# Weather shocks & risk preference: Evidence from Dak Lak

Duc Tri Anh Nguyen

Institute for Environmental Economics and World Trade

Gottfried Wilhelm Leibniz Universität Hannover

# Outline

- Motivation
- Literature
- Theoretical background
- Data
- Empirical Strategy

# An Overview

- **Question:** How reported weather shocks affect individual risk preference?
- **Goal:** Quantify the shock effect using **panel data** from **rural Dak Lak**

# Motivation

- Individual preferences can be malleable over time. (Becker and Mulligan, 1997; Bowles, 1998; Fehr and Hoff, 2011)

- Exogenous natural disasters can affect risk preference in short and long terms.
  - Heterogenous evidence on the impact of rare disasters on risk preference

  (2004 Indian Ocean Tsunami in Indonesia, 2005 Hurricane Katrina in the U.S., 2011 Great East Japan Earthquake)

- Limited research on how the cumulative experience of "smaller-scale" disasters affects risk preference.
  - Rural Vietnamese typically face smaller-scale disasters in hydrometeorological category (flood, drought, landslide, and storm).

# Motivation

| Study | Disaster Type | Risk aversion | Gap between disaster experience and survey date |
|---|---|---|---|
| Eckel et al. (2009) | Hurricane Katrina in the US | Less risk averse (short)<br>Not significant | 1 month after, 11 months after the event |
| Page et al. (2014) | Floods in Australia | Less risk averse | 2 months after the event |
| Cameron and Shah (2015) | Natural disaster (Flood /Earthquake) | Increases | 0 to 36 months after the event |
| Cameron and Shah (2015) | Natural disaster (Flood/Earthquake) | Not significant | 0 to 332 months after the event |
| Cameron and Shah (2015) | Natural disaster (Flood) | Increases | 0 to 416 months after the event |
| Cameron and Shah (2015) | Natural disaster (Earthquake) | Not significant | 0 to 416 months after the event |
| Chantarat et al. (2015) | Floods in Cambodia | Increases | 30 to 33 months after the event |
| Cassar et al. (2017) | Tsunami in Thailand | More risk averse | 52 months after the event |
| Hanaoka et al. (2018) | Earthquake in Japan | Less risk averse (male)<br>Not significant (female) | 1 month before, 11 months after, and 59 months after the event |
| Abatayo & Lynham (2020) | Natural disaster (Typhoon) | Less risk averse (female)<br>Not significant (male) | 18 months after the event |
| Beine et al. (2020) | Natural disaster (Earthquake) | Increases | From 1 month before to 3 months after the event |

# Literature

- **Impact of Man-made and Natural Shocks on Risk Preference:**
  - **Effects of man-made shocks** (economic, unemployment, financial crises, and geopolitical conflicts) **on risk preference.**

  - Malmendier & Nagel (2011); Malmendier et al. (2023); Callen et al. (2014) etc.

  - **Effects of natural disasters:** the U.S., China, Japan, the Philippines, etc.

  - Eckel et al. (2009), Li et al. (2011); Bchir & Willinger (2013); Cassar et al. (2017); Chantarat et al. (2019); Van den Berg (2010); Sawada & Kuroish (2015); Page et al. (2014); Hanaoka et al. (2018); Ingwersen (2014); Callen (2015) etc.

# Theoretical background

- **Endogenous Preferences**: Becker and Mulligan (1997); Bowles (1998); Fehr and Hoff (2011)

  - Economic and social conditions can shape individual preferences.

  E.g.: Early exposure to market environments can alter adult behaviors and preferences.

- **Natural Disasters and Risk Aversion**: at least three channels:

  - income shocks altering utility functions (Gollier and Pratt, 1996),

  - increased perception of future negative events (Cameron and Shah, 2015),

  - emotional responses to disasters (Li et al., 2011; Eckel et al., 2009).

=> varying impacts of disasters on risk behavior due to both short-term emotional effects and long-term changes in risk perception.

# Theoretical background

- **Rational belief updating and Prospect theory**:

  - Preference shifted due to updates in beliefs regarding risk, significantly impacting migration intentions and insurance investments

  - Beine et al. (2020) and Reynaud et al. (2019) find empirical evidences for beyond belief updating and offer psychological channels as alternative explanations.

# Research Question

- Q: **How do the reported weather shocks affect risk preference in short and medium terms?**
  - Consider the time gaps between the reported shocks and the survey date.
  - Examine three analysis samples based on their gap in disaster experiences.

# Data

- Thailand–Vietnam Socioeconomic Panel Survey
  - Aims to measure vulnerability to poverty in rural areas of Vietnam.
  - Initially launched in 2007 and funded by German Research Foundation (DFG).
  - Initial sample included approximately 2,000 households across 110 communes or 220 villages.

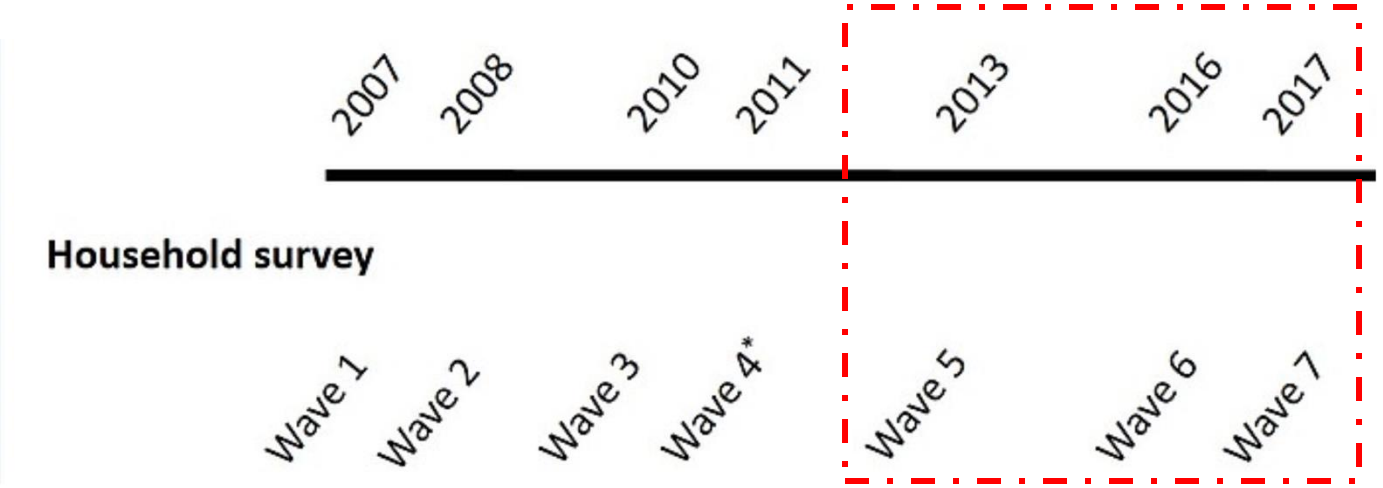


**Figure 1:** TVSEP survey timeline starting from the first survey in 2007.

# Data

- **Geographical and Demographic Variations**: Falk et al. (2018)

  - significant variations in preferences across and within countries,

  - influenced by gender, age, income, education attainment, and cognitive ability,

  - correlated with economic outcomes like savings and entrepreneurship.

- **Cognitive Ability**: Dohmen et al. (2010), Andersson et al. (2016); Vieider (2018)

  - Higher cognitive abilities are associated with greater risk tolerance,

  - Complex methods of risk elicitation may yield different responses based on the subjects' understanding, affecting the measurement of risk aversion.

# Data

Table 1: Descriptive statistics of control variables (N = 946 for the whole sample in rural Vietnam)

| VARIABLES | Mean | SD | Min. | Max. | Mean | SD | Min. | Max. |
|---|---|---|---|---|---|---|---|---|
| Control group | 0 | | | | 1 | | | |
| Dummy for female (1 if female) | 0.63 | 0.48 | 0 | 1 | 0.56 | 0.50 | 0 | 1 |
| Dummy for ethnicity (1 for Kinh majority) | 0.82 | 0.39 | 0 | 1 | 0.87 | 0.34 | 0 | 1 |
| Dummy for low education (1 for having 0-4 years) | 0.16 | 0.37 | 0 | 1 | 0.16 | 0.37 | 0 | 1 |
| Individual age in 2016 | 53.12 | 12.40 | 22 | 86 | 55.29 | 13.86 | 18 | 93 |
| Dummy for farming/fishing (1 for being farmer/fisherman) 2016 | 0.77 | 0.42 | 0 | 1 | 0.63 | 0.48 | 0 | 1 |
| Dummy for farming/fishing 2017 | 0.82 | 0.38 | 0 | 1 | 0.65 | 0.48 | 0 | 1 |
| Dummy for Out of Labor (1 if retired/disabled) 2016 | 0.03 | 0.18 | 0 | 1 | 0.09 | 0.28 | 0 | 1 |
| Dummy for Out of Labor 2017 | 0.03 | 0.18 | 0 | 1 | 0.08 | 0.27 | 0 | 1 |
| Dummy for subjective health (1 if healthy) 2016 | 0.36 | 0.48 | 0 | 1 | 0.42 | 0.49 | 0 | 1 |
| Dummy for subjective health 2017 | 0.33 | 0.47 | 0 | 1 | 0.33 | 0.47 | 0 | 1 |
| Dummy for Unemployment (1 if unemployed) 2016 | 0.04 | 0.19 | 0 | 1 | 0.07 | 0.25 | 0 | 1 |
| Dummy for Unemployment 2017 | 0.01 | 0.12 | 0 | 1 | 0.05 | 0.22 | 0 | 1 |
| Yearly income per capita 2016 | 2994.48 | 3491.22 | -254.53 | 22808.93 | 3006.57 | 3383.20 | -1617.67 | 27232.00 |
| Yearly income per capita 2017 | 2685.08 | 2831.53 | -903.99 | 25545.67 | 3316.11 | 5290.08 | -7389.51 | 105820.49 |
| Observations | 737 | | | | 209 | | | |

# Data

Table 2: **Dependent variables and relevant statistics** (N = 946)

| VARIABLES | Mean | SD | Min. | Max. | Mean | SD | Min. | Max. |
|---|---|---|---|---|---|---|---|---|
| Control group | 0 | | | | 1 | | | |
| Risk attitudes 2016 | 6.20 | 2.21 | 0 | 10 | 6.01 | 2.35 | 0 | 10 |
| Risk attitudes 2017 | 5.77 | 2.56 | 0 | 10 | 6.01 | 2.69 | 0 | 10 |

**"General risk attitudes"** measured by:
"Are you generally a person who is fully prepared to take risks or do you try to avoid taking risk?
(Please choose a number on a scale from 0 to 10. With 0 being unwilling to take risks and 10 being fully prepared to take risks)"

# Data

Table 3: Balance check of individual characteristics between control and treatment groups

| VARIABLES | Treatment group Mean | Control group Mean | Difference | t-Statistic | p-Value |
|---|---|---|---|---|---|
| Risk Attitudes | 6.1962 | 6.0054 | 0.1907 | 1.0504 | 0.2938 |
| Dummy for female (1 if female) | 0.6268 | 0.5604 | 0.0664 | 1.7152 | 0.0866 |
| Age | 53.1244 | 55.2944 | -2.170035* | -2.0434 | 0.0413 |
| Yearly Income per capita | 2994.4840 | 3006.5740 | -12.0908 | -0.0453 | 0.9639 |
| Dummy for farming/fishing | 0.7656 | 0.6255 | .1400414*** | 3.7874 | 0.0002 |
| Dummy for ethnicity (1 for Kinh majority) | 0.8182 | 0.8711 | -0.0529 | -1.9444 | 0.0521 |
| Dummy for low education | 0.1579 | 0.1615 | -0.0036 | -0.1239 | 0.9014 |
| Dummy for Unemployment | 0.0383 | 0.0651 | -0.0269 | -1.4520 | 0.1468 |
| Dummy for Out of Labor | 0.0335 | 0.0868 | -.0533457** | -2.5900 | 0.0097 |
| Dummy for subjective health | 0.3636 | 0.4152 | -0.0516 | -1.3408 | 0.1803 |
| Observations | 737 | 209 | | | |

Note: Standard errors are in parentheses. Significance levels are indicated as * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).

# Empirical strategy:

- Use wave 6 (2016) and wave 7 (2017) of the panel data
- Exploit the exogeneity of disaster experiences & the between- and within-individual variations in exposure to weather shocks.
- Estimate the impact of reported weather shocks for different time gaps in exposure. (12-month, 18-month, and 24-month gaps)

# Empirical strategy:

$$R_{ijT} = \alpha + \beta_d E_{ijT} + \beta_x X_{ijT} + \gamma Z_{jT} + \pi_i + \varepsilon_{ijT} \ (1), \text{ where:}$$

$R_{ijT}$ is a measure of risk preferences for individual i at province j at time T;

$E_{ijT}$ = 1 if individual i reported any disasters within the past 12/18/24 months at location j at time T;

$X_{ijT}$ represents a vector of time-varying individual characteristics, including gender, age, employment status, education level, and ethnicity.

$Z_{jT}$ represents time-varying characteristics of the province j;

$\pi_i$ represents unobserved time-invariant individual characteristics; and

$\varepsilon_{ijT}$ is an idiosyncratic shock.

# The End!