The Economic Costs of Natural Disasters, Terrorist Attacks, and other Calamities: An Analysis of Economic Models that Quantify the Losses Caused by Disruptions

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Disasters on the Rise

- Costs from disasters have risen from $50 billion to $200 billion in the last decade
- 4% of spending for natural disasters is preparedness, 96% is recovery
- $1 spent on preparing for disasters → $4 in savings [1]
Estimating Economic Consequences of Disruptions

- Comprehensive study of economic consequences from disruptions (both historical and hypothetical)
- Economic models (Input-Output Models)
- Models how industries are connected
- Models how industries behave during disruptions
This Research

- Compiles studies of economic estimates of disasters
- Our goal: provide a useful benchmark for understanding seriousness of disasters and to help prepare for them
- Studies differ because of
  - Type, magnitude, and duration of the disruption
  - Affected area of the disruption
  - Type of model used to estimate the economic impacts
  - Key assumptions in the model of the disruption
What We Did

Reviewed 55 papers (peer-reviewed journal articles and book chapters)

- 16 earthquakes
- 15 hurricanes
- 13 terrorist attacks
- 5 pandemic diseases
- 3 cyber attacks
- 5 closures of ports
- 11 other disruptions
Earthquakes

• Depending on magnitude, losses range from $100 million – $100 billion
• 1995 Great Hanshin Earthquake: $100 billion, 2.1% of Japan’s GDP [2]
• 2011 Japan earthquake and tsunami: $32 billion in March, $52 billion in April [3]
• Hypothetical 7.1-magnitude earthquake in the Los Angeles: $100 billion in losses [4]
• Hypothetical earthquake that disables the Portland Metropolitan Water System: regional output losses between $418-$516 million [5]
Hurricanes

- Losses could range from millions to billions depending on magnitude
- Hurricane Katrina
  - $149 billion in losses with no inventory [6]
  - $74 billion in losses with inventory [7]
- Hurricane Sandy: $10 billion in losses [8]
Terrorist Attacks

9/11 Attacks

• $108 billion total losses
• $40 billion losses in the air transportation sector [9]
Hypothetical Terrorist Attacks

- Attacks on Los Angeles-Long Beach Ports
  - Scenario 1 (Two small radiological dispersal devices): $34 billion
  - Scenario 2 (Four conventional bombs): $45 billion [10]
- Bioterrorist attack (Foot and Mouth Epidemic): $23-$34 billion [12]
Pandemic Diseases – Hypothetical Studies

- 30-day period with a 20% reduction in the workforce:
  - $200 million direct losses
  - $70 million indirect losses [13]
- 4-week pandemic involving a 15% and a 25% attack on the workforce
  - 15% attack: $4-$5.5 billion
  - 25% attack: $7-$9 billion [14]
Cyber Attacks – Hypothetical Studies

- 10-day Internet outage. Effects on manufacturers
  - Oil and gas: $405 million loss
  - Automobile parts: $65 million loss
  - Electrical: $23 million loss [15]
- A cyber-attack involving a 1% loss in each of 10 sectors in the U.S. economy
  - $38 billion losses
  - Computer and electronic product manufacturing sector impacted the most: $14 billion [16]
Port Closures – Hypothetical Studies

- 10-day shutdown of the Port of Los Angeles
  - $770 million – $1.3 billion total output losses per day
  - $387-$904 million in production losses per day [17]
- 1-2 months shutdown of the inland-way water port in Oklahoma
  - Production losses: $46 million – $5 billion [18]
Other Disruptions

- The 2003 Northeast Blackout
  - 3-day loss $6.5 billion
  - Highest losses in business sector: $1 billion [19]
- Hypothetical study – 1 year U.S. border closure to trade and travel (2001 data)
  - $2 trillion in losses
  - 14% of 2001 GDP [20]
Conclusion

- Major disasters could cost up to $100 billion (e.g., Hurricane Katrina, 9/11)
- Other disruptions are $10-$50 billion (e.g., Hurricane Sandy, Northeast Blackout)
- The need to prepare
  - Other consequences that go beyond monetary value (e.g., loss of lives)
  - How likely are these disruptions going to happen?

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References


References


References


