STERN'S REVIEW, CRITIQUES, AND REPLIES

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1. PREAMBULE

- I have NOT read the entire Stern Review Report.
- I have NOT read all critiques, ‘reviews of reviews’, replies, reply to replies, etc.

2. Main Conclusions of Stern's Review

Business as Usual

- Atmospheric greenhouse gases may reach 550 ppmv CO_2 eq. by 2035, if unchecked
- Probability of (Temperature increase > 5 ^{0}C) > 50% (last ice-age was 5 ^{0}C colder)
- Poor countries will suffer most. Costs will be equivalent to 5-20% GDP, forever

Stabilizing alternative

- will require reduction of GHGs by about 25% in 2050 (compared to current levels), and by 80% in longer term (as opposed to expected increase)
- Costs of stabilization will be about 1% of GDP per year (range of –1% - 4%)
- All countries will have to contribute, no countries will need to reduce economic growth

Stabilizing the climate is costly, but less costly then not stabilizing (about 5 times)

- Emission cutting options exist, policy needs to motivate their take-up
- International cooperation is required with elements integrated in development policy:
  - emission trading
  - technology exchange
  - reduced deforestation &
  - adaptation
- Even if we reduce emissions, adaptation is essential

3. CARTER ET AL., WORLD ECONOMICS 7(4): 165-198

- Scientific debate is not presented correctly in Review
- We still don't know the current state of the climate, as we are not sure of the role of
  - clouds interacting with climate change
  - methane
  - solar changes
  - cosmic rays
  - aerosols
- CO_2 has probably a minor role only in current warm period. Changing climate so far (0.1-0.2 ^{0}C/decade) fall within the natural variability, and compare with Minoan, Roman and Mediaeval warm periods and 'Little Ice Age'.
- Greenland ice cover is thickening in the centre, and the local temperature is at the 1930 level. (Same for polar ice)
- Extreme weather effects are not statistically proven to increase due to global warming
- Scientific evidence for dangerous climate change is NOT overwhelming
  - Predicting the climate is impossible, as simulations cascade uncertainties
- Agricultural production will adapt to climate change, contrary to Review's assumption. The same applies to water supply and health risks.
- Effects on ecosystems are even less understood.
- Data supporting global change thesis is not public and badly verified.

4. BYATT ET AL., WORLD ECONOMICS 7(4): 199-232

- BAU emissions will be less than assumed in the Review, as oil becomes more expensive.
- The climate has almost no effect on industrial activity
- Vulnerable sectors have declining share in economy
- So costs to economy can never be 5-20% of GDP.
- Climate change costs must be intangible or risk of catastrophe, and thus, speculative.
- Thus, the Review's climate damage costs estimates are pure speculation & too high

- The review assumes too huge carbon tax recycling revenues. Theory suggests that tax-interaction may counter the tax recycling benefit.
- The review assumes free-lunch induced technology
- Thus, abatement costs estimates are speculation, and too low

- The review uses a 0.1%/yr pure rate of time preference, without sensitivity analysis in the core of the review. A 1.5%/yr PRTP decreases the NPV of climate damages by 75%.
- Such a low discount rate is inconsistent with concerns for present poverty, as it implies that present poor should save more for future poor.
- Such a low discount rate leads to crowding out of more beneficial public expenditures

BYATT ET AL., WORLD ECONOMICS 7(4): 199-232, CTD.

- Flat marginal climate damage costs + steep marginal abatement costs imply that a (low) tax is best instrument.
- Review assumes steep marginal climate damage costs + flat marginal abatement costs to suggest a permit instrument as optimal
- Failure to link different carbon markets (e.g. business and private) will lead to inefficient abatement efforts
- The review neglects government failure. Who is sure the government is the best agent to set targets?
- Peer review in IPCC literature is too much group action. Reviewers are not independent.

5. TOL&YOHE, WORLD ECONOMICS 7(4): 233-250

- Estimated Climate costs of BAU are too high:
  - too low discount rate (pure rate of time preference of 0.1 %/yr)
  - double-counted risk
  - insufficient adaptation assumed (Africa is assumed to continue living in hunger when climate change reduces food production; the Stern Review does not assume BAU improvements in efficiency. Similarly, malaria is assumed to remain costly, but if Africa develops they may buy better prevention)
- Estimated Abatement cost are too low
  - Literature survey is biased to optimistic ITC literature
  - Costs of abatement may increase after 2050 (omitted in Review)
  - Transition costs due to sunk capital are omitted (turnover of power plants)
- There is no optimization in the Stern review. It is just BAU vs. Stringent CC Policy
- We don't need scary scenarios to promote climate action
- Alarmism attracts critiques on the numbers, pulling attention away from the real question: to tackle or not to tackle climate change
- Stern Review is not credible

6. NORDHAUS, MIMEO?

- All CBA studies on climate change suggest slowly tightening policies: first become rich, then reduce emissions when it is less costly
- The Review is a political report, not an academic review.
- The review assumes almost zero pure discounting, based on neutral inter-generational weighing. But there are alternatives for inter-generational neutrality, with rather different results:
  - Maintaining total societal capital: there seems no problem with BAU
  - Maximin (Rawls): leads to more spending, less saving, less abatement
  - Precautionary: leads to stockpiling everyghing, e.g. vaccines
- Low discount rate + CRRA=1 is inconsistent with Reviews assumption of optimal Ramsey growth model and empirical data. If you also adjust the risk aversion parameter consistently ($r=\rho+\gamma g$), then the surprising results vanish.
- The Reviews discount rate would mean you increase savings enormously to build up capital. Who will reduce present consumption? The poor? The rich?

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7. WEITZMAN, BOOK REVIEW FOR JEL

- Discount rates are decisive on climate change CBA
- We don't know as much as we think about long-term discounting
- Thick tails of uncertainty matter
- Gathering data on 'tail' uncertainty should be research priority
- No economist believes people behave in accordance with assumed zero discount rate in Stern's report. Stern's assumptions would lead to 31% savings rate, which is way beyond realistic levels of, say 10%
- There is an important distinction between discount rates used for risk-free or non-risk-free investment.
- If climate damages occur most heavily under low economic growth scenarios, then we should use low discount rate.
- From an empirical perspective, the equity premium is still unsolved, and any discount rate parameters can be justified.
- The possibility of real disaster plus low economic growth puts the low discounting right, but then
- The Stern report may be right for the wrong reason (no 'ethics' but uncertainty)

8. Reply to Scientific Critique, World Economics 8(1)

- Uncertainty of climate science is not only for the good. The future might also be much more hostile.
- Most recent studies suggest water vapour has positive feed-back effect
- Greenland ice gets thicker and smaller. Overall it looses ice.
- Extreme weather effects seem to increase
- Ice ages are understood to be triggered by solar events, with a positive feed back follow-up of a greenhouse effect and an albedo feed back (ice melting).
- Observed warming in the 20st century seems to be throughout the earth climate system: oceans, ice, land, atmosphere (not only the latter)
- The patterns of warming found (where is it warming by which relative amount) fit the theory of global warming quite well (‘fingerprint’, or ‘smoking gun’)
- The broad scientific understanding of earth history is consistent with the Greenhouse Theory and the data from 1900-2000.
- The review does not depend on one study, but on many

9. Reply to Economists' Critique, World Economics 8(1)

- On sources: It has used meta-studies as a major source of information
- On peer review: It has presented it findings during the process, and has given everyone possibility of comment, at every stage. It did not (have to) accept all critical comments.
- On damages: The Stern review has assumed adaptation of food production. But the speed of change may make adaptation quite costly.
- On damages: Most literature CBA neglect uncertainty and assume deterministic future. This is know to lead to too less abatement compared to uncertain case.
- On abatement costs: The Stern Review has assessed the literature and concluded that many high-abatement cost studies neglected substitute energy sources. Thus, while reviewing the literature, the report did not choose the average cost estimates.
- On CBA: such is impossible for climate change, so 'we' deliberately did not want it.
- Specific reply to Tol and Yohe
  - They misrepresented the marginal costs results underlying the Review report
  - The Review costs estimates excluded studies with huge tax recycling benefits
  - The Review costs estimate did include capital turnover times
- Those that say the low discount rate implies other investments to be more beneficial than abatement, can't be sure that capital will remain its high rate of return in the future when climate damages come in.
- Those that say there is no reason to give equal weight to rich future forget about the possible catastrophic results.
- Anyway, the discounting is not the entire story, as Nordhaus suggests with his deterministic model

10. ASSESSMENT

- Stern's team made a review. They did not take average estimates, but made their own assessment of previous studies and used meta-studies to help them.

On climate damages

- Stern's team seem to consider the low climate damage estimates as incomplete, and the high-damage studies as more reliable.
- Importantly, the Review considers the possibility of really high damage non-negligible.

On abatement costs

- Stern's team considers the high-cost estimates as biased due to missing options (non-carbon energy + technology adaptation)

On discounting

- Stern's team takes an ethical stand that we should not discount future generations purely for the fact that they are born later.

Together, these believes/choices force one to accept a stringent climate policy.

- It is not the average of science, but a very well-informed political report.

11. DISCOUNTING

- As the choice for zero pure discounting received most of the economic criticism, it deserves some extra attention.

Main critical comments:

- Zero pure discounting does not reflect preferences as revealed through actual choices made by society (aggregate savings), nor by individuals.
- Using zero pure discounting for climate change policy while using positive discounting for (e.g. infrastructural) public investments leads to inefficient policy trade-offs.

Main reply:

- Everyday-life preferences may not be proper for an intergenerational problem such as climate change. We cannot set aside ethical concerns.

A naive question:

- Everyone seems to accept the Ramsey rule ($r=\rho+\gamma g$) as a condition that both describes real-life behaviour of consumers, and as a condition for optimal policy. Why is that?

12. THE FALLACY OF THE RAMSEY RULE

- The main real-life interpretation of the Ramsey-rule ($r=\rho+\gamma g$) is when it is applied to an individual who has internally consistent preferences and actions.
- When tested, the Ramsey rule is typically refuted (smoothing of consumption over pension break, unemployment, life-cycle, does not fit model).
- The Ramsey rule has no clear meaning on the aggregate level.
- There is no reason to expect that there exist parameters ρ and γ such that the Ramsey rule will hold for a market economy over any time span.
- Assuming that one can calibrate ρ and γ on past data and use it to describe future interest rates is as arbitrary as assuming that one can use the Solow constant savings rule.
- Recall: the Ramsey-Koopmans (=growth model with Ramsey consumer) model was 'invented' to extend the Pareto-efficiency type of analysis, popular in static models to dynamic models.
- Various applied simulations carried out in the context of the pension gap (how can we pay for the ageing population, pay as you go versus fully funded) suggest that r will decrease over time, not because of slowing growth, but because of increasing pension asset needs due to ageing (higher supply of savings decreases the return on savings).

13. PUBLIC ECONOMICS OF DISCOUNTING, INTRO

Introduction to Public Economics (here: balancing costs & benefits of government redistribution)

- Literature on efficient taxes has two core elements:
  - Taxes distort the equilibrium, decreasing overall income (marginal costs of public funds)
  - The government favours an even distribution of income and needs to protect citizen with a low income-earning capacity; taxes are needed for redistribution.
- Formally, the second element is represented through an aggregate welfare function that is concave in vector space of individual's income levels.
- That is, for given aggregate income, welfare increases when the distribution becomes more even. Taxes + social security reach that goal. But since taxes decrease aggregate income, there is a trade off.
- The efficient tax outcome is that income is partly and not fully redistributed.
- Intuition: some redistribution yields high gains in distributive welfare and low costs in terms of aggregate income losses. Too much redistribution costs too much income.

What happens when we apply the same reasoning to discounting and climate change?

14. Public Economics of Intergenerational Policy

- Public economics of discounting, axioms/assumptions/assertions
  - Interest rates are the result of a complex market equilibrium balancing savings and investments (Weitzman)
  - Public intervention that redistributes income over generations (e.g. public investment paid out of taxes) distort the economy and decrease the NPV of income.
  - The government is free to have some intergenerational welfare function, which can be independent of the actual market outcome (e.g. it can have equal weights for all generations, but not necessary; it is a political choice)
- Than, the government has to balance costs of policy intervention, e.g. through public investments in infrastructure, or carbon taxes, with the benefits in terms of the intergenerational welfare function
- Government may want to transfer income to the future, e.g. by investment in infrastructure or by implementing carbon taxes, as such increases its own aggregate welfare function for given aggregate income.
- At the same time, policy intervention is costly as it adds distortions and decreases aggregate income.
- The government has to balance costs and benefits. For investment in infrastructure, the weight given to the beneficiaries in the social welfare optimum and through the market interest rates may not be that different. So, there is not much reason to sacrifice aggregate income for redistribution.

PUBLIC ECONOMICS OF INTERGENERATIONAL POLICY, CTD.

- For short-term and medium-term policy issues, there is not much reason to deviate from market-based interest rates when the government intervenes.
- For climate change, the weight given to the beneficiaries in the social welfare optimum and through the market interest rates are very different. So, redistribution has a potential large effect on public welfare, and there may be good reason to sacrifice aggregate income for redistribution.
- Government can have its own pure time preference, and need not follow market interest rates. The market does not represent individuals' preferences for the very-long future. It may represent only an intra-personal inter-temporal trade-off, heavily distorted.
- To paraphrase Weitzman: the Stern Review may be right for the wrong reason.