"On *Shaky* Ground: The Effects of Earthquakes on Household Income and Poverty"

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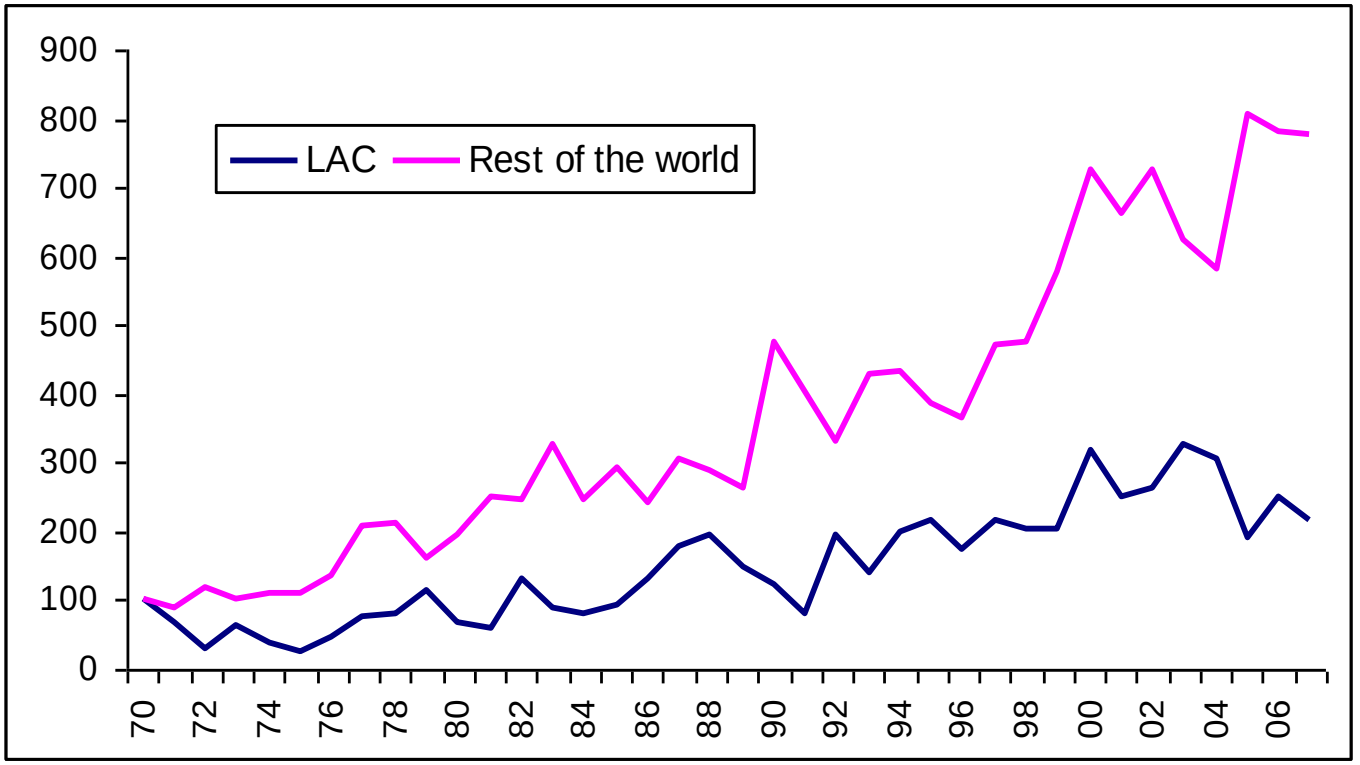
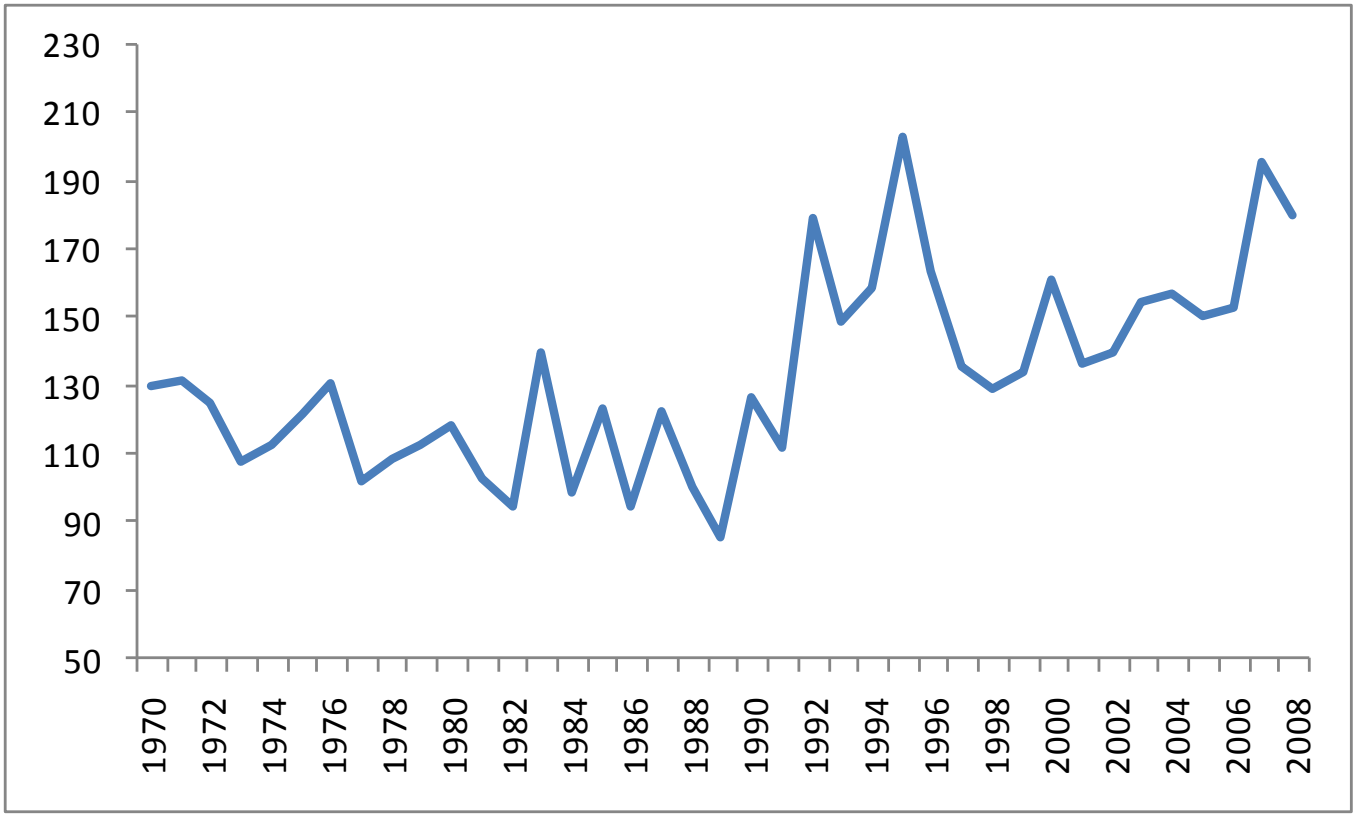
An increase in the frequency of natural disasters worldwide …



Source: Calculations based on EM-DAT: The OFDA/CRED International Disaster Database, Catholic University of Louvain. Taken from Baez and Mason (2008)

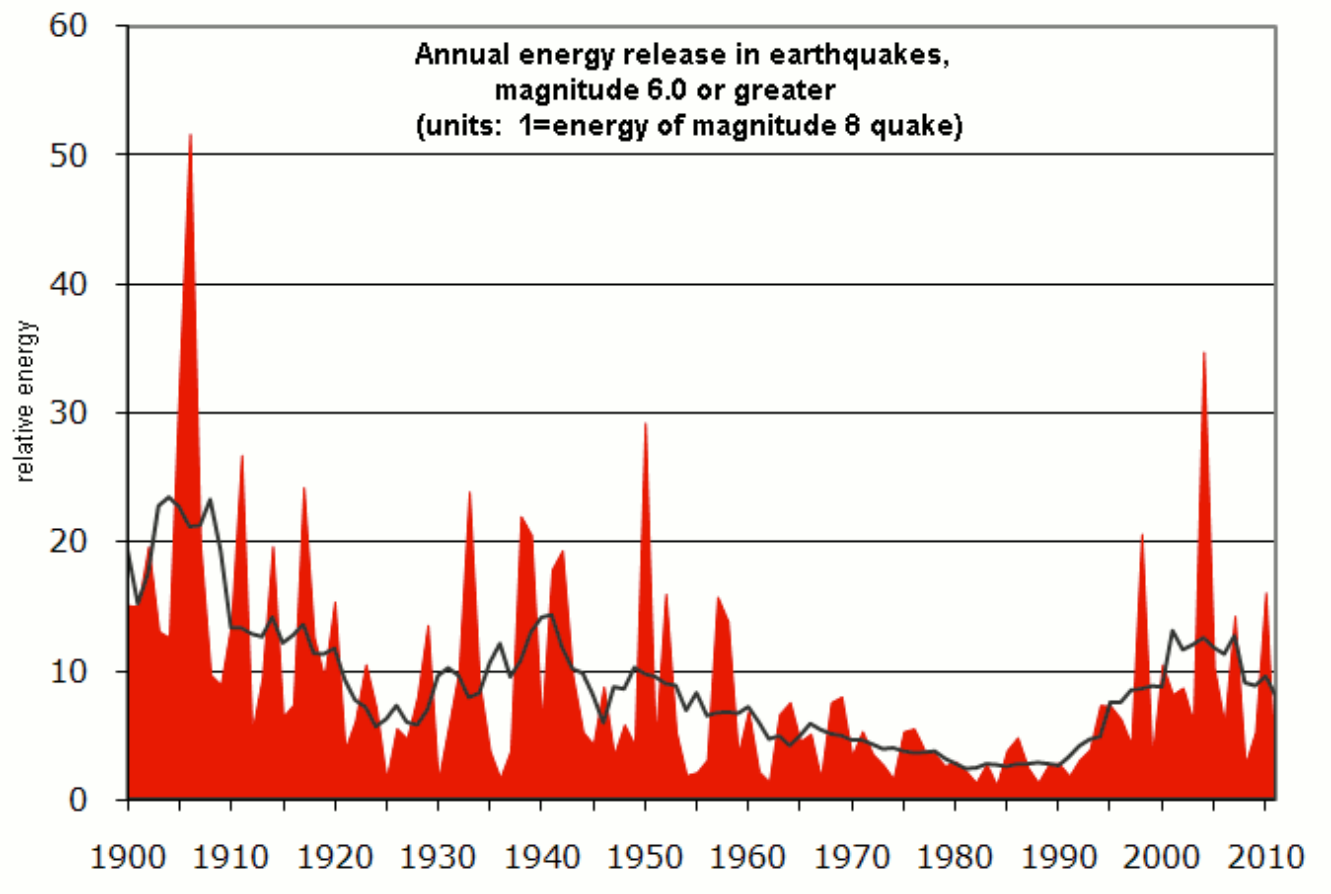
Notes: It includes disasters that meet at least one of the following criteria: (1) 10 or more people reported death, (2) 100 people reported affected, (3) declaration of a state of emergency, (4) call for international assistance

… also when looking only at the number of earthquakes and …



Source: USGS Earthquake Hazards Program
Notes: Number of earthquakes magnitude 6 M_L or greater

… their intensity



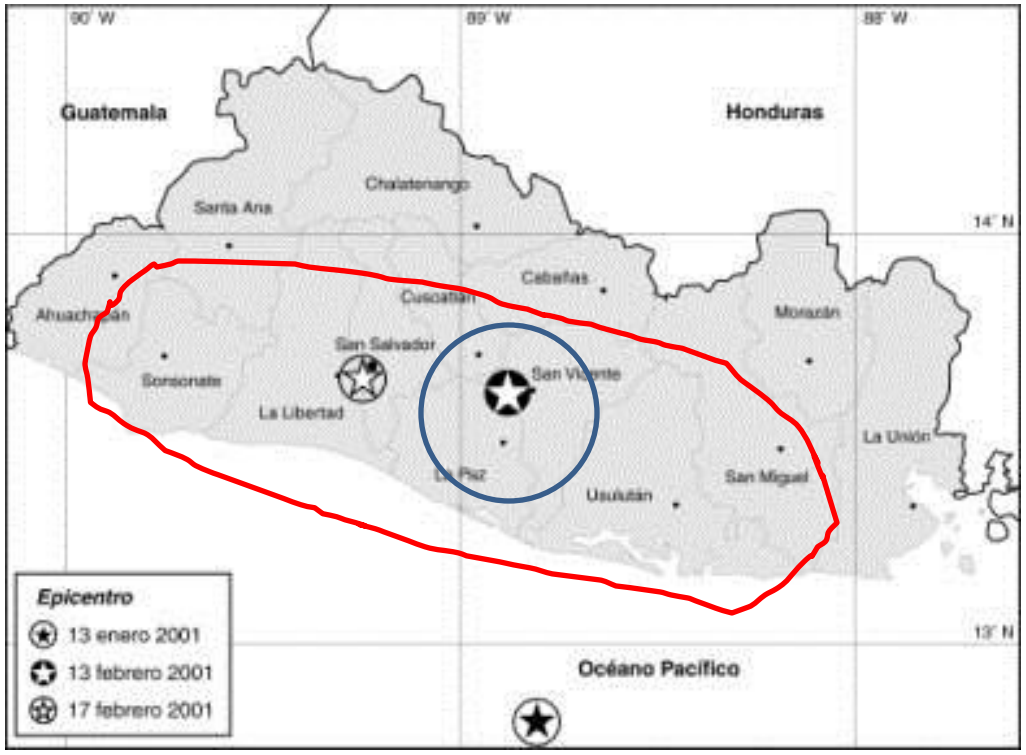
Source: USGS Earthquake Hazards Program
Notes: Estimated total annual earthquake energy release (magnitude 8 earthquake = 1 = 1,000 magnitude 6 earthquakes) in red; 7-year average in grey

This paper

- *Question*: effects of two earthquakes that hit El Salvador in 2001 on income and poverty
- *Empirical strategy*: exploits variation in
  1. The timing of the events and location of households
  2. Geological parameters (depth and energy released) and soil types of villages
- *Data*:
  - Two rounds of rural panel data (DD framework)
  - Geological records from three accelerograph networks and 31 stations
  - Units of analysis: rural households
- *Outcomes*: household income and poverty measures

Earthquakes in 2001 (I)

- January 13 (7.7 M_L; depth 60km) & February 13 (6.6 M_L; depth 10km)
- Around 300,000 dwellings affected (approximately 32% of the existing housing stock in the country)



Notes: The red (largest) oval represents the area primarily affected by the January 13 earthquake, while the blue (smallest) circle indicates the zone hardest hit by the February 13 seism.
Source: CEPAL, (2001b), "El Salvador: Evaluación del Terremoto del Martes 13 de Febrero de 2001".

Natural experimental groups

- Shock measure
  - "shaking" determined by the magnitude, depth, duration, spectral distribution of movements, distance to epicenter, local soil, and quality of dwellings (attenuation relationship)
  - measured as a percentage of gravity acceleration

- Two definitions of treatment intensity
  1. Treated if belongs to top half of the distribution (T = 0.7g, C = 0.32g)
  2. Continuous definition of treatment

Summary of the findings (1)

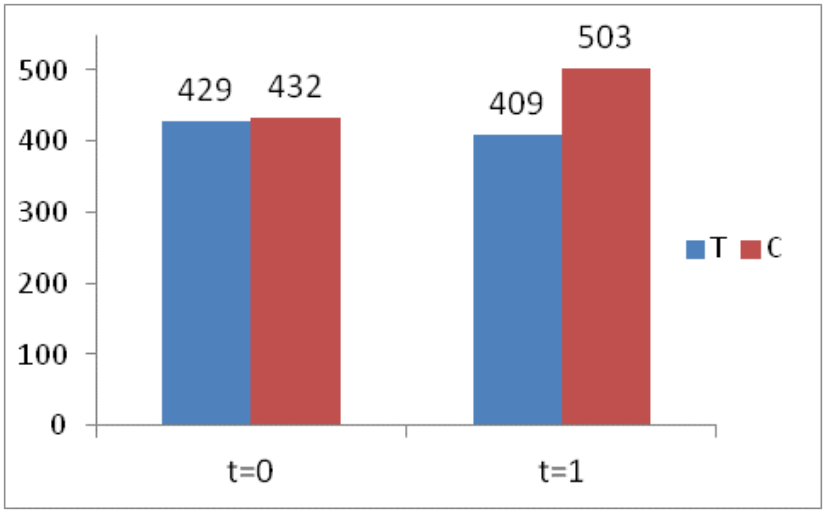
- **Balancing tests**: T and C comparable at baseline
- **Shock ('treatment') indicator relevant** → positively correlated with self-reported losses
  - An ↑ of a σ in the PGA (0.08 PGA) associated with an ↑ of

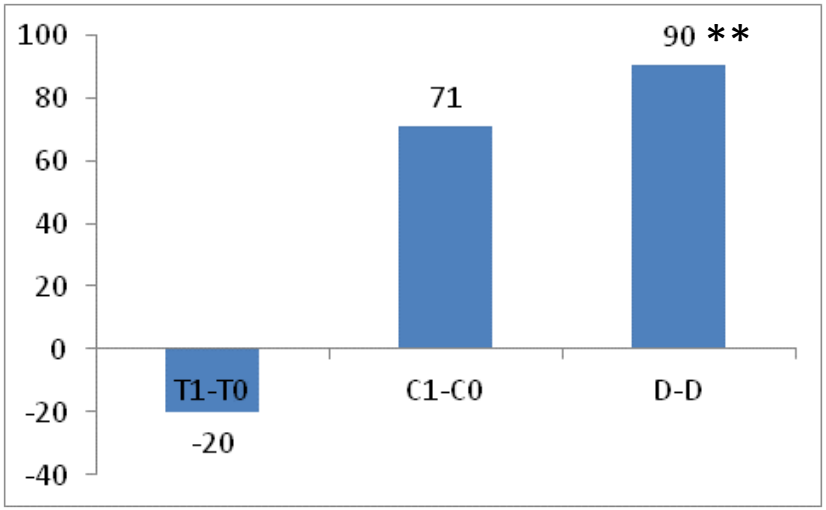
    (i) 7pp in the probability of reporting a loss and

    (ii) the amount of losses (≈ 1/3 of monthly income per capita)

Summary of the findings (2)

- A **negative effect on income per capita**



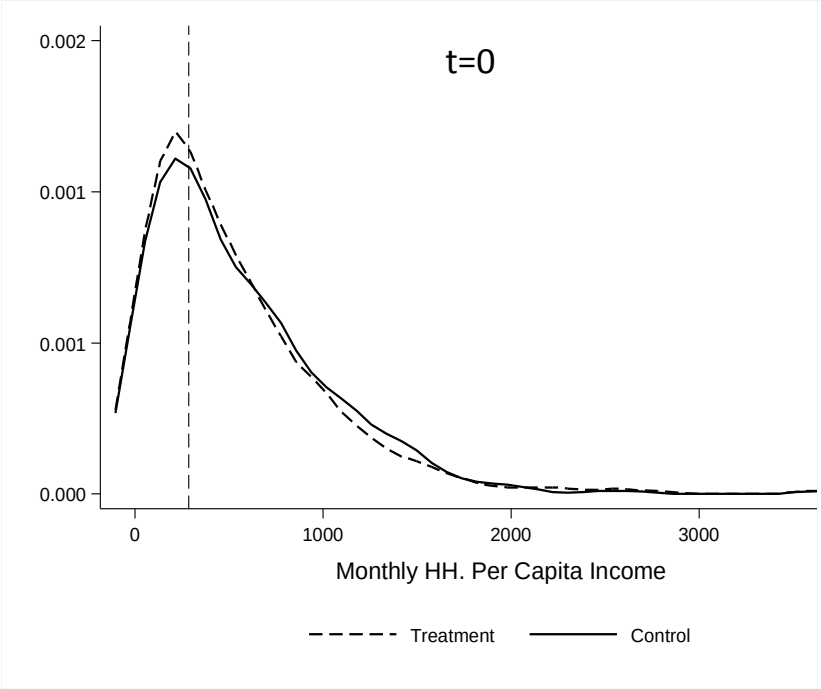


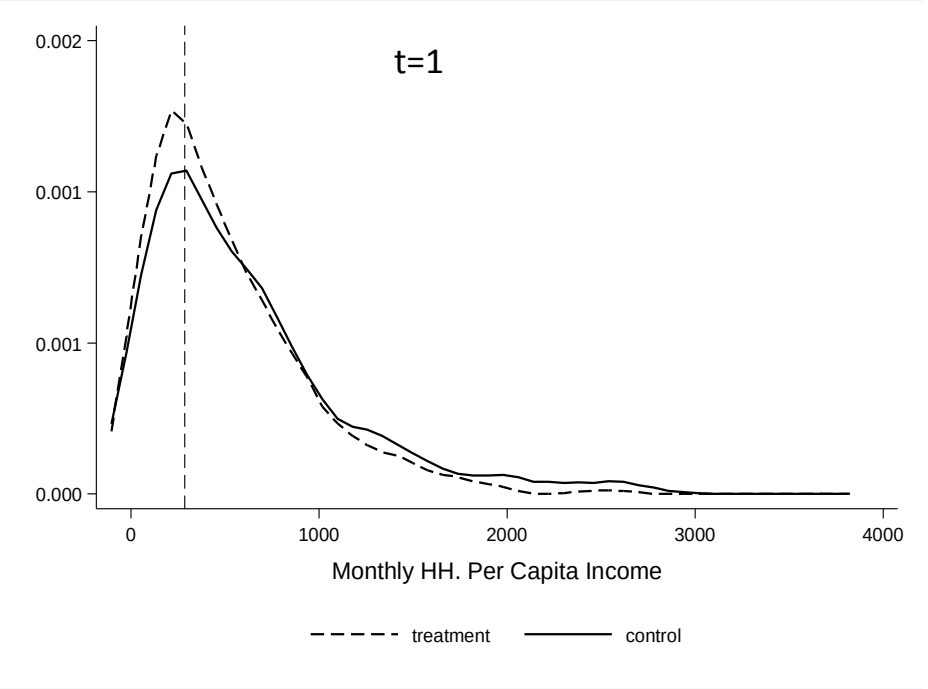
Note: Y-axis measures monthly household income per capita in *colones* of 2000

- A fall of 20 percent of the pre-shock level – equivalent to 40% of the gains in income achieved in the 1990's
- An increase of a σ in the ground shaking reduced income per capita by 8.5 percent (marginally significant)

Summary of the findings (3)

- **Effects on poverty?**





- Headcount ↑ by 4.7-5.1 pp– but point estimates not significant (only "switchers" allow identifying effects)
- Effects higher for households in 3rd and 5th quintiles

Summary of the findings (4)

- **Mechanisms**: looks at impact heterogeneity (but limited statistical power!)
  - Larger losses for households:
    - Highly dependent on agricultural production, own businesses and off-farm income
    - Remotely located from key infrastructure and markets

Robustness analysis

- **Attrition**
  - very low
    - 4.7% (1998-2000); 3.4% (2000-2002).
  - There is not evidence that it was endogenous

- **Use non-parametric methods**
  - Relax linearity assumptions of D-D
    - Results: very similar

- **Differential pre-trends?**
  - A placebo test for a pre-shock period (1998-2000) where all households were controls
    - Evidence of no treatment effect