

Risk and Reaction

Dealing with Interdependencies

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With the increasing concentration of people and businesses in high-risk areas and the increasing interdependencies within the world, catastrophes are more likely than ever. Consider the disasters of Hurricane Katrina and the September 11 attacks. Not only was Hurricane Katrina the largest natural disaster in US history, but it also demonstrated how economic and social activities affected by the event translated into global risks with worldwide ripple effects. Katrina had major impacts on several international markets, such as oil, gas, and insurance. The terrorist attacks of September 11 had the immediate impacts of property damage and fatalities, killing more than 3,000 people from more than 90 countries, injuring about 2,250, and inflicting direct damage estimated at nearly US\$80 billion. They also caused significant business interruption losses throughout the world and reshaped international relations.

Natural disasters and terrorist attacks are examples of what have been classified as low probability-high consequence (LP-HC) events. Despite the first half of their title, these events are now in the headlines with increasing frequency. There are features of these potentially catastrophic events that need to be carefully examined in order for individuals, firms, and governments to take steps today to reduce the risk of their occurrence in the future and to reduce the consequences should they occur. Every government in the world faces the question of how to help its citizens face the risks of catastrophe. Reducing these risks requires a concerted effort by individuals and firms. This poses a set of challenges due to the difficulty of anticipating LP-HC events.

It Will Not Happen to Me

Prior to catastrophic events, decision-makers often assume that these disasters will not happen to them. Hence they have little interest in undertaking costly protective measures. Only after a disaster is there concern with taking steps to prevent another such catastrophe from occurring. Hurricane Katrina and the September 11 terrorist attacks highlight this point.

Before Hurricane Katrina, the US Army Corps of Engineers did not adequately shore up the existing levees to protect the New Orleans metropolitan area from flooding. The reasons were several: cost increases, design changes caused by technical issues, environmental concerns, legal challenges, and local opposition to portions of the project. The Corps' project fact sheet from May 2005 noted that the appropriated amounts in the President's budget for fiscal year 2005 were insufficient to fund new construction projects that included levee enlargement. The interested parties concerned with the hurricane threat to the Gulf Coast acted as if a disaster such as Katrina would not occur in the next few years. This is sometimes referred to as the NIMTOF—Not in My Term of Office—phenomenon. It was convenient to ignore the numerous alerting studies—which stated that the existing levees were inadequate and that one of the nation's highest priorities should be to reinforce these flood control projects—or even the October 2004 National Geographic warning about what could be the most devastating natural disaster in US history. The scenario became reality 10 months later.

The federal government is now committed to providing disaster assistance to the victims of Katrina. There is serious discussion of reinforcing and rebuilding the levees in New Orleans and other parts of the Gulf Coast. A few days after Katrina made landfall, the US Senate needed just a few hours of discussion to vote to grant nearly US\$60 billion in federal aid. As of February 2006, six months after Hurricane Katrina, some US\$88 billion in federal aid had been allocated for relief, recovery, and rebuilding, with another US\$20 billion requested to help victims of the storm and the region recover and rebuild.

Likewise, prior to the September 11 attacks, insurers viewed losses from terrorism as so improbable that they never explicitly considered the risk when pricing their standard commercial insurance policies. Losses from terrorism were never excluded from so-called “all-risk” policies, with the exception of some marine cargo, aviation, and political risk policies. Even the first attack on the World Trade Center (WTC) in 1993 and the Oklahoma City bombing of 1995 were not seen as threatening enough for insurers to consider revising their view of terrorism as not worth considering when pricing a commercial insurance policy.

The attacks of September 11 produced a fundamental change in how terrorism is perceived in the United States. Insurers and re-insurers, who paid the bulk of the US\$35 billion of insured losses from the terrorist attacks, were reluctant to continue offering protection except at very high prices. As a result, insurers excluded terrorism damages from their “all-risk” commercial policies when renewing these policies. Firms demanding insurance protection against such losses were forced to purchase a policy that included terrorism as a specific cause. They often had difficulty finding an insurer offering such coverage at a premium they were willing to pay. Sometimes they could not find a seller willing to provide terrorism insurance at any price.

The lack of availability of terrorism insurance soon after the September 11 attacks led some private sector groups, such as the construction and real estate industries, to call for federal intervention. In response, the US Congress passed the Terrorism Risk Insurance Act of 2002 (TRIA) at the end of 2002 and renewed the act for two years with only minor changes at the end of 2005. Under TRIA, insurers are now obligated to offer terrorism coverage to all of their commercial policyholders. Firms are not

required to purchase this insurance unless mandated by state law, as is the case with workers' compensation protection. To date, more than 50 percent of commercial enterprises in the United States have bought terrorism insurance. It is very likely that this proportion would increase significantly should another attack occur on US soil.

Interdependent Security

An interdependent security (IDS) setting is one in which each individual or firm that is part of an interconnected system must decide independently whether or not to adopt protective strategies. These measures can reduce the risk of a direct loss, but there is still some chance that the individual or firm can suffer damage from others who do not adopt similar measures. The economic incentive of any decision-maker to invest in protective actions thus depends on whether it expects others to follow suit—a classic case of game theory. The protective strategies can be direct risk-reducing measures as well as information-gathering and preparedness strategies. That such events are typically probabilistic and that risk is often determined in part by the behavior of others gives a complex structure to the incentives that individuals or firms face when deciding whether to invest in risk mitigation measures.

For many IDS problems, if an individual or firm thinks that others will not invest in security, it has less incentive to do so if such security measures cannot provide protection against ripple effects from the failures of others. On the other hand, if each decision-maker believes that others will invest in security, then its optimal strategy is also to undertake protective measures. So there may be equilibrium solutions wherein no one invests in protection, even though all would be better off if each of them had incurred this cost. Airline baggage screening is an IDS scenario that illustrates this problem.

An airline has to determine whether it wants to invest in baggage screening security, knowing that even if it takes this action it may face a security risk from a dangerous bag loaded onto its plane by another airline. The airline faces this risk unless it inspects all transferred bags. Lest this point be considered only theoretical, recall the crash of Pan Am 103 in 1988. Terrorists checked a bag containing a bomb in Malta on Malta Airlines, which had minimal security procedures. The bag was transferred in Frankfurt to a Pan Am feeder line and then loaded onto Pan Am 103 in London's Heathrow Airport. The bomb was designed to explode above 28,000 feet, a height normally first attained on this route over the Atlantic Ocean. The terrorists deliberately exploited the widely varying security procedures across the airlines. This problem is common to other transportation modes, where there are interconnections between transfer points in the network.

In the wake of September 11 and Hurricane Katrina, the private and public sectors share an interest in making social and economic systems less vulnerable to disasters. There is a growing interest in protecting the critical infrastructure—such as transportation, telecommunication, electricity, and financial services—to assure the social and economic continuity of the nation. One challenge is the existence of interdependent operations between multiple infrastructures in different sectors. For example, financial systems or emergency services are highly dependent on telecommunication operations, which are highly dependent on electricity. When the interdependencies cut across sectors,

the nature of the risks is often not well understood. These risks pose special policy challenges at the national level. The problem has even more economic significance and presents greater challenges for coordination between countries should there be interdependent effects at the international level. Risk Management Challenges

The combination of an “it will not happen to me” attitude and the interdependent security nature of many events with catastrophic potential calls for a rethinking of strategies for managing these risks. When decision-makers decide not to pay attention to these risks prior to the occurrence of an event and the public sector then responds with large-scale disaster assistance or recovery aid, we need to examine whether there are better ways of dealing with this problem. In the case of natural disasters, we should ask: What is the responsibility of citizens residing in hazard-prone regions to protect themselves against the consequences of these events prior to their occurrence? When it comes to terrorism, we can ask businesses a similar question: What will it take for them to purchase insurance to cover losses from damage and business interruption before the next terrorist attack occurs?

The nature of interdependencies poses additional challenges for risk management. An airline will have less economic incentive to invest in risk-reducing measures if it knows other airlines will not follow suit. This is a principal reason that new federal baggage and passenger security measures were instituted in airports after September 11. Government officials were concerned that no individual airline would undertake these measures on its own. With respect to the impact of catastrophic accidents on the survival of firms, what economic incentive does any unit in a decentralized firm have to invest in protective measures that adversely affect its balance sheet, if other divisions in the organization are not taking similar actions? A culture of risk-taking can spread throughout the firm. The knowledge that a few groups are taking their chances lowers the incentives that others have to manage their operations carefully.

In this context, the private market alone will not be able to reduce future losses from catastrophic risks. There is little incentive for individuals or firms to invest in protection if they are not concerned about the consequences of such an event and know that they may suffer losses from other unprotected firms even if they themselves have invested in mitigation measures. What is particularly unfortunate about this state of affairs is that if everyone took protective actions, they would be better off in the long-run.

Managing Risk: Reducing Catastrophic Losses

Insurance can play a central role in reducing future losses and providing protection. But this policy tool needs to be supplemented with other actions that require some type of public sector involvement. In theory insurance can encourage individuals to adopt loss reduction measures by lowering premiums or deductibles. For this to occur, however, rates have to reflect risk. Even then it is hard to sell this idea to policyholders because the premium reduction given to the property owner is normally relatively small compared to the cost of a mitigation measure.

To illustrate, suppose that a resident or business can reduce its potential wind damage caused by a

hurricane by bracing its roof trusses and installing straps or clips. These modifications are relatively inexpensive and will result in the property owner paying a lower insurance premium. Suppose the cost of this measure is US\$1,500, but it would prevent US\$30,000 in damage if a hurricane hit. If the annual likelihood of a hurricane in the area is estimated to be 1 in 100, then the expected benefit from strengthening the roof would be US\$300. A risk-based insurance premium would thus be reduced by US\$300 if the home or business undertook this loss reduction measure. If the property owner was myopic and only compared the cost of renovations with the expected benefits in reduced premiums over the next several years, he would not invest in mitigation. If the property owner planned to move in the near future, the investment would be attractive only if it led to higher property values. A property owner with budget constraints would have an additional reason not to invest in this loss reduction measure.

The public sector can encourage the adoption of cost effective mitigation measures, such as roof mitigation in hurricane-prone areas, by developing building codes. Building codes are normally imposed on new structures but not on existing ones. To encourage property owners to retrofit their property built before the code was established, banks should consider providing long-term mitigation loans that could be tied to the structure rather than the owner. These loans would provide the funds necessary to retrofit the building and would be economically advantageous as long as their cost was less than the reduction a homeowner would receive in insurance premiums. In the above example, if the bank provided a 20-year home improvement loan at an annual interest rate of 10 percent, then the annual loan payment would be US\$145. Because the reduction in the insurance premium would be US\$300 for strengthening the roof, the property owner would save US\$155 by taking out a loan to invest in this mitigation measure.

The challenge in implementing such a program is that the premiums charged to those residing in the highest-risk areas are likely to be considerably larger than they are today with current cross-subsidy among different locations within a state or even between states. In fact, many states regulate rates so that premiums do not reflect the actual risks. Furthermore, some homes in high-risk areas are owned by low-income families who cannot afford the costs of insurance or the costs of reconstruction should their house suffer damage from a natural disaster. Because uninsured, low-income victims are likely to receive federal assistance after a disaster, loans or grants for insurance or mitigation measures to this group would reduce the cost to all taxpayers following a disaster and also reduce the uncertainty associated with the level of reimbursement these families would receive in case of a disaster. A risk-based insurance program with subsidies to low-income individuals in the form of insurance vouchers, similar in concept to food stamps, would enable insurers to set the appropriate rates over time.

Where Do We Go From Here?

Misperceptions of risk and interdependencies pose enormous challenges for individuals, firms, and the public sector in managing catastrophic risks. By recognizing the nature of people's decision processes and the limitations of the private sector in coping with these risks on its own, creative partnerships between the public and private sectors can be developed. There is the inevitable tension between letting individuals make their own choices and imposing requirements on them. But because individuals ignore a problem because they do not think it will happen to them and believe the public sector will rescue

them if it does, there are grounds for imposing requirements in advance of a possible catastrophe. This point was highlighted almost 30 years ago by Finn Kydland and Edward Prescott in their Nobel-prize winning paper arguing for rules rather than discretion. The challenges of managing the risks of global catastrophe are even more significant today than they were then.

The gravity of the challenges of interdependent risks is particularly apparent when considering a potential avian influenza outbreak. Much as we were aware of the possibility of an event like Hurricane Katrina, we are aware of the danger of a possible outbreak as a result of human-to-human transmission of the virus. Each country in the world can undertake its own preparations, but if some do not, the scope and spread of the disease will be much greater than if every country took the same measures to prevent an epidemic from occurring. Countries must be induced through collective agreements to work together to mitigate the potential catastrophic risk of a pending avian influenza outbreak. Unlike the case of Hurricane Katrina, however, there is no global government to come to the rescue.

We need to rethink ways of reducing the likelihood and consequences of catastrophic risks. During the past five years, the United States has been hit by a series of unprecedented major disasters, opening a new era of large-scale catastrophes. Perhaps some decision-makers still prefer not to think about the problems caused by these disasters because it means that they can devote time to the short-term issues that demand immediate attention. After the next disaster strikes, the consequences will be much greater than they imagined. More than ever, governments, firms, and individuals must take steps to address these risks before they become the next catastrophes.

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