

Attitudes toward Catastrophe

Christoph Rheinberger

European Chemicals Agency

christoph.rheinberger@echa.europa.eu

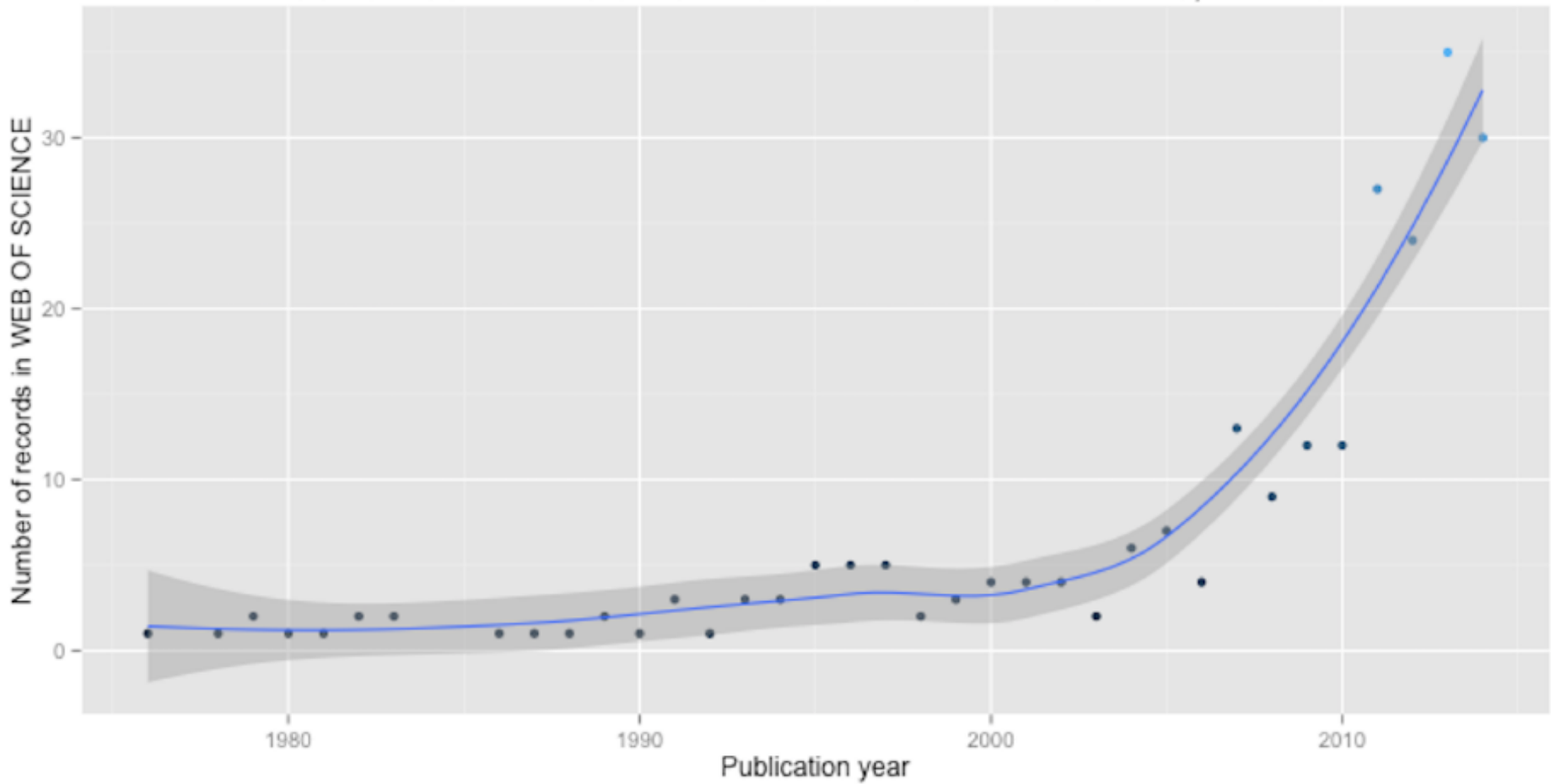
Nicolas Treich

Toulouse School of Economics

nicolas.treich@toulouse.inra.fr

Disclaimer: the views expressed in this research are those of the authors and do not necessarily represent the views of the European Chemicals Agency.

ECONOMICS PAPERS ON CATASTROPHES AND DISASTERS, 1974-2014



Introductory quote

"[...] a society trading off a decreased probability of its own catastrophic demise against the cost of lowering the probability of that catastrophe is facing a decision problem conceptually analogous to how a person might make a tradeoff between decreased consumption as against a lower probability of that person's own individually catastrophic end."

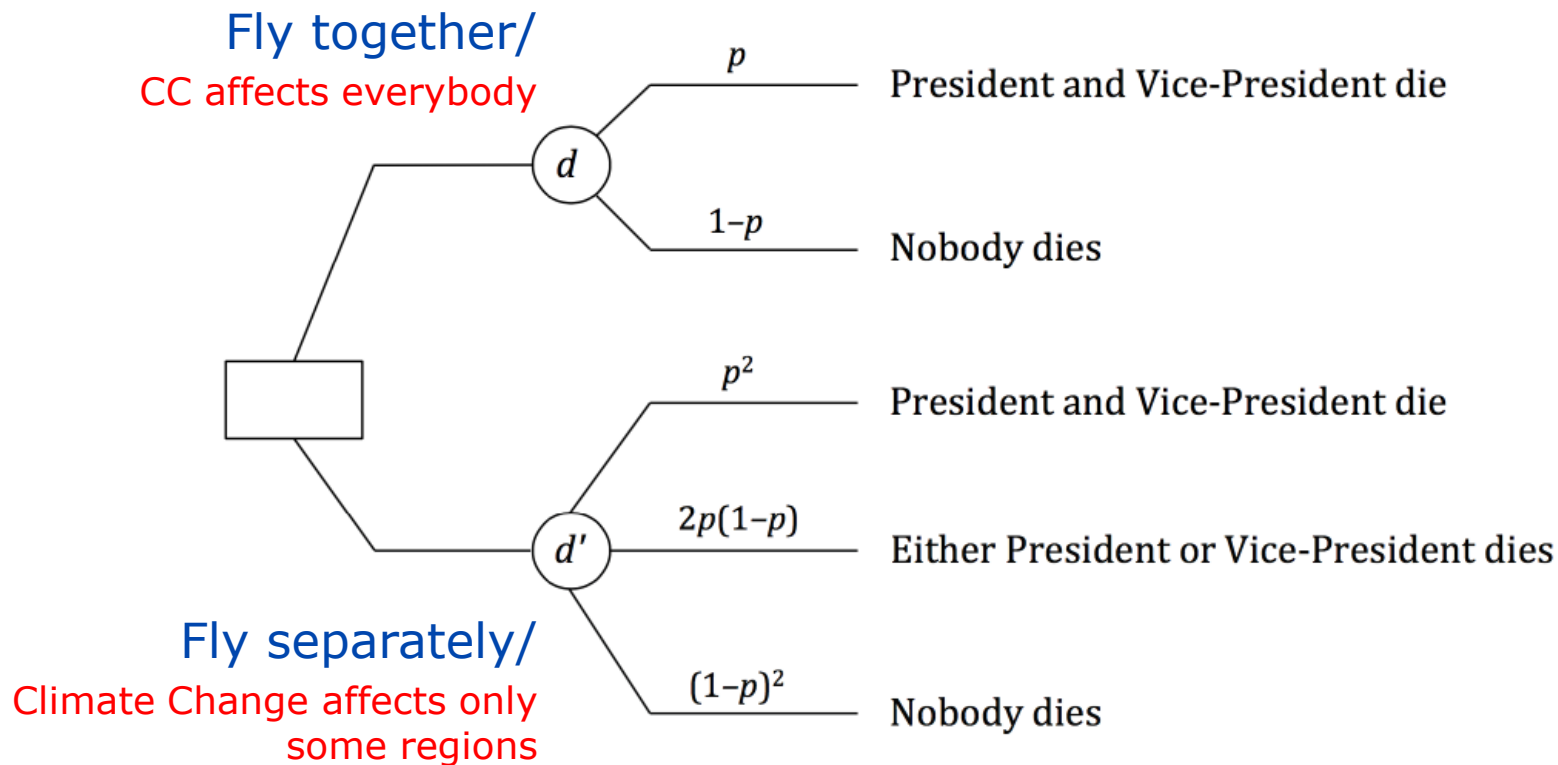
Weitzman (2009, Rev Econ Stat)

- *Society should be catastrophe averse, just as the representative agent is risk averse*

This paper asks...

- whether catastrophe aversion is normatively and descriptively appealing by:
 - *defining cat risks and attitudes toward them*
 - *reviewing empirical evidence*
 - *exploring normative appeal of cat attitudes*
 - *looking at risk management options in use*

Air travel example



Definition of catastrophic risk

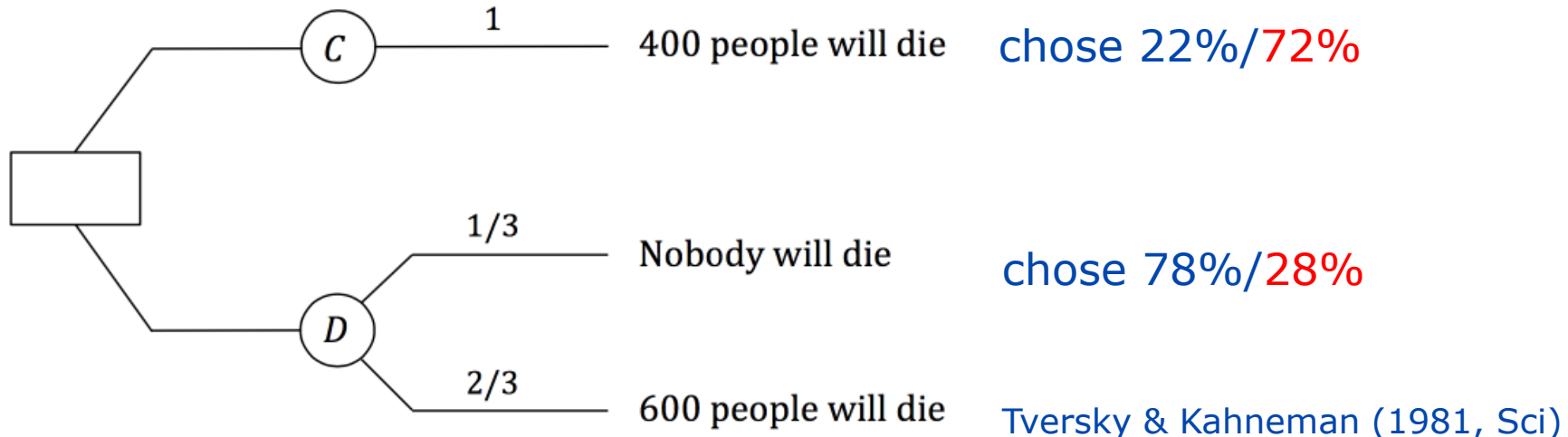
- Catastrophes as a “bunching” of fatalities
- Identity of victims/survivors does not matter
- *No sharp distinction b/ catastrophic & normal risks*
- Criterion to rank possible distributions of fatalities in terms of how relatively catastrophic they are.
- *Compare social risks based on spread in distribution of fatalities*

Attitudes toward catastrophic risk

- Technical definition of catastrophic risk based on 2nd order stochastic dominance
- “Less is better **and** one of three risk attitudes”:
 - *Catastrophe **averse**: preference for least catastrophic distribution (travel separately)*
 - *Catastrophe **accepting**: preference for most catastrophic distribution (travel together)*
 - *Catastrophe **neutral**: indifference b/ distributions*

Empirical evidence

- Analyzed some 30 studies from decision science
- Used either standard gamble, paired gamble or discrete choices, e.g. Asian disease problem



Empirical evidence

- Evidence favors catastrophe acceptance
 - *majority of people would take gamble that offers a chance to everyone*
- Looked also on altruistic money gambles, social dictator games, public goods games
 - *no clear indication of catastrophe aversion either*
- Behavioral explanations: perceptions and emotions, inequity aversion, framing, psychophysical numbing
 - *consistent w/ findings in Econ and Psych literature*

Catastrophe attitudes & social choice

- The Diamond (1969, JPE) example:

$$\begin{array}{c}
 A: \\
 j=\text{head} \\
 j=\text{tail}
 \end{array}
 \begin{array}{cc}
 i=1 & i=2 \\
 \left[\begin{array}{cc} 1 & 1 \\ 0 & 0 \end{array} \right]
 \end{array}
 \text{ vs. }
 \begin{array}{c}
 B: \\
 j=\text{head} \\
 j=\text{tail}
 \end{array}
 \begin{array}{cc}
 i=1 & i=2 \\
 \left[\begin{array}{cc} 1 & 0 \\ 0 & 1 \end{array} \right]
 \end{array}
 \text{ vs. }
 \begin{array}{c}
 C: \\
 j=\text{head} \\
 j=\text{tail}
 \end{array}
 \begin{array}{cc}
 i=1 & i=2 \\
 \left[\begin{array}{cc} 1 & 0 \\ 1 & 0 \end{array} \right]
 \end{array}$$

- **A** implies most catastrophic risk, while **B** and **C** induce same distribution of fatalities.
- **B** ex post unequal: one dies, other one stays alive.
- **C** ex ante & ex post unequal: i_2 dies, i_1 stays alive.

Catastrophe attitudes & social choice

- Example highlights conflicts between equity concerns and attitudes toward catastrophe
- How do common social welfare functions (SWFs) handle conflicting goals?
 - *Utilitarian (CBA) approach: catastrophe and inequity neutral*
 - *Ex ante prioritarian SWF: cat neutral, ex ante inequity averse*
 - *Ex post prioritarian SWF: same as utilitarian approach*
 - *Ex post transformed SWF: cat sensitive, inequity neutral*

Regulatory approaches to catastrophic risk

- Standard BCA catastrophe neutral, can be extended
 - *Adjusted Value of Statistical Life*
- Risk criteria (RC) and legal thresholds
 - *Individual and societal risk criteria*
- Political economy of catastrophic risk regulation
 - *Perception/attention, responsibility & rent seeking, group interests & regulatory capture...*

Take home message

- Different attitudes toward catastrophe conceivable
- Standard BCA is catastrophe neutral
- Empirical evidence suggests that people are often catastrophe **accepting**, but context matters!
- SWF approach can assess catastrophic risk and does reflect attitudes/preferences toward catastrophe

Thank you for the attention!

Christoph Rheinberger

European Chemicals Agency

christoph.rheinberger@echa.europa.eu

Nicolas Treich

Toulouse School of Economics

nicolas.treich@toulouse.inra.fr