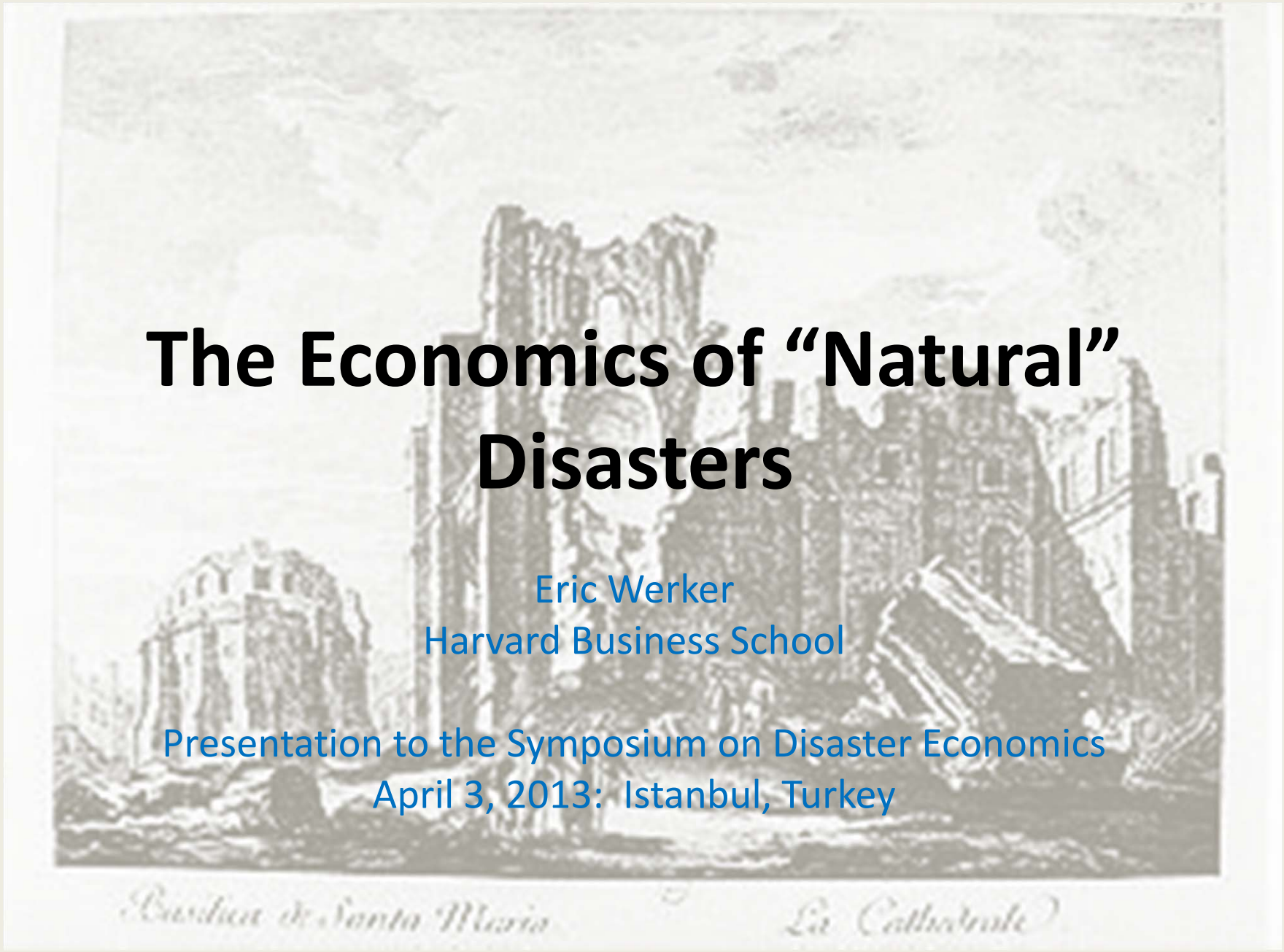

The Economics of "Natural" Disasters

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Are disasters bad for the economy?

- Yes
  - $2.3 trillion in damage 1970-2008
  - 3.3 million deaths 1970-2008
  - Enrollment rates for education fell by 20% in Cote d'Ivoire with extreme rainfall change in 1986-7
  - School attendance fell by 7% in 2001 El Salvador earthquakes
  - Rural adults in China were 3cm shorter if they had been children during the 1959,61 famines
  - Reduction in education, malnourishment predict lower future earnings

Are disasters bad for the economy?

- But not necessarily for GDP
  - GDP measures gross output
    - Not wealth
    - Not depreciation
  - Research on the effects of disasters on economic growth have conflicting results
- Remittances, humanitarian aid increase
  - But remittances don't increase 1-for-1
  - Disaster relief aid is often development aid relabeled

The Key Insight

- Disasters are not natural.
- Hazards, shocks, “acts of God” are natural, but their impact on a population depends on the level of disaster prevention and emergency management and relief

Consider…

Chile

- 8.9 Richter
- Concepcion moves 10 feet to the west
- <500 deaths

Port au Prince

- 7.0 Richter
- 250,000 deaths

Who has worse disasters?

THE DEATH TOLL FROM NATURAL DISASTERS: THE ROLE OF INCOME, GEOGRAPHY, AND INSTITUTIONS

Matthew E. Kahn*

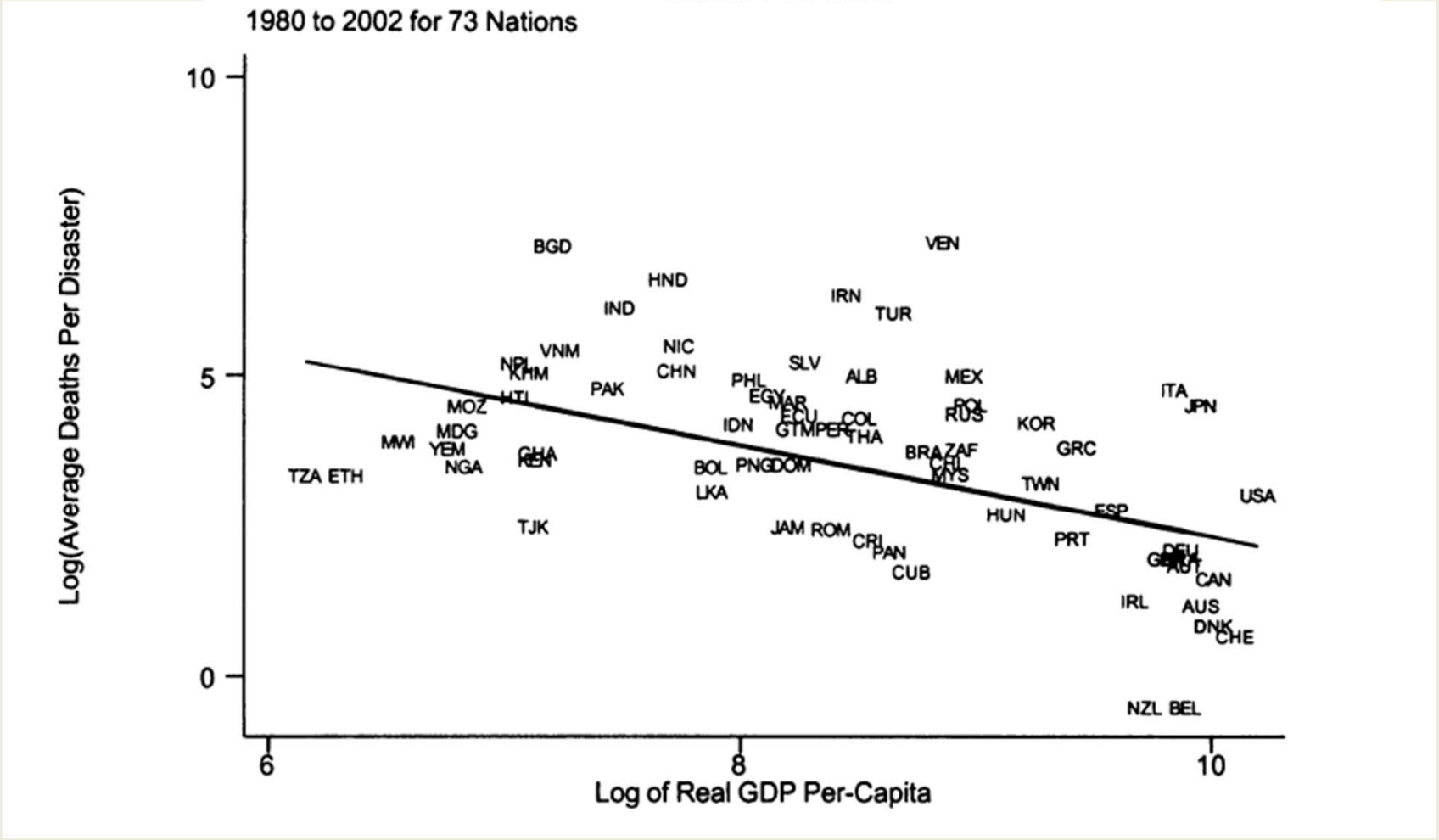

TABLE 6.—DETERMINANTS OF ANNUAL NATIONAL TOTAL DEATH FROM NATURAL DISASTER

	Zero-Inflated Negative Binomial Regressions			
Dependent Variable	(1)	(2)	(3)	(4)
Total count of disasters	0.0717	0.0460	0.0551	0.0320
	(0.0447)	(0.0385)	(0.0323)	(0.0358)
Log population	0.7325	0.8026	0.8376	0.8712
	(0.1843)	(0.1646)	(0.1418)	(0.1505)
GDP per capita	−0.1364	−0.1162	−0.0929	
	(0.0254)	(0.0224)	(0.0225)	
Income Gini coefficient		0.0908	0.1035	0.1170
		(0.0156)	(0.0162)	(0.0150)
Time trend	0.0232	0.0064	0.0170	0.0226
	(0.0271)	(0.0180)	(0.0198)	(0.0182)
America dummy		1.2217	0.8271	0.4486
		(0.4371)	(0.3987)	(0.3944)
Asia dummy		1.4425	0.9144	0.9519
		(0.3851)	(0.4447)	(0.4618)
Europe dummy		0.4174	0.1017	0.0270
		(0.4857)	(0.4524)	(0.5423)
Elevation		−0.6648	−0.2228	−0.1664
		(0.2314)	(0.2506)	(0.2280)
Absolute value of latitude		0.0339	0.0128	−0.0145
		(0.0170)	(0.0135)	(0.0113)
Average population density		−0.2239	−0.3050	−0.3841
		(0.0707)	(0.0748)	(0.0863)
Democracy			−0.0327	−0.0681
			(0.0247)	(0.0269)
Ethnic fragmentation			−2.5163	−2.8998
			(0.5498)	(0.6095)

The microeconomics

- A simple optimization:

maximize

Probability(no disaster)*Utility(no disaster) +
Probability(disaster)*Utility(disaster)

subject to

Income = expenditures on disaster prevention + relief + insurance + all other consumption

For an individual

- Optimize level of insurance

P(no dis)*(Income – Premium) +
P(dis)*(Income – Premium – Damage + Payout)

- The optimal level of insurance may not be total insurance.
  - Through wealth (model is slightly more complicated), one can (partly) self-insure
- Adverse selection
  - people with more risk of damage may buy insurance
- Moral hazard
  - Insured people may take higher risks
  - If the government offers free insurance, private purchases will decrease
  - “Parametric” insurance may be more efficient, but take-up low

Table 8b. Correlates of Take-Up

	All	Landless	Land Owners
	1	2	3
Targeted Marketing	0.059	0.030	0.073
	(0.052)	(0.036)	(0.080)
Wealth Index	0.499 *	0.319	0.496
	(0.257)	(0.289)	(0.345)
Log PCE	0.050 *	0.065	0.047
	(0.026)	(0.043)	(0.048)
Highest education<middle	0.110 *	0.117	0.086
	(0.061)	(0.077)	(0.105)
Highest education>=middle	0.074	0.137 **	-0.057
	(0.058)	(0.057)	(0.107)
Scheduled Caste	0.039	0.009	0.073
	(0.050)	(0.061)	(0.086)
Scheduled Tribe	0.019	-0.067	0.166
	(0.079)	(0.091)	(0.143)
Muslim	0.193 **	0.097	0.266 ***
	(0.097)	(0.158)	(0.085)
Impatience	-0.105 *	0.019	-0.239 ***
	(0.062)	(0.081)	(0.090)
Has Loan	0.039	-0.002	0.063
	(0.043)	(0.055)	(0.053)
Has SEWA Insurance	0.077 *	-0.025	0.159 **
	(0.045)	(0.060)	(0.077)

Gaurav, Cole, and Tobacman (2009)

For a government

- What if disasters are local? A national government can "be the insurer" and borrow or spend surplus to rebuild public goods after a local disaster.

P(no dis)*(Income – Prevention) +
P(dis)*(Income – Prevention – Relief(Prevention))

- Now the optimal level of prevention spending depends on the likelihood of disaster and the relationship between prevention and damage.
- Some governments may want to insure, or over-prepare, against "national" disasters.
  - But Froot (2001): Disaster reinsurance premiums are far higher than expected losses

Predictions

- Rich countries spend more on prevention, if it is a normal good
- Small countries spend more on prevention, since it is harder to self-insure

Annual averages, 1975-2000	Deaths from disasters per 1,000,000 people	Persons affected by natural disasters per 1,000 people
Small countries (<500,000 people in year 2000)	12.4 (3.6)	19.4 (1.2)
Large countries (>500,000)	17.6 (3.6)	17.2 (4.6)

Cohen and Werker, 2008

What if governments aren't purely altruistic?

- Some governments value citizen welfare more than others
  - Kahn (2005): fewer deaths in democracies
  - Stromberg (2007): Fewer deaths in competent governments
  - Amartya Sen: "Famines are easy to prevent if there is a serious effort to do so, and a democratic government, facing elections and criticisms from opposition parties and independent newspapers, cannot help but make such an effort."
- Citizens play a role
  - Besley and Burgess (2002): Indian relief is higher in states with better media coverage.
  - Cole, Healy, and Werker (2012): Indian voters reward incumbents who give more relief during weather shocks.

Machiavellian disaster policy

- Using disaster prevention and relief like any other political act
- US and spending in swing/supporting regions
  - Sobel and Leeson (2008): Presidential disaster declarations are more frequent in election years.
  - Garret and Sobel (2003): Half of all U.S. FEMA payments are politically motivated.
- Drought, famine and war in Ethiopia, South Sudan
  - Strategic neglect, malicious targeting

Humanitarian aid for natural disasters

- (Stromberg, 2007) $4.6 billion per year
- Determinants
  - Olsen, Carstensen, Hoyen (2003): media, political interest, network of humanitarian NGOs and international organizations
- Media
  - Eisensee and Stromberg (2007): U.S. foreign disaster relief dropped during major media events (Olympics, World Series)

Table 6

Disaster Relief and Donor–Recipient Relations

	Is relief provided?	*Amount relief provided (log_e), when relief is provided*	*Share provided (log_e)*
Colony	0.08	0.38	0.66
	(0.03)***	(0.18)**	(0.16)***
Latin European colony	0.10	0.66	0.66
	(0.05)**	(0.27)**	(0.24)***
Common language	0.02	0.38	0.22
	(0.02)	(0.15)**	(0.09)**
Geographic distance	−0.11	−0.79	−1.13
	(0.05)**	(0.38)**	(0.23)***
Trade value (log_{10})	0.08	0.24	
	(0.01)***	(0.10)**	
UN friend	−0.26	1.20	
	(0.11)**	(0.62)*	
Observations	15819	4155	22910
R-squared	0.40	0.55	0.45

(Stromberg 2007)

The microeconomics of disaster prevention under humanitarian aid

P(no dis)*(Income – Prevention) +

P(dis)*(Income – Prevention – Damage(Prevention) + Relief(Damage, Cost of relief))

- The humanitarian aid will pay for the relief
- This introduces a “moral hazard” bias in which the government doesn’t have to pay for the relief
- In turn, introduces the “Samaritan’s Dilemma”
  - humanitarian cannot withhold aid ex post, so distorts government’s incentive ex ante
  - E.g. Perpetual drought and bailouts in Ethiopia

Predictions

- When a country is harder to be reached by humanitarian aid, it will be able to depend less on relief

	Deaths from disasters per 1,000,000 people	Persons affected by natural disasters per 1,000 people
Landlocked	8.5 (3.9)	22.1 (1.4)*
Not landlocked	19.0 (1.5)	16.3 (3.1)*

Cohen and Werker, 2008

Predictions

- Cohen and Werker (2008): When a country has bad relations with the international community, it will be able to depend less on relief

Total deaths from disasters	South Africa	Rest of Africa
1962-1990 (Apartheid sanctions)	808	1,200,000
1990-2002	920	95,000

Qadhafi 1969-2002	Libya	Algeria	Tunisia
Deaths	0	58	840
Damages (millions)	$42	$10,600	418

Disaster mortality in the region

	1991-2001			2002-2012	
Country	**No. Disasters**	**Deaths/Disaster**		**No. Disasters**	**Deaths/Disaster**
Afghanistan	47	247.7		92	84.5
Albania	7	3.1		13	1.5
Bosnia-Hercegovenia	5	1.2		14	1.0
Bulgaria	10	1.9		24	5.3
Croatia	6	6.8		14	58.1
Iran Islam Rep	63	75.4		49	579.5
Kyrgyzstan	9	28.2		16	10.5
Macedonia FRY	4	3.8		12	1.7
Moldova Rep	7	8.7		8	3.5
Switzerland	11	5.7		19	55.9
Tajikistan	21	90.8		34	7.6
Turkey	38	516.8		46	28.3
United States	293	12.6		240	21.5
GLOBAL TOTAL	*3662*	*144.2*		*4638*	*244.9*

Insights for governments

- Prepare the most for natural hazards that are the most common, the most costly, and the most systemic
  - Respond competently to the others
- Part of good preparation is being able to offer quick, efficient relief to the extent demanded by a natural shock
- Make sure your citizens have access to private insurance
- Infrastructure development and political development are two important measures to reduce the cost of disasters

Insights for donors

- If you are going to offer free relief, offer free prevention, to solve the moral hazard problem
- Decentralize relief, so that you don't play into domestic politics
  - To prevent donors from having to decentralize relief, government disaster response agencies should develop reputations for being apolitical and competent

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THANK YOU