**UK, US, and China: Externalities and the Free Rider Problem**

No doubt some people will be damaged more buy climate change and some damaged less. And some people will be benefited more by averting climate change and some people benefited less. However, there is a great deal of uncertainty about how, where, and when climate change will wreak its havoc. Therefore it is not unreasonable to assume that people will be affected equally by climate change and by averting climate change. In which case we can assume that countries are damaged by climate change, and benefited by averting climate change, roughly in proportion to the sizes of their populations.

**The United Kingdom**: Since the UK has 0.9% of the world’s population, whenever GHGs are emitted by *any country*, the UK incurs 0.9% of the damages, or “costs.” And whenever *any country* reduces GHG emissions, the UK will get 0.9% of the benefit.

**The United States**: Since the US has 4.4% of the world’s population, whenever GHGs are emitted by *any country*, the US incurs 4.4% of the damages, or “costs.” And whenever *any country* reduces GHG emissions, the US will get 4.4% of the benefit.

**The People’s Republic of China**: And since China has 18.7% of the world’s population, whenever GHGs are emitted by *any country*, China incurs 18.7% of the damages, or “costs.” And whenever *any country* reduces GHG emissions, China will get 18.7% of the benefit.

*Social rationality requires reducing emissions as long as the benefits exceed the costs.* But as long as each country must bear 100% of the cost of reducing its own GHG emissions, but receives a much smaller percentage of the global benefits from those reductions, it is individually irrational for any country to reduce emissions as much as is socially rational, that is, up to the point where the global benefits no longer exceed the costs. Even China, whose population is the largest, receives less than 20% of the benefits from its own emission reductions, while the US receives less than 5% of the benefits from our reductions, and the UK receives less than 1% of the benefits from its reductions.

**Absent a treaty that guarantees every country that it will benefit from reductions by other countries in exchange for its own reductions, it is hard to imagine we will reduce global emissions as much as we should, and need to.**