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Dear Ross,

Re: Productivity Commission Staff Working Paper on the Stern Review

The Australian Productivity Commission Working Paper (WP) is a welcome addition to the growing discussion on the economics of climate change stimulated by Stern Review (the Review). It underlines the importance of the careful use of economic tools in the analysis of the risks and costs of climate change, and stresses the role of economics in developing policy responses. It also examines some of the issues arising in the discussions following the Review.

However, the WP unfortunately contains some serious errors, in two key areas: (i) the assessment of the risks of climate change, and (ii) the ethics involved in valuing those risks. The purpose of this letter is to alert you to these errors, in order to inform your work on the Garnaut Review.

1. Risks

The WP asserts that the Review “draws heavily on studies that have a more pessimistic view on climate change and its impacts, and gives little attention to more optimistic views.” If anything, the opposite is true. In retrospect, the Review could be criticised for being overly optimistic in each of the four steps linking human emissions to climate change: (i) future emissions growth, (ii) the carbon cycle linking emissions (flows) to concentrations (stocks), (iii) the climate sensitivity, linking concentrations to temperature increases, and (iv) damages from a given temperature increase.

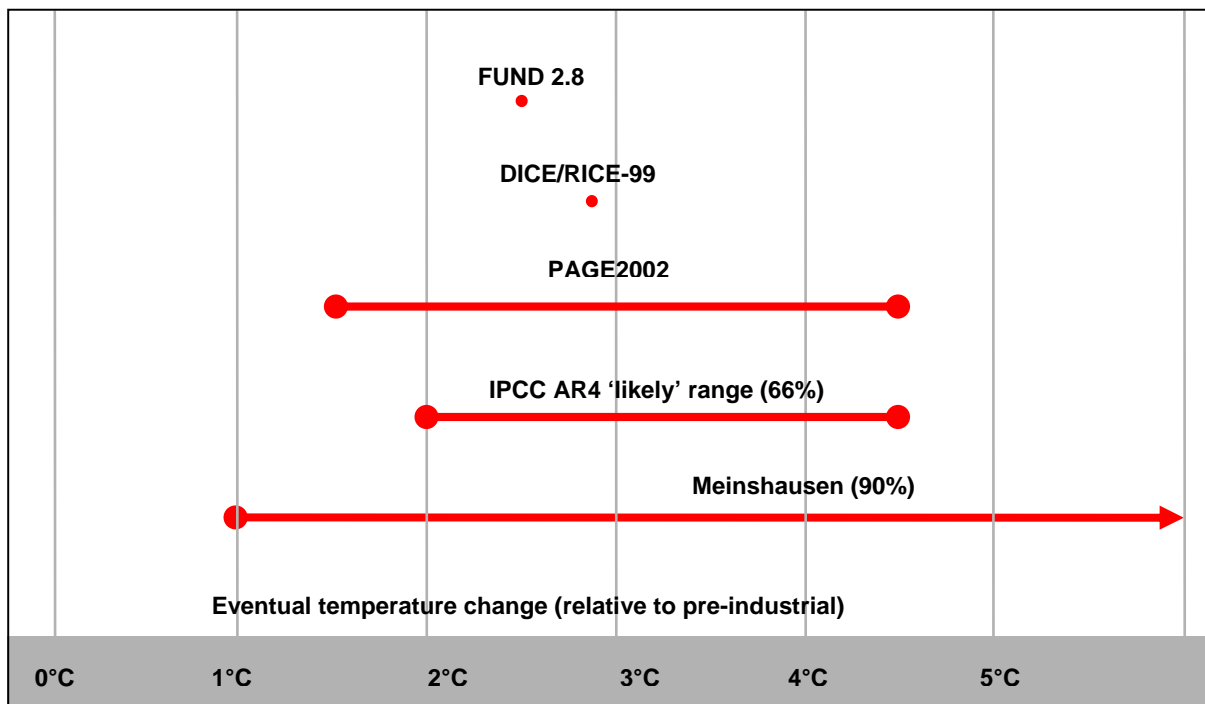
First, the Review was probably optimistic, not pessimistic, in its assumptions about **future emissions**. Chapter 6 of the Review (Stern, 2007, pp.173-88) employs the second highest of the four scenarios in the IPCC Special Report on Emissions Scenarios or SRES (IPCC, 2000), namely the A2 scenario. However, the highest of the four scenarios, A1F1, is likely to be the best description of business-as-usual emissions, as you have indicated (Garnaut, 2007). This is primarily due to rapid growth in the developing world, particularly China and India, driven by increases to coal-fired power generation (ECIEP, 2006).

Second, the Review was optimistic, not pessimistic, in the assessment of the links between human emissions and **atmospheric carbon stocks**. The Review did not take into account the fact that the carbon cycle is likely to weaken as a result of, for example, the possible collapse of the Amazon forest at temperature increases of above 3-4°C, or the decreasing absorptive capacity of the

oceans. Further, the Review did not account for the fact that a thawing of the permafrost is likely to result in additional methane release. Omitting these positive feedbacks in the carbon cycle may have led to a significant underestimate of the risks.

Third, the Review was optimistic in its assumption of how increased carbon stocks affect **temperatures**. The Review employed the PAGE2002 model, with triangular distributions for the climate sensitivity parameter, implying that the highest (and hence worst) possible values were cropped. The full spread from *all* (100%) of the Review's Monte Carlo runs is roughly coincident within the IPCC AR4 "likely" (66% confidence interval) range, shown in Figure 1 below. The Review was therefore more optimistic than the IPCC on climate sensitivity. Other research indicates that much higher values still of the climate sensitivity cannot be ruled out (e.g. Meinshausen, 2006). Concerning the possibility of much higher temperature increases, one computationally intensive Monte Carlo estimate of climate sensitivity found a 4.2% probability of temperatures exceeding 8°C (Stainforth et al., 2005).

Figure 1: Estimates of climate sensitivity from IAMs compared to GCMs



Source: Stern (2008)

Fourth, the Review was optimistic in its mean estimates of **damages from climate change**. It was calculated that a 5°C warming would reduce GDP by a mean of 5% (Stern, 2007, p.180). However, as Stern (2008) notes, a temperature increase of 5°C would most likely transform the physical and human geography of the planet, leading to massive human migration and large-scale conflict. As such, costs of 5% of GDP seem, in our view, to be likely to significantly underestimate the damages from climate change from a 5°C warming (Stern, 2008).

In summary, the WP's allegation that the Review showed a tendency to draw on the more pessimistic literature is badly wrong. The analysis in the Review was, of course, intended to

provide an accurate picture of the damages from climate change. With retrospect, however, it is arguable that the Review was, if anything, too optimistic rather than too pessimistic.

2. Ethics

The WP correctly describes climate change as a problem that is unusually long-term, uncertain and non-marginal, and which “places extraordinary strains on analytical techniques that generally have been devised for more conventional projects, and almost inevitably means that value judgements and ethical perspectives become more prominent.” The strain placed on our analytical techniques means that great care is required, and a lack of care is evident in some of the comments quoted by the WP.

Normative or descriptive

Climate change policy inevitably requires consideration of normative, and specifically ethical, issues (Broome, 1992; Beckerman and Hepburn, 2007; Dietz et al, 2008) because the actions of one group of people are causing harm to another group of people. There is a conflict of interests. Resolving this conflict of interests raises questions that are fundamentally and inescapably ethical. The ethical issues cannot simply be side-stepped by arguing that an efficient result can be achieved through applying current market discount rates. Even if this were true — and it is false over long time horizons, see Weitzman (2001), and for non-marginal problems (see next section) — efficient climate policy is not necessarily equitable (Beckerman and Hepburn, 2006).

This is a fundamental concept that the WP – along with some economists – appear not to grasp. The WP presents both “descriptive” and “prescriptive” approaches to the issue, as if both are plausible, and indeed even appears to favour the “descriptive” approach, which simply employs current market interest rates rather than engage with the ethical issues.

Using market interest rates constitutes a specific and unusual ethical position, and very specific ethical arguments would need to be mounted in order to defend such an unusual position. This is very rarely done, probably because it is close to impossible to construct a plausible ethical arguments to defend the view that (i) the efficient outcome is also an equitable outcome, and that (ii) the efficient outcome is achieved by applying current interest rates.

Non-marginality

The most basic mistake made by many commentators is to use a marginal concept (an exogenous discount rate) to make non-marginal comparisons between different macroeconomic paths. Climate policy will shift the pattern of growth for a whole collection of capital goods, including natural capital. Each path has an implied set of discount factors and rates associated with it (Stern, 2007, pp.27-31; Hepburn, 2006). Thus it is simply wrong to look at interest rates as currently observed, or in historical terms, which refer to existing paths. Even if a “descriptive” approach were adopted (but see above), it would need to compare the appropriate general equilibrium rates in a forward-looking manner, along different future paths, rather than simply use current or historical interest rates.

In short, using an analogy with investment under certainty to claim that climate mitigation is an “inferior investment”, relative to investing resources elsewhere and putting the proceeds towards mitigation in the future, completely misses the point. The next 200 years are highly uncertain, and the underlying structure of the economy will be transformed as changes to our climate alter the human and physical geography of the planet.

Market interest rates

It should be clear that to employ market interest rates for climate policy evaluation is to make a serious conceptual error. Nevertheless, if we ignore all these problems and look to market interest rates, we find that (relatively) ‘riskless’ real rates on government bonds are around 1.5%. Pricing policies, with implications for prices across the board, are likely to be central to resource reallocation for climate change policy. These increases will influence both consumption and investment and relative to GDP the reallocation is likely to be mostly from consumption, which represents 80% or more of GDP in most countries. Actions to reduce carbon are likely to be financed via the diversion of resources mainly from consumption (via pricing) rather than from investment (Stern, 2008). Thus long-run ‘riskless’ rates associated with consumer decisions are arguably a better benchmark for climate change policy than the return on equities. The fact that rates of return on equities cannot be explained by standard expected utility theory – the equity premium puzzle – is a further reason to be circumspect about using a benchmark rate of return drawn from observed returns on equities, as these returns can only be reconciled with conventional models by assigning parameter values (such as that for the elasticity of the marginal utility of consumption) which would generate contradictory results elsewhere.

Convention

The WP asserts that the Review employs “unconventional” discount rate parameters. If the parameters are appropriate, it is obviously irrelevant whether they are “conventional” or “unconventional”. Nevertheless, the implicit social rate of time preference (SRTP) in the Review is within the conventional range. While base case SRTP varies from region to region and scenario to scenario, it eventually settles at 1.4% p.a. (and higher rates are examined in the sensitivity analyses). Weitzman (2001) surveyed 2,000 economists on this issue and determined that the median SRTP was 3%, and more than 10% (around 300) of the economists recommended a SRTP of 0% or 1%. Hence a real discount rate of 1.4% is clearly within the conventional range, even if it is towards the lower end of that range.

Further, there are conventional justifications for both of the key parameters employed in the base case ($\delta = 0.1\%$, $\eta = 1$) as well as those considered in the sensitivity analysis ($\delta = 1.5\%$, $\eta = 1.5$). Many of the great economists (including various Nobel Laureates) have supported the use of a pure time discount rate of $\delta = 0\%$. Arguments for both $\eta < 1$ and $\eta > 1$ can be advanced (Stern, 2008). The UK Government, in its official guidance, recommends the use of $\eta = 1$ (HM Treasury, 2003). It is therefore incorrect to suggest that the parameters used in the Stern Review are “unconventional”.

Sensitivity analysis

The WP claims that the Review erred in its failure to present a range of results for different discount rates. Sensitivity analyses were presented in the Postscript to the Review (Stern, 2007) published

with the Review (Cambridge University Press, 2007), showing that the key conclusions hold for a pure time preference rate of at least $\delta = 1.5\%$ in the most optimistic scenario, and higher if more reasonable and complete scenarios are employed. An analogous set of results applies for $\eta = 1.5$. Additional sensitivity analysis is presented in Dietz et al (2007a). Arrow (2007) and Stern (2008) also discuss the sensitivity of the results to the discount rate, and those papers and all sensitivity analyses indicate that while the discount rate is indeed an important variable in the analysis, the conclusions of the Review, in particular that the costs of action are a lot less than the costs of inaction, are robust to significantly higher discount rates.

Alternative ethical approaches

In contrast to the assertions discussed above, it is plausible to argue that other ethical approaches, beyond the Reviews' mainstream economic paradigm of utilitarianism, welfarism and consequentialism, could be brought to bear on the question (Beckerman and Hepburn, 2007; Dietz et al, 2008). Notions of rights, duties, vital needs, and the virtues may all be relevant to the crucial question of what we "should" do about climate change. More research, and the involvement of moral philosophers, would be welcome in this area.

CG

This letter has addressed only two of the important issues raised by the WP. There are many others, and for more detail, we would refer to you the large number of academic papers published since the Stern Review, starting with Dietz et al (2007a,b,c) and the references cited in Stern (2008). Legitimate debates about the ethics and the quantitative modelling approach are ongoing. But the key conclusions of the Review are robust—in particular the costs of action are much less than the costs of inaction—and do not rest on any one particular modelling approach or assumption. The Review's case for strong and timely action, supported by well designed economic policies, is clear and compelling. And, in the light of new developments in the science, this case is now even stronger.

While the shortcomings in the WP are significant, it nevertheless constitutes a useful continuation of the discussion of the economics of climate change since the Stern Review, in particular for the Australian context. It is vital that economics and economists are more strongly involved in discussions around the new global framework to ensure the outcome is as efficient and as equitable as possible. But it is also important the economic analysis reflects an understanding of modern public economics, as well as the unusual nature of climate change.

We would be happy for you to share this letter, if this would be useful, with the Prime Minister and appropriate members of the Australian Government. You should feel very welcome to get in touch with either of us if we can be of any further assistance to your Review.

Warm wishes,

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