

General comments:

A clearly-described analysis, showing that plausible changes to three important parameters can make the SCC high enough to justify the most aggressive abatement possible. The only hesitation I have about recommending this paper is that essentially the same result can be obtained with a small fraction of the effort from a single tornado graph of a fully probabilistic model such as PAGE (see for instance figure 7 in http://www.jbs.cam.ac.uk/research/working_papers/2011/wp1105.pdf submitted to this special issue). So it is not exactly at the cutting edge of research. However, the clear exposition and revealing comparison with marginal abatement costs is useful. There is one technical problem with the abatement cost comparison, detailed below, that needs to be recognised before publication.

Detailed comments:

abstract: Spell out all values such as \$21/tCO₂, for avoidance of doubt, as they are called social cost of carbon estimates.

p3: "The Interagency Working Group used three well-known models of climate economics: DICE, PAGE, and FUND." The paper should reference here at least one paper describing each of the PAGE and FUND models.

p3: "\$30 in PAGE". Need to acknowledge that this is a mean value from many runs of the model under uncertainty.

p4: "The four business-as-usual scenarios used by the Working Group were adopted from an Energy Modeling Forum (EMF) exercise which compared ten models". This needs a ref to the EMF study.

p5: "All else being equal, lower emissions imply lower damages, and therefore a lower estimate of the SCC." Perhaps surprisingly, this is not firmly established. Although total impacts will be lower, it is not certain that the SCC will be, as a marginal ton of emissions has a greater effect on temperature when superimposed on a lower emissions trajectory. See Hope C, 2006, "The social cost of carbon: what does it actually depend on?", *Climate Policy*, 6, 5, 566 - 572.

p5: "would lead to larger SCC values". Soften to "would probably lead to larger SCC values."

p6: "We follow the Working Group in reporting results for both average and 95th percentile climate sensitivity,". I don't think this is quite what the working group did, at least for PAGE. They reported the 95th percentile output, for the full range of uncertainty in climate sensitivity and other parameters. This does not correspond exactly to the result for the 95th percentile of the climate sensitivity input. However, it may well correspond for DICE, if climate sensitivity is the only uncertain input.

p9: "The risk-free rate is often estimated to be lower than 2.7 percent." It would be worth also referencing a more recent study, since the financial crash, in support of this point.

p12: Abatement costs. Need some confirmation that these are all in the same year's dollars as the SCC, or that any differences in the numeraire are small enough not to matter.

p13: "In a cost-benefit framework, it should be compared to the marginal cost of climate protection." This is true, but the comparison made here is technically incorrect. If it is true that the SCC varies with the emissions scenario, the relevant comparison is between the marginal abatement costs of the most aggressive abatement scenario and the SCC *if emissions follow that scenario and give a CO2 concentration of 400 or 450 ppm*. The SCC under these emissions could be a lot lower. The analysis in this paper does not calculate the SCC under such an aggressive abatement scenario. The authors should either make that calculation, or explicitly mention that they have not done so, and soften their conclusions accordingly.