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Disasters and Compensation Systems

OVERVIEW OF DISASTERS

This volume explores the recent history of disasters in the United States using state-level data that extend back to the early 1950s. From 1953 through the end of 2013 the cumulative number of declarations made by FEMA was 2,046 major disasters, 355 emergency declarations, and 1,050 fire management declarations.\textsuperscript{1} The results of analyzing state-level data in Chapter 2 show a strong upward trend in both major disaster and fire management assistance declarations. Between 1953 and 2013 the annual increase in major disasters was about one per year (shown by the annual trend coefficient of 0.885). The analysis also finds an acceleration in the occurrence of major disasters after 1995. Fire management assistance declarations in particular have become significantly more numerous since 1995.

Chapter 2 also documents the strong upward trend in the annual number of floods and tornadoes, which account for about three-quarters of all major disasters. Drawing on the findings of subsequent chapters, however, the increase in disasters is a broad-based phenomenon and is not limited to just one or two categories. In addition, Chapter 2 shows that the occurrence of disasters has far outpaced the growth in population since the early 1950s. A disaster incurs significant costs, including loss of life, reduced economic production, and damage to property and infrastructure. Generally speaking, fewer people are dying in disasters, but the financial costs associated with disasters are increasing.

Improved science and technology is a principal reason that fewer lives are lost when a disaster occurs. The forecasting of potential natural hazards has improved, and superior structures are being built to better withstand the effects of disasters due to these hazards. Even though property and infrastructure are more resistant to damage, the total dollar amount of destruction has been increasing, mainly because the number
of disaster-related events is rising. Stated simply, society now has a larger volume of valuable resources exposed to hazards. The increase in the occurrence of disasters also requires increasing taxpayer dollars to finance the various agencies responsible for managing the adverse effects of hazards and related disasters.

LABOR MARKET EFFECTS OF DISASTERS

Hurricanes stand out among the categories of major disasters for the scale of their destructive effects. The 33 hurricanes and tropical storms of the 1980–2013 period accounted for nearly half of the $1.1 trillion of total costs from the 170 billion-dollar disasters as estimated by NOAA. Hurricanes also accounted for approximately two-thirds of DUA weeks compensated since 1983 and two-thirds of NFIP cash payments since 1978. Drought is the only other category of major disaster that is of comparable cost per event.

Chapters 4 and 5, which examine hurricanes and floods, establish that disasters have measurable effects in the labor market. Hurricane Katrina caused significant increases in the statewide unemployment rates of Louisiana and Mississippi in the fall of 2005. Associated with higher unemployment were significant increases in the number of UI beneficiaries in these two states, but not in Alabama. While Hurricane Sandy did not raise statewide unemployment rates in New York and New Jersey, it did cause significant increases in the number of UI beneficiaries in both states. In contrast, our analysis of Hurricanes Andrew and Ike and the four destructive hurricanes that impacted Florida during August–September 2004 does not find evidence of statewide increases in unemployment or UI beneficiaries.²

Our analysis of three major floods in the Midwest region also identifies significant labor market effects that followed the floods of 1993 and 1997, but not the flood of 2008. Unemployment rates in the affected states were higher and the number of UI beneficiaries increased significantly.³ In our analysis of tornadoes and drought, we also test for labor market effects due to these two categories of disasters, but do not find significant effects in statewide data.
These results lead us to conclude that finding state-level effects of major disasters is likely only if the disaster is of an extremely large scale and/or the state is comparatively small. The effects of Hurricanes Katrina and Sandy were discernible at the state level because of their large-scale destruction. We also infer that the effects of disasters on unemployment and UI recipiency were of comparatively short duration, lasting from four to six months or fewer. A larger and richer data set, particularly with county-level data, could provide more information on disaster-related labor market effects.

The reporting of UI benefit payments does not separately identify payments due to disasters. We encourage a modification to the UI data reporting system to explicitly recognize disaster-related UI payments. This modification would allow policymakers and other stakeholders to more accurately assess the importance of major disasters as a cause for UI benefit payments. The need to know such information may grow in the future if the scale of the DUA program continues to decline, as documented in Chapter 3. Both UI and DUA benefits provide a cushion to vulnerable individuals not only during but after a disaster. These programs are already being delivered and can reach a sizable number of disaster-prone households. Our proposed modification requires relatively minor adaptations to the existing UI program with comparably low additional costs.

The current practice in state UI programs is to treat disaster-related UI benefit payments as noncharged benefits; that is, these payments are a common charge whose cost is spread across all covered employers and not assigned only to the individual employers who make the payments. In effect, current financing makes these benefit payments a shared financial responsibility of all employers in the state.

An argument can be advanced that disaster-related UI benefit payments are a federal rather than a state responsibility. To the extent that social insurance (as opposed to private insurance) compensates survivors, national funding of these benefits seems appropriate, analogous to the national funding of DUA benefits. A starting point for advancing this idea of national funding is to collect information on the current volume of disaster-related payments made by the UI programs. To obtain this information, a survey of the states is needed. Securing state cooperation in such a survey should not be a problem since the states would be transferring to the federal partner a part of the cost of benefits
currently financed by state-level UI taxes. After implementation, this approach to financing these benefit payments would be a national rather than state responsibility.

THE ROLE OF INSURANCE

Hazards, exposure, and vulnerability are characteristic of the relationship between people and risk. The UNISDR (2009) divides risk into two broad categories: extensive and intensive. An extensive risk is “associated with the exposure of dispersed populations to repeated or persistent hazard conditions of low or moderate intensity, often of a highly localized nature, which can lead to debilitating cumulative disaster impacts” (p. 15). An intensive risk, on the other hand, is “associated with the exposure of large concentrations of people and economic activities to intense hazard events, which can lead to potentially catastrophic disaster impacts involving high mortality and asset loss” (p. 18). A drought is an example of an extensive risk. Extensive risks are largely shaped by the underlying risk factors and can be relatively easily reduced. Flooding in large river basins and hurricanes are examples of an intensive risk. Intensive risks are largely determined by the location, severity, and frequency of the hazard, which means that there are limits as to how much risk can actually be reduced.

While the risks cannot be eliminated, the scale or severity of hazards can be substantially lessened in a way that can minimize the hazard to individuals and communities. If hazard severity and exposure cannot be reduced, then the main opportunities for reducing risk lie in reducing vulnerability. Vulnerability refers to the way a disaster will affect human life and property. The UNISDR (2015) considers three kinds of risk management strategies to reduce vulnerability: prospective risk management, corrective risk management, and compensatory risk management. Prospective risk management requires strategies to ensure that development does not introduce new risks to the stock of risk-prone assets. For example, building standards can be improved and enforced to reduce vulnerability in new construction, land-use planning can deter development from hazard-prone areas, and better water management can reduce drought risk. Corrective risk management removes risks
already present before they become a loss. For example, highly exposed and vulnerable structures could be relocated, obsolete infrastructure could be renovated, and degraded ecosystems could be restored.

Different risk management strategies are needed to reduce the two categories of risk defined above. Since extensive risks are largely shaped by the underlying risk factors, a greater understanding of these risk factors can reduce them. The more intensive risks need to be addressed through compensatory risk management, which can include risk transfer mechanisms, such as insurance and reinsurance, contingent financing, and social insurance and social protection programs. Insurance is a valuable tool for managing risk and handling vulnerability. When insurance functions as intended, it not only provides financial protection to individuals and communities, but also a profitable business model for insurance providers.

Private insurance policies can be devised for many hazards that have catastrophic consequences. There are three general requirements for insurability. First, the hazard and the associated losses need to occur with sufficient frequency that the insurance provider can develop an accurate estimate of the distribution of potential losses. Second, the act of insuring does not alter the distribution of the loss; that is, there is no moral hazard. Third, the parameters of the loss distribution (frequency and size of losses) are stable over time such that actuarially fair policies (including a profit for the insurer) can be devised.

Several hazards identified in this book satisfy these three conditions. Examples of anthropogenic hazards would include commercial airline crashes, construction collapses, maritime disasters, mine disasters, and train wrecks. Insurance policies can be devised and compensation provided to recipients who incur covered losses. For instance, commercial airlines can insure their equipment for the hazard of an air crash.

Chapter 3 presents the most common private insurance policy for homeowners in the United States: the Homeowner-3 (HO-3) policy. A standard HO-3 policy provides broad coverage for losses from hazards, such as explosions, fire, hail, lightning, smoke, storms, theft, tornadoes, vandalism, and wind. In some hailstorm-prone areas, there is a specific hail damage deductible. A deductible is the part of the claim that is not covered by the insurance company and will be borne by the insured homeowner. There are some restrictions in coverage for windstorm damage if one lives near the Atlantic or Gulf coasts because of the high
risk of damage from hurricanes. Similarly, if one lives in certain parts of the Midwest where tornadoes are common, windstorm damage is not usually covered.

Individuals choose how much prevention to undertake, how much insurance to purchase, and how much residual risk to bear through coping. Economic theory posits that individuals undertake prevention to the point where expected benefits (avoiding losses) exceed the costs, subject to a budget constraint. Survey findings show that individuals sometimes misperceive risks and may not always act in their own best interests. They tend to discount low-probability future losses and seem reluctant to invest in disaster risk management. A survey conducted by Viscusi and Zeckhauser (2006) finds that most respondents assess their risks as “below average.” Those in riskier areas who experience disasters estimate their risks to be higher, but not as high as they should statistically. These individuals appeared to underestimate risk even though the survey was conducted in 2006, shortly after Hurricane Katrina.

As Chapter 9 notes, earthquake insurance can be purchased for an additional premium under a standard HO-3 policy in all states except California. Earthquake coverage for residents in California can be purchased through the California Earthquake Authority, which is a state-run earthquake insurance program. Earthquake coverage for business firms in California is usually included in a commercial policy or can be purchased from private insurers as separate coverage.

Other hazards with catastrophic consequences do not satisfy the three requirements for insurability. Examples include terrorist attacks, cyber attacks, nuclear power plant disasters, and biological catastrophes, such as plagues and epidemics. The likelihood of these hazards occurring is extremely rare, but the associated losses are devastating, making it difficult or impossible to assess. Hence, a catastrophic hazard is a low-probability, high-consequence (LP-HC) event.

Providing insurance for LP-HC events is a particular challenge for individuals at risk, insurance providers, and regulators. Individuals at risk have a tendency to ignore extremely rare events until after a disaster occurs. Many individuals do not voluntarily buy coverage against potential LP-HC events because they do not think a catastrophic loss will happen to them. Chapter 5 shows that people voluntarily buy insurance only after incurring a serious loss, but many cancel their policies if they do not experience a compensated loss in succeeding years. This
pattern leads us to conclude that many individuals do not view insurance as a protective measure. Rather, they consider insurance an investment and believe that the premium is wasted if they do not receive payment from an insurance claim.

Insurance providers do not behave optimally in the case of LP-HC events. After they suffer a severe loss, they may decide that the risk is completely uninsurable rather than increase the premium to cover the hazard. Chapters 3 and 5 note that private insurance companies provided flood insurance until the late 1920s. Following the heavy losses incurred by the insurance industry after the Mississippi floods in 1927, private flood insurance coverage was discontinued. Prior to the *New York Terrorist Attack* (DR-1391) on September 11, 2001, terrorist insurance was included (but not explicitly priced) in standard property loss policies providing coverage against damage to commercial property. Nearly all property loss policies written after September 2001 excluded terrorist attacks because insurance providers feared catastrophic losses from future attacks.

State regulators often limit insurance premiums in the case of LP-HC events because they are concerned about the affordability of insurance, especially to those who are at higher risk. Kunreuther and Michel-Kerjan (2011) outline how the state of Florida set up its own insurance company, Citizens Property Insurance Corporation, and heavily subsidized the policies of homeowners residing in hurricane-prone areas. These highly subsidized rates undercut the premiums of private insurers. Moreover, an inappropriate premium has adverse effects that are difficult to rectify later. For example, low premiums encouraged the construction of vacation homes in hazard-prone areas of Florida.

The behavior of at-risk individuals, insurance providers, and regulators outlined above defeats the objective of insurance. The main purpose of insurance is threefold: it needs to provide information about the severity of risk through setting appropriate premiums, it needs to motivate those at risk to undertake protection against LP-HC events, and it needs to offer incentives in the form of premium reductions to reward individuals and communities who invest in risk-reducing measures.

At least two insurance approaches can be suggested for LP-HC situations. First, the government can act as the insurer. Second, private insurers can write the basic policies but operate with back-up provided by reinsurance. As currently structured, terrorist insurance has an ele-
ment of the first approach in that the government insures against large open-ended liabilities. The private insurance industry participates with a sharing arrangement for what is in effect the deductible element of the insurance. Currently, the United States does not have an explicit insurance structure to insure against cyber attacks.

As Chapter 7 describes, the crop insurance program is a federal program that is delivered by private sector insurance providers, who use a federally designed insurance policy to enter into a private contract with agricultural producers. Both the federal government and the insurance providers share in the underwriting performance of the contract.

Government insurance programs now provide coverage for the hazards of both floods and terrorist attacks. Recall that floods were perceived to be uninsurable for three main reasons: adverse selection meant that only households and firms in flood-prone areas would purchase coverage; risk-based premiums were too costly for the average household; private insurers could not generate sufficient premiums to insure against a catastrophic flood event. Because private carriers effectively deemed potential losses too uncertain to price out and stopped providing coverage, the federal government has stepped in to provide it. Private carriers continue to participate in the administration of both the flood insurance and crop insurance, but the ultimate financial liability for losses resides with the federal government.

SOCIAL INSURANCE

An alternative approach for providing insurance protection against disaster risk is through social insurance. As noted in Chapter 3, social insurance can be viewed as a scheme that requires individuals to contribute in advance to a program that will help them in times of personal need, rather than rely on taxpayers when the need arises. All parties at risk pay actuarially fair premiums into a trust fund, which dispenses payments to those survivors who have coverage. Coverage can be mandatory as with UI and workers’ compensation insurance. A potential advantage of social insurance is the mandatory feature of coverage so that the issues of adverse selection are avoided. Social insurance can also charge differential contribution rates that reflect risk; for exam-
ple, higher premium rates for residences and business establishments located adjacent to rivers, in floodplains, and in coastal areas. These same insurance-pricing features can also be provided through private insurance.

Social insurance does not reduce disaster risk in and of itself, but it can be part of strategic disaster risk management. Social insurance instruments can enhance the disaster resilience of individuals and households and protect household assets. Many of these instruments are already being delivered in the United States. They have the advantage of reaching large numbers of disaster-prone households and communities both during and after a disaster and can help compensate for income loss, medical expenses, and other expenses.

**INCREASING PARTICIPATION IN THE NATIONAL FLOOD INSURANCE PROGRAM**

NFIP coverage has been stable and even declining since 2006. As mentioned in Chapter 5, the program has difficulty maintaining coverage among insured homeowners who do not receive payments for losses in the years immediately after electing coverage. Three approaches hold promise for increasing coverage: the use of community ratings, multiyear policies, and increased enforcement of mandatory coverage.

Community ratings and multiyear policies differ from current NFIP policies that are sold annually to individual homeowners and business establishments. Community ratings would apply to an entire community where all households and businesses would participate and pay a community premium rate. These would be of particular relevance to communities where a substantial share of property is located in a 100-year floodplain.

Multiyear policies would be sold for multiyear periods, perhaps for the duration of a mortgage for property located in a 100-year floodplain. Such policies would encourage investment in preventive and protective measures with premiums reflecting risk over a longer time horizon than current annual insurance policies. Experience could determine if the price of multiyear insurance would be higher than single year coverage, but one advantage for individuals would be price stability. Regula-
tors would have to allow insurance providers to charge premiums that reflect risk.

Enforcement of mandatory participation in either approach, however, presents major administrative challenges. Pilot projects should test both ideas to assess their effectiveness and to help identify implementation problems. The point of both approaches would be to more effectively maintain flood insurance coverage compared to the present situation where annual attrition rates can be as high as 30 percent of covered properties.

A third approach to increasing coverage would be to aggressively enforce insurance coverage on properties located in 100-year floodplains. Estimates from the National Academy of Sciences (2015) suggest that half of all properties with mortgages in these locations avoid NFIP mandatory coverage. Enforcement could consider penalizing both the property owner and the mortgagor when noncovered properties are identified.

As noted in Chapter 5, NFIP coverage has not been increasing since about 2007 or even after the destruction caused by Sandy in late 2012. Unless coverage can be enhanced, the NFIP will decline and necessitate greater future reliance on emergency payments rather than insurance payments to the survivors of major floods.

CONCLUSIONS

As a nation, we can take measures to increase our resilience to disasters. These measures are generally long-term projects to enhance our awareness of hazards, improve our physical structures and infrastructure, and ensure that effective recovery procedures are in place when a disastrous event occurs. The Stafford Act instituted a first response to a disaster, introduced long-term recovery strategies, and established disaster assistance programs.

Managing disaster risks involves adaptation and mitigation from individuals, the private sector, and all levels of government. The UNISDR (2009, p. 19) defines mitigation as the “lessening or limitation of the adverse impacts of hazards and related disasters.” Mitigation measures include public awareness of hazards, dissemination of infor-
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Disasters and timely warnings, hazard-resistant construction, and policies that incorporate disaster risk management. Individuals can respond to expected hazards and moderate their harmful effects. Local government and the private sector are critical players in reducing disaster risk, given their roles in managing risk information and financing. National governments can coordinate the efforts of local and state governments by providing information, establishing policy and legal frameworks, delivering financial support, and protecting vulnerable groups.

We need to continue investigating hazards so that we know how to prepare for and respond to them when they occur. Such observation usually involves monitoring natural hazards to identify any anomalous change that may lead to a more devastating event. As outlined in Chapter 4, hurricanes are known to pass through several stages of development: from tropical depression to tropical storm and then hurricane. Once a tropical depression is identified, meteorologists can monitor it to predict how long the development will take and identify the eventual path of the storm.

We can design and install early warning systems to alert us to hazards that may be about to occur. A people-centered early warning system would disseminate timely and meaningful warning information that would enable individuals and communities threatened by a hazard to prepare for and act appropriately with sufficient time to reduce the possibility of harm or loss. Together with early warning systems, we need to establish lines of communication and ensure that the public has an appropriate response to warnings. Warnings and evacuations need to be coordinated, and local capabilities must be able to respond to the warnings.

We can also develop and enforce building codes that require structures to withstand earthquakes or high winds. Building codes and regulations, construction styles, and zoning statutes are important elements in enhancing resilience to hazards. Climate data show that average temperatures and annual precipitation has increased in the United States. The increased temperature trend can lead to wildfire-induced degradation of ecosystems as well as property loss and mortality. Chapter 8 notes that forest managers and municipal planners are increasingly incorporating fire protection measures, such as prescribed burning, to support ecosystem adaptation. The U.S. Global Climate Change Program (Joyce et al. 2014) finds that adaptation in human settlements is
constrained by private property development in high-risk areas; adaptation could be encouraged by appropriate land-use planning.\textsuperscript{4} Chapter 5 indicates that extreme precipitation can result in floods in riverine and coastal areas that lead to property and infrastructure damage as well as environmental degradation. Older rainfall design standards are employed in some areas and need to be updated to reflect current climate conditions. The intensity of flood events could be reduced by conservation of wetlands and land-use planning.

While we do not discuss climate change in detail, we make references to the phenomenon throughout the book. Here we acknowledge that steps to increase resilience to climate change would significantly reduce exposure and vulnerability in densely populated areas and lead to successful prevention. The many disaster risks of climate change tend to be concentrated in urban areas. Improving housing and constructing resilient infrastructure systems are vital. The federal government has taken the lead in providing guidance, information, and support in planning for and implementing measures to adapt to climate change. The new federal climate adaptation initiatives and strategies developed in recent years are outlined in the U.S. Global Climate Change Program (Joyce et al. 2014).\textsuperscript{5} While all federal agencies are required to plan for adaptation, state/tribal governments, and local and regional governments are currently engaged in various stages of planning.

Risk-financing mechanisms in the private and public sector, such as insurance, can contribute to increasing resilience. As Chapter 10 shows, the design of insurance instruments is a continuing challenge; unintended consequences can lead to disincentives, market failure can result, and equity could be decreased. We can structure insurance policies to assist in the recovery from the damages incurred as well as providing compensation. Insurance providers and regulators need to educate at-risk households and businesses that insurance is a proactive way to reduce risk. In addition, insurance policies need to be transparent, understandable, and equitable. It is also important for insurance premiums to reflect risk so that policyholders accurately perceive the risk they face and become aware of the preventive or protective measures that reduce their vulnerability to potential losses. Insurance also needs to deal with the issues of affordability and equity. Any special treatment given to individuals at risk (for example, low-income uninsured or inadequately insured individuals) should be in the form of means-tested
financial support rather than insurance premium subsidies. Kunreuther and Michel-Kerjan (2011), Kunreuther, Pauly, and McMorrow (2013) and Kunreuther (2015) suggest that the financial support should be means-tested insurance vouchers, financed by the federal government or at a state level through general taxes.

The United States uses a combination of private insurance, government insurance, disaster assistance, and other income support to manage the risk and vulnerability of disasters. The book examines selected aspects of these systems, as they provide support to survivors of catastrophic events. As a nation, we can take many steps to reduce the risk and vulnerability to hazards and to respond effectively when a disaster occurs. While these steps can be divided into several categories, it is important to note that there is no clear distinction among them: preevent preparedness, emergency responses immediately after extreme events occur, postevent recovery and reconstruction, and developing resilience in nondisaster times.

Preventing a disaster requires strategies that reduce exposure and vulnerability to contain damage and loss. Not all disasters, however, can be prevented. The impact of a disaster depends on how individuals and governments react and cope. Effective prevention requires a myriad of measures working harmoniously together. With enough public awareness, individuals, the private sector, and governments can undertake preventive measures, and the federal government can take the lead. The ultimate goal is to increase our resilience to hazards and avoid disasters. Our choices make us either more susceptible to disasters or more resilient.

Notes

1. Information on major disaster declarations is available from 1953; for emergency declarations from 1974; and fire management declarations from 1970.
2. The four hurricanes were Charley, Frances, Ivan, and Jeanne.
3. The nine Midwest states affected by the flooding in 1993 were Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin. The 1997 flood resulted in major disaster declarations in Minnesota, North Dakota, and South Dakota. The major disaster declarations in 2008 were in Iowa, Missouri, Nebraska, and South Dakota.
4. Bierbaum et al. (2014) find that adaptation by human settlements is also by limited household-level adaptive capacity.
5. See Note 4.