term *losses* refers to the reduction in the flow of benefits, such as income, that results from the disaster. The United Nations Economic Commission for Latin America and the Caribbean (ECLAC) has developed a methodology for estimating the consequences of a disaster and for determining the finances needed to rebuild affected areas. For the accounting framework used by ECLAC in assessing disasters, detailed information about what is included, and how each category is measured, see ECLAC (2014).
9. Fischer and Knutti (2015) show that the largest proportion of the most rare and extreme events is anthropogenic and the increase in these events is nonlinear as global temperatures further increase.
10. The Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 amended the Disaster Relief Act of 1974. The legislation establishes the statutory authority for most federal disaster response and recovery activities especially as they relate to FEMA and FEMA programs.
11. Section 102(2) of the Stafford Act defines the term *major disaster* as "any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snow storm, or drought), or regardless of cause, any fire, flood, or explosion in any part of the United States, which in the determination of the president causes damage of sufficient severity and magnitude to warrant major disaster assistance under this chapter to supplement the efforts and available resources of state, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby" 42 U.S. C.5122 (2).
12. To test for a possible association between major disaster declarations and presidential elections, a categorical (dummy) election variable is added to trend regression Equations (2.1.1) and (2.1.2) in Chapter 2. The election dummy variable equals 1.0 in presidential election years and zero otherwise. The regression results

of both equations show that the estimated coefficients of the election variables are positive as hypothesized with values of 2.5–2.6; but with *t*-ratios of only 0.7–0.8, these ratios are far below the level required for statistical significance. Hence, the results do not support the hypothesis of an association between major disaster declarations and presidential elections. Using data from 1960 to 2008, Kunreuther and Michel-Kerjan (2009) control for differences in the incidence of damaging floods by using precipitation and damages as covariates. The adjusted mean is 5.3 in reelection years and 4.4 in other years. Theoretical and empirical investigations of political considerations in disaster declarations are available in the literature, particularly the political science literature. For instance, Healy and Malhotra (2009).

13. These 2,046 events all occurred in the 50 states plus D.C. An additional 109 major disaster declarations were announced in seven outlying territories: American Samoa, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.
14. The quote is part of the mission of FEMA. See https://www.fema.gov/declaration-process-fact-sheet (accessed July 27, 2016).
15. The U.S. Department of Homeland Security defines national preparedness as "the actions taken to plan, organize, equip, train, and exercise to build and sustain the capabilities necessary to prevent, protect against, mitigate the effects of, respond to, and recover from those threats that pose the greatest risk to the security of the Nation." Security is defined as "the protection of the Nation and its people, vital interests, and way of life," and resilience as "the ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies." See http://www.dhs.gov/presidential-policy-directive-8-national-preparedness (accessed July 27, 2016).
16. The assessment of damage is difficult, prone to both overestimation (for example, double counting) and underestimation (for example, it is difficult to value loss of life or damage to the environment). For information on the conceptual issues in the compilation of U.S. data, see Smith and Katz (2013) and Smith and Matthews (2015).
17. The former National Climatic Data Center (NCDC) is now known as the National Centers for Environmental Information (NCEI) and is "responsible for preserving, monitoring, assessing, and providing public access to the nation's treasure of climate and historical weather and information."
18. See http://public.wmo.int/en/our-mandate/what-we-do (accessed July 27, 2016).
19. Note that the term *compensation* is actually a misnomer because the amounts people receive in recompense are usually less than what has been lost.
20. A northeaster is a large-scale storm along the upper east coast of the United States and Atlantic Canada.

Disasters in the United States

Frequency, Costs, and Compensation

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