

COOPERATION STUDIES OF CATASTROPHE AVOIDANCE

Implications For Climate Negotiations

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INTRODUCTION

- Greenhouse gas emissions continue to rise, posing the risk that we may one day cross a threshold for dangerous climate change (Alley et al., 2003; Lenton et al., 2008; Schellnhuber et al., 2006)
- The protection of the global climate commons is an “aggregate effort” global public good (Barrett, 2007)
- Like all public goods, it suffers from the free-rider problem
- Climate protection is an example of a more general and pervasive problem—*the tragedy of the commons* (Hardin, 1968)

CLIMATE NEGOTIATIONS

- As climate protection depends upon the collective action of many countries, international climate negotiations are crucial:
 - allow emission reduction targets to be set
 - provide evidence that countries are not acting in isolation
- But progress on establishing an international climate treaty has been painfully slow

CLIMATE NEGOTIATIONS: RIO 1992

- United Nations Framework Convention on Climate Change (UNFCCC) established at the Rio Earth Summit in 1992
- Established a treaty compelling governments to take action to prevent “dangerous anthropogenic interference with the climate system”
- Signed by more than 150 countries
- Does not specify any emission reduction targets

CLIMATE NEGOTIATIONS: KYOTO 1997

- Kyoto Protocol established to reduce global greenhouse gas emissions by 5% relative to 1990 levels
- Required 55 countries accounting for 55% of global emissions to ratify the agreement
- Did not happen until February 2005 when Russia signed up (the US remains a non-participant)
- The treaty has been largely unsuccessful in reducing emissions

CLIMATE NEGOTIATIONS: COPENHAGEN 2009

- UNFCCC meeting in Copenhagen 2009 resulted in the “Copenhagen accord”
- Two major breakthroughs:
 - identified a threshold for “dangerous anthropogenic interference” of 2 °C
 - world’s largest emitters agreed to cooperate to avoid dangerous climate change
- Two major setbacks:
 - not a legally binding treaty
 - does not specify emission reduction targets

STILL NO MEANINGFUL CLIMATE TREATY

- After two decades of international bargaining, the world still lacks a meaningful climate treaty
- Negotiations have failed to provide the justification for action and resolve issues of equity and fairness
- E.g., tensions between rich and poor and concerns about whether climate change is an urgent threat all came to the fore at the Copenhagen negotiations in 2009
- *Climate negotiators need to be equipped with better tools to make treaties easier to agree on*

- Cooperation studies involve groups of individuals playing a game, which can only be solved through cooperation
- Such studies can be used to explore when people are likely to cooperate and when they will refuse
- They provide insights into which strategies are likely to succeed in climate negotiations in order to avoid a real tragedy of the climate commons
- The problem of avoiding dangerous climate change has been investigated experimentally using a cooperation game known as the collective-risk social dilemma

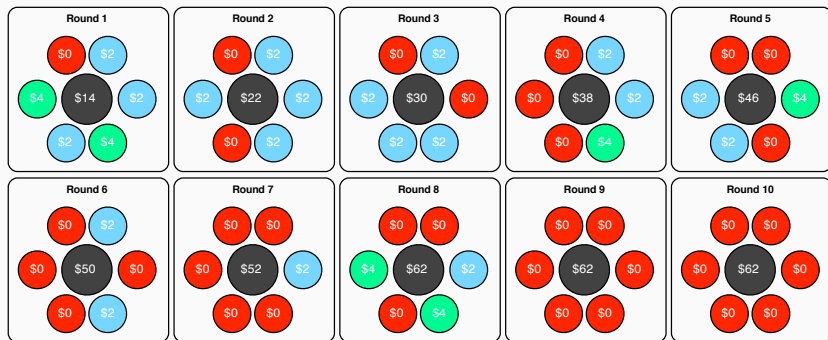
THE COLLECTIVE-RISK SOCIAL DILEMMA

Milinski et al. (2008)

- At the start of the game, each of six players is endowed with €40
- On each of 10 subsequent climate rounds, each player must decide whether to invest €0, €2, or €4 into an account for climate protection
- If the combined investments in the climate account are equal to or greater than €120 by the end of the game, dangerous climate change is averted and players keep any money not invested
- If the target sum is not reached, dangerous climate change is simulated with a probability (e.g., 50%) that all remaining endowments will be lost

THE COLLECTIVE-RISK SOCIAL DILEMMA

Milinski et al. (2008)



FACTORS AFFECTING COOPERATION

1. Perceived risk
2. Inequality
3. Uncertainty about dangerous climate change
4. Intergenerational discounting

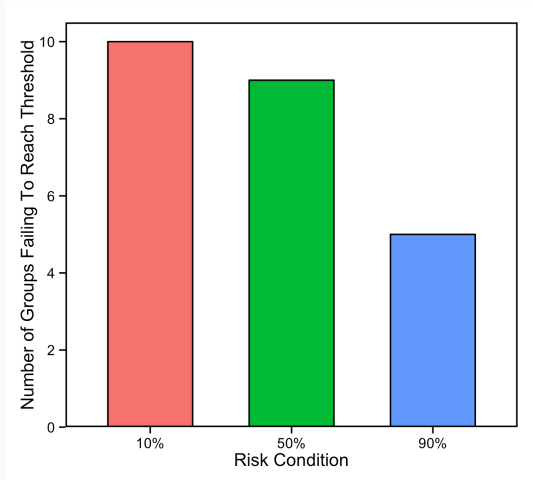
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PERCEIVED RISK (MILINSKI ET AL., 2008)

- Milinski et al. (2008) examined the impact of perceived risk of dangerous climate change on cooperation
- Manipulated the probability of dangerous climate change occurring if groups failed to reach the target sum of investments
- Three risk conditions:
 - 10% (low-risk)
 - 50% (moderate-risk)
 - 90% (high-risk)
- Dependent measure of interest was number of groups (out of 10) that failed to reach the target sum of investments

PERCEIVED RISK (MILINSKI ET AL., 2008)



IMPLICATIONS FOR CLIMATE NEGOTIATIONS

- A necessary—but not sufficient condition—for a climate agreement to be reached is convincing countries of the very high probability of dangerous climate change
- If they believe in a lower probability, this could imperil efforts to reach an agreement
- Expert bodies, such as the IPCC, must not “play down” climate risks to avoid the charge of being “alarmist” (cf. Allison et al., 2009; Freudenburg & Muselli, 2010)
- Efforts must be taken to ensure climate negotiators have a “shared perception” of the likelihood and consequences of dangerous climate change

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INEQUALITY

- In the collective-risk game considered so far, all players are equal
- This is not an accurate reflection of the real climate change game
- Inequalities exist in terms of:
 - responsibility
 - resource capacity
- Several studies have examined how such inequalities impact on cooperation

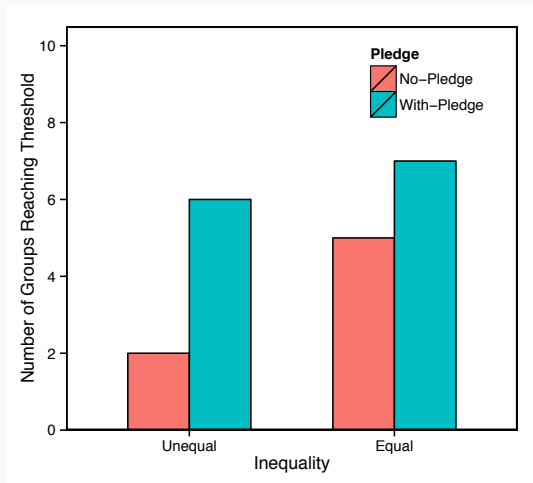
INEQUALITY: TAVONI ET AL. (2011)

- Tavoni et al. (2011) examined how “historical inequalities” impact on cooperation
- Employed an augmented collective-risk game divided into “passive” and “active” phase sub-components
- **Passive phase:** Rounds 1–3
 - *equal condition*: all 6 players in a group forced to contribute €2 to the climate account (all players left this phase with €34 each)
 - *unequal condition*: half of the players forced to contribute €4, whereas the other half were forced to contribute €0 (“poor players” left this phase with €28; “rich players” with €40 each)
- **Active phase:** Rounds 4–10
 - players allowed to decide how much to invest in climate account

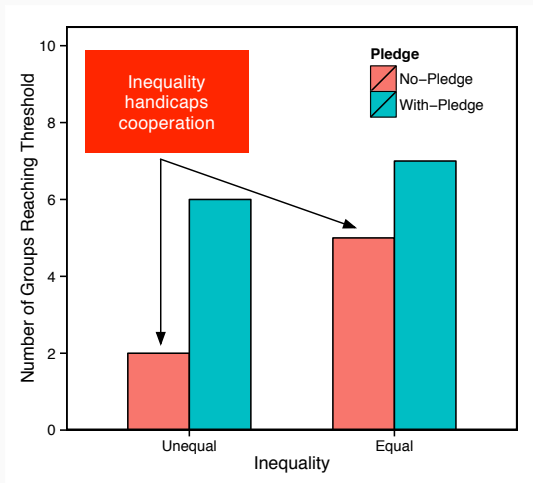
INEQUALITY: TAVONI ET AL. (2011)

- In addition to the equality manipulation, Tavoni et al. also allowed some groups, but not others, to pledge how much they intended to invest in future rounds
 - *with-pledge condition*: pledges could be made at the end of rounds 3 and 7. Players were informed whether pledges, if adhered to, would avert catastrophe
 - *no-pledge condition*: communication between players was not permitted

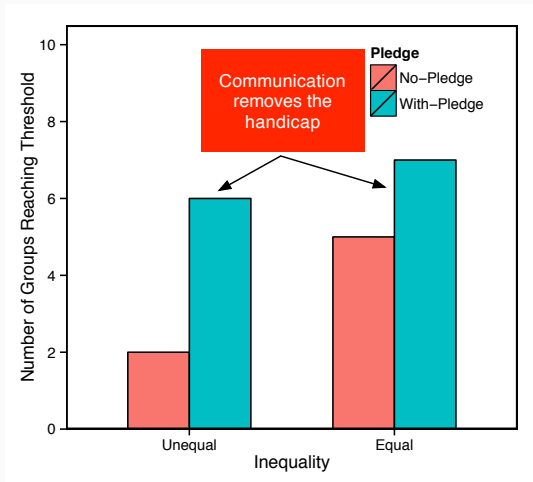
INEQUALITY: TAVONI ET AL. (2011)



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INEQUALITY: TAVONI ET AL. (2011)



- Compared rich groups, poor groups and mixed groups (3 poor players + 3 rich players)
- Cooperation was highest amongst rich groups, followed by mixed groups, followed by poor groups
- Some groups given “intermediate target” of reaching €60 by round 5 in order to avoid a costly intermediate “climate event” (mimicking intermediate climate damages caused by heat waves and droughts)
- The intermediate target increased cooperative interactions between rich and poor in mixed groups—rich players compensated for the lower investments of poor players, as in the study of Tavoni et al.

IMPLICATIONS FOR CLIMATE NEGOTIATIONS

- Equity concerns should take centre stage in climate negotiations
- A **bottom-up**—“pledge-and-review” (cf. Schelling, 2010)—approach may be more effective than a **top-down**—“target-setting”—approach
- The Paris negotiations will use a bottom-up approach:
 - countries have been asked to submit their pledges in advance of the meeting
 - they will undergo review at the Paris meeting to determine if they are sufficient to avoid crossing the 2 °C threshold
- Intermediate climate targets should also be set to facilitate cooperative interactions between rich and poor countries

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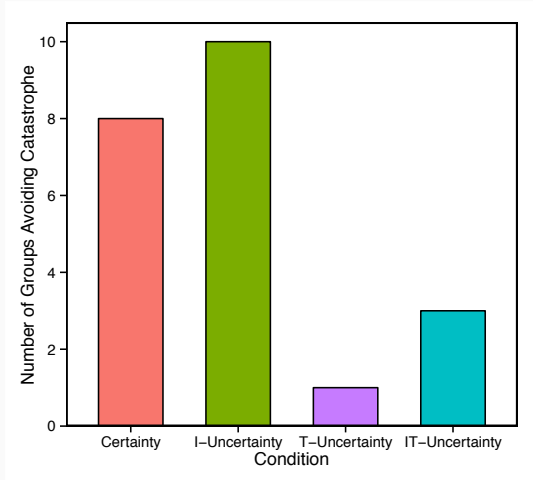
UNCERTAINTY ABOUT CLIMATE CHANGE

- Uncertainty is an inescapable and integral part of climate science
- It is often highlighted in public debate in order to prevent or delay political action on climate change
- How does uncertainty about dangerous climate change affect the prospects for international cooperation?
- Barrett and Dannenberg (2012, 2013) have examined the effect of “impact” and “threshold” uncertainty on cooperation

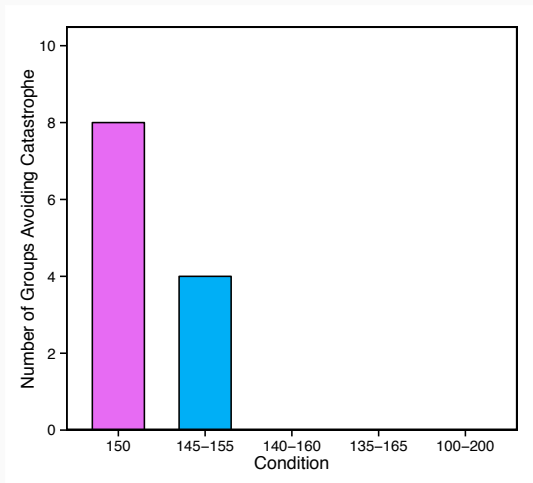
- Augmented collective-risk game involving groups of 10 players
- Players allocated €31: divided into operating fund (€11) and endowment (€20)
 - operating fund could be used to invest in “weak” or “strong” abatement by purchasing chips (max = 10) at a cost of €0.10 each or €1.00, respectively
 - endowment could not be spent and was included to ensure players could not become bankrupt
- Game played in stages: (1) communication stage; (2) feedback stage; (3) contribution stage

- Groups of players randomly assigned to one of four conditions:
 - *certainty*
target sum of investments to be reached was €150, otherwise €15 was deducted from each player's endowment
 - *impact-uncertainty*:
target sum of investments to be reached was €150, otherwise €10–20 was deducted from each player's endowment
 - *threshold-uncertainty*:
target sum of investments to be reached was €100–200, otherwise €15 was deducted from each player's endowment
 - *impact+threshold-uncertainty*:
target sum of investments to be reached was €100–200, otherwise €10–20 was deducted from each player's endowment

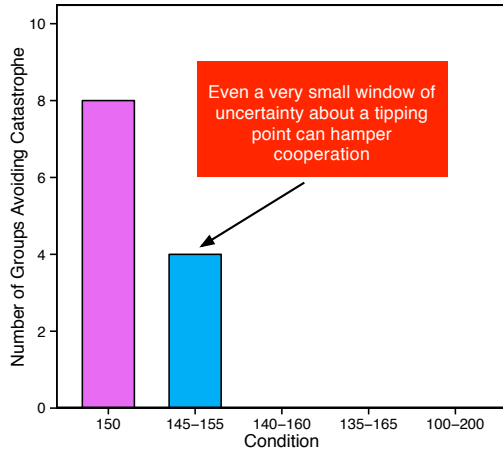
BARRETT AND DANNENBERG (2012)



BARRETT AND DANNENBERG (2013)



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IMPLICATIONS FOR CLIMATE NEGOTIATIONS

- Uncertainty about the threshold for dangerous interference needs to be minimised to create the conditions for cooperation to succeed
- The Copenhagen accord states that a threshold of 2 °C should be avoided
- Yet uncertainties about the relationship between concentrations and temperature make it difficult to know how to meet the threshold
- Climate negotiators need to identify—based on the best climate science—a “certain” concentration target to ensure the threshold is avoided

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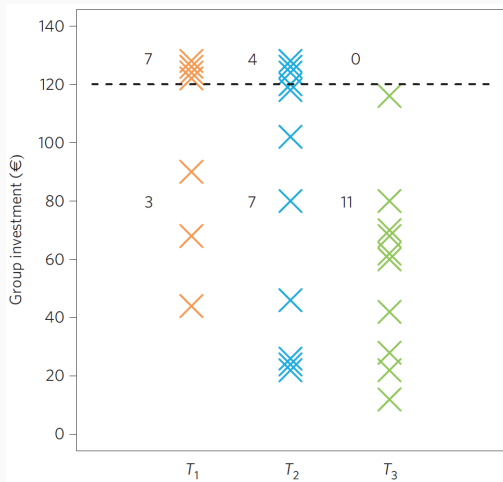
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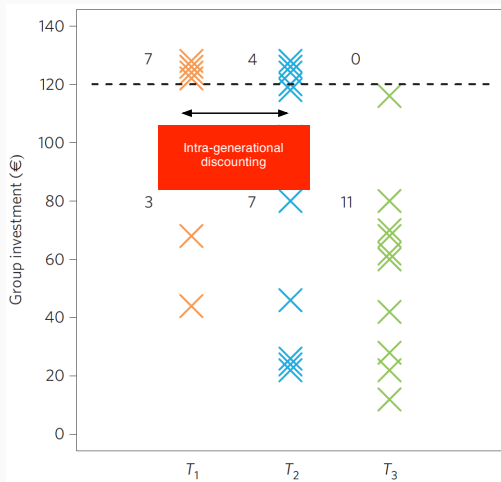
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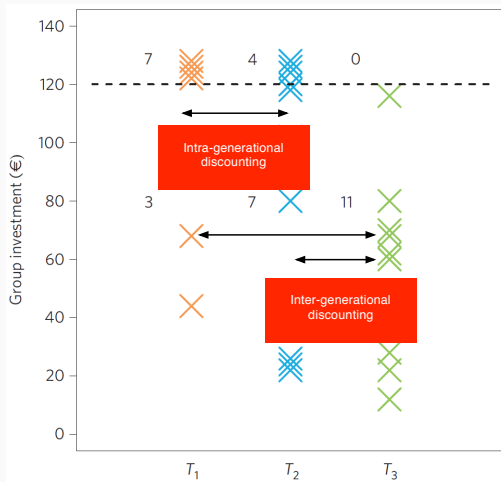
INTERGENERATIONAL DISCOUNTING

- The difficulty of avoiding dangerous climate change is exacerbated by climate change's intergenerational nature
- The current generation bears the costs of cooperation, whilst future generations inherit the benefits (if cooperation succeeds) or the costs (if cooperation fails)
- **Temporal discounting**—the tendency to prefer immediate over delayed monetary rewards—has long been known to influence individual choice
- Does it also manifest in a group setting resembling climate negotiations?

- Players given operating fund of €40 and endowment of €45
- Players always receive the left-overs of their operating fund at end of game, whereas the endowment is only awarded if catastrophe is avoided
- Three conditions:
 - $T1$: endowment delayed by 1 day
 - $T2$: endowment delayed by 7 weeks
 - $T3$: endowment delayed by several decades with wider range of beneficiaries
- $T1$ vs. $T2$ = “intra-generational” discounting
- $T1$ or $T2$ vs. $T3$ = “inter-generational” discounting







IMPLICATIONS FOR CLIMATE NEGOTIATIONS

- Intergenerational discounting is a major impediment to cooperation—immediate monetary rewards matter most
- Climate negotiations therefore must make intergenerational considerations a focal point
- Intergenerational discounting may be mitigated—over the short-term—by increasing *intergenerational identification*; highlighting the *power asymmetry* of current and future generations; and framing climate action as a *legacy building* process (Wade-Benzoni et al., 2009, 2012)
- Sustaining cooperation once a treaty has been signed may require enforcement mechanisms (e.g., trade restrictions)

CONCLUSIONS

- We only have one chance to avoid a real tragedy of the global climate commons
- Cooperation studies allow us to identify the impediments to international cooperation and establish how they may be overcome
- Although far removed from the world of international politics, they are plausible representations of the real climate change game being played
- Such studies promise to offer insight into how to make a climate treaty easier to agree on, and make it last

Thank you for listening!
Questions?