Demand Reactions in the Aftermath of Catastrophes and the Need for Behavioral Approaches

Annual Meeting of the American Risk and Insurance Association
Washington, DC 08/06/2013
Agenda

• Motivation, Literature Review and Hypothesis

• Data and Method

• Results and Discussion

• Conclusion
Motivation

- Several natural disasters in recent history
- Demand reactions in the aftermath of catastrophes
- Rational or irrational?
- Purpose of this research / research question:

  Do we need behavioral approaches to explain demand reactions in the aftermath of catastrophes?
Motivation

• We need a “rational” control group

• Assumption I: businesses are more sophisticated in insurance matters than households

• Assumption II: more sophisticated agents elicit the informational value of an event better than less sophisticated agents

• Method: comparing demand reactions of less sophisticated homeowners and more sophisticated businesses in the aftermath of catastrophes
The Demand for Catastrophe Insurance

- Browne and Hoyt (2000): evidence that insurance demand increases if there was a catastrophic event in the year before.


- Cameron and Shah (2012): people that have recently experienced catastrophes report higher probabilities for catastrophic events in the following year.

- Gallagher (2010): evidence for an increase in insurance demand after catastrophes which vanishes after several (nine) years. Reaction also in same media market neighboring communities.
The Demand for Catastrophe Insurance

- Shafran (2011): develops an experimental design to test the influence of loss experience on self-protection. Evidence for switching protection strategy after a loss round.
- Fier and Carson (2009): evidence for positive influence of catastrophes on life insurance demand, also in neighboring states.
The Demand for Catastrophe Insurance / Drawbacks

- Existence of alternative theories for explaining the increase in insurance demand after catastrophes
- No clear benchmark for rational behavior → informational value?
- Experiments → behavior in the field?
- In this project, the reaction of businesses serves as a benchmark for how “rational” or at least “more rational” agents would have reacted to the informational value of catastrophic events.
Hypothesis

• Two cases:
  – Demand reactions in the commercial market / Positive informational value
    • Reaction in the homeowners insurance market?
  – No demand reaction in the commercial market / No informational value
    • Reaction in the homeowners insurance market?

• Statistical hypothesis:

\[ H_0: \text{Demand reactions in the aftermath of catastrophes do not differ between the commercial insurance market and the homeowners insurance market.} \]

• By rejecting this hypothesis we are able to provide evidence for different reactions in both markets.
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- NAIC: underwriting and financial information for all U.S. property insurers for the period 1984–2007
- Similar to Born and Klimaszewski-Blettner (2012): two main segments of the property insurance market: personal and commercial lines
- Information on premiums earned by firm, by line, and by state over this period
- Demand Reactions:
  - Increase in quantity of insurance
  - Decrease in price sensitivity
  $\rightarrow$ separate quantity regression
The effect of catastrophic events on premiums earned in a catastrophe state

Supply effect
- Higher Premiums (+)
- Firm exits / Capacity reduction (-)

Demand effect (+)

Overall effect (+/-)
Data

- Catastrophic events (total damage by county level and year) are compiled from SHELDUS™.

- Catastrophic events: top 1% of damages with at least $5.5 million damages in a county.

- Information on rate regulation is obtained from state statutes.

- Dependent variable: premiums earned

- Independent variables:
  - Holnd, Catnst
  - Controls: income, Catst, Catst_Catnst, nlines, numstsit, strictreg, state_prem, nat_prem, residual, reinsurance, group, totcat, lpremiumsearned
Method

- For company i in state s in year t the logged premiums earned are regressed on:

\[
\ln(\text{premium earned})_{ist} = \beta_0 + \sum_{j=0}^{1} \beta_{j+1} \text{Catst}_{s,t-j} + \beta_3 \text{HInd}_{ist} + \sum_{j=0}^{1} \beta_{j+4} (\text{HInd} \ast \text{Catst}_{s,t-j}) + \sum_{j=0}^{1} \beta_{j+6} \text{Catnst}_{s,t-j} + \sum_{j=0}^{1} \beta_{j+8} (\text{HInd} \ast \text{Catnst}_{s,t-j}) + \gamma \text{Controls} + \sum_{j=1}^{24} \delta_j Y_j + \sum_{i=1}^{n} \eta_i F_i + \varepsilon_{ist}
\]

- Separate quantity regression: dependent variable = present value of losses incurred

- Separate „size“ regression: small catastrophes (lower 90%) and large catastrophes (top 10%)
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## Results

**Table 3 Fixed-effects regression results / dep. variable log(premiumseamed)**

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) log_premiumseamed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catnst</td>
<td>-0.008 (0.006)</td>
</tr>
<tr>
<td>lCatnst</td>
<td>0.004 (0.006)</td>
</tr>
<tr>
<td>HoInd_Catnst</td>
<td>0.036*** (0.010)</td>
</tr>
<tr>
<td>HoInd_lCatnst</td>
<td>0.018* (0.010)</td>
</tr>
<tr>
<td>Controls</td>
<td>...</td>
</tr>
<tr>
<td>Observations</td>
<td>228,092</td>
</tr>
<tr>
<td>Number of Firm_State_HoInd</td>
<td>33,531</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.660</td>
</tr>
</tbody>
</table>

(Sig. Levels: * p < 0.1, ** p < 0.05, *** p < 0.01)

- **No evidence for demand effect in the commercial line**
- **Evidence for demand effect in the homeowners line**
## Results

**Table 4** Fixed-effects regression results / dep. variable 
log(present value of losses incurred)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catnst</td>
<td>-0.009* (0.013)</td>
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<tr>
<td>lCatnst</td>
<td>-0.010* (0.010)</td>
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<tr>
<td>HoInd_Catnst</td>
<td>-0.017* (0.018)</td>
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<tr>
<td>HoInd_lCatnst</td>
<td>-0.070*** (0.016)</td>
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<tr>
<td>Controls</td>
<td>...</td>
</tr>
<tr>
<td>Observations</td>
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<tr>
<td>Number of Firm_State_HoInd</td>
<td>32,948</td>
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<tr>
<td>R-squared</td>
<td>0.303</td>
</tr>
</tbody>
</table>

(Sig. Levels: * p < 0.1, ** p < 0.05, *** p < 0.01)

No quantity reaction ➔ Increase in price insensitivity
Reactions to small and large catastrophes do not differ significantly.
Discussion

• We need behavioral approaches to explain demand reactions in the aftermath of catastrophes!

• Forgetful individuals

• Prospective Reference Theory

• Availability heuristic / affect heuristic
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Conclusion

- We provide evidence for the need for behavioral approaches to explain the observed temporary increase in homeowners insurance demand after catastrophes.

- To the best of our knowledge, this is the first study to provide an empirical baseline estimate for “rational” behavior in the aftermath of catastrophes.

- Our findings contribute to the discussion of whether the temporary increase in risk perception is “irrational”.

- Limitations: firms → cat bonds?; same risk in neighboring states?; aggregated data!

- Policy implication: peer effects influence people’s risk taking → our findings support increasing transparency between the commercial and the homeowners insurance market so that homeowners can “learn” from more sophisticated firm behavior.
Thank you very much for your attention!