Are People Willing to Pay to Prevent Natural Disasters?

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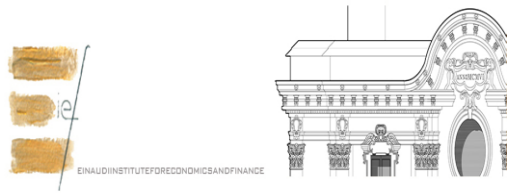


Motivation

- *Tackling consequences of global worming and associated extreme events entails massive mobilization of public resources*

  - *EU Green transition=> at least **578 billion** per year for 30 years (EU estimates, 2023)*
  - *US Inflation Reduction Acts => **$783** billion expenses to accelerate private clean energy investments (CBO)*

- *Are people ready and willing to support this effort?*

- *Disseminating information on involved risks and their consequences could be a powerful strategy to raise support*
- *Can it work?*

What we do

- *Conduct a RCT on a representative panel survey of 5,000 Italians fielded at the end of 2023*

- *Elicit survey participants WTP to finance investments to **mitigate hydrogeological risk***
- *Expose people to different information treatments*
- *Test whether fear of free-riding can threaten information dissemination effectiveness*

Outline

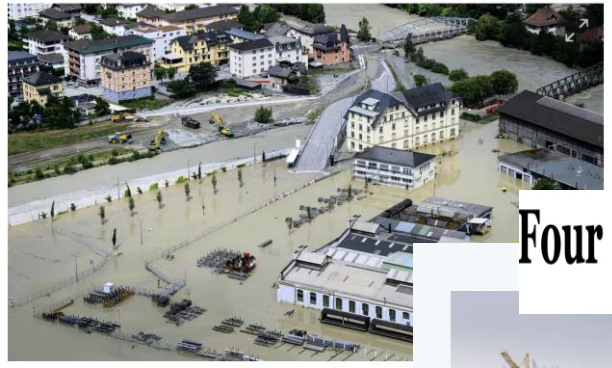
1. *Describe Data*
2. *RCT design*
3. *Results*

Why hydrogeological risk

- *Is globally relevant (among top 10 large risk)*
- *Direct exposure allows people to trace its consequences to climate change*
- *Economic and human life costs can be observed*
- *Costs and benefits of mitigation policies can be computed*

Seven dead after storms lash France, Switzerland and Italy

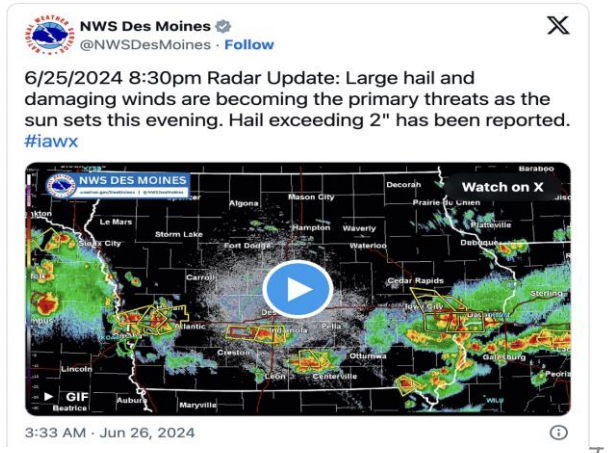
Three people died when tree crushed car they were travelling in, while torrential rains triggered landslides



Few episodes, June and Jule 2024
Frances, Switzerland, Germany, the US

Four dead in floods in southern Germany

The big picture: Days of historic flooding rains that have hit Nebraska, South Dakota, Iowa Minnesota have prompted evacuations and water rescues and breached levees, and nearly million people were under flood warnings and watches on Wednesday morning.



DATA: 1

- *Run experiment on the Italian Survey of Consumers Expectations (ISCE)*
- *A new consumption and expectations survey*

  - *Quarterly panel of 5,000 Italian adults (18-75) drawn from Doxa repository (120,000 panelists)*

  - *Wave I fielded in Oct 2023, Wave II in Jan 2024, Wave 3: April 2024*

  - *Data on demographics, household resources, consumption and (mostly) expectations etc.*
  - *Interviews are Computer Assisted Web Interviews (CAWI), response rate 70%*

DATA: 2

- *Sample demographics similar to those in SHIW*
  - *ISCE higher share of college education (22% versus 13 in SHIW), lower share of retired, singles and high income*

- *Wave I: asks probabilities of a tails risk, including on hydrogeological risk*

> «*Now you will read about a series of serious events. Think about each of these events and indicate on a scale from 1 to 100 how likely you think each event is to occur in the next 5 years in our country, where 1 indicates that you think it is "virtually impossible " and 100 that you think it is "virtually certain"*. **The event was described as follows: natural disasters linked to climate change (floods, droughts, landslides, fires, etc.**)"

- *Measure of prior belief on hydrogeological risk, useful later*

The RCT design

- *Two stage information treatment applied to Wave II sample*

- ***1th stage**: randomly allocate survey participants to three groups*
  - *T1 : Control group=> receives no treatment*
  - *T2 : Receives an information treatment on consequences of hydrogeological risk=> emphasis on human life costs*
  - *T3 : Same as T2 but add emphasis on economic costs*
- ***2th stage**: all participants (T1, T2, T3) randomly allocated to **two** groups*
  - *G1: No treatment*
  - *G2: An information treatment **evoking free riding***
- ***Next, all are asked WTP***

Treatments: first stage 1

- *T1:*

  In Romagna, on the night of May 16 and 17 (2023), an unprecedented amount of rain caused the rivers to rise rapidly and flood in the space of only a few hours. Practically all the waterways between Rimini and Bologna, a total of 21, burst their banks, flooding vast areas of Romagna. ***Fifteen people died and some 40,000 were displaced****.*

- *T2:* *Same as T1 +*

  The regional government calculated that the damage to roads, schools, embankments, canals and private homes and commercial buildings would reach nearly €9 billion

- *Both treatments focus on cost of consequences (not on frequency)*

Treatments: first stage 2

- *Romagna episode was quite dramatic one*
- *Very salient on the news*

- *Rainfall established a historical record*
  - *4 billion cubic meters of water fall on a territory of 1,600 km, 7% of the size of the region*
  - *Equivalent to annual consumption of water in the whole region*
- *Treatment took place 8 months after the episode => likely still salient*

Treatment: second stage

- *G1:*
  - *Those who receive no second stage treatment are asked*

    1. *"Containing environmental instability and securing areas exposed to hydrogeological risk (floods, landslides, etc.) requires large amounts of public resources. To finance these investments,* ***would you support the creation of a dedicated public fund****?*

    "Yes", "No", "Do not know"

    2. ***How much would you be willing to contribute voluntarily to this fund each year in Euro?*** *5-10; 10-20; 20-50; 50-100; 100-200; 200-300; 300-400; 400-500; 500 -1000; more than 1000.*

- *G2:* *Same as G1 but .. ..****Success depends on the size of the fund. If only a few contribute, the policy will fail.*** ***To finance these investments, would you support the creation of a dedicated public fund****?*

- *Red is the treatment, makes free riding salient*

Six sample groups, 5 treatments and one control: summary stats and balance

	T1	T2	T3	G1	G2
Age	48.19	48.358	47.66	48.114	48.024
Male	.487	.495	.502	.492	.497
Married	.531	.56	.54	.544	.544
Family size	2.80	2.76	2.77	2.77	2.79
High school	.449	.423	.456	.462	.424
College	.232	.24	.224	.221	.243
Centre	.195	.186	.195	.191	.193
South	.34	.335	.337	.337	.338
Employed	.436	.411	.431	.421	.431
Self-employed	.079	.095	.085	.097	.076
Retired	.189	.192	.17	.182	.186
Log income	7.573	7.593	7.571	7.592	7.566
Homeowner	.753	.772	.757	.77	.751
N. of observations	1,667	1,670	1,664	2,507	2,494

- Characteristics of groups in first and second stage randomization very similar
- Formal balance test: out of the 56 estimated parameters only 3 differ from zero at 5% level

WTP in baseline (control) sample

	Control group T1G1
Support to the fund	
% Yes	52.1
% No	18.4
% I don't know	29.5
N. of observations	840
Amount willing to contribute if "Yes"	
5th pct	7.5
Median	**25**
95th pct	250
Mean	63.4
Standard deviation	119.4
Skewness	5.97
N. of observations	438

Main results: model specification

- *Estimate*

$$y_i = \beta_1 T_2 + \beta_2 T_3 + \beta_3 G_2 + \beta_4 T_2 G_2 + \beta_5 T_3 G_2 + \varepsilon_i \qquad (1)$$

- *LHS either support or Euro contribution*
- *Estimate probit (or ordered probit) for support and Tobit for contribution*
- *Excluded group, the untreated in 1th and 2th stage*
- β_1 *and* β_2*: causal effect of first stage treatment*
  - $H_0: \beta_1 = \beta_2$ *adding economic costs to human life cost matters*
- β_3: *casual effect of free riding treatment alone*
- β_4 *and* β_5*: causal effect of first stage and second stage treatment*
  - $H_0: \beta_4 = \beta_5 = 0$ *adding to first stage also free riding has no effect on outcomes*

Effects of information treatments on probability of supporting the fund

Treatment	Probit	Probit
T2	0.093	0.085
	(0.024)***	(0.017)***
T3	0.072	0.080
	(0.024)***	(0.017)***
G2	-0.060	-0.060
	(0.024)**	(0.014)***
T2G2	-0.017	
	(0.034)	
T3G2	0.016	
	(0.034)	
P-value test : $\beta_1 = \beta_2$	0.388	0.799
P-value test $\beta_4 = \beta_5 = 0$	0.629	
Average of LHS variable	0.521	0.521
N	5,001	5,001

- LHS=1 if Yes to support; Consequence of HR => support up by 9 pp (18% of untreated mean); no difference if econ costs added;
- Free riding fear => support down 6pp, enough to turn majority in minority
- Free riding => no effect if treated *with* consequence of HR

Ordered probit estimates, where is support coming from?

Treatment	Marginal effect on	Ordered probit
T2	Oppose	-0.055
		(0.010)***
	Undecided	-0.035
		(0.006)***
	Support	**0.089**
T3	Oppose	-0.053
		(0.010)***
	Undecided	-0.034
		(0.006)***
	Support	**0.086**
		(0.016)***
G2	Oppose	0.026
		(0.008)***
	Undecided	0.017
		(0.005)***
	Support	**-0.043**
		(0.013)***

- (Set effect of T2G2=T3G2=0)
- 60% of the positive effect on support of T1 and T2 from fewer opposers
- 60% of negative effect on support from free riding treatment due to increase in the files of those who oppose

Effects of information treatments on amount contribute the fund

Treatment	Tobit	Tobit
T2	28.878	27.481
	(9.724)***	(7.066)***
T3	22.351	24.1888
	(9.734)**	(7.097)**
G2	-7.859	-7.558
	(9.989)	(5.607)
T2G2	-2.832	
	(13.897)	
T3G2	3.744	
	(13.922)	
P-value test : $\beta_1 = \beta_2$	0.497	0.631
P-value test $\beta_4 = \beta_5 = 0$	0.891	
Average of LHS variable	73.48	73.48
N	5,001	5,001

- LHS=WTP if Yes to support; Consequence of HR => WTP up by **29 euros** (34% of average contribution among supporters);
- Free riding fear => WTP down by 8 euros but imprecisely estimated
- Free riding => no effect on WTP if treated *with* consequence of HR

Back of the envelope calculation

Use estimates to get a sense of how much information campaign can boost WTP

- ***Baseline fund:*** *(without treatment) would be:* ***€ 826 million***
  - *(Average contr. of non treated*×*fraction supporting fund*×*pop size)* =63.4 ×0.52 ×25
- ***Treat whole population****: Treatment has two effects:*
  - *Increase share of supporters by 6 pp*
  - *Increase conditional amount contributed by € 12*
  - *Overall effect would be to raise contributions by* ***€ 268 million, 32% of baseline***
  - *Equivalent to* ***46%*** *of estimated annual cost necessary in Italy to reduce damage due hydrogeological risk by a factor of 4 and lower exposed population by 84% (Dottori et al. 2023)*

Extensions

1. *Heterogeneity of treatment: effect larger among people less informed to begin with=> find all effect comes from the less educated (arguably already aware)*

2. *Our treatment meant to shift perceived consequence of hydrogeological risk, not the beliefs about its frequency*
    1. *Find some mild effect that treatment affects WTO also by shifting priors, but most by shifting perceived costs*
3. *Persistence/memory of effect? Repeat question on Wave 3, no effect of treatment on => short lived in treated only once. What is repeated? Investigate in forthcoming Wave*

Discussion & conclusions

Key findings

- *Evidence implies information campaign can significantly shift WTP and consensus on funding collection*
- *Economic effects are large*
- *Survey treatment is transitory and people WTP threatened by free riding concerns*

Implications for campaign design

- *Campaign needs to be re-novated, cannot be one shot. People forget, most importantly they receive also contrarian signals*
- *Campaign should be targeted to contain costs*