Editor’s Introduction to the Economic Impacts of the September 11, 2001, Terrorist Attacks

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Abstract

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1. INTRODUCTION

The September 11 terrorist attacks left an indelible mark on the psyche of the United States, and perhaps much of the world. Its other impacts are potentially strong and wide ranging. For example, Osama Bin Laden had previously stated that one of his major objectives was to cause great harm to the economy of the United States. Several years after 9/11, however, we still lack a definitive assessment of whether he succeeded in this regard.

This volume contains eight studies that address this issue and that together have succeeded in narrowing the range of plausible estimates. The studies use two major approaches: top-down macroeconomic modeling that is often applied in the context of forecasting and business cycle analysis, and a bottom-up economic impact analysis that is typically applied more directly to the basic features of the external shock. The former approach usually encompasses all changes that have taken place in the economy and attempts to decompose them. The latter usually is limited to a specific set of actions/reactions and omits many important background factors. In these contexts, the papers shed light on whether 9/11 was dwarfed by the business cycle downturn at the time and whether the shock measured up against an industry or system-wide economic collapse.

The collection of papers in this volume represent the outcome of a collaborative and iterative research process known as the CREATE Economic Impact Modeling Forum (EIMF). In essence it capitalizes on an active exchange of ideas between modeling groups. The special issue considers work by academics, policy-makers, practitioners and consulting firms. Those represented include: New York Federal Reserve Bank, Regional Economic Models, Inc. (REMI), INFORUM (U. of Maryland), RMS, Inc., Bryan Roberts, Peter Gordon research team, Adam Rose research team, and Brock Blomberg research team.

2. BACKGROUND

John Bates Clark once said “The modern world regards business cycles much as the ancient Egyptians regarded the overflowing of the Nile. The phenomenon recurs at regular intervals, it is of great importance to everyone, and the natural causes of it are not in sight.” Yet that damning quote has not dissuaded researchers from pursuing a better understanding of the economic causes and consequences of business interruptions, even though more than a century has passed since Professor Clark penned those words. Federal Reserve Chair Ben Bernanke provides an alternative way to think about it: "To understand the Great Depression is the Holy Grail of macroeconomics.” While economists have made great progress, he continues, “we do not yet have our hands on the Grail by any means.”
In the current environment of increasing worldwide unemployment that some are labeling the “great recession”, many economists are pursuing the latest version of the Holy Grail of economics, and advances in economic modeling are aiding in the effort. For example, new research by Barro (2009) shows that we can estimate the loss to an economy’s welfare from economic shocks that are more severe than a typical recession, and that these impacts are quite large.

As progress continues in development of economic modeling, it seems only natural to employ these models to estimate the consequences of other major/high impact events. One of the most transformative events to occur in our generation is the bombing of the World Trade Center and Washington D.C. on September 11th. Early estimates by Looney (2002) put the cost of lost physical assets to be “$14 billion for private businesses, $1.5 billion for state and local government enterprises and $0.7 billion for federal enterprises. Rescue, cleanup and related costs have been estimated to amount to at least $11 billion for a total direct cost of $27.2 billion. … The implied projected cumulative loss in national income through the end of 2003 amounted to 5 percentage points of annual GDP, or half a trillion dollars.” Others have made more conservative estimates. Bernasek (2002) estimates business costs associated with the attack to be as much as $151 billion. The International Monetary Fund (IMF) (2001) finds that “the loss of output from all these sources could be as much as ¾ percent of GDP.” This amounts to approximately $75 billion in 2001 dollars.

It is now more than seven years since these original impacts were derived. With the benefit of hindsight, the special issue hopes to provide a more definitive estimate of the economic costs of 9/11. It is useful to note that economics has been concerned with understanding consequences of conflict almost as long as it has been researching business cycles. John Maynard Keynes, who is often more associated with business cycle research, was one of the first to address the issue in his study “The Economic Consequences of the Peace” (1919). Other prominent economists followed as A.C. Pigou wrote on “The Political Economy of War” (1940), and Lionel Robbins wrote on “The Economic Causes of War” (1942). The tradition continues today as Nobel laureate Joe Stiglitz writes with Linda Bilmes (2008) on the cost of the Iraq war.

Prominent economists have also contributed to these arguments in some of the earliest issues of this same journal. Isard (1994) and Polachek (1994) were the first in the journal to formalize "peace economics" as a research field. In doing so, they discussed the definitional, philosophical, political and policy implications associated with the area of study. Isard, who established the field of “peace science” in the 1960s, characterized the newly emerging field of peace economics as being concerned with: (1) resolution, management or reduction of conflict in the economic sphere, or among behaving units in their economic activity; (2) the use of economic measures and policy to cope with and control conflicts whether
economic or not; and (3) the impact of conflict on the economic behavior and welfare of firms, consumers organizations, government and society. Tinbergen (1994) provided a broad framework for an international agency to encourage conflict resolution and economic development. In his discussion, he explained how economists have attempted to do their part through the Economists Allied for Arms Reduction (ECAAR). Arrow (1995) in a paper discussing his role on being a co-chair of ECAAR, pointed to five different ways in which conflict harms the economy -- the cost of war; the diversion of resources in preparation for war; the macroeconomic implications for military budgets; the political economy of arms reductions; and trade and war. This final point was analyzed in more detail by Krugman (1995).

In the vein of impact analysis, a first major application was the World War II European Theater Strategic Bombing Study, which involved the application of input-output (I-O) analysis to estimate the direct and indirect economic impacts. It involved such notable economists as John Kenneth Galbraith and Nicholas Kaldor (Galbraith et al., 1945). Since then, I-O and more advanced models, such as computable general equilibrium analysis, have been used to perform impact studies of military action in addition to their more conventional applications (see, e.g., Enders and Sandler, 1991; Richardson et al., 2007; Rose et al., 2007). The authors of the special issue are therefore contributing to an established tradition of quantifying the impacts of conflict as they estimate the economic consequence of September 11.

3. FINDINGS

An innovative aspect of this set of studies is seen in the range of impacts considered in the study. The impacts of 9/11 extend beyond those covered by most ordinary models, including behavioral responses such as relocating businesses whose facilities incurred substantial damage and avoiding air travel. Many of the papers in the volume include government (and private sector) responses in mitigating future events, including increased airport security. In some of the studies, modeling has been undertaken to decompose the overall impact according to the various shocks, responses, and stimuli. The researchers responded to the need to enumerate the impact categories and clearly state the bounds of the event in relation to these categories.

However, the research agenda pursued in this Special Issue faced significant challenges. One of the most important is the problem of "unscrambling the eggs". All of the researchers were working with one historical record. Discovering how much of that record is attributable to the 9/11 attack is not trivial, as econometricians and historians know well. The models employed in the analysis require the ceteris paribus assumption, which (by definition) does not

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hold in the historical record. Other analysts used a building block approach by simulating those factors that shocked the economy and also those that caused it to be resilient. Some efforts were made to control for background factors, such as the on-going recession, but many factors were omitted, including remedial action at the WTC site, heightened homeland security, and military actions overseas.

Some of the models employed in the analyses are less subject to this criticism. These models used what is typically referred to as event analysis: comparing data and trends before and after the attack to look for breaks and/or regime shifts in time series. This also requires "unscrambling," but the methods employed in event analysis are designed to address this problem.

Another challenge is evaluating impacts at the sectoral and regional level versus at the national level. National-level impacts will generally be less than the sum of separately-estimated sectoral or regional impacts due to substitution and reallocative efforts. Consider two estimates that have already been cited in various analyses. First, a previous CREATE study estimated that the immediate and longer-run impacts of 9/11 on the airline sector were roughly $17 billion and $300 billion, respectively (Gordon et al., 2007). People did substitute away from airline travel, but they shifted to other travel modes (train, automobile etc) to carry out the same activities requiring travel (business, tourism, etc.) (see the paper by Rose et al., in this volume), found alternatives to travel to carry out the same activities (e.g. teleconferencing) (see more recent work by Gordon et al, 2007 on the impact of 9/11 not included in this volume), or shifted to activities that did not require travel (vacationing at home rather than flying to a resort).

Second, a report by the New York City Comptroller’s Office estimated that New York City lost roughly $58 billion during 2001-04 as a result of 9/11 (NYC Office of the Comptroller, 2002). However, some jobs and business activity that NYC lost may have been shifted to other geographical locations, so that from a regional or national perspective, the net loss of activity was significantly less than the loss suffered by NYC alone.

These substitutions have to some extent been properly accounted for in a general equilibrium context in order to evaluate the overall impact of 9/11 (see the papers by Rose et al., and by Werling and Horst in this volume). It would also be useful to evaluate these impacts in welfare terms if possible. A welfare impact should estimate the monetized value of the difference of engaging in a most-

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1 The immediate impact is the average value of the impact of shutting down the airline system for one week, and the longer-run impact is the average value of the shortfall in U.S. airline traffic below a no-9/11 baseline for the two years after 9/11.
2 Some suggest that the methodology employed by the NYC Comptroller has many issues, e.g., there is likely cross-boundary substitution not controlled for in the analysis. Hence, including the estimate may be considered as a “straw man” to some. Still, it is worthwhile to note that initial estimates by policy-makers were considerably high.
preferred activity or being in an optimal location to engaging or being in less-preferred ones.

A final challenge is seen in the ability to separate out the impact of mitigating factors in our study. Almost immediately after the attack, President Bush pledged $20 billion to rebuild the city. This is a large amount of money relative to the capital loss, and presumably had a substantial effect on observed outcomes. For example, residential property price effects (which were quite small in downtown Manhattan) are presumably net of the substantial subsidies that homeowners received. How much those subsidies offset price declines that would have occurred in their absence is difficult to estimate but important to address.

Given these challenges and potential limitations, several consistent empirical findings emerge in the special issue. First, the regional impact seen in New York and New Jersey is significant. The papers show that the cost to New York City accounts for $36.5 billion, and the cost to the surrounding areas account for another $10 to $20 billion. These impacts add up to approximately 50 percent of the total impact in the United States economy. Second, the national impacts, though significant, are substantially smaller than what was originally reported by many of the first estimates. Nearly all of the studies show that the cost of September 11 was approximately $35 to $109 billion for the U.S. as a whole in 2006 terms, or approximately 0.5 to 1.0 percentage points of GDP.

We suspect that one reason these impacts are smaller than originally reported by organizations such as the IMF is that the United States economy is resilient. The term resilience refers to the ability of individuals, markets, and the economy as a whole to continue functioning when shocked by a disaster (see, e.g., Holling, 1973; Perrings, 2001; Rose, 2004; Rose 2007; Boettke et al., 2007). A more general definition that incorporates dynamic considerations, including stability, is the ability of a system to recover quickly from a severe shock. Input substitution and business relocation are two of the major forms of resilience.

4. THE EIMF PROCESS

The compilation of papers in this volume resulted from a unique collaborative research effort that was intended to arrive at definitive results and to improve the methodologies used to obtain them. It is patterned after the successful 25-year experience of the Stanford Energy Modeling Forum (EMF), which has used it to arrive at definitive estimates of such topics as the future price of oil and the potential economic impacts of the complying with the Kyoto Climate Change Treaty (see, e.g., Huntington, 2009; Weyant, 1999).

3 The $36.5 billion figure includes capital losses.
Twelve modeling groups were invited to participate in the EIMF 9-11 Project, and eight ultimately contributed research projects. The group of teams first exchanged ideas on the scope of the topic in the early winter of 2008. In January and February 2008, the group agreed on a scope and on a set of basic assumptions and data during a series of e-mail exchanges and conference calls at two-week intervals, which continued throughout the course of the project. Initial runs were exchanged, and the group met in early April to discuss the results and the methodologies. We found several inconsistencies in assumptions and gaps in data. We also discussed the deeper philosophical issues of “unscrambling the eggs” of an event that had taken place in the midst of various other cyclical and secular economic, as well as non-economic, phenomena. We found a great disparity in the initial results, due in part to some differences in assumptions and data, but also to the application of disparate models. Assumptions were made uniform and data and findings (e.g., on direct business interruption and resilience) exchanged. Participants also offered suggestions for improving each others’ methodologies.

Subsequent modeling runs were presented at a Workshop at the Homeland Security Institute (HSI) in late July 2008, which was attended by Department of Homeland Security (DHS) staff and several DHS contractors, and members of the EIMF 9/11 Advisory Board. The review process was repeated, this time with advice from an audience. Not surprisingly, the range of estimates narrowed in relation to the April meeting. The groups then returned to their home bases and continued to refine their estimates.

Eight presentations were made of methods and results at the Annual Meetings of the North American Regional Science Association in Brooklyn, NY in November 2008. The modelers benefitted from the feedback from formal discussants and the general audience at the conference. Final refinements were aided by continued exchanges between group members and from detailed comments in formal reviews by the Advisory Board of preliminary versions of papers in this volume.

5. SUMMARY OF PAPERS

This section provides a broad overview of all of the papers included in the volume and describes the main results summarized in Table 1. The summary describes the variety of approaches employed in the analyses and the robustness of the results. Using various econometric and simulation methodologies, the majority of the papers estimate the economic consequence of September 11 terrorist attacks to be approximately $35 to $109 billion in 2006 dollars for the United States as a whole in terms of lost Gross Domestic Product and $6 to $14 billion for various geographic delineations of the New York City area.

http://www.bepress.com/peps/vol15/iss2/1
### ECONOMIC IMPACTS OF SEPTEMBER 11 TERRORIST ATTACKS ON THE WTC
(in billions of 2006 dollars)

<table>
<thead>
<tr>
<th>Team/Time Period</th>
<th>Geographic Area</th>
<th>Gross Domestic (or Regional) Product unless noted</th>
<th>Scope</th>
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<td>Upper Bound</td>
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<td>Bram et al.</td>
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<td>(wage &amp; salary)</td>
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<tr>
<td>Blomberg &amp; Hess</td>
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<td>2006-2020</td>
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*aTypically involves assumptions of low levels of resilience.

*bTypically involves assumptions of high levels of resilience.

*cAscribes all national and NYC Metro Region losses to 9/11, and none to the national recession.

*dAscribes no national and NYC Metro Region losses to 9/11, and all to the national recession.
Jason Bram, Andrew Haughwout, and James Orr of the Federal Reserve Bank of New York consider only the economic impact of the September 11 terrorist attacks on the World Trade Center (WTC) in New York City. Since the attack took place during a national and local recession, they emphasize the importance of controlling for economic conditions to obtain a precise estimate of the attack’s effects. First, they estimate the physical capital loss based on the cost required to clean up the site and repair and replace the destroyed and damaged infrastructure. The estimated foregone lifetime earnings of the workers killed in the attack are used to gauge the loss of human capital. The total physical capital loss was estimated to be $26.8 billion, and the lifetime earnings loss was estimated to be $9.7 billion, yielding a total estimated stock loss of $36.5 billion in 2006 dollars. They provide estimates of the disruptive effect on employment and earnings by comparing the actual path following the attack with a counterfactual path constructed from an auto-regressive model that predicts trends in NYC private-sector employment. They find a net job shortfall of roughly 65,000 jobs immediately after the attack, converging to near zero by the end of 2002. Over the period it is estimated that wage and salary income was roughly $6 billion in 2006 dollars lower than it would have been if the attack had not occurred. In addition to these short run costs, they also investigate the extent to which the attack may have adversely affected the city's longer-term economic growth potential by examining real estate markets. With the possible exception of downtown commercial real estate, they find little evidence that perceptions of the city as a place to live or do business were adversely affected by the attack.

Patricia Grossi of Risk Management Solutions, Inc. (RMS) estimates the insurance cost of September 11, 2001. RMS issued a report in the week following the event, based on its research and limited on-site reconnaissance, to help qualify and quantify the magnitude of the damage and insured loss from the disaster at the WTC. At the time, RMS was in the business of natural catastrophe modeling (e.g., earthquake, windstorm, and flooding events) and used its expertise in modeling analytics and understanding of the impacts of natural disasters to frame the potential insurance consequences of the tragedy. Grossi builds on this initial research with new information and the development of an RMS® U.S. Probabilistic Terrorism Model to summarize the overall property damage and final insured loss estimates from the WTC attacks in downtown Manhattan. Overall, she finds that there was $22.7 billion loss to property in and around the WTC complex as a result of the terrorist attacks. Insured loss to property, which includes building, contents, and time element coverage (e.g., business interruption), totaled approximately $19 billion. With this large insured loss, ranking only second behind Hurricane Katrina’s $41.1 billion insured loss, the paper concludes with a discussion of the enormous impact of this event on the
U.S. insurance industry, including the federal government backstop for terrorism-related losses.

Adam Rose, Gbadebo Oladosu, Bumsoo Lee and Garrett Beeler Asay employ a Computable General Equilibrium (CGE) framework to estimate both the national and regional sectoral and macroeconomic impacts of the September 11, 2001, World Trade Center attacks. There are several novelties to the approach. First, they construct a new dataset on relocation of firms displaced by the attack. Second, they refine prior estimates of a major source of impacts -- the ensuing decline of air travel and related tourism. Third, they employ an approach that allows for a parsing of the direct effects of external shocks from indirect (in this case, general equilibrium) effects. This approach has the additional advantage of allowing the researcher to include behavioral responses of individual businesses and households and to incorporate features of inherent and adaptive resilience at the level of the individual household, business, and government in order to gauge quantity and price interactions across economic sectors. They find that the total business interruption losses from the WTC attacks on the U.S. economy were only $109 billion, or about 1.0% of Gross Domestic Product. The decline in Gross Regional Product for the New York Metropolitan Area was only $14 billion, or 1.2% of this economy.

The paper by Jeff Werling and Ron Horst of Inforum considers the aggregate and industry-level impacts of the terrorist attacks. Their approach integrates features of macroeconometric, input-output, and general equilibrium models, which allow for full industrial detail and a consistent representation of the macroeconomy. The paper also incorporates the findings of other papers in this volume in order to conduct their analysis. Inforum collects the set of primary impacts from Rose et al. and Park et al. among others. These impacts provide the historic baseline economy, which enables Inforum to construct the “counterfactual” or what the economy would have experienced by avoiding 9/11. They show that compared to the shocks imposed on the model, the net, six-year effect on overall real GDP is relatively small--$35 billion, or about 0.3 percent of GDP in 2001. Effects on real national income and personal consumption, however, are estimated to be of larger magnitude, or approximately twice the impact on GDP. Their upper- and lower-bound estimates on GDP are $90 billion and $12 billion, respectively.

Jiyoung Park, Peter Gordon, James Moore II, and Harry Richardson take on the challenge of estimating macroeconomic consequences by decomposing the history of U.S. GDP and unemployment fluctuations temporally. Using panel VAR analysis, they found that separating the individual effects of the recession and the 9/11 attack was problematic. Within this severe constraint, they showed that the national economic impact of 9/11 appears to have been both modest and short-lived. Their result is supported by the fact that there tended to be a sharper
decline in industrial production in 2001 than in 2002, suggesting that any residual effect from the terrorist attack was temporary. At the regional level, they show that the impact seems to be more important in creating relocations than in actually reducing economic activity. For example, they show that New Jersey actually fared better economically during 2001 (as businesses relocated from New York) and only experienced a decline in 2002. They found that New York City experienced something altogether different from other spatial units due to resilience. Finally and importantly, their results show that there was only one significant change in the industrial sector linkages – as seen in losses to the effect of Finance and Insurance on Professional, Scientific, Technical Services.

The paper by S. Brock Blomberg and Gregory Hess employs several macroeconometric methods to estimate the cost of September 11 attacks to the U.S. economy. Their analysis brings together information on economics, terrorism, and conflict in a panel data set spanning 177 countries over the past 40 years. They employ cross-sectional and panel growth regression analysis and a structural VAR model to estimate the impact using the average effect of terrorism. They then employ a variety of robustness checks to examine the extent to which the estimate is fragile. On average, the incidence of terrorism may have an economically significant negative effect on growth, albeit one that is considerably smaller and less persistent than that associated with either external wars or internal conflict. As well, terrorism is associated with a redirection of economic activity away from investment spending and towards government spending. Their “bottom-line” best estimate of the impact of the September 11 attacks is approximately a 0.50 percentage point decrease in GDP growth, or $58 billion in 2006 dollars. Their lower-bound estimate is $23 billion and their upper-bound estimate is $122 billion.

Fred Treyz and Billy Leung of Regional Economic Models, Inc. (REMI) use an macroeconometric forecasting model to analyze the regional and sectoral impacts on New York City and the surrounding metropolitan region. Incorporating data inputs collected from a variety of sources, including other studies in this volume, into the REMI Policy Insight Model, they are able to recreate economic interactions on a regional basis and simulate the economic impact of the events of 9/11. Their paper quantifies the economic impacts in terms of various economic indicators, including employment, gross regional product, output, real disposable personal income, labor productivity, and population. These impacts are analyzed for Manhattan itself as one region, combining it with the four other boroughs of the City, and the nine regions of the New York City Consolidated Metropolitan Area. The impacts are also presented for the rest of the U.S.

Bryan Roberts makes a significant departure from these approaches by analyzing how economic forecasters themselves estimated the economic
consequence. He first demonstrates that evaluating the economic consequences of the 9/11 attack is challenging, because consequences were differentiated across space, sectors, and time, and the attack induced responses that may have mitigated or magnified initial impacts. Rather than econometrically analyze historical data on actual outcomes or use a model to simulate the attack and its outcomes, he evaluates how forecasters revised their predictions of growth in real GDP and unemployment after the attack occurred. Real-time forecast evidence suggests that the short-run macroeconomic impacts of the 9/11 attack were a reduction in real GDP growth in 2001 of 0.5%, and an increase in unemployment by 0.11%, which represents an additional 598,000 people thrown into the ranks of the unemployed. This result is robust to controlling for how economic forecasts typically change over the course of the forecasting horizon and in recession years. Evidence from revisions to forecasts for 2002 outcomes is striking and might suggest an upper bound to a “resiliency effect”, but a difficult identification issue is faced in interpreting 2002 outcomes.

Finally, the range of estimates of these impacts is actually rather small, suggesting a certain degree of precision in these findings, with the median being approximately $50 to $100 billion at the national level. In the "Average" column, the low estimate at that level is approximately $35 billion, and the high estimate is approximately $109 billion. The one outlier is the study by Gordon et al., which admittedly was unable to distinguish the impacts of 9/11 from the on-going recession.

6. POLICY IMPLICATIONS

The economic loss estimates presented here quantify the impact of a specific historical catastrophic terrorist attack. Some of the methodologies employed to make these estimates can be applied to the evaluation of the impacts of other historical disasters. Some of the studies also provide insights into how to estimate potential economic losses from prospective disasters. Such loss estimates should be used as the basis for benefit estimates (avoided losses) in DHS benefit-cost analyses of policies and measures intended to reduce the threat of terrorist attacks on major cities in the United States. These analyses are essential if decisions on homeland security policies and programs are to take into account the rational assessment of the economic tradeoffs involved in these decisions. We also should emphasize that going through the exercise of quantifying the impacts of a disaster necessarily forces analysts to think carefully and rigorously about how a disaster really impacts an economy, and such thinking creates opportunities to conceptualize ways to prevent a particular impact from occurring, or reducing the impact by way of resilience if it does materialize.
This project identified the power of a broad range of resilient responses by many entities (businesses, households, government) in reducing losses. The responses by these entities should be further examined as “good-practice” if not “best-practice” approaches to coping with disasters. However, although relocation and adaptation of New York-based business clearly played an important role in reducing the business interruption impacts of the 9/11 attack, even stronger contingency plans for relocation (or back-up facilities) in the aftermath of a disaster would have reduced those losses even further. Further opportunities for resilience should be identified and evaluated. One good example is the physical dispersal of critical economic sectors and facilities, though any added costs of this dispersal should be assessed as well. The social amplification of risk played a key role in generating significant GDP losses at the national level after the 9/11 attack, and measures to control this amplification when it is unwarranted could play an important role in reducing losses after a major terrorist attack in the future. Such measures would involve better analysis of the nature of terrorism risk and communication of this analysis to the public, and a well-organized and disciplined system to disseminate information to the public when a major attack does occur.

7. WHERE DO WE GO FROM HERE?

A central contribution of the papers in the volume is that they have employed a myriad of methodologies and a standardized set of assumptions and data to provide a more definitive estimate of the economic consequence of the September 11 terrorist attacks on sectors and regions of the United States, and the U.S. economy as a whole. Once such an exercise has been completed, it is tempting to conclude that the process is finished, and the work is done. However, such an exercise usually raises as many questions as it answers, and it is useful to identify future research opportunities and needs coming out of the exercise.

As noted previously, the methodologies used in these studies can be employed to estimate losses resulting from other low-probability but high-impact shocks. Other catastrophic events could conceivably occur in the near future, and our understanding of the consequences of such events would be improved by applying these same research strategies to evaluate them. For example, research teams could use these tools and methodologies to evaluate the impact of natural disasters such as Hurricane Katrina or pandemics such as the swine flu (H1N1) virus.

A more explicit approach to modeling the broader behavioral responses to disasters is also clearly needed. While some of the papers consider the “fear factor” in the limited sense of its impact on travel decisions, they do not address how the fear factor impacts other sectors such as investment activity, and how responses to a disaster shapes the fear factor and its impacts. The fear factor, risk
perception, and risk communication are at the heart of several of the most important events and decisions of the first decade of the 21st century, and the stakes involved in better understanding and managing these issues are large indeed.

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