Improving Homeland Security in the Wake of Large-scale Disasters: Would Risk-Based All-Hazard Disaster Insurance Help in the Post-Katrina World?

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August 18-19, 2006
CREATE Symposium – USC, Los Angeles
Homeland Security

“The concerted effort to prevent attacks, reduce America’s vulnerability to terrorism, and minimize the damage and recover from attacks that do occur”

The White House – July 2002

Ought to apply for natural and technological disasters as well.

This strategy must be a comprehensive national effort that adequately weights its ex ante (prevention/mitigation) and ex post (financial protection) components.

Major challenge: how can the security/preparedness world and the insurance/reinsurance/finance world talk to each other, and work hand-in-hand?
Nature of the Problem

A radical change in the scale and rhythm of catastrophes

Natural disasters have caused severe insured losses in recent years
  – Hurricane Katrina: $40-$55 billion
  – Hurricane Andrew: $22 billion (2005 dollars)

Victims complain about receiving substantially less than the actual costs to repair or rebuild their damaged structures from Katrina

Federal government is committed to providing liberal disaster assistance to aid the victims of Katrina and rebuild the Gulf Coast
Agenda

1. Insurance Infrastructure Is Resilient… But It now Faces a New Dimension of Loss

2. What’s Happening? The Question of Attribution

3. How Well Does the U.S. Deal with Catastrophe Insurance?

4. How Can We Do A Better Job?
1. Insurance Infrastructure Is Resilient…

After Hurricane Andrew and the Northridge earthquake (first *Super-Cats*), insurers/reinsurers have paid more attention to their exposure to extreme events.

Not one insurer became insolvent after 9/11 - Only 1 this year after the 2005 hurricane season (Poe)

2/3 of the 9/11 insured losses paid by reinsurers (mainly European); half of Katrina insured losses paid by overseas firms or reinsurers

Resilience: despite the 2004/2005 hurricane seasons, U.S. insurance industry recorded a 12% increase in net income after taxes ($43 billion) in 2005
… But insurance now faces a new dimension of loss
Worldwide Evolution of Catastrophe Insured Losses, 1970-2005

(Property and business interruption (BI); in U.S.$ billion indexed to 2005)
Sources: data from Swiss Re and Insurance Information Institute

Human-caused catastrophes
Natural catastrophes
9/11/2001 attacks

(Property and business interruption (BI); in U.S.$ billion indexed to 2005)
Sources: data from Swiss Re and Insurance Information Institute
The 20 Most Costly Catastrophe Insurance Losses, 1970-2005
(18 of them occurred between 1990 and 2005; 10 of them occurred in the last 5 years)

<table>
<thead>
<tr>
<th>Rank</th>
<th>U.S.$ Billion (indexed to 2004)</th>
<th>Event</th>
<th>Victims (Dead and missing)</th>
<th>Year</th>
<th>Country</th>
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<tr>
<td>1</td>
<td>40-60*</td>
<td>Hurricane Katrina</td>
<td>1,281*</td>
<td>2005</td>
<td>USA</td>
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<td>2</td>
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<td>9/11 Attacks</td>
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<td>Northridge Quake</td>
<td>61</td>
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<td>Hurricane Ivan</td>
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<td>2004</td>
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<td>Typhoon Mireille</td>
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<td>6.7</td>
<td>Winterstorm Daria</td>
<td>95</td>
<td>1990</td>
<td>France, UK et al</td>
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<tr>
<td>9</td>
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<td>1999</td>
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<td>USA</td>
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<td>Seaquake, Tsunami</td>
<td>280,000</td>
<td>2004</td>
<td>Indonesia, Thailand et al</td>
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<tr>
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<td>Storms and floods</td>
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<td>2004</td>
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<td>41</td>
<td>2001</td>
<td>USA</td>
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</tbody>
</table>

Sources: Wharton Risk Center with data from Swiss Re, Insurance Information Institute and press releases (*estimations)
2. What’s Happening? The Question of Attribution

• Higher degree of urbanization

• Huge increase in the value at risk
  - E.g.: population of Florida
    2.8 million inhabitants in 1950 - 6.8 million in 1970 - 13 million in 1990
    19.3 million population in 2010 (590% increase since 1950) (US Bureau of the Census)
  - A direct hit on Miami by Hurricane Andrew that would have cost $60bn in 1992 and $120bn in damage in 2004 because the market value has doubled (ISO) - and still increases

• Weather patterns
  - Among the top 19 natural disasters that occurred in the past 35 years, more than 80% were weather-related events
  - Changes in climate conditions or return to a high hurricane cycle? Or a combination of both

Direct consequence:
More intense weather-related events which cost more, much more

Will 2006 or 2007 Be Even Worse?
Total Value of Insured Coastal Exposure in 2004 (in $billion)

- Florida: $1,937bn
- New York: $1,902bn
- Texas: $740bn
- Massachusetts: $663bn
- New Jersey: $506bn
- Connecticut: $405bn
- Louisiana: $209bn
- S. Carolina: $149bn
- Virginia: $130bn
- Maine: $117bn
- North Carolina: $105bn
- Alabama: $76bn
- Georgia: $73bn
- Delaware: $46bn
- New Hampshire: $45bn
- Mississippi: $44bn

Source: AIR Worldwide
Katrina – As of Sunday August 28, 2005

Sources: National Weather Service.
Two Questions

What are the main limitations of current catastrophe insurance programs in dealing with this new loss dimension?

Has the time come for a well defined risk-based all hazard insurance program?
3. How Well Does the U.S. Deal with Natural Catastrophe Insurance?

After major catastrophes, insurers have decided to leave the market; State or federal government has established public-private programs that provide insurers with safety net:

- Florida Hurricane Catastrophe Fund (1993; FL only; reinsurance for storms)
- California Earthquake Authority (1996; CA only; earthquake insurance)

Or the fed govt. took over to provide specific public coverage:
- National Flood Insurance Program (national; est. 1968; flood)
Limitation 1: Complex mosaic of different programs, all of them single-hazard based.

One policy for wind
One for flood
One for earthquake …

Might be confusing for policyholders (e.g., distinction of flood versus wind after Katrina)
Limitation 2: Price is often not based on risk

- Price is often (highly) subsidized

- No risk signal from price

- No incentive for mitigation, because no or little reward

- Implicit incentive to build in high risk areas (e.g., directly on the coasts of Florida)
Limitation 3: Despite subsidized rates most people still don’t buy coverage

• Flood insurance is required in special flood hazard areas but …
  FEMA found 84% of 1549 flood victims did not have coverage after 1998 flood in northern Vermont
  Only 40% of inhabitants of the New Orleans parish had flood insurance

• Earthquake risk in CA has been extensively reported by the media recently, but… only 30% bought coverage in 1996, 15% in 2005…
Limitation 4: These programs are not scaled to face super-cats

- **Florida Hurricane Catastrophe Fund (FHCF)**
  Exposure: $1,500 billion
  2004 claims: $2 billion (10% reinsurance out of total of $22 billion)
  Deficit at the end of 2004: $1.6 billion

- **National Flood Insurance Program (NFIP—Federal)**
  2005 deficit: $21 billion
  Annual premiums: $2 billion

- **California Earthquake Authority (CEA)**
  Covers only up to $7.3 billion (in 2006)
  Plausible scenario: $100 to $200 billion earthquake
• These programs suffer a intrinsic lack of reserve … but can pass virtually infinite deficit to all policyholders in the state (“assessment”)

• *Ex post* surcharge on all insurance policies (residential and commercial)

• In Florida alone: 8-10% assessment after 2004/2005 hurricane season

“Pay as you –Don’t– Go”
Limitation 5: Huge federal relief afterwards for non-insured

• $115 billion for 2005 hurricane season (as of June 30, 2006)

• That is more than what the insurance industry has paid for all natural disasters in the world between 1970 and 1990.

• Tropical Storm Agnes (June 1972)--$5,000 forgiveness grants and 1% loans

• What incentive do people have to invest in mitigation and purchase costly insurance coverage if they know they will be bailed out by the federal government anyway?
Declared Disasters in the U.S. per Year (with some election years highlighted)

Sources: Data from the U.S. Department of Homeland Security (FEMA) (2006)
4. How Can We Do A Better Job?

**Principle 1: Risk-based Premiums**
- Provide a clear signal of the danger
- Facilitate mitigation (possibility to demonstrate the effectiveness of specific measures through greatly reduced premiums if implemented)

**Principle 2. Dealing with Equity and Affordability Issues**
- NFIP provides evidence that subsidized insurance is not a good mechanism to induce low income people to purchase insurance
- An alternative would be the development of insurance voucher (you pay full price of insurance, but get reimbursed for part of it)
Linking Mitigation Loans with Insurance
(Dealing with Lack of Interest in Protection)

**Strategy:** Institute home improvement loans for mitigation with payback period coterminous with life of mortgage

**Condition:** Need risk-based insurance rates

**Illustrative Example**
- Cost of partial roof mitigation: $1500
- Annual probability of hurricane: 1/100
- Reduction in loss due to partial roof mitigation: $27,500
- Expected annual benefit of partial roof mitigation: $275
- Annual payments from 20 year $1500 loan at 10% annual interest rate: $145
- Reduction in annual insurance payment: $275
- Reduction in annual payments due to mitigation: $275-$145= $130

**Everyone is a Winner:**
- **Homeowner:** Lower total annual payments
- **Insurer:** Reduction in catastrophe losses and lower reinsurance cost
- **Financial institution:** More secure investment due to lower losses from disaster
- **General taxpayer:** Less disaster assistance
Case for Comprehensive Disaster Insurance
(All natural disasters covered by a single policy)

- Allow insurers to achieve a higher degree of risk and geographical diversification
- Reduces variance of insurers’ losses relative to surplus
- No uncertainty by homeowner as to whether s/he has coverage
- Insureds know they are covered for everything - Avoids wind-water controversies
Challenges in Developing a Risk-Based Comprehensive Insurance Program

Uncertainties associated with risk
  – Use of catastrophe models
  – Possibly a huge impact on premiums (relative to their current level)

Setting risk-based premiums
  – Higher rates for those residing in high-hazard areas
  – State currently regulates rates (caps on premiums)

Providing protection against catastrophic losses
  – Availability and pricing of reinsurance
  – Role of capital market instruments
  – Role of state funds
  – Use of multi-state pools
  – Federal involvement: Should there be any? At what threshold?
A Word on…
The 2006 Wharton Initiative on Insuring and Mitigating Risks of Large-scale Natural Disasters

15 industry partners -- 3 modeling partners – 2 research partners
AIG, All State, Liberty Mutual, Nationwide, Munich Re, Renaissance Re, StPaulTravelers, State Farm, Swiss Re, Zurich, AIA, RAA, PCIAA -- AIR Worldwide, EQECat, RMS -- Insurance Information Institute, Georgia State University

Collaboration with most State and Federal Programs:
FHCF, Citizens, Texas Wind pool, NFIP

Focus on homeowners’ insurance (possible extension to commercial later on)

Focus on disaster markets in 5 states and metropolitan areas:
Florida (Miami); Texas (Houston); New York (specific zip codes of NYC); South Carolina (Charleston); California (Oakland or San Francisco)

Timeline
Start: Winter 2006 -- Data collection for homeowners’ policies: June-August
First workshop (with sponsors): June 15, 2006 (Wharton)
Preliminary report (October) and feedback from sponsors and other organizations (October)
Wharton Disaster Insurance Forum (wider group of participants) : Autumn 2006
Publication of final report: at the end of 2006
The Facts: Totally new era of “large-scale risks”; huge and still growing concentration of value in high risk areas; indicators for even more devastating disasters to come

The Reality: Our current insurance and mitigation programs are becoming obsolete

The Challenge: How do we modify them?

Research question: What is the first best solution for catastrophe risk sharing among different interested parties and what incentive for mitigation can we create?

Policy question: How does the natural disaster elements fit into the homeland security agenda? More generally, how does the question of financial protection fit into the national security agenda?