5.063 Evaluating the Atmospheric Chemistry Implications of Climate Policies for Human Health in the U.S. and China.

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Abstract:

We use atmospheric modeling, coupled with economic modeling and health impacts analysis, to compare the health implications of carbon policies for the U.S. and China. Climate policies can have a variety of benefits for air quality, in particular the concentrations of health-damaging pollutants O_3 and $PM_{2.5}$ as well as toxic pollutants such as mercury. Meteorological changes that result from changing climate conditions (e.g. increased temperatures, stagnation) can affect the concentrations and distribution of pollutants; if future climate changes lead to increased pollution, mitigating climate change can have direct air pollution benefits. In addition, controlling CO_2 sources such as power plants and vehicles can lead to concomitant reductions in other pollutants such as SO_2, NOx, and Hg – so-called “co-benefits.” Here, we compare the magnitude of both direct benefits and co-benefits for carbon policies in the U.S. and China. In particular, we assess how policy design, stringency, and context affect the projected air pollution and health implications. We find that while U.S. co-benefits exhibit diminishing returns to projected increases in policy stringency, Chinese co-benefits increase with more aggressive climate goals. The magnitude of health-related co-benefits is sensitive to the choice of health impact function, with China-specific functions yielding substantially less co-benefit than those typically used in the U.S. We find that China’s direct benefit is more variable across polluted regions than those accrued in the U.S. In both cases, we see overall benefits but substantial regional variation, illustrating the benefits of coupled atmospheric-economic analysis.