Economics of Business Interruption Insurance Against Terrorism

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Prominence of Business Interruption

• September 11, World Trade Center Attacks
  - property damage: $24 billion
  - BI: $100 billion

• Hurricane Katrina
  - Property damage: $75B
  - BI: $100B and still rising

• “ShakeOut” San Andreas Fault Earthquake
  - Property damage: $100B
  - BI: $67B
Dirty Bomb Attack in LA

- 9/11: unconventional delivery/conventional destruction
- Rad/Chem/Bio in contrast: insidious attack agents
  - could spawn enormous dread
  - could engender fear of lingering contamination
- Economic impacts
  - property damage minimal
  - major direct and indirect BI
    (15X larger than ordinary BI; 10,000X property damage)
Cyber Attack

• Insidious in other ways
  - stealth
  - extensive reach

• Again, property damage could be minimal

• BI losses can be enormous (halt or scramble):
  - financial markets
  - ordinary business transactions
  - infrastructure provision

• Losses worldwide could be in trillions of dollars
Key Questions on BI Insurance: Are These Losses Insurable?

1. Are they worthy of insurance protection?

2. How do we measure BI and CBI?
   - BI: measure resilience & behavioral linkages
   - CBI: use computable general equilibrium analysis

3. How do we handle the many complications?

4. How can terrorism BI insurance be made financially sound?
BI Insurance Complications

- BI is less physically apparent than property damage

Stock vs. Flow distinction:
- Property damage takes place at a given point in time
- BI just begins at the point of the disaster & continues until recovery is complete (or reaches a “new normal”)

Thus, BI affected by the variability of:
- public policy: outside aid, reconstruction
- resilience: numerous ways to mute losses
- behavior: fear (risk perceptions)
- behavior: gaming the system (e.g., moral hazard)
Consequence Analysis Framework

Disaster Event Scenario

- Target Specific Economic Impacts
- Loss of Life
- Direct Remediation Costs

Resilience Adjustments

- Behavioral Linkages

Ordinary Indirect Economic Impacts

Total Economic Impacts
BI Insurance and Resilience

• Elements of ordinary BI insurance coverage
  - direct damage of property
  - slowdown or suspension of operations
  - period of interruption
  - actual loss of income

• *Due diligence requirement to mitigate BI loss; Resilience refers to how this is accomplished*

• Tension/ambiguity between insurers & insureds affect likelihood of implementation of resilience
Economic Resilience

• Definitions:
  - *Static*: ability to maintain function when shocked  
  - *Dynamic*: speed of the system to recover

• Operative at micro, meso, macroeconomic levels

• Resilience implementation:
  - capacity can be enhanced before the event, but it is implemented in the aftermath
  - some inherent & some adaptive
Resilience Example: 9/11 Relocation

- 1,100 firms in WTC; 95% survived by relocating
- If all of firms in the WTC area went out of business, direct BI loss would = $43B
- If all relocation were immediate, then BI = 0
- Delays took place; still nearly all businesses relocated within 8 months, so BI loss = $12B
- Metric: avoided loss / maximum potential loss
  
  \[
  \frac{31B}{43B} = 72\%
  \]
Behavioral Linkages

• Off-site responses stemming from behavioral change (business, household, investor, worker, gov’t)

• Sources:
  - social amplification of risk (media coverage, rumor)
  - stigma effect (lingering fear)

• Fear feeds on itself and spreads (people/time/space)

• Translates into direct and indirect BI losses

• Could be 2 to 3 orders of magnitude higher
September 11 and the “Fear Factor”

- CREATE Economic Impact Modeling Forum: Economic Impacts of WTC Attacks
  - property damage: $25 billion
  - loss of life: $15B
  - direct business interruption: $11B
  - indirect business interruption: $14B
  - reduced airline travel/tourism: $50B
  - indirect effects of fear factor: $60B
  Total of business interruption: $135B
RDD Direct Behavioral Effects
(Burns and Slovic Survey)

• Consumer/tourist risk perceptions
  - 15 to 23% price discount (subset of goods)
  - mid-range of stigma-related WTP literature

• Employee risk perceptions
  - >25% risk premium in affected area
  - much higher than WTP literature for other types

• Investor risk perceptions (non-survey)
  - 20% rate of return premium
  - mid-range of property value studies (Lucas, 2004) & factoring in Tobin’s Q
## LA RDD BI Impacts

<table>
<thead>
<tr>
<th>Impact</th>
<th>BI Category</th>
<th>Value (in $m.)</th>
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</thead>
<tbody>
<tr>
<td>1) Short-run</td>
<td>Direct business interruption (BI). (Output loss, $m.)</td>
<td>-$1,400</td>
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<tr>
<td>2) Short-run</td>
<td>Direct business interruption (BI). (GDP loss, $m.)</td>
<td>-$817</td>
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<tr>
<td>3) Short-run</td>
<td>Indirect business interruption (BI). (GDP loss, $m.)</td>
<td>-$214</td>
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<tr>
<td>4) Short-run</td>
<td>Other resource loss. (GDP loss, $m.)</td>
<td>-$27</td>
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<tr>
<td>5) Short-run</td>
<td>Behavioral effects. (GDP loss, $m.)</td>
<td>-$889</td>
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<tr>
<td>6) Short-run</td>
<td>Total short-run. (GDP loss, $m.)</td>
<td>-$1,947</td>
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<tr>
<td>7) Long-run</td>
<td>One-Year Behavioral. (GDP loss, $m.)</td>
<td>-$2,628</td>
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<tr>
<td>8) Long-run</td>
<td>Total Ten-Year Behavioral. (GDP loss, $m.)</td>
<td>-$15,808</td>
</tr>
<tr>
<td>9) NPV</td>
<td>NPV (5%) of Total Ten-Year Behavioral (GDP loss, $m.)</td>
<td>-$12,849</td>
</tr>
<tr>
<td>10) Ratio = [(2)+(3)]/(2)</td>
<td>S-R total BI/S-R Direct BI</td>
<td>1.26</td>
</tr>
<tr>
<td>11) Ratio = [(2)+(3)+(4)]/(2)</td>
<td>S-R Ordinary Loss / S-R Direct BI</td>
<td>1.30</td>
</tr>
<tr>
<td>12) Ratio = (7)/(2)</td>
<td>L-R One-Year/S-R Direct BI</td>
<td>3.22</td>
</tr>
<tr>
<td>13) Ratio = (8)/(2)</td>
<td>Total Ten-Year Behavioral/S-R Direct BI</td>
<td>19.4</td>
</tr>
<tr>
<td>14) Ratio = (8)/[(2)+(3)+(4)]</td>
<td>Total Ten-Year Behavioral/Ordinary Loss</td>
<td>14.9</td>
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</tbody>
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Contingent BI

- Coverage for BI resulting from property damage to named dependent suppliers or customers:
  - locations that supply critical inputs
  - locations that accept the insured’s products
  - manufacturing locations that provide products for delivery to the insured’s customer
  - leader locations that attract customers to the insured’s business (e.g., anchor store in a mall)

- Typically assumed to be more difficult to measure
Contingent BI Estimation

• Computable General Equilibrium (CGE) Modeling
  - ideal for estimation of “indirect” effects
  - multi-market model of behavioral responses to changes in prices & external shocks w/in limits of available capital, labor & natural resources.

• Model of integrated supply chains at the sector level
  - Inherent resilience imbedded in the model
  - Adaptive resilience through parametric changes
Conclusions

• BI & CBI of terrorism is potentially enormous and thus worthy of insurance

• BI & CBI are amenable to measurement/prediction

• Measurement is complicated by behavioral responses, public policy, and strategic gaming

• Many polices are available to reduce BI & CBI

• Insurer/insured cooperation is needed to reduce strategic gaming