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

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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.
- Michel-Kerjan and Kousky (2010): big catastrophes in 2004 led to an increase in insurance demand.
- 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.
- Meyer (2012): evidence for reinforcement learning. People reduce protection after a “near-miss” event.
- Kousky (2010): examines property price reactions in the aftermath of flood events. 100-year floodplain: no reaction; 500-year floodplain: drop in property prices.
- 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: 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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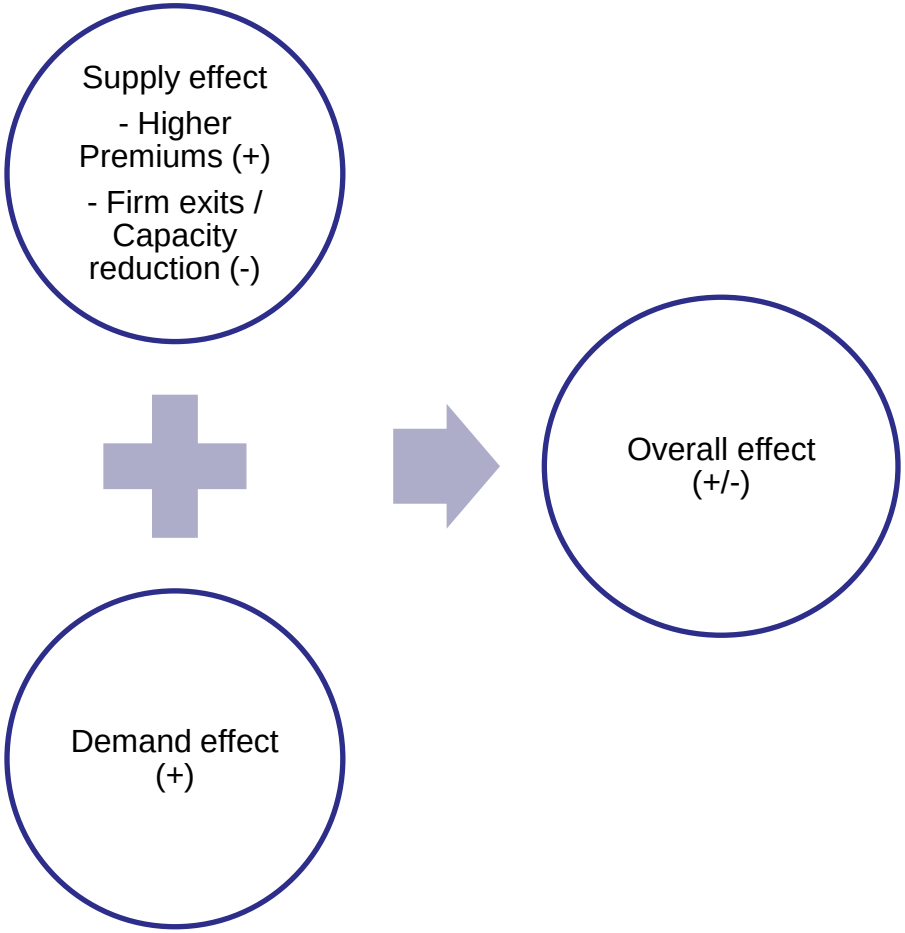
Data

- 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

  → separate quantity regression

The effect of catastrophic events on premiums earned in a catastrophe state



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:
  - HoInd, 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:

$$\ln(\text{premiumsearned})_{ist} = \beta_0 + \sum_{j=0}^{1} \beta_{j+1} \text{Catst}_{s,t-j} + \beta_3 \text{HoInd}_{ist} + \sum_{j=0}^{1} \beta_{j+4} (\text{HoInd} * \text{Catst}_{s,t-j}) + \sum_{j=0}^{1} \beta_{j+6} \text{Catnst}_{s,t-j} + \sum_{i=0}^{1} \beta_{j+8} (\text{HoInd} * \text{Catnst}_{s,t-j}) + \gamma \text{Controls} + \sum_{j=1}^{24} \delta_j Y_j + \sum_{i=1}^{n} \eta_i F_i + \varepsilon_{ist}$$

- 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)

VARIABLES	(1) log_Premiumseamed
Catnst	-0.008
	(0.006)
lCatnst	0.004
	(0.006)
HoInd_Catnst	0.036***
	(0.010)
HoInd_lCatnst	0.018*
	(0.010)
Controls	…
	…
Observations	228,092
Number of Firm_State_HoInd	33,531
R-squared	0.660

(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)

VARIABLES	(1) lpvlossinc
Catnst	-0.009
	(0.013)
lCatnst	-0.010
	(0.010)
HoInd_Catnst	-0.017
	(0.018)
HoInd_lCatnst	-0.070***
	(0.016)
Controls	…
	…
Observations	223,354
Number of Firm_State_HoInd	32,948
R-squared	0.303

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

No quantity reaction
→ Increase in price insensitivity

Results

Table 5 Fixed-effects regression results with differentiation between small and large catastrophes / dep. variable log(Premiumseamed)

VARIABLES	(1) log_Premiumseamed
Catnstla	-0.007
	(0.007)
lCatnstla	0.008
	(0.007)
HoInd_Catnstla	0.039***
	(0.012)
HoInd_lCatnstla	0.011
	(0.014)
Catnstsm	-0.008
	(0.006)
lCatnstsm	0.004
	(0.006)
HoInd_Catnstsm	0.035***
	(0.010)
HoInd_lCatnstsm	0.019*
	(0.010)
Controls	…
	…
Observations	228,092
Number of Firm_State_HoInd	33,531
R-squared	0.660

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

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!