

Behavioral Impacts of Terrorist Attacks: Bounded Rationality Analysis of the “Fear Factor”

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The study will translate the research by decision scientists and psychologists on the social amplification of risk into a formal economic modeling framework.

Brief Description:

The economic impacts of many terrorist attacks extend far beyond the usual direct and indirect impacts. One area of negative impacts that can be as many as two or three orders of magnitude greater than the direct effects is negative *behavioral linkages*, such as the “fear factor.” This stems from the social amplification of risk, where media attention and personal and social psychological responses cause people to over-react to an event. A classic example is the almost two year significant reduction in air travel to and from the United States following the September 11 attacks. Although psychologists and decision analysts are making great strides in the analysis of the social amplification of risk (see, e.g., Burns and Slovic, 2007; Burns, Slovic, Rose and Asay, 2007), this work stops short of being able to analyze the economic consequences. The proposed study would translate the research by others at CREATE, as well as data and insights collected by DHS staff, into a formal economic modeling framework. This would begin with individual decision functions of producers and consumers in the context of bounded rationality. These utility and production functions would then be inserted into a computable general equilibrium model in order to ascertain broader indirect effects.

Objectives:

This research will develop a bounded rationality framework to analyze extreme behavioral reactions to catastrophic risk, to calibrate the production utility functions to data collected by other CREATE researchers, generate estimates of the range of behavioral linkages such as the “fear factor,” apply the model to various case studies, and transfer the modeling capability to other researchers and DHS staff.

Interfaces to other Center Projects:

This research will build on work of CREATE researchers in the areas of risk analysis.

Interfaces to non-Center Projects:

A proposal has been submitted to perform the proposed analysis, along with a broader decision analysis framework, to the NSF Human Social Dynamics Program (see, e.g., Burns et al., 2007). In addition the topic lends itself to greater connections with researchers at PACER.

Major Products and Customers:

Project deliverables will consist of refereed journal articles, characteristic utility and production functions that embody extreme behavior, a formal economic model to analyze direct and indirect impacts of terrorist attacks and possible over-reactions, and, in conjunction with other researchers, an overall decision analysis framework. Prior studies by CREATE researchers have indicated that omission of such behavioral linkages can lead to an underestimation of overall impacts by an order of magnitude or more (see, e.g., Gordon et al., 2006). Hence, there is a strong need to integrate the findings into various models being developed for use by DHS.

Technical Approach:

It has been widely observed that, when disasters occur, individuals do not necessarily act as standard economics predicts. *Bounded rationality* is a useful framework for modeling behavior that differs from the norm (Conlisk, 1996). We will incorporate such behavior as:

- Extreme degrees of risk aversion (building on the risk perception literature).
- A “safety constraint” affecting investment in repair that allows for operation only if the post-disaster safety of workers is above a certain threshold.
- Working with very limited information about input quantity and quality.

The CGE model is a state of the art approach to economic impact and simulation analysis. It is especially well suited for this project because it is based on individual decision-making by households and business under either normal circumstances or crises (see, e.g., Rose and Liao, 2005). This provides a mechanism for incorporating the empirical findings about risk perception into a formal model capable of determining both their direct economic consequences.

Major Milestones and Dates: (Key high-level progress management steps and schedule)

1. Develop bounded rationality framework for households--December 2007
2. Develop bounded rationality framework for firms--February 2008
3. Integrate individual utility and production functions into overall CGE model--May 2008.
4. Test theoretical model--July 2008

A bounded rationality framework is in the process of being developed. Insights into its formulation with respect to specification of objective functions, constraints and parameter values was obtained from related work with Bill Burns and Garrett Asay on the perception of terrorist risk.

Year 2: Work with decision analysts/psychologists to calibrate empirical model and apply to single case study.

Year 3: Apply model to broader range of case studies and transfer technology to DHS.

References:

- Burns, W., S. Slovic, A. Rose, and G. Asay. 2007. “Modeling Community Response and Economic Impacts of Risk Amplification Following a Terrorist Strike.” proposal submitted to NSF Human Social Dynamics Program, Decision Research, Eugene, OR.
- Conlisk, J.. 1996. “Why bounded rationality?” *Journal of Economic Literature* 34: 669-700.
- Gordon, P. et al. 2006. “the Economic Impacts of a Terrorist Attack on the U.S. commercial Aviation System,” *Risk Analysis* , forthcoming.