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COMMENTARY

The economics of climate change impacts à la Stern: Novel and nuanced or rhetorically restricted?

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ABSTRACT

The Stern report conducts an estimation of Greenhouse Gas control costs weighed against the benefits of avoiding damages at the global scale. As I show, Stern and colleagues are aware of the limits to CBA, although they chose to ignore the considerable literature on the subject, the many contributions by ecological economists, and especially work specific to the enhanced Greenhouse Effect. Various problems are raised or mentioned in the report including: strong uncertainty, incommensurability, plural values, non-utilitarian ethics, rights, distributional inequity, poverty, and treatment of future generations. How then can this report, acknowledging so many of those aspects of climate change that render CBA an unsuitable tool for generating policy recommendations, go ahead to conduct a global CBA and make policy recommendations? I explain how issues are suppressed and sidelined in a careful and methodical manner, with the pretence they have been addressed by 'state of the art' solutions. Meanwhile, the authors maintain allegiance to an economic orthodoxy which perpetuates the dominant political myth that traditional economic growth can be both sustained and answer all our problems. Besides perpetuating myths, this diverts attention away from alternative approaches, away from ethical debates over harming the innocent, the poor and future generations, and away from the fundamental changes needed to tackle the very real and serious problems current economic systems pose for environmental systems.

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1. Introduction

"Those who reject theory for pragmatism are liable to find themselves unwitting adherents of bad theory." (Loasby, 1976: 21).

The report by Stern and colleagues, hereafter Stern plural¹, is claimed to be an in-depth review of the current state of knowledge about climate change economics (Stern, 2006: 38). Rather than an independent review, this report was commissioned by the UK

Government, and launched, 30th October 2006, at an international press conference attended by the Prime Minister and Treasurer. A report led by an ex-Chief Economist of the World Bank, with publicised backing from an elite of economists, including various Nobel award winners,² would suggest a rigorous piece of work. The key conclusion, and international headliner, states:

"Using the results from formal economic models, the Review estimates that if we don't act, the overall costs and risks of

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¹ There are 22 people named as "the team" besides Stern himself (Stern, 2006: ii) although people refer to the report as if written by Stern alone. I therefore use Stern as a plural to cover all authors and for brevity i.e., read as Stern et al.

² At the Ninth ISEE Conference, New Delhi, 2006, Amartya Sen came to the defence of the Stern report on grounds of it being a cost-effectiveness study, contrary to the fact that control benefits are a major focus (Chapters 2–6). Sen also took the pragmatists position in his advocacy, even though this approach contradicts his own arguments concerning freedom and capabilities, and critiques of welfarism.

climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around 1% of global GDP each year.” (Stern, 2006: vi).

However, that precise GDP numbers on climate change control costs and benefits may be precisely wrong has been a subject of previous commentary in *Ecological Economics* (Funtowicz and Ravetz, 1994). Perhaps the much quoted 20% (like figures produced by Nordhaus) “... is one of those ‘magic numbers’ designed to produce confidence in the existence of a hard core of objective fact deep inside the mass of intuitive fuzz.” (Funtowicz and Ravetz, 1994: 201). So is this report substantively novel?

The overall picture is identical to that drawn 25 years ago (d’Arge et al., 1982); that is, possible slight initial gains and consistently rising damages. Some 15 years ago Cline (1992) produced a global cost–benefit analysis (CBA) which gave a central estimate of damages reaching 6% of GDP with a 10 °C warming, and 20% of GDP lost under a pessimistic scenario. He showed that, even with a 5% discount rate, incorporating only a small probability of catastrophe within such economic models is all that is required to justify ‘aggressive’ action (Cline, 1992: 6). This literature is ignored by Stern³ (as indeed it has been by those opposing emission controls)⁴ while economists calculating small, or negative, control benefits and large control costs are praised, e.g., Mendelsohn, Nordhaus and Tol. Stern will get little thanks from these authors for this praise, because they are also cited as having failed to account for the latest science, treated risk and uncertainty inappropriately, underestimated optimal mitigation, used unsuitable methods, and neglected future generations (Stern, 2006: 298). Also, just as Nordhaus attacked Cline (see Spash, 2002: 185–188), Stern must expect criticism from mainstream economists for raising ethical concerns, especially with regard to that favourite economists’ red herring, discounting. Indeed, divergence from economic orthodoxy seems to be driving the results with the report claiming novelty in the treatment of future generations, distributional inequity, and uncertainty.

The report has therefore been taken as a clarion call, by those supporting Greenhouse Gas (GHG) control, stimulating public debate and international reaction. However, as I will show, the appearance of an heterodox approach is highly misleading and Stern mostly pay lip service to the problems mentioned. Being pragmatic, ecological economists who realise this may keep quiet or mutter qualms in academic corridors. They may see climate change as a perfect moral storm (Gardiner, 2006), and agree with Singer (2006: 422) that when escaping such a storm “the motivation isn’t as important as the outcome.” The fact that Stern conduct a global CBA regardless of all theoretical limitations and ethical concerns might then be regarded as less important than their call for mitigation. Those ecological

economists who have been placing large numbers on global ecosystem services may be comforted to find other environmental pragmatists arguing that this is the way in which environmental problems should be articulated, i.e. as investment opportunities set in a market place. The warning by Brian Loasby, cited above, then seems appropriate.

In what follows I detail the strengths and weaknesses behind the headline cost–benefit figures. In the next section I show how Stern raise the issues of catastrophic and extreme events, irreversibility, vulnerability of the poor to damages, risk and uncertainty, ethical concerns, and incommensurability. This is followed by an explanation of how each of these issues is in fact treated in a manner which reinterprets them into more simplistic alternatives to fit within orthodox economic methods. In so doing I expose some of the underlying value judgements made by Stern. This establishes what has been done by Stern but not why it was done. I therefore proceed to reflect upon the context and motivation for producing such a document framed in terms of GDP growth. This emphasises the problems facing a society which focuses upon increasing consumption and production as the *raison d’être* for life. I close with some brief concluding remarks.

2. Strengths

“Now even those mainstream economists who engage in debate on the environment find themselves adopting the rhetoric of an ecologically sensitive approach. In spite of their efforts to reach orthodox conclusions, their very language reflects how they are forced to recognize and cope with the new problems of economics in an ecological context.” (Funtowicz and Ravetz, 1994: 199).

Anyone contemplating the future projections for human induced climate change knows that the prognosis is bad, and can only get worse, as long as we humans continue to emit substantial GHGs. There are a whole series of potentially catastrophic events. The poor and least able to adapt will obviously suffer worst. On these points Stern are clear and repeat the general agreement, and concern, amongst all those demanding serious mitigation.

The emphasis on catastrophic and extreme events is something the IPCC process of consensus report writing, and its inherently conservative scientific and political approach, has downplayed. A move, away from a sole focus upon average temperature rises, towards concern for the changing frequency of climatic factors and their temporal and spatial distribution is also overdue (Spash, 2002: 98–106). Extreme climatic events, such as hurricanes, floods and droughts already result in major damages, e.g., Hurricane Katrina ~ 1.2% GDP in USA (Stern, 2006: 132).⁵ The insurance industry is rightly concerned.⁶ Stern also

³ One of the co-authors informed me that a reference to Cline would, in light of my comments, appear in an appendix upon hard copy publication.

⁴ MacCracken (2006: 386–387) notes the selective use of industry funded economic model results by the US President in withdrawing from the Kyoto Protocol.

⁵ As noted later disasters can also contribute to GDP increases. For example, hurricanes can lead to booms in the construction sector. This says more about the failings of GDP as a measure of overall welfare and well-being than the impacts of such events.

⁶ While the fear is of large payouts the sector may also profit, at least in the short term, due to an increase in the number of policies taken out and by being able to justify higher premiums.

highlight the potential for some unique irreversible disasters e.g., disruption of the North Atlantic ocean circulation, and melting of the West Antarctic and Greenland ice sheets.

Three chapters (3, 4 and 5) explain the dangers to industrially developed and developing countries in physical and monetary terms. These are speculative and dependent on four scenarios. Drawing precise inferences is notoriously difficult and various monetary numbers are based on a variety of ad hoc assumptions, as with all such previous work. However, the overall point is clear, that damages rise without GHG control, millions will be affected in the rather too near future, and billions are vulnerable the longer the delay.

Stern also join the chorus of those pointing out the vulnerability of the poor to climate change and their limited ability to adapt. As Chapter 4 notes: “Strong and early mitigation is the only way to avoid some of the more severe impacts that could occur in the second half of this century.” (Stern, 2006: 92). Stimulation of conflict, violence and wars is a noted potential (Stern, 2006: 136–137), rather reminiscent of Meadows et al. (1972).

In Chapter 6, past economic modelling is criticised for having failed to address adequately extreme events, a full range of impacts, distributional issues and uncertainty.

“Above all, they carry out cost-benefit analysis appropriate for the appraisal of small projects, but we have argued in Chapter 2 that this method is not suitable for the appraisal of global climate change policy, because of the very large uncertainties faced. As a result, these studies underestimate the risks associated with large amounts of warming. Neither does any of these studies place much weight on benefits and costs accruing to future generations, as a consequence of their ethical choices about how to discount future consumption.” (Stern, 2006: 298).

Stern incorporate uncertainty as subjective probability distributions, produced by Monte Carlo simulation. A 5% loss of GDP is taken as the baseline, compared to 0–3% under past models, for a 2–3 °C average global temperature rise. Monetisation of non-market benefits of health and environment add a further 6% loss, feedback mechanisms 2–3%, and equity weighting 6%. In producing these figures the study recognises that there are large uncertainties, gaps in knowledge, models are merely illustrative and that the model results: “should be treated with great circumspection. There is a danger that, because they are quantitative, they will be taken too literally. They should not be.” Yet, despite this the authors believe that “if the model is to quantify the full range of effects, it must place monetary values on health and the environment, which is conceptually, ethically and empirically difficult.” (Stern, 2006: 144).

Ethical issues are raised as a central concern (Chapter 2). Stern appear set to make the matter a high priority, stating: “it is not possible to provide a coherent and serious account of the economics of climate change without close attention to the ethics underlying economic policy raised by the challenges of climate change” (Stern, 2006: 38). Under “the ethics of adaptation” rich countries are named as responsible for supporting the poor, due to having generated climate change via past consumption and growth (Stern, 2006: 37). Furthermore, they should cover the majority of initial control costs. This is a clear assignment of liability, contrary to the standard

economic analysis of climate change (Toman, 2006: 373). Pure time discounting is rejected as unethical, although reintroduced (as discussed below). Income inequity is argued to need weighting, via a social welfare function, to balance the position of the poor versus the rich. Incommensurability also seems to be accepted, as Stern state:

“Economists have developed a range of techniques for calculating prices and costing non-market impacts, but the resulting estimates are problematic in terms of concept, ethical framework, and practicalities. Many would argue that it is better to present costs in human lives and environmental quality side-by-side with income and consumption, rather than try to summarise them in monetary terms. That is indeed the approach taken across most of the Review.” (Stern, 2006: 145);

and follow later with,

“...we have conceptual, ethical and practical reservations about how non-market impacts should be included, although there is no doubt they are important.” (Stern, 2006: 164)

All this would seem to concur with Toman (2006: 366) who notes: “Neither science in general nor economics in particular can resolve the fundamentally moral issues posed by climate change.”

3. Weaknesses and orthodox conformity

“Economics has traditionally been able to maintain its credibility by relegating uncertainties in knowledge and complexities in ethics firmly to the sidelines.” (Funtowicz and Ravetz, 1994: 197)

This apparent pluralism and recognition of multiple incomparable criteria is not the approach emphasised in summaries, conclusions or the launch speech. Instead Stern concentrate there upon aggregate changes in GDP taken from Chapter 6. At one point Stern seem to reject aggregation of “mounting risk of serious harm to economies” stating that, unlike previous bottom-up studies, they see no necessity “to add these up formally into a single monetary aggregate to come to a judgement that human induced climate change could ultimately be extremely costly” (Stern, 2006: 285). However, they go on to employ a model which involves “considerable simplification” to achieve “quantitative implications” in a preference utilitarian framework where costs and benefits are measured as changes in consumption. Despite their criticisms of previous work, the fundamental methodology is noted to be the same (Stern, 2006: 304), and shares “many of the limitations of other formal models” (Stern, 2006: 153). “Specifically, it yields a probability distribution of future income under climate change, where climate-driven damage and the cost of adapting to climate change are subtracted from a baseline GDP growth projection.” (Stern, 2006: 153).

There are some clear value judgements behind the report and most strongly that economic growth is essential and will increase welfare. For example, the analysis models reduction of poverty and child mortality as driven solely by GDP growth. Relegated to a footnote is the explanation that other factors such as income distribution are assumed constant (Stern, 2006: 108). This just pre-loads the results to favour a pro-growth strategy in which GHG control is subsumed (Stern, 2006: viii). That GDP growth is historically highly correlated with energy use (Kümmel, 1989), and so GHG emissions, is apparently unproblematic.⁷

Underlying this approach is an archaic model of the social costs of GHGs. Stern treat the whole problem as a simple externality with reference to Pigou (1912, 1920) without any reflection on the critical literature of the intervening 90 years. As Kapp (1978) explained, at some length, the problem lies with the whole economic process of business enterprise not some simple bilateral pollution problem which is a minor aberration of an otherwise perfect market system. Every product in the market place has embodied energy, is related to GHG emissions, and therefore has the 'wrong' price. Stern are totally contradictory here, noting and characterising the all pervasive nature of the problem and then using such a simplistic, abstract and misleading theoretical construct.

Similarly, the review of past CBA work is extremely thin and fails to reference any of the more critical literature in the area (e.g., Ayres and Walters, 1991; Daily et al., 1991; Funtowicz and Ravetz, 1994; Ekins, 1995; Spash, 1996; 2002; Toman, 2006). This is particularly worrisome because Stern rely on this past CBA work to cite, almost as a fact, that 2–3 °C increases may be a positive outcome! Lack of consistency between economic studies is mentioned in passing, but not discussed as a major problem. Convergence of past studies on 1.5% to 2.0% GDP damages appears as a sign of validity (Stern, 2006: 146). Actually such convergence is rather meaningless. For example, there is no agreement between studies on the scenarios used or categories of damage, let alone whether damages in the same sector of the same economy are positive or negative (Spash, 2002: 192–196; 2007a). This is a clear indicator of the analysts' ad hoc assumptions and need to make arbitrary choices in the face of strong uncertainty (Funtowicz and Ravetz, 1994).

Stern (2006: 33–34) do note the Keynesian differentiation between weak and strong uncertainty.⁸ One approach to complexity and strong uncertainty is scenario analysis. Thus, the forty scenarios which informed the IPCC work under the third assessment report were explicitly stated to be "equally valid with no assigned probabilities of occurrence" (Nakicenovic et al., 2000: 4). Stern (2006: 61) rely upon work by Parry and the UK's Hadley Centre, to draw very specific inferences from just four scenarios. Stern then employ expected utility modelling, which is know to be an inadequate representations of human behaviour e.g., assuming away loss aversion (Perrings, 2003). Subjective probability density functions then give precise computer generated outcomes. This belies the fact that prices cannot be predicted by economists

with such accuracy over short time horizons let alone over 200 years, and that climate change is endogenous to economic production systems so causing all prices to change with every scenario. Comparative statistics, shifting from one equilibrium to another, conceal complex processes of change. Thus Stern manage to convert unknown and unknowable futures into events with known probabilities, and miraculously strong uncertainty becomes weak uncertainty.

In Chapter 3, the report is keen to emphasise that, unlike others, thresholds and extreme events are taken into account. In Chapter 6, catastrophic impacts are modelled as a GDP loss event of known low probability with a positive and increasing risk. Stern (2006: 153) state: "When global mean temperature rises to high levels (an average of 5 °C above pre-industrial levels), the chance of large losses in regional GDP in the range of 5–20% begins to appear. This chance increases by an average of 10% per °C rise in global mean temperature beyond 5 °C." There is a finite probability of the threshold, at which catastrophic loss of GDP starts, being as low as 2 °C. However, these assumptions mean that "moderate" warming of 2–3 °C appears acceptable, while Stern fail to point out that during the last 10,000 years, the Holocene, the mean temperature of the Northern Hemisphere varied by no more than 2 °C (Gates, 1983). Lenton et al. (2006: 20) use modelling to simulate climate behaviour over the last 126,000 years and find annual average surface temperature varied no more than 2.1 °C globally, or 2.8 °C and 1.5 °C for the Northern and Southern Hemispheres respectively.

As with Nordhaus, the future no longer threatens irreversible surprise disasters, but rather such 'catastrophes' are now known bounded threshold events measured as reduced consumption growth. Catastrophes are by their nature surrounded in unknowns rather than fitting within normal probability density functions. Any rational person would do their utmost to avoid those being described by scientists under the enhanced Greenhouse Effect. The appropriate response is precaution (Perrings, 2003), but this is excluded by the economic modelling employed.

Stern also make much of the ethical basis for decisions on climate change being important, but there is no breadth or depth in argument or literature. Instead various moral theories are stated to collapse into concern for three objects of desire: health, environment and income/consumption (Stern, 2006: 145). These objects are assumed commensurable (Stern, 2006: 30–31). So, more consumption makes everything better, assuaging ethical concerns. Thus displacement of people in developing countries is priced at three times per capita income (Stern, 2006: 134). Why? How has someone decided this? What do we do about the fact that the poor sell cheaply (Martinez-Alier, 2002), and that millions live on \$2 a day or less? Is a couple of thousand dollars meant to compensate forced relocation?⁹ Such ethical questions are answered implicitly. Similarly, there is a need to specify the overall (social) utility function and its implicit rules of distribution, but such technical issues are duly relegated to appendices. That selecting an intergenerational objective function requires a moral framework, and these vary, even within a utilitarian approach (Spash, 1993), goes unremarked.

⁷ I will return to problems with this pro-growth stance in the next section.

⁸ For more detail on weak and strong uncertainty in the context of the enhanced Greenhouse Effect see Chapters 4 and 5, respectively, of Spash (2002).

⁹ Note, under the Kaldor-Hicks potential compensation criteria the losers do not even have to actually be paid.

A key ethical concern highlighted by Stern is the need to consider impacts on future generations. Discounting is described as unethical.¹⁰ This ethical rejection of a pure time preference rate is qualified by a 0.1% rate to allow for potential extinction of humanity as a 9.5% chance within 100 years (Stern, 2006: 47). Discounting is also in fact conducted on the basis of economic growth reducing the utility of consumption over time. The actual rates behind the headline results are hard to find, but in Chapter 6 footnote 35 the baseline GDP growth rate is given as 1.9%, arbitrarily selected from an IPCC scenario (Stern, 2006: 161). Elsewhere the economy is mentioned to potentially grow at 6% per year (Stern, 2006: 49). The rate could vary, but let us take the assumed 1.9% baseline. This must be combined with a factor for the utility of consumption. Again the detail is hard to find with the factor exemplified as being 1.5 by Stern (2006: 48), although 1.0 was apparently used in Chapter 6 according to a post publication technical annex.¹¹ The latter would mean that Stern's baseline discount rate is 2.00%.¹² Even this apparently low rate reduces the weight of benefits from avoiding damages to half their full value (50%) in just 35 years, and 14% in 100 years. That is, the future is dramatically reduced in importance within the lifetime of the current generation and beyond that is effectively written-off. This hardly seems to pay much attention to future generations, let alone address ethical concerns. At 6% GDP growth with a 1.5 factor using Stern's approach gives a 9.1% discount rate, meaning the future has no weight in decisions after 40 years. The ethical judgement is abrogated, as being prescriptive, in favour of a supposed descriptive efficiency. This follows an economic defence of the orthodoxy found in the IPCC third assessment (see Spash, 2002: 186–188), where counter arguments are segregated as “non-economic,” a standard strategy (Kapp, 1978: 305–318).

Similarly, economics commonly assumes commensurability. Past economic climate change studies have equated recreational benefits with loss of life, e.g., more golfing in the USA compensates for deaths in China or India (see Spash, 2002: 169–196; 2007a). While such disaggregation is not reported, Stern do seek a single aggregate metric which includes mortality, environmental damages and consumption changes. The whole episode of controversy with the IPCC's previous valuation of life is simply ignored. To their credit Stern use weighting for consumption by the poor to help address income inequity (although detail is absent). However, this does nothing to address the violation of comparability i.e. more consumption compensating for death and destruction. Incommensurability raises serious problems limiting economic analysis (Aldred, 2002), showing different realms of value (Trainor, 2006) and favouring alternatives to CBA for the articulation of environmental values (Martinez-Alier et al., 1998).

That other ethical systems, especially deontological rights, are not consequential, utilitarian or focussed on preference satisfaction is given little serious attention. Stern note the potential for “the right to be protected from environmental damage inflicted

by the consumption and production patterns of others,” but then restrict this to a discussion of low per capita emissions rights, which they dismiss as an assertion which is unlikely to gain approval (Stern, 2006: 42)¹³. This short discussion effectively removes the topic of rights to the protection from harm despite having noted their presence in liability law (Stern, 2006: 41) and a liability of rich to poor with respect to historical GHGs (Stern, 2006: 37). Instead the proposal is that “...future generations should have a right to a standard of living no lower than the current one” (Stern, 2006: 42). This is consistent with making the future rich richer while harming the future poor. It also conflates the transfer of resources for basic needs maintenance with compensation for harming innocent people (Spash, 1994; 2002).

The basic issue is not the detail but the whole approach (Spash, 2007b). Economists finding themselves facing a complex and long-term problem recognise many of the key issues. Stern repeatedly tell us that there is considerable uncertainty over cause–effect relationships, that these will be outside empirical observation (Stern, 2006: 293 ft nt7), that their model relies upon “nonexistent data” (Stern, 2006: 153), and that ethics and social values are crucial to the decision. However they then squeeze all issues to fit within an existing theoretical model which is totally inadequate for addressing the problems they themselves have outlined.

4. The political economy of climate change

“The criticism of such a methodology is not that we always need high-precision in our economic analyses. Rather, that it is wrong to manipulate the uncertainties in information and conclusions in such a way that recommendations turn out to be far more certain than could possibly be justified scientifically.” (Funtowicz and Ravetz, 1994: 203).

Professional experts on climate change CBA may argue over whether the control costs are as low and the benefits of control (avoided damages) as high as Stern claim, but all employ the same basic manipulation of information. So, in short, Stern make numerous ad hoc assumptions and hidden ethical judgements in order to use CBA so they can recommend GHG control as a good investment with positive returns, a profitable macroeconomic enterprise. More than this, Stern tell us that financial institutions can make billions along with carbon traders, energy suppliers and other entrepreneurs quick off the mark. In contrast to their many qualifications on data their recommendations are most certain: “Tackling climate change is the pro-growth strategy for the longer term, and it can be done in a way that does not cap the aspirations for growth of rich or poor countries.” (Stern, 2006: viii). The more fundamental question is why the prospect of human induced climate change is best reflected in GDP at all, why is the problem being framed like this, as “the pro-growth strategy”?

¹⁰ The most comprehensive coverage of all issues relating to discounting is Price (1993).

¹¹ http://www.hm-treasury.gov.uk/media/54B/BA/Technical_annex_to_the_postscript_P1-6.pdf.

¹² The former produces a consumption discount rate of 2.85% and overall rate of 2.95%.

¹³ In this context they argue that such rights have been asserted but must be argued. They are apparently unaware of the work doing just that by Martinez-Alier (2002: 229–233).

Consider two worlds. In state A there is no enhanced Greenhouse Effect, there is no need for defensive capital expenditures or new investment in energy sources, and the fossil fuel economy continues into the future, say, eventually switching to perfect substitutes. Economic growth can be taken as more material consumption or reduced work hours. In state B the enhanced Greenhouse Effect threatens to destroy the economic system so mitigation is undertaken. Investment goes into research and development of alternative energy sources, new markets are established to trade carbon, expenditures are undertaken to build new capital and structures are adapted to changed temperatures and sea levels. All these activities have displaced consumer and capital items or potential for reduced working hours in state A. Both states have human activity, both have GDP growth as measured by throughput and people are fully employed doing things. The point is that the states are qualitatively different not quantitatively different. They are different worlds. Both are actually pro-growth strategies, the difference is in terms of “for what?” economic activity is undertaken.

Of course, state A above is nonexistent and, actually, under state A there is potential for large surprises. The surprises are not some bounded probability distributions which experts can specify by staring into their crystal balls and magically convert from vision to monetary value (absolute or GDP). The surprises are potential scenarios which scientists can outline to the best of their ability and which involve loss of life and human infrastructure on a grand scale; losses only preceded by the mass movement of people, death and destruction of World War II. However, there is no enemy to defeat nor peace treaty to sign, only our own actions to control. Once the surprises start in earnest action will be too little too late. For example, ice sheet melt causing a six meter sea level rise is a scenario which would flood all the major coastal cities. A two-meter sea level rise alone will displace hundreds of millions of people and inundate low lying cities (Lenton et al., 2006: 15). How does this get transformed into X% GDP with any semblance of meaning left in the utter disaster and human suffering which would be entailed? Indeed, there are four major problems with the whole framing of human induced climate change as GDP losses and gains.

First, as Georgescu-Roegen (1975) explained, in critiquing Daly’s steady state economics, zero or even declining growth does not prevent the exhaustion of resources. Yet Stern (2006: iv) state that “if we are not ‘green’, we will eventually undermine growth.” Georgescu-Roegen’s point was that even if we are ‘green’ we cannot expect traditional economies to continue ad infinitum in a finite environment (i.e. limited by energy, materials availability and assimilative capacity). Modern economies make disproportionate use of limited stocks of terrestrial free energy versus the flow of solar energy (Krausmann et al., 2007). A world which is concerned for future human generations does not squander the resource base. Thus Georgescu-Roegen recommended solar energy, organic agriculture, population limitation, product durability, moderate consumption, international equity, and disarmament. Such fundamental ecological economics’ messages, based on the laws of thermodynamics, conflict with the pro-growth stance of Stern.

Second, that an economy can grow through disaster prevention shows that GDP measures activity not well-being, and that the market system can feed-off itself. We are supposed to plaudit GDP growth due to spending billions on controlling and adapting to GHG emissions. The opportunities for making money to prevent disaster are large.

“Climate change also presents opportunities for financial markets. Capital markets, banks and other financial institutions will have a vital role in raising and allocating the trillions of dollars needed to finance investment in low-carbon technology and the companies producing the new technologies.” (Stern, 2006: 270) “The development of carbon trading markets also presents an important opportunity to the financial sector. Trading on global carbon markets is now worth over \$10bn annually” (Stern, 2006: 270).

GDP measures face a problem when addressing defensive expenditures and are misleading if they treat them as positive gains. There are goods and services which deliver direct primary satisfaction in themselves and those that yield zero or negative satisfaction, i.e. intermediate and defensive expenditures. Intermediate goods and defensive expenditures do not add to welfare and should therefore be distinguished as such in GDP; this is a well known but apparently neglected issue (Hirsch, 1977: 55–67). Indeed, GDP calculations too often subsume expenditures for damage avoidance as positive welfare growth. More generally, traditional macroeconomics fails to address the “for what?” question and is only concerned with aggregates of prices, employment and throughput.

Third, is the issue of removing poverty worldwide. This needs to be addressed, but through direct attention to social, economic and political constraints, not hopes of trickle down from blanket increases in material throughput, and activity regardless of reason or location. Distribution of wealth remains a major neglected economic issue both within and across nation states. For example, why exactly do the rich need more consumption?

Fourth, economic growth is divorced from human well-being. If the scale of the physical economy shrank 20% would anyone in affluent societies really suffer that much? Perhaps this is equivalent to the material goods unused in cupboards and stored in garages? That economic growth is no panacea and does not continually increase happiness has been pointed out for some time (Mishan, 1969; Easterlin, 1974). For example, Japan had a fivefold increase in real income from 1958 to 1987 but no increase in average self-reported happiness levels (Easterlin, 1995). That large increases in the standard of living have almost no detectable effects on life satisfaction or happiness is discussed by Kahneman and Krueger (2006), and is actually not restricted to affluent societies. They cite evidence (N=15,000) for the decline in life satisfaction and increase in reported dissatisfaction for China, 1994–2005, despite real income increasing two and a half times over the same period (Kahneman and Krueger, 2006: 15).¹⁴ They conclude that “subjective well-being is not mainly a matter

¹⁴ They also note the considerable increase in material possessions: household ownership of colour televisions from 40% to 82%, telephones 10% to 63%.

of income and consumption” (Kahneman and Krueger, 2006: 18) and point toward what appear more important: namely, social contact, less commuting, reduced working hours or improved work satisfaction, and social standing. The last of these points raises the role of relative rather than absolute income and social limits to well-being (see Hirsch, 1977).

So at best GDP is an aggregate measure of the monetary value of throughput, not well-being or its distribution. The distribution of impacts is more important than the gross measure. Damages evenly spread across an entire population are different from those concentrated on one city, region or sector. Damages of materials are different from destruction of support systems and human fatalities. GDP loss hides the characteristics of physical and social impacts, neglects their distribution, makes catastrophes appear equivalent to a reduction in money flows, confuses financial expenditures with welfare gains and replaces plurality with monism.

Measuring environmental damages using economic growth and investment analysis, as in the Stern report, can then be seen as achieving the exclusion of substantive arguments. There is no issue of consumption being incommensurable with loss of life or harm of the innocent. Ethical issues are encapsulated in preference utilitarianism. Future generations are unimportant because they are assumed to have more to consume. There is no debate as to the reasons for more luxuries in Australasia, North America and Europe, because the cake can grow regardless of what it consists, who gets to eat it or how. There is no stark contrast between deciding whether millions of people suffer and die rather than airplane, car, oil, coal and energy supply companies having to adjust their operations and rich consumers their consumption habits. There is no question as to precaution in the face of strong uncertainty. There is no moral storm (Gardiner, 2006). There is only a bottom line in monetary rates of return. Rather than asking why humanity should expect a positive rate of return on climatic disaster prevention, the only question is how large is the return?

The Stern report may be a subject of future research in terms of political economy, motives and values, or perhaps it will soon be forgotten like Cline’s study. There are various potential hidden political agendas to speculate about such as: supporting new investment in nuclear power for the UK, fending-off a Green vote in forthcoming elections, allowing the Treasury to justify a new tax. However the key role of the report would seem to be as a justification for economic policy to continue with traditional growth strategies and for such policy to be seen as offering the “solution” with a bit more trading and some new technology.

This then explains why Stern do what they do. The orthodoxy must be defended and the “for what?” question is politically out of bounds. Neither the majority of the public nor governments appear ready to face this inevitable question. Stern therefore claim the moral high ground by raising ethical critiques of CBA and issues of poverty and claim that they have ‘state of the art’ techniques to overcome these ‘analytical’ problems. Yet their results are no less arbitrary than any past global CBA of the enhanced Greenhouse Effect. What they achieve is a means of sidelining alternative approaches and closing down the debate; this is essential if ever increasing growth in material consumption and production is to remain

unquestioned along with the role played by social organisations which benefit from the existing system.¹⁵

5. Concluding remarks

Stern raise the issues of inequity, ethics, treatment of future generations, uncertainty, and extreme and catastrophic events. In doing so past CBA studies are shown to be conservative and biased. The brewing storm over the Stern report is likely to be couched in technical terms which conceal analysts’ political and value judgements, or produce *ad hominem* responses, as directed at Cline. This commentary has tried to expose the fundamental issues, which relate equally to Stern and other professional experts on climate change CBA.

Like those others, Stern ignore the critical literature in ecological economics and prefer to cite a mainstream economic elite. The strengths I have noted show an apparent awareness of a range of problems that are absent from similar studies, but rather than debating issues or taking heterodox ideas onboard they simply sideline critiques (as if they were of no import). The result is the same as if the issues were never raised, but more subtle in its muffling of voices. This “conspiracy of silence” by those with much of their human capital invested in supporting the orthodoxy is not new and is often associated with a second line of defence which is to exclude topics as “non-economic.” To some extent the guard is dropped by Stern on that second defence.

However, the approach taken clearly allows traditional economic growth to be defended. The argument avoids the fundamental question of why more consumption and production is necessary. Indeed to ask such a question is economic heresy because such growth is the foundation of modern political economy, where the consumer is mythically sovereign, firms have no political power and governments hardly exist. That this orthodox economic model might be failing and is impossible to sustain goes to the heart of ecological economics.

Modern economic growth has been locked-in to dependence upon fossil fuels and these are the historical source of the majority of GHG emissions. Humanity is facing the transformation of the economy away from this dependence; that transformation will come whether humanity chooses to plan for it or not. A permanently smaller material economy has been positively advocated, by literature on steady-state economics, as something for which we should be planning. Smaller by design, rather than smaller by disaster.

Several realisations are then relevant. A new economics is required in which human well-being is addressed as a multifaceted concept which involves a plurality of values. Poverty in less industrially developed economies is not solved by supplying more luxuries to the already wealthy. Traditional

¹⁵ One referee claimed Stern could do little else but ignore ecological economic critiques of growth given the political context. Indeed they infer that no one more radical than an ex-Chief Economists of the World Bank would have been trusted to write such a report. Their belief is that if a different (more heterodox?) report had been forthcoming it would never have been published. If true, this is a sad reflection on modern democracy and economics as a science, but also supports the need for a radical change in order to address the enhanced Greenhouse Effect.

“pro-growth” policies fail to address the problems humanity faces, the necessary transition or the nature of widespread environmental change we are undertaking. All these realisations raise the question of economic activity “for what?”

The orthodox economic approach actually undermines much of what is good in the Stern report by diverting attention away from the value conflicts, distributional and ethical issues, treatment of strong uncertainty and surprise events, and handing over the entire debate to economic modellers and a discourse based upon monistic universally commensurable numbers. No longer is the issue about avoiding harm of the innocent or how we structure the economy without destroying the environment for future generations, but rather how much consumption growth will be affected in rich (and poor?) countries. The problem is framed as one of profitable returns on an investment not precaution to avoid a disaster. At the end of the day the Stern report is a standard economic approach to weighing-up costs and benefits on the basis of over simplification, adopting narrow ethical positions and sidelining much of what the authors themselves state is important to consider.

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