Pricing climate change as a mortal threat

Marc H. Vatter

Executive summary

Mitigation of global warming and aggregate consumption are chosen to maximize the product of expected human lifetime and population. The approach here is to equate the incremental effects on the number of human life-years of consumption and reductions in global mean surface temperature (GMST). Previous such studies often rely on aggregation of, say, wage-premia attached to marginal mortal risk in dangerous occupations into the value of a "statistical life" (VSL), when the probabilities of death add to unity. The VSL approach "applies only when changes in risk are small and similar among the affected population", but neither of these conditions are met in the case of climate change.[1]

John Broome writes "that a cost benefit analysis will automatically reject any project which causes anybody's death [with certainty] (except possibly one which also saves lives)."[2] Both consumption and climate affect mortality. I am not claiming that the value of human life is infinite ("death is not the worst of evils"), only that it is the same whether attenuated by poverty or natural disaster.

Constant relative risk aversion utility is parameterized using a panel of annual NASA and World Bank data covering 185 countries from 1990 to 2018. The fraction of consumption that extends human life-years by the same amount that a one-degree increase in GMST attenuates them in the "1° world" that was 2020 is estimated to be 0.16 under base case risk aversion, 0.24 under high risk aversion, and 0.21 under low risk aversion. In a 3° world, as might obtain in 2100, those fractions would be 0.25, 0.29, and 0.27, respectively.

An empirical result here is that these fractions are constant with respect to consumption. Consequently, optimal CO_2 taxes are proportional to consumption per capita and, therefore, vary tremendously from poor to rich countries. Assume that a doubling of atmospheric CO_2 eventually raises GMST by 2.5°C, and growth in consumption per capita is 1.00%, 2.00%, and 1.77% p.a. in the U.S., Mexico, and worldwide, respectively. Then, the social demand price in the U.S. starts at \$40/tCO_2 in 2020 and rises to \$344, in a 3° world, in 2100. The price in Mexico starts at \$12/tCO_2 in 2020 and rises to \$234 in 2100. The worldwide average price, which has no specific policy application, but does represent a central tendency among optimal national prices, starts at \$10/tCO_2 in 2020 and rises to \$162 in 2100, all in 2020USD. These prices do not reflect the costs of ocean acidification or other greenhouse gases.

Another result is that a globally uniform tax on emissions would take more human life through poverty than it would save through mitigation of climate change. This implies that emissions should be taxed or restricted near the point of consumption, and not at the "source", inasmuch as prices of emitting fuels are determined in global markets, because raising the price globally would be tantamount to a uniform tax. Production of oil, refined products, and LNG should not be taxed or restricted, but only decline in response to taxes or restrictions on emissions near the point of consumption.

[1] Hammitt, J.K., Treich, N. (2007). Statistical vs. identified lives in benefit cost analysis. Journal of Risk and Uncertainty, 35(1), 45 66. http://www.jstor.org/stable/41761269. p. 46
[2] Broome, J. (1978). Trying to value a life. Journal of Public Economics, 9, 91-100.