enhance
Partnership for Risk Reduction

Household Flood Damage mitigation measures: effective or not?

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How to manage risk?

- Flood risk is non-uniformly changing more methods for managing are needed.
- All stakeholders should play an active role in managing risk
- What role can households play in managing future risk?
  - Can household damage mitigation work?
    - > How effective are they in mitigating damage?

How effective are household measures?

- There is a traditional method of evaluation
  - Represented by studies such as Kreibich et al. (2005)
- Mean Comparisons
  - Simple and intuitive
  - Estimates the ATT; the effect of the measure on the population that use it
- However, it can be problematic

- Non-random usage means we can:
  - Overestimate if SB>0
  - Underestimate if SB<0
- A later studies tries to address this issue
  - Same method, but…
  - …look at households with the same traits
- Solves SB, but reduces sample size

Objectives

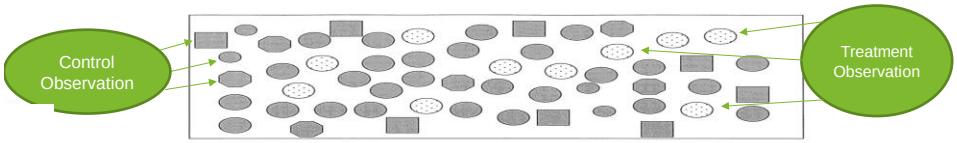
- There are two problems to solve:

•SB because usage is non-random
> We need a technique to mimic random assignment

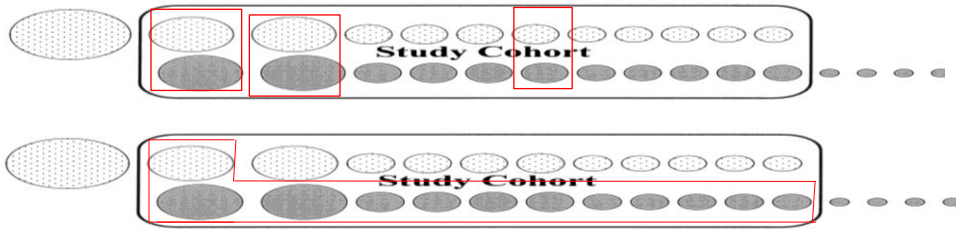
•Dimensionality
> Having to find identical people in a sample can be hard or impossible
> We need a way of compressing all the information

A New(ish) Method

- We use Propensity Score Matching to make selection into using a measure “as good as random”
- Propensity scores compress all the relevant information into a single value



Matching Method



- All in all, we use 5 matching methods
- Why?
  - They should provide roughly the same estimate of effectiveness
  - If they are not consistent something is wrong
    - Propensity score is not correctly constructed
    - Rule of thumb

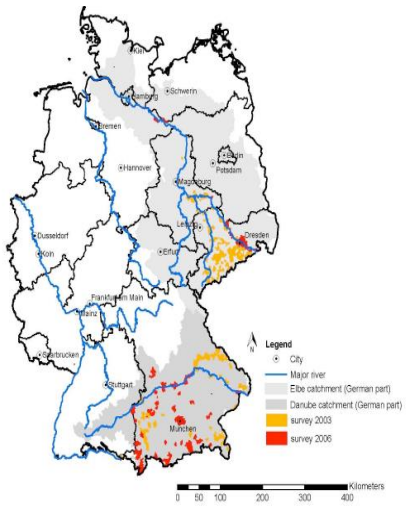
What propensity variables to include?

- The variables that affect both using a measure and outcomes
- $Incentive = F(probability)F(exposure, vulnerability, Hazard)^* F(social\ pressures, risk\ perceptions)$

The Propensity Variables

- $Outcome = F(exposure, vulnerability, Hazard)$

The Sample



Data (taken from Kreibich et al., 2011)	
Date	Two Telephone Survey waves 2003 for 2002 floods 2006 for 2005/6 Floods
Locations	The German Elbe and Danube River Catchment Areas
Observations	2000 Observations in total (1600 from the 1st wave, 400 in the 2nd)
Questions asked	Socio-economic status at the time of flood (i.e. income) Flood traits (i.e. water height) Vulnerability traits (i.e. type of house)

DMM description

DMM	Description
Flood-adapted use	Use in a low-value way the flood endangered floors, to keep possible flood damage low, e.g. storing only low-value items in flood-prone areas.
Flood-adapted interior fitting	Avoid valuable fixed units as interior fitting in the flood-endangered floors but use water-resistant or easily replaceable materials for interior fitting.
Adapted building structure	Adapting the building structure, e.g. ad an especially stable building foundation or waterproof sealed cellar walls
Water barriers	Mobile Barriers to prevent water entering the building, e.g. sandbags or local small flood protection walls.

Propensity Variables

- Exposure: Replacement value of household contents, household value
- Hazard: Flood water height, flood duration,….
- Vulnerability: Type of house, house age, quality of construction…
- There are about 40 variables

- Matching methods – Nearest Neighbour, Radius, Stratification, Gaussian Kernel and Epan. Kernel

Results (Damage Prevented)

	Adapted Use (Contents Damage)	Adapted Use (Building Damage)	Adapted Interior Fittings (Contents Damage)	Adapted Interior Fittings (Building Damage)	Water Barriers (Contents Damage)	Water Barriers (Building Damage)
Our Estimate	€6 732	€14 385	€5 202	€11 302	Not effective	€8 551
Previous Estimate	€8 415	€21 968	€9 063	€25 817	Not effective	€15 486
Selection Bias	€1 683	€7 583	€3 861	€14 515	-	€6 935
Matches Made	85	93	80	88	68	88

Conclusion (1)

- Household measures are still effective….
- … the measures investigated follow the same pattern as Kreibich et al. (2005) in the magnitude of effectiveness…
- ….just less so than previously thought

Conclusion (2)

- We have shown the applicability of a “new” evaluation methodology to natural hazard risk subjects
- We also have 4 main recommendations on how to apply propensity score matching:
  - 1) Use multiple matching methods
  - 2) Have direct indicators for exposure, hazard, vulnerability
  - 3) Include variables other than direct confounders (connected to outcomes)
  - 4) Try to have a wide geographical reach

Thank you for your attention

References

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