Response to referee report 2 on 'The treatment of risk and uncertainty in the US social cost of carbon for regulatory impact analysis'

I would like to thank the referee for his/her very insightful comments on my paper. The key point for me to address is the case for setting a long-run target for the *quantity* of carbon emissions, such that *prices* are an instrument to deliver the target. In previous work with Sam Fankhauser (Dietz & Fankhauser, 2010), we mostly take the existence of a long-run quantity target as given. This is true to the political context in, for example, the UK. But it is not the case in the US, and in any case a quantity target should be justified in the first place.

To do this, I reiterated reasoning set out in the Stern Review (Stern, 2007), which interpreted the seminal work of Weitzman (1974) to indicate that, in the context of climate change, prices are more efficient under uncertainty than quantities in the short run, while the opposite is true in the long run (i.e. over several decades). It is at this point in my line of argument that the referee offers a probing account of whether the position I take is in fact consistent with previous analyses, notably the benchmark papers by Billy Pizer (Pizer, 1999, 2002). Pizer (2002) finds that prices are more efficient than quantities in controlling carbon emissions in the short run (i.e. over one year, in 2010 to be precise), and my paper cites this result.[1] However, arguably my paper misleads by what it omits to say: with Pizer's standard assumptions, he also finds that prices outperform quantities in the long run, putting our views apparently at odds.

This is not the end of the story though. Pizer (2002) bases this part of his analysis on the standard damage function in Nordhaus' (1994) DICE model, which assumes a quadratic relationship between damages and temperature, as I explain and question on page 4. When Pizer (2002) instead looks at greater integer values for the damage-function exponent, he finds that the preference for price over quantity controls is reversed, and to his great credit he is careful to emphasise this.

Overall then, the position I take rests in part on believing Pizer's sensitivity analysis on steeply increasing climate damage more than his standard analysis. The paper could be usefully tweaked to make this clear.

References

Dietz, S., & Fankhauser, S. (2010). Environmental prices, uncertainty, and learning. *Oxford Review of Economic Policy, 26*(2), 270-284.

Nordhaus, W. D. (1994). *Managing the Global Commons: the Economics of Climate Change*. Cambridge, Mass: MIT Press.

Pizer, W. A. (1999). The optimal choice of climate change policy in the presence of uncertainty. *Resource and Energy Economics, 21*, 255-287.

Pizer, W. A. (2002). Combining price and quantity controls to mitigate global climate change. *Journal of Public Economics, 85*, 409-534.

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[1] Actually I cited Pizer (1999) mistakenly here.

Stern, N. (2007). *The Economics of Climate Change: The Stern Review*. Cambridge, UK: Cambridge University Press.

Weitzman, M. L. (1974). Prices versus quantities. *Review of Economic Studies, 41*(4), 477-491.