The Timing of Climate Change Policies

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Questions raised by economic analysis of climate change

- Is it worth taking action against climate change
  - If yes, how much action should we take
  - Is it worth delaying action until either we understand the issues better or we have better alternatives available to us

Disputes about the answers

- Even today there is controversy about these basic issues
  - Stern claims that rapid and strong actions are justified
  - Nordhaus claims that we should act, but slowly
  - Dasgupta claims that economics cannot tell us what the answers are

Disagreements about

- Welfare parameters δ and η representing pure rate of time preference and elasticity of marginal utility
- Magnitude of damages from climate change
- Costs of mitigating climate change

Welfare parameters

- Pure rate of time preference (prtp) – Stern 0%, Nordhaus 3%
- In my opinion, the correct rate is 0%: there is no case for a positive pure rate of time preference – cite Sidgwick, Ramsey, Harrod, von Weizacker, Mirlees, ..
- This is a purely ethical choice – no economic content at all

Welfare parameters

- But *consumption discount rate* (cdr) can be different from prtp
- η is curvature of payoff function $C^{\eta}/(1-\eta)$, measures risk aversion and redistributive preferences
- Larger η - more risk averse and MU of income falls faster. Value increments of income to the rich much less than to the poor

Consumption discount rate

- $\rho = \delta + \eta\, g(C)$
- Here ρ is the cdr and $g(C)$ is the rate of growth of consumption C
- cdr is rate of change of marginal valuation of C
- With $\delta = 0$, $\rho = \eta\, g(C)$ or cdr = elasticity of MU of C x growth rate of C

Welfare parameters

- Dasgupta, Nordhaus and Stern disagree on value of η with D arguing for η = 2-4 and N and S for η = 1
- η is a complex parameter to choose – reflects ethical judgments and risk aversion
- Certainly true that 1 is a low number both ethically and from data on RA. Heal & Kristrom use 2-8

Dasgupta's comment

- "$\eta = 1$ is to insist that any proportionate increase in someone's C is of equal social worth to that same proportional increase in the C of any other contemporary no matter how rich or poor. With $\delta = 0$ it implies that any proportionate increase in C today is of the same social worth as the same proportional increase at any other date no matter how rich or poor the people then."

Choosing η

- η = 1 implies that $1 from a person earning $1000 can be compensated by $1,000,000 to Bill Gates
- Higher values imply even sharper tradeoffs
- Empirical evidence on risk aversion does suggest η in the range 2-6

Implication

- With $\delta = 0$ and $\eta = 2\text{-}4$, or $\delta = 3$ and $\eta = 1$, and growth of aggregate consumption at historical rates, there is not a strong economic case for action on CC
  - cdr is about 3%
  - Stern sets $\delta = 0$ and $\eta = 1$
- Have to accept N's recommendation that we move slowly
- But these are aggregative one-good models

Environmental goods

- With many goods C_i i = 1,…,n we have
  - $cdr_i = \eta_{ii}\, g(C_i) + \Sigma_{k \neq i} \eta_{ik}\, g(C_k)$
  - where η_{ik} is the elasticity of the MU of good i wrt changes in consumption of good k
  - Different goods have different cdrs which are not constant
  - If good i is an environmental good then C_i may be <0 and cdr_i may be <0

Environmental goods

- So if environmental goods matter and are in declining supply, some cdrs may be zero or negative
- Seems realistic to argue that human welfare is a function of stocks of environmental assets and the services – ecosystem services – that flow from them

Environmental goods

- Ecosystem services include pollination, carbon sequestration, nutrient cycling, pollination, protection from ozone or from floods, recreational services, existence values, ….
- Considerable evidence that these are of great value and will be damaged by CC

Environmental goods

- CC will deplete these assets and the services from them
- So consumption of their services will fall and it is likely that cdrs will be low or negative
- This can justify stronger actions on CC (see An Even Sterner Review)

Cost, Risk & Uncertainty

- Stern estimates costs of CC as equivalent to 5% of GDP in perpetuity taking into account only market effects (no ecosystem services)
- Worrying aspect of CC is small risk of massive disaster – e.g. ice sheet melting, thermohaline circulation changing, mass extinctions, devastating diseases etc.

Cost, Risk & Uncertainty

- Worth paying an insurance premium to reduce this risk
  - How much depends on same parameters – δ and η
  - Could be several % of GNP (Heal & Kristrom)
- Allowing for risks and for non-market losses – ecosystem services – could place costs of CC in 5-10% range

Costs of abatement

- Stern puts this at around 1%, IPCC at <3%
  - Sensitive to policies used, whether market-based or not
- Reality check – mitigating CC requires reducing CO2 emissions by 70% which is $20x10^9$ tons at say $30-60 per ton giving 1-2% world GDP (=$\$66x10^{12}$ @ ppp)

Costs of abatement

- Justification for $30-60 per ton cost of reducing CO2 emissions
  - Can cut back emissions from deforestation – about 20% of total – substantially for roughly $60 per ton
  - Can capture and store CO2 for $30-50 per ton
  - Non-carbon power sources (nuclear, renewables) competitive at $50/ton CO2 or less

Gains from delaying?

- Will we have better technologies for mitigation in the future and does it make sense to wait for them?
- Is there any chance we will change our minds over CC?
- Could we use the money better?

Gains from delaying?

- Question 1 is pure guesswork
- Question 2 the answer seems to be no – the science is now certain
- Could we use the money better? The benefit-cost ratio from stopping CC is > 5 – a very good use of our money. Unlikely that we can do better.

Costs from delaying

- Long lags in economic responses to policies once policies are in place
  - Takes energy use 10 years to respond to higher prices
- Long lags in response of climate system to changes in CO2 emissions
  - May be decades
- Need to act now to have an effect in 2040

Bottom Line:

- We should act and act now
  - The economic return to action is high
  - There are substantial risks from delay