

# **Iterative Climate Policy**

## **Questions and Issues (when you have a steering wheel)**

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# Motivation from the Synthesis Report of the AR4

- “Responding to climate change involves an iterative risk management process that includes both adaptation and mitigation and takes into account climate change damages, co-benefits, sustainability, equity, and attitudes to risk.”
- Excellent. This is RIGHT! Now what do we do?

# Some Earlier Work under the Auspices of EMF-12, EMF-14 and EMF-22

- EMF-12 and 14
  - Two values for climate sensitivity and damages (baseline and extreme)
  - Complete resolution in 25 years
  - Optimal hedging
- EMF-22
  - Wider distributions of climate sensitivity and emissions paths with complete or partial resolution in 25 or 50 years
  - Hedging to minimize adjustment costs for achieving selected temperature targets (2 and 3 degrees) with complete resolution at a date certain.

# A Troubling Development: Uncertainty May Never be Resolved

- Roe and Baker (2007) show, for example, that “the probability of large temperature increases” is “relatively insensitive to decreases in uncertainties associated with the underlying climate processes”.
- Allen and Frame (2007) responded by arguing that it was pointless for policy makers to count on narrowing this fundamental uncertainty.

Allen, M. and D. Frame (2007), “Abandon the Quest”, *Science*, **328**, 582-583.

Roe, G. and M. Baker (2007), “Why is Climate Sensitivity so Unpredictable?”, *Science*, **328**, 629-632.

# Implications for Iterative Policy

- It is probably not a good idea to presume resolution of the uncertainty about climate sensitivity.
- Other work: temperature thresholds may be determined from key vulnerabilities that are triggered in the middle of the distributions.
- Focusing on the near-term is critical, but how should *adjustments* be made in the evolution of long-term policy?
  - Relatively likelihoods below the tails can be important
  - Identifying uncomfortable likelihoods will be informative.

# An Issue of Context

- What are the “laugh tests” for contemplating long-term objectives?
  - For example, can the assumed diffusion of technologies make sense from a historical perspective (nuclear????)
  - What is the sensitivity to sub-global participation?
    - Allocations of efforts for R&D?
    - Diffusion of technologies designed for labor scarce economies to developing countries that are labor rich does what to those economies (e.g., labor markets)

# Some Adjustment Issues

- Adjustment costs depend on:
  - Timing: Adjusting too frequently or too infrequently are the type 1 and type 2 errors that can arise in mitigation, adaptation, and R&D policy; there are costs to both types of error.
  - Policy design: It is critical to keep adjustment uncertainty to a minimum – a predictable and observable process is required.
  - Where to start: A corollary: the adjustment process can influence the starting point.
  - Subjective judgments about the relative likelihoods of particular outcomes and learning both play a role.

# Policy Design Example: Prices versus Quantities

- Cap and trade fixes quantities over time (unless price volatility limited by design) at the cost of coping with enormous complexity.
- Taxes fix the price signal over time; quantities vary, but with little cost because climate change depends on cumulative emissions.
- Hypothesis: Adjustment costs are reduced by greater stability in the signal that matters most – the price of carbon.

# Some More Adjustment Issues

- The adjustment process depends on monitoring something; what should it be?
  - The choice depends on the target(s) and the drivers.
  - Certainly monitor progress toward the target(s) however defined (performance) and adjust.
  - Could want to adjust the target(s)
    - Multiple and alternative hypotheses of the processes that produce the risk can exist.
    - Negative learning is possible.
    - Type 3 errors are possible.

## Some More Adjustment Issues

- The pace of learning will influence the frequency of adjustment; policies designed to promote learning for key vulnerabilities can be essential, and policy design can influence where learning would be most effective.
- Prepare to respond to what could be calls for action in the wake of an extreme event – i.e., prepare adjustment plans designed to allow us to panic intelligently.

# Selection Criteria

- Minimize adjustment cost
  - Vis à vis alternative temperature objectives (defined in terms of tolerable likelihoods)
  - Vis à vis type 1 and type 2 errors
  - Vis à vis preparing to respond aggressively in the wake of an extreme event
  - Vis à vis fundamental miscalculations or misrepresentations of the baseline

# The Steering Wheels

- Adaptation – path dependent and site specific.
- Mitigation:
  - The price of carbon over time
  - R&D policies
- Evaluating climate change benefits or costs of other policies:
  - The social cost of carbon
  - The shadow price of mitigation activity
    - Easier to calculate
    - Can be defined domestically despite global externalities