How to think about the climate change negotiations

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Big picture

- 2° C. Is this the right level?
- Stabilizing concentrations at *any* level requires reducing net emissions to zero.
- This requires either reducing emissions to zero, or removing CO$_2$ from the air.
- Temperature can be limited by geoengineering.
Air Capture
“Backstop technology”

- Can be scaled to any level, removing CO$_2$ at approximately constant marginal cost.
- A backstop technology, capable of being implemented by a “coalition of the willing.”
- Marginal cost likely to be high. Estimates range from $200 to over $1,000/tCO$_2$.
- Social cost of carbon today perhaps $18.6 (Nordhaus), $12-$129 (White House); other estimates higher; SCC will rise over time.
- CO$_2$ removal is a slow process, and there may be risks to storage.
Geoengineering
Geoengineering

• Another way to limit temperature: control the Earth’s albedo.

• We are already doing some geoengineering inadvertently. Might we do it deliberately? Who gets to decide?

• This is a colossal governance problem, as geoengineering is quick-acting and cheap.
Adaptation
Adaptation

- Adaptation can be done unilaterally.
- Most of it will be done “automatically.”
- Some of it will require public goods.
- Could include “nature engineering.”
- A partial substitute for reducing emissions.
- Worldwide, likely to be very uneven.
Reducing emissions

• Energy conservation limited.

• Need for alternative energy sources:
  • Renewables have limitations.
  • Nuclear entails risks.
  • Other options: biomass with CCS; synthetic liquid fuels; better batteries; etc.

• R&D is needed to stimulate an energy-technology revolution.
Incentives to do R&D

• Some R&D pays off unilaterally. This includes R&D into extracting and burning fossil fuels.

• Some R&D only pays off if the technologies embodying the R&D are diffused and used to reduce CO₂ (CCS).

• In these cases, the incentive to do R&D limited by the incentive to cut emissions.
A thought experiment

• MC of producing energy using coal is C.
• MC of renewables is R.
• R&D leading to $R < C$ will cause renewables to spread; but:
  • Intermittency and transmission.
  • History.
  • MC of fossil fuels is non-constant.
• Only a “miracle” technology would cause the world to abandon fossil fuels.
Reducing CO$_2$ to Zero

- Absent a “miracle” technology, reductions in emissions are a prisoners’ dilemma, vulnerable to free riding.
- Free riding is exacerbated by trade leakage.
- And the workings of global energy markets.
Prisoners’ dilemma

- 100 players in the room.
- Everyone gets a red and a black card.
- Everyone must hand back one card, without others knowing which one was returned.
- Every player gets $5 if he/she keeps the red card plus $1 for every red card handed in.
Prisoners’ dilemma

• There’s a strong tendency in this game for people to keep their red card.

• However, everyone is better off if all the red cards are handed in.

• Handing in a red card is a metaphor for reducing emissions.
“Miracle” v. “catastrophe”

- Framework Convention stresses the need to avoid “dangerous” climate change.

- Another thought experiment:
  - Suppose a global “catastrophe” would be triggered at 500 ppm.
  - And that avoiding this catastrophe is worth the cost.
  - Will the world act to avoid 500?
Yes!

• As long as the catastrophic threshold is certain, this is a coordination game.

• The international system is very good at coordinating.

• However, there is substantial uncertainty about the tipping point.

• There is also uncertainty about the impacts, but this doesn’t matter.
Coordination (threshold public good) game

• As before, everyone gets a red and a black card and must return one card.

• As before, every player gets $5 if he/she keeps the red card plus $1 for every red card handed in.

• In addition, every player gets $100 if at least 66 red cards are handed in.
Climate negotiations
as a game.
Theoretical prediction

(The Journal of Environmental Economics and Management, 2013)
Experimental results
(with Astrid Dannenberg; Nature Climate Change, 2014)
Strategy

- If we can’t rely on a “miracle” or a certain, approaching “catastrophe,” we have to devise a strategy for changing behavior.

- The central aim of this strategy must be to change the cooperation game into a coordination game.
Doomsday machine

...the doomsday machine is terrifying.
Doomsday machine

• Another thought experiment.
• All nuclear warheads connected via computer to Mona Loa.
• When concentrations reach 500 ppm, the bombs are detonated.
• Will we avoid 500 ppm?
Strategy

• The challenge is to identify an “acceptable” strategy.
Past negotiations

- Kyoto Protocol confronted the prisoners’ dilemma head on, but:
  - Did not limit emissions of countries like China.
  - Lasted only 5 years.
  - Provided no means for enforcement.
    - US did not ratify
    - Canada withdrew
  - Overall had virtually no effect.
Past negotiations

- Copenhagen talks were supposed to extend Kyoto. They failed.
- Copenhagen Accord asked countries to make voluntary pledges; no enforcement.
- Doha Amendment extends Kyoto, but without US, Canada, Japan, New Zealand, Russia.
The road to Paris

• Current “non-paper” asks

  • Each party “to prepare, communicate and implement . . . commitments/contributions.”

  • Periodically to communicate or update their commitments/contributions.

  • Submissions may be open for review by an “ex ante consideration process.” Parties may be asked to revise commitments/contributions.
The road to Paris

• Commitments/contributions communicated by countries
  • Could be included in an annex, like Kyoto
  • or contained in national schedules communicated, like Copenhagen.

• Governing body to conduct “strategic review” of aggregate effect of implementation efforts. Based on this, parties to “adjust” commitments/contributions “upwards.”

• Compliance not [yet?] addressed.
How to think about Paris

• Current draft agreement is a kind of blend of previous approaches. Why should we expect this approach to work better?

• What’s different this time is that emissions are much higher, concentrations are much higher, the SCC is higher, so countries have a stronger incentive to act unilaterally.

• Is what we’re seeing really better than some conception of BAU?
Can we do better?

- One approach is to couple obligations with trade restrictions.
- Problems: credibility; fairness; trade wars.
- Another approach: break the problem up.
  - Control HFCs under Montreal Protocol.
  - Standards for trade-sensitive sectors.
- These things can be additional to other approaches.
However

- Even a “best case” approach to negotiations is unlikely to stabilize concentrations at a “safe” level.
Implications

• Climate change is the greatest collective action problem ever.

• Our international institutions are poorly equipped to deal with it. They are bad at enforcement.

• The consequence is that we will do too little; we may trigger “catastrophes.”
Speculation

• Climate change may cause our institutions to change.
• It may also cause countries to geoengineer.
• Geoengineering won’t fix every problem. Its use may provoke a crisis of its own.
• Climate change has profound significance for global governance; and the way global governance evolves will in turn determine the fate of the climate.
Thank you.