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Estimating the State-by-State Economic Impacts of Hurricane Katrina

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Chapter 1. Introduction

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This book explores some of the issues arising from the Hurricane Katrina disaster. Scholars from many fields such as decision analysis, risk management, economics, engineering, transportation, urban planning and sociology explore some of the more important policy issues resulting from Katrina such as insurance, flood control and rebuilding the levees, housing, tourism, evacuation and relocation, utility lifelines recovery and resilience, the racial implications of the disruption of life in New Orleans, and interregional economic impacts of the disaster. The focus is less on what happened in the past but on how to deal with future risks, not only in New Orleans but in other locations threatened by disaster.

Of course, the travails of New Orleans in the wake of Katrina are far from over. There is also a mound of research already in the pipeline on Katrina (some of it already published), and it is impossible for a single book such as this to cover the full range of topics comprehensively, especially when authors from so many disciplines are involved.
There are two chapters that deal with levee rebuilding (Chapters 3 and 4) while a third (Chapter 9) addresses the issue of flood protection in a very different context (the River Thames in London, England). However, they do not fully answer the question of how to trade off between high construction costs and Category Five hurricane protection.

Another major issue barely mentioned in the book is whether to rebuild New Orleans at all is a wise idea. There is a case for building a new New Orleans on higher ground further north in the State. Despite all the policy failures since Katrina, this is probably a political non-starter. So, an intermediate position is that New Orleans will end up much smaller than before. Many of the former residents will not come back, and there is little point (given the risks) in attracting new residents.

Kunreuther and Michel-Kerjan (Chapter 2) examine the role that insurance can play as a policy tool for reducing losses from future natural disasters while at the same time providing funds for recovery. After examining the decision processes of three interested parties who will be at the centerpiece of such an insurance program, residents in hazard-prone areas, insurers and reinsurers and the federal government, they provide a rationale for comprehensive disaster insurance with rates based on risk as an integral part of a hazard management program. They illustrate how such a
program would function in the context of a case study of the Florida market. To reduce future losses there is a need for creative private-public partnerships to complement insurance through economic incentives and well-enforced regulations and standards. (e.g., building codes). The chapter also explores the issues as to whether coverage should be voluntary or mandatory and what types of special arrangements should be given to low income families in high hazard areas.

Southwell and von Winterfeldt (Chapter 3) remind us that when the Corps of Engineers analyzed several alternatives for improving the levee systems around New Orleans in the 1970s and 1980s, they made several rather optimistic assumptions about the frequency and impacts of hurricanes. They also ignored breaches of the levees as a failure mode. As a result, they concluded that a protection level for a Category 3 hurricane would be sufficient. This chapter builds upon an earlier decision analysis framework for improving how to rebuild the levee system after Katrina. It reports on a formal, fully parameterized risk and cost-benefit analysis model using influence diagrams. Some preliminary conclusions are presented.

Lee and Willardson (Chapter 4) point out that the Katrina disaster was not merely the result of the overtopping and breaches of the levees but also the product of electrical power failure and the abandonment of the pumping
stations. For example, as explained in Chapter 9, the Thames Barrier has its own electric generators and sells surplus power to power stations when their system is not in active use. The flood protection system in the New Orleans area is quite complex, but it is only as strong as its weakest link. In case of failure, there is a need for more effective recovery mechanisms. Scarce resources have dictated repairs below the Category Five level, so the risks of a recurrence have not been fully handled.

Bier and Zhuang (Chapter 5) describe the results of a model that applies game theory to identify equilibrium strategies for both attacker and defender in a fully endogenous model of resource allocation for countering both terrorism and natural disasters. The key novel features of this model include balancing protection from terrorism and natural disasters, and describing the attacker choice by a continuous level of effort rather than a discrete choice (e.g., attack or not). Interestingly, in a sequential game, increased defensive investment can lead an attacker to either increase the level of effort (to help compensate for the reduced probability of damage from an attack), or decrease the level of effort (because attacking has become less profitable). This can either reduce or increase the effectiveness of investments in protection from intentional attack, and can therefore affect the relative desirability of investing in protection from natural disasters.
Clarke (Chapter 6) argues that considering worst case scenarios helps to design more effective policy. Sharing the blame with everybody was very popular with federal officials (i.e. those who had the mandate and enough power) to have ameliorated the hurricane’s damage. The problem with this position is that it distributes responsibility evenly. That is a mistake because if power, among officials and among organizations, is distributed unevenly then responsibility should be too.

One of the biggest official failures that September was one of imagination. That failure led them to be caught off-guard by what to many others seemed an obvious risk. But what is a worst case imagination? It is one that emphasizes possibilities over probabilities; it emphasizes the consequences of the likelihood that courses of events will occur. Probabilistic thinking has come to be equated with rationality itself. But this is a mistake. Possibilistic thinking can be usefully employed to counterbalance probabilism. There is some relationship between possibilism and counterfactual thinking. Explore a worst case counterfactual world, and prepare for it.

According to Block (Chapter 7), the market, not the government, is that last best hope for actual and future potential victims of hurricanes. State subsidies have perverted locational settlement decision-making. They have
acted in such a manner as to encourage people to build in more dangerous areas than they otherwise would have. By undertaking part of the costs of rebuilding in the aftermath of storms, the government has encouraged irrational settlement patterns, which have led, in turn, to needless loss of life and wealth.

Hauser et al. (Chapter 8) take account of the fact that recent, current, and future threats to the American Homeland, whether by natural elements or by human-induced threats or actions, represent unique and complex strategic and tactical planning challenges that must be well understood by local, state and federal emergency responders, including the military. Considerable attention is currently being given to research and development into modified trip generation, distribution, route and modal assignment transportation models, with hurricane evacuation modeling the current focus.

To be valid, decision support tools must account for the dynamic and adaptive interactions of the threat and the populations at risk. Individual-based computational simulation modeling holds considerable promise to provide a framework for simulating and analyzing the non-linear macroscopic impacts of the numerous microscopic interactions within the population at risk (in both known and unknown scenarios). The potential for loss of life, serious injury, and the physical, economic, and psychological
aspects of catastrophes need to be estimated ex-ante in order to make mitigating real-time decisions.

The research aims to better understand why decisions are made about whether to evacuate or not to evacuate. About 400 residents or former residents of New Orleans and Orleans Parish were interviewed about their decisions. Geographic locations, socio-economic status and mobility characteristics were all examined. The results of the study can be used to develop a risk profile to help local authorities decide whether to designate and enforce a mandatory evacuation, and the optimal time to do it.

Bae and Richardson (Chapter 9) take a more detached and more distant look from New Orleans to examine a case where hitherto flood protection has worked, the Thames Barrier in London. Many world cities have been prone to floods for centuries. Although none of them can prevent floods, some have been much more successful in dealing with floods and protecting land than others. What makes the difference? Acknowledgment of the costs and the willingness to bear them plus leadership. The project was spearheaded by a Scientific Advisor to the government, Sir Herman Bondi, in 1966 although the Barrier was not opened until 1983. For the future, there is a new proposal to block the 10 miles width of the Thames River reaching from Kent to Essex, and to build a road above the dam. This is a very
ambitious project to protect Londoners from flooding related to an anticipated 2-3 feet sea level rise, possibly associated with greenhouse gas emissions.

Deloughery (Chapter 10) examines one of the most important sectors in New Orleans, tourism, and its prime event, Mardi Gras. Many viewed the 2006 Mardi Gras celebration as a way to gauge the early economic rebirth of New Orleans. The chapter looks at data on Mardi Gras over the past decade to determine the effect Hurricane Katrina had on the 2006 celebration. First, hotel data is examined. With the damage to downtown New Orleans, which hotels were able to open, and of those, how many were able to hold capacity? Taking the capacity constraints into consideration, I looked at whether people were still staying in the city, or if the crowd had moved to suburban areas. The main indicator of whether Mardi Gras was as big as ever, and that New Orleans is on the road to recovery, was the amount of money people spent while there. In order to look at the full spectrum of the New Orleans economy, revenue was considered from many different sectors. Bar, restaurant, casino, and transportation (cabs and trolleys) revenue were examined for the last decade. However, the fact that many establishments had not reopened should be taken into consideration when drawing conclusions from these data.
One of most celebrated features of Mardi Gras is the parades. These parades are run primarily by those living in and around New Orleans. Looking at the number of parades, and the number of floats in each parade, yields information about the number of Louisiana natives coming to Mardi Gras. This facilitates a breakdown of the effect between natives and tourists on the economy of New Orleans during Mardi Gras. The Mardi Gras celebration is usually a two week event, becoming more crowded as Fat Tuesday draws near. Determining the length of time people are staying in New Orleans, and when the influx of people starts to arrive, yielded more information about whether the 2006 Mardi Gras celebration had been scaled down. Additionally, these results can be compared with other New Orleans events popular with tourists, i.e. the Jazz Festival. This comparison sheds light on whether the Mardi Gras is a true representation of the economic growth of New Orleans, or whether it is an outlier.

Gordon et al. (Chapter 11) apply the National Interstate Economic Model (NIEMO), the first operational multi-state input-output model of the U.S., to estimating the state-by-state economic impacts of Hurricane Katrina. Whereas the effects of Katrina on U.S. GDP have been minor, this sort of aggregation masks important sub-national differences. Estimates of direct losses of tourism, port services, and oil and gas refining drive the model.
The results are for 50 states, 47 industrial sectors and each of the three major sectors.

Rose and Oladosu (Chapter 12) analyze resilience. The term refers to the ability to mute potential economic losses from disasters through various types of inherent and adaptive coping mechanisms. These take place at three levels: individual business (e.g., conservation, input substitution, relocation), market (e.g., resource allocating ability of prices), and regional economy (e.g., import substitution). Several studies indicate that resilience in the case of ordinary disasters is quite high (see, e.g., Tierney, 1997; Rose and Lim, 2002; Rose et al., 2005, 2006). The studies to date, however have been limited to the effects of a disaster targeting one sector (e.g., terrorist attacks on electricity generators or transmission lines) or in large cities with relatively small pockets of damage (e.g., the Northridge Earthquake in Los Angeles, and September 11 in New York City).

The situation in the aftermath of Hurricane Katrina, however, is far different from these other events. The physical damage is so widespread and recovery is so slow that these factors may have undercut or overwhelmed resilience. For example, inventories have been depleted, substitution options limited, permanent loss of customers and suppliers limit production rescheduling, some markets may become so thin or disrupted that they can
no longer be depended on to provide the proper signals for efficient resource allocation, and disrupted transport networks limits imports flowing into the region.

The purpose of the research is to use data collected from the Hurricane Katrina experience to analyze the effectiveness of resilience in the context of a true catastrophe. Implications are drawn about the effects of disaster magnitude and duration on resilience. Another focus is on how resilience can be enhanced or safeguarded so that it will be more effective against future catastrophes.

People adjust to the risks presented by natural disasters in a number of ways; they can move out of harms way, they can self protect, or they can insure. Smith et al. (Chapter 13) examine Hurricane Andrew, the largest U.S. natural disaster prior to Katrina, to evaluate how people and housing markets respond to a large disaster. The analysis combines a unique _ex post_ database on the storm’s damage along with information from the 1990 and 2000 Censuses in Dade County, Florida where the storm hit. The results suggest that the economic capacity of households to adjust explains most of the differences in demographic groups’ patterns of adjustment to the hurricane damage. Low income households respond primarily by moving into low-rent housing in areas that experienced heavy damage. Middle
income households move away to avoid risk, and the wealthy, for whom insurance and self-protection are most affordable, appear to remain. This pattern of adjustment with respect to income is roughly mean neutral, so an analysis based on measures of central tendency such as median income would miss these important adjustments.

Clay (Chapter 14) argues that Hurricane Katrina could prove to be a defining event in the way the global community thinks about natural disasters. The conventional wisdom has been that, with development, disaster risk – the combination of hazard probabilities and vulnerabilities - declines. Richer countries invest in preventive measures, engage in risk transfer and evolve more effective public and private responses to natural hazards. Hurricane Katrina dramatically calls in question such assumptions.

We already know that there was institutional failure at Federal, State and local government levels. Some of the problems that have been exposed involve at least similarities to disasters in poorer, so-called developing countries. First, the professional risk assessments pointing to the serious possibility of a catastrophic event did not result in commensurate disaster prevention measures either with regard to regulation of human habitat and business activity or investment levels of storm and flood protection. Second, the public response revealed problems similar to those found in the manuals
on disaster risk reduction for developing countries. Third, analyses for developing countries typically focus on the links among vulnerability, poverty, social exclusion and marginality. An interesting question is whether we are dealing with problems of a general nature, inherent in the way both public institutions and the private sector manage risk and respond to catastrophic events? Are some developing countries, with much more limited resources and that are exposed to similar categories of hazard, more effective in at least some aspects of disaster prevention or response? Are higher levels of economic development likely to be associated with structural changes in the economy and society that could increase some of the risks associated with extreme, highly improbable natural events? This paper considers and contrasts evidence from developing counties exposed to extreme riverine flood and coastal hazards with Hurricane Katrina and the 2002 Elbe floods in Central Europe.

Bostic and Molaison (Chapter 15) examine Katrina’s impact on New Orleans’ housing sector and assesses the various alternatives for reconstruction of the city. The chapter begins by providing a broad inventory of the damage wrought by the storm, and focuses on the spatial distribution of the damage and the resultant implications for reconstruction in terms of city functionality and cost. The analysis then turns to the various
plans for reconstruction and evaluates them in light of the damage inventory and its implications. It concludes by highlighting general lessons learned from the Katrina experience that can inform policy-makers and emergency responders to enhance preparation for future disasters to minimize housing-related damage and dislocation.

Logan (Chapter 16) reports the preliminary results of a study of the impacts of Hurricane Katrina on New Orleans, focusing mainly on the future redevelopment of the city. The key questions are: whose neighborhoods were destroyed, and whose neighborhoods will be rebuilt? Analyses of the pattern of development of New Orleans in the second half of the 20th Century will show how race and class became closely connected to elevation in a city where there was always a risk of water damage.

Research on the post-Katrina situation provides information on the pattern of dispersion and return of residents, the impacts of early policy decisions on recovery, and the mobilization of neighborhood constituencies to participate in the political process.

The post-Katrina saga will continue for some years to come. It is unknown what the eventual stable population will be. Resolution of the housing stock problem will take time, and again with an indeterminate outcome. At the time of writing, the Louisiana Recovery Authority has
barely begun its work. The funding stream from the Federal Government is intermittent and uncertain. The strength of the repaired levees is problematic. There is a powerful case for the drastic reform of FEMA. There are many lessons still to be learned. Our hope is that this book makes a contribution to the debates.