

Referee Report: Additive Damages, Fat-Tailed Climate Dynamics and Uncertain Discounting

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Martin Weitzman has made a career out of extracting critical issues from complicated problems and exploring their underlying structures in ways that produce fundamental insights based on first-principles. In this paper, he is at it again.

The last two topics reprise results (in numbers 2 and 3 of the abstract) derived in earlier work, but here they are demonstrated in concise and internally consistent ways that add to their credibility for economists and climate researchers, alike. Both speak to Weitzman's widely expressed concern that integrated assessment models of climate change are being misapplied and/or are producing misleading results when researchers have used them to explore optimal solutions to the climate problem. It does not matter that most of the climate profession has moved beyond long-term optimization as the way to approach the climate problem. The most recent work tries, instead, to build a similarly consistent and efficiency-based risk-management approach that can accommodate the recognized need for portfolios of iterative mitigation and adaptation responses in the face of profound uncertainty that will likely not be resolved in a timely fashion. Assessments are now informed by this insight, and policy deliberations use the language of risk; but both continue to be cast by many in terms of costs and benefits. Weitzman's contributions here have added to a literature that supports a call for a more complete paradigm change so that risk assessments can stand alongside benefit-cost analyses in the "decision-intensive" ministries around the world. It also does not matter that the climate community long ago recognized thick tails and the need for multiple policies to address ambiguous vulnerabilities calibrated in multiple metrics. The economics community needs to see this, as well, so that risk assessment and the pursuit of robust strategies can be explored.

In this paper, though, the first topic on the possibility of additive damages is new. Its insertion into a modeling exercise that can accommodate discussions of fat tails and uncertain discounting adds to the value of this contribution. The proposition that changing the form of damage functions can have an enormous effect on valuation exercises is an important one – satisfying the Lester Lave rule that it can make a difference of more than a factor of two and so is outside the noise of uncertainty. It does not matter that the results is obvious if one simply computes marginal rates of substitution for additive and multiplicative functional forms to see that it far more sensitive to changes in temperature in the later than the former. It does, though, matter that the choice between the two cannot be made on the basis of theory of the sort derived from the Sterner and Persson work. While a perfectly reasonable set of parameters produces an additive function of the sort proposed by Weitzman, it must be noted that environmental goods are sensitive to temperature but consumption is not in the underlying structure. Does the distinction between additive and multiplicative damages matter for climate policy evaluation? Perhaps, but only if the Sterner-Persson

formulation more accurately reflects the ways in which climate change damages are distributed across an economy. It does not matter that I am not convinced of this point; it matters only that the distinction between additive and multiplicative damages can have an enormous effect on policy tradeoffs – and so Weitzman has again highlighted a fundamental underlying construction that needs empirical investigation.