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Chair: Professor Lord Stern
of Brentford

22 February 2013

Dear Mr Lilley,

Many thanks for your correspondence of 2 January responding to my letter of 14 December, and my apologies for the delay in replying.

However, I am somewhat puzzled about why you remain so confused about the economics of climate change, and indeed your response merely repeats the basic errors that featured in your pamphlet for the Global Warming Policy Foundation and in your recent statements in the House of Commons. I will do my best to address your main mistakes (again), but I also honestly encourage you to seek tuition on modern public economics to help you grasp these issues.

1. You begin by accusing the Stern Review of “comparing apples and pears”. This seems to be based on the complaint that the Review did not estimate what proportion of the risks of future climate change could be attributed to past emissions of greenhouse gases. This is a rather odd way of viewing the options available today for managing future risks, and seems to be based on the misconception that the impacts of the rise of less than 1°C in global average temperature to date would constitute a large part of the cumulative damage from climate change resulting from a temperature increase of 5°C or more. The Review shows, through robust analysis, that the costs of inaction, even when adopting a rather conservative view of possible future impacts, would be markedly greater than the price of cost-effective reductions in greenhouse gas emissions that could be taken now to avoid a large rise in global average temperature. As the Review points out, climate change is a ‘stock-flow’ problem, a bit like a bath of water filling up from a tap. You seem to be complaining that the Review has only assessed the cost of turning the tap off now to prevent it from reaching a dangerous level in the future, rather than including the hypothetical cost of going back in time and stopping the tap from being turned on in the first place.

2. You criticise the Review for “conflating centuries ahead with ‘now’”. However, you focus obsessively on a partial quotation from the ‘Summary of Conclusions’ (and ignore the rest of the Review) in order to justify your criticism. In fact, the Summary states:

“Using the results from formal economic models, the Review estimates that if we don’t act, the overall costs and risks of 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.”

Hence, by neglecting to include the term “equivalent to” in the quotation, you construct a straw man which you then attempt to knock down. As I pointed out in my letter of 14 December, the Review explains very clearly the concept of the balanced growth equivalent for analysing the potential impacts of unmitigated climate change with formal economic models. This concept was originally introduced into theoretical economics in a paper by Nicholas Stern and James Mirrlees published in the ‘Journal of Economic Theory’ in 1972. For each model run, the growth path was calibrated in terms of welfare by equating it to a balanced growth path (one which grows at a constant rate from a given starting point). Welfare differences between growth paths were compared by analysing the differences between their equivalent balanced growth paths now and forever.

You go on to observe that the risks of impacts from unmitigated climate change that would be avoided mainly apply to the next century. The scientific evidence indicates that there are significant risks associated with unmitigated climate change during this century, and ‘business as usual’ threatens consequences in the following centuries that would be truly dire. Yet, you seem to have adopted a rather strange approach to risk management, a bit like complaining that the payment of an insurance premium is only worthwhile when a catastrophic event occurs and not beforehand.

3. Next, you claim that the Review used “inconsistent discounting of the costs and benefits”. It is clear from your letter and your pamphlet that you are very confused about the issues of discounting. This may simply reflect your lack of basic training in modern public economics.

As I explained in my letter of 14 December, the Review used many discount rates to explore a range of possible outcomes from unmitigated climate change because of the large variation in potential impacts. By contrast, the evidence suggests that the long-term costs, including opportunity costs, of investment in energy and resource efficiency and in alternatives to unabated fossil fuels are relatively low and comparatively less variable, hence there would be negligible difference between the discount rates associated with different mitigation scenarios.

Some of the original critics of the Review suffered from this confusion about the discount rates used to assess the costs of inaction and the costs of mitigation. The contributors to the Review responded fully to these criticisms some time ago in journal papers. I encourage you to read these (a list of which I included with my last letter and which I have appended again to this letter), and particularly ‘The Stern Review and costs of climate change mitigation’ by Dennis Anderson, which was published in ‘World Economics’ (volume 8, number 1, pages 211-219) in 2007.

Professor Anderson outlines three main reasons why a single discount rate of 10 per cent was used in the Review for costing the technologies and practices for mitigation at the project level and in aggregate:

- a) “to identify the costs at which substitution between the low-carbon technologies and fossil fuels would begin to occur, which obliged us to use a discount rate close to that on which commercial decisions are based”;
- b) “to assess the financial implications of shifting to low-carbon technologies as a basis for the policy analysis in later chapters”; and
- c) “using the 10% rate would provide a better indication of the impact on GDPs of turning to low-carbon technologies”.

Under these circumstances, the use of a fixed discount rate, which takes the state of the world as given over the next four decades, is broadly acceptable. The assumption of constant marginal parameters and an exogenous underlying growth rate approximately holds.

By contrast, for assessing the costs of damage caused by unmitigated climate change, the concept of discounting concerns the value of an extra unit of a particular good at some particular time in the future relative to the value of that good now. That is indeed the definition of a discount factor. Its value will depend on the good and time under consideration, and the circumstances at that time, particularly the amount of the good in question, and overall living standards and levels of other key goods and services at that time (including environmental services). The discount rate for that good at that time is the rate of fall of the discount factor. Both concepts, from their definition, will generally depend on both time and circumstances, particularly living standards. The choices involved over future climate conditions and related investment and consumption, with potentially great consequences for future living standards, will clearly influence both discount factors and discount rates. Thus it reveals a basic lack of understanding of modern public economics to think that there is an exogenously defined single discount rate which shapes everything else when considering the future impacts of unmitigated climate change.

4. You accuse the Review of “sacrificing today’s poor for tomorrow’s rich”. However, your claim seems to depend entirely on the circular logic of your assumption that future generations would automatically be “many times better off than us”, no matter what damage is caused by unmitigated climate change. This mistaken belief, of course, pre-determines your conclusions, but is at odds with the science, which clearly indicates potentially huge impacts, such as large changes in global sea level or in the frequency and severity of extreme weather events, that could lead to the possible movement of hundreds of millions of people away from the areas most badly affected. This could lead to widespread conflict that could undermine economic growth and development and render future generations worse off than we are today, particularly in poor countries which are most vulnerable to the impacts of a changing climate. Hence your premise is profoundly incorrect.

The error in your assumption is compounded by your fixation on Figure 6.5 in Chapter 6 of the Review, which shows the results of sensitivity tests, carried out on an integrated assessment model, for a range of climate feedbacks and non-market impacts. Unfortunately, you appear not to have read the text that accompanies Figure 6.5, which states: “These estimates still do not capture the full range of impacts.” The model runs only took into account impacts for which estimated quantities were available. Importantly, the ‘Conclusion’ section of Chapter 6 points out “there are potentially worrying ‘social contingent’ impacts such as migration and conflict which have not been quantified explicitly here” and warns against “over-literal interpretation” of the model results.

Thus Figure 6.5 provides rather conservative estimates, rather than “Stern’s own worse case assumptions” as you claim, of the future potential impacts of unmitigated climate change, and excludes migration and conflict which are difficult to quantify in an integrated assessment model, but would fundamentally harm economic growth and development. Yet even these cautious model results show very clearly that the costs of inaction are far greater than the costs of action.

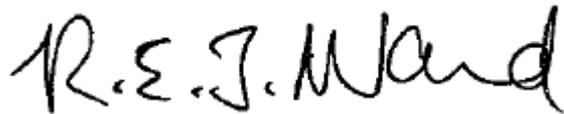
You then go on to explain the reasoning behind your Parliamentary Question of 29 November 2012, but merely demonstrate your lack of knowledge of modern public economics. The purpose behind a price on carbon is to create a charge on greenhouse gas pollution. The intention is that an appropriate price provides the necessary disincentive against emitting pollution. Some have tried to argue that introducing a price on greenhouse gas pollution would increase the price of fossil fuels so much that economic growth would be significantly harmed. This claim is addressed in Box 11.2 (to which you refer) in the Review, which shows that a carbon price of \$30/tCO₂, if passed through to the oil price, would have a relatively small impact on consumer prices and GDP.

However, you have mistakenly confused the purpose of this analysis, which shows the impact on the economy, and not on emissions, of an increase in the price of oil. Hence you try to equate an increase in oil price due to a carbon price with an increase in the oil price due to market factors, such as changes in supply and demand, which do not necessarily result in a reduction in emissions. It is true that sustained high prices for oil and gas will be expected to yield behavioural changes in the long run, reducing the demand for such sources. This was the case in the 1970s and 1980s when, for example, energy efficiency improved dramatically across a range of sectors. But you are quite wrong to claim that “a rise in the cost of hydrocarbons, whether brought about by a rise in market price or by imposing a carbon tax, will have the same effect on encouraging a switch to renewable or other non-carbon fuels and fuel efficiency”. A market-driven price change differs from one driven by policy, such as a carbon tax, because it also induces an increase in the supply of fuels that have a high marginal extraction cost, which become economically viable at a higher price. Hence a market-driven increase in oil price will increase supply, leading to higher emissions. I am rather surprised that you

have not fully grasped this fundamental point about the oil price given that you are Vice-Chairman of Tethys Petroleum.

You devote the rest of your letter to what you describe as my “diversionary criticisms” of your pamphlet. Since these merely repeat your erroneous statements, I see little point in addressing them again here and simply suggest that you read carefully my letter of 14 December. You seem to have missed completely the fundamental point highlighted in the Review that climate change is the result of a huge market failure. Those who are unwilling to correct market failures with market-oriented policies are simply anti-markets, and do not embrace the power of markets, competition and entrepreneurship. You seem wedded to the out-dated high-carbon path for the economy, unable to imagine anything better, even though it will ultimately destroy growth through the impacts of climate change. Instead of just looking to the past, why not look forward to a future of low-carbon economic growth that will be less polluting and more creative, innovative, efficient, secure and sustainable?

Yours sincerely,

A handwritten signature in black ink that reads "R.E.J. Ward". The letters are cursive and somewhat stylized, with the first letters being larger and more prominent.

Bob Ward
Policy and Communications Director

cc Rt Hon Ed Davey, Secretary of State for Energy and Climate Change
Tim Yeo, Chair of the House of Commons Select Committee on Energy and Climate Change

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Nigel Arnell, Rachel Warren and Robert Nicholls (2007). Response to ‘The Stern Review: A Dual Critique’. *World Economics*, volume 8, number 1, pages 229 – 231: <http://www.world-economics-journal.com/Contents/ArticleOverview.aspx?ID=275>

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Ian Simmonds and Will Steffen (2007). Response to ‘The Stern Review: A Dual Critique—Part I: The Science’. *World Economics*, volume 8, number 2, pages 133 – 141: <http://www.world-economics-journal.com/Contents/ArticleOverview.aspx?ID=287>

Weitzman, Martin L. (2007). A review of The Stern Review on the Economics of Climate Change. *Journal of Economic Literature*, volume 45, number 3, pages 703-724: <http://www.ingentaconnect.com/content/aea/jel/2007/00000045/00000003/art00004>

Geoffrey Heal (2009). The economics of climate change: a post-Stern perspective. *Climatic Change*, volume 96, number 3, pages 275-297: <http://www.springerlink.com/content/2866362w164531tg/>