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Referee report for economics-ejournal

The influence of the specification of climate change damages on the social cost of carbon (ms#541)

by Kopp, Golub, Keohane, and Onda

A widely cited U.S. interagency working group report of 2010 recommended a social cost of carbon (SCC) of about \$22 per ton of CO2. A problem with this report was that in effect a linear utility function (risk neutrality) was postulated to deal with the uncertainty. This potentially introduces a downward bias, since for a concave utility function of consumption, EU(C) < U(EC). The current paper is useful because it attempts to quantify the magnitude of this error. With a coefficient of relative risk aversion of 1.4, the authors show that under certain other assumptions some damages specifications can yield SCC values more than triple those of the interagency SCC study. The paper is a bit messy, in part because of the need to combine and compare various approaches, models, and specifications. But, overall, I think the basic issues and conclusions are sufficiently interesting and important to warrant publication.

What follows are some comments aimed at increasing the readability of the paper.

On page 4 and throughout, the paper refers to "rational or exponential mapping." This is extremely obscure terminology that will confuse most readers. The authors should state more precisely and clearly what they mean. Also, "damages" are never defined clearly once and for all. Sometimes it appears that damages are subtractions from consumption, other times they enter multiplicatively. The damages function D(T) should be clarified and defined at the beginning.

The first paragraph of Secion 2.3 (page 8) is confusing. Which kind of damages have effective damages at a given temperature increase more rapidly than output? This phrase is obscure and should be clarified. Likewise the last paragraph of page 9, the

sentence beginning "The additive specification is equivalent to making relative damages a function of wealth...." is unclear and should be clarified.

On page 10, first full paragraph, maybe explain better the sentence "For values of risk aversion less than one, the net effect will be to decrease the social cost of carbon".

Around section 3.2 (page 12) it is unclear how critical is the assumption of direct capital damages. Given that this approach is unusual, maybe justify a bit more why it is being done?

On page 14, first full paragraph, eta is not "the marginal utility of consumption." Clarify. Also, equation (4) is an unusual form of the Ramsey equation. Either explain it, or, preferably I think, use the standard form r = rho + eta g.

On page 15, in the last paragraph, what is meant by "a one-sigma uncertainty of 1.7x"? What is the x? Also maybe try to defend a bit more the numbers being used in the simulations.

On page 19, first full paragraph and later, I think it is more generally the variability of damages, rather the more specific variance of damages that is intended.

The authors choose values of eta equal to 0, 1, and 1.4. Why these particular values? Many people think eta should be above 2. Presumably a higher value of eta would accentuate the nonlinear effect on the SCC that the authors are trying to show. Some clarification may be in order. It would be nice to see what happens with eta equal to 2, say, or even 3.