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ANALYSIS

The political economy of global carbon emissions reductions

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ABSTRACT

The discussion about what reductions in greenhouse gas emissions are required and how the emissions rights might be distributed globally has fostered the belief that there is a fundamental conflict between the rich nations of the "North" and the poor but populous nations of the "South." The argument is that grandfathering the rights will only reinforce existing global inequalities, while per capita distribution of the rights would lead to such huge transfers of wealth to the South as to be unacceptable to the North. However, a very simple general equilibrium model highlighting key elements of the global economy shows that this perception is incorrect under a plausible interpretation of the goal of the United Nations Framework Convention on Climate Change to "avoid dangerous anthropogenic interference with the climate system." Instead of using an economic damage function to determine the optimal level of emissions reductions, the model's utility functions are calibrated to reflect scientific understanding of what would be required to stabilize the atmosphere at safe concentrations of greenhouse gases. Among policy options that would accomplish this, the United States has a preference for grandfathering the allocation of emissions rights over a per capita allocation, but this preference is not strong and could be offset by other geopolitical considerations.

1. Background

The debate on how to avert dangerous anthropogenic climate change has mainly been centered on two themes: (a) what is the economically optimal reduction in emissions, based on comparison of the costs and benefits of mitigating climate change, and (b) how can the cost of the emissions reductions be distributed to facilitate achievement of a global regulatory agreement. This approach has failed so far to produce a clear path forward. The cost-benefit calculations have not been conclusive, and suffer from very large uncertainties on both the cost and benefit sides. In the United States the alleged "cost to the economy" has proven to be a serious barrier to action. At the same time, no formula has been worked out for how to distribute across nations the obligations that surely must accompany significant climate action.

The Kyoto Protocol reflects these tensions. Acknowledging "common but differentiated responsibilities" of countries at various states of economic development, Kyoto established a regulatory regime that called for modest first-step reductions by the Annex I nations (roughly speaking, the rich countries) but no binding reduction schedule by the rest of the world (UNFCCC, 1998). In addition, Kyoto fell very short of the large-scale global emissions reductions that will be necessary to stabilize the atmosphere, and left to further rounds of negotiations (which are now taking place) how to strengthen

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the target as well as bring about the participation of the developing countries.[1] Measures such as the Clean Development Mechanism (CDM) to enable some rich-country emissions reductions to be bought by financing projects in developing countries have been adopted under Kyoto, but the success of the CDM in reducing global emissions and in transferring new technologies to the developing countries has been modest at best, and the CDM has spawned scandalous examples of gaming the system (Wara, 2006, 2007).

It is an unexamined presumption, not a known fact, that economics can determine the proper level of regulatory stringency for greenhouse gas emissions. Standard integrated assessment models (IAMs) calculate “optimal” emissions reductions by attaching an economic damage function to a physical climate model. But the damage function is not something that can be known to any degree of precision. First of all, any economic analysis comes up against the reality that climate policy’s costs and benefits will fall unevenly on different generations, so no policy prescription can avoid some kind of treatment (even if it is implicit) of the issue of intergenerational equity. Even if this problem is subsumed in the conventional expected discounted utility approach, Weitzman (2007, 2008) has shown that very deep analytical problems arise because of irresolvable uncertainty about potentially catastrophic and irreversible planetary changes associated with warming.[2]

Second, the problem of distributing the burdens of action across nations is one of equity and politics, raising issues that reach beyond economics. Economically efficient emissions reductions are bound to involve creation of new property rights (or the disposition of new tax revenues), but economics alone cannot specify how these rights or tax revenues should be assigned. Many different Pareto-optimal outcomes (with different wealth and income distributions for each) are possible depending on how the emissions rights are allocated.[3] The distributional variations can matter more for politics than the pure economic efficiency of the outcome.

These considerations suggest the need for an alternative approach. Instead of trying to squeeze optimal policy prescriptions out of IAMs, economics can be usefully employed in a different way. Scientific insights about what might constitute “dangerous anthropogenic interference in the climate system” can be used to calibrate the utility functions in an economic model so that the optimal solution corresponds to the scientific guidelines. Then alternative ways of handling the burden-sharing can be compared to see which approach or approaches would be preferred, and by whom. In this way, the science becomes the foundation of policy-making and economics offers insight into how the political problems might be solved.

Science alone, of course, cannot define “dangerous anthropogenic interference.” The meaning of “dangerous” ultimately must be decided by society (Pachauri, 2006). Science can indicate the consequences of alternative emissions pathways for atmospheric concentrations of greenhouse gases, however, and the “safe” target is most conveniently expressed in terms of atmospheric concentrations of GHGs or temperature increases relative to pre-industrial levels. So, for example, the European Council in 1996 adopted as a climate target that ’global average temperatures should not exceed 2° above the pre-industrial level’ and reaffirmed this target on subsequent occasions (Meinshausen, 2006, citing EU Presidency Council conclusions 2005; see also European Environment Agency, 2008). A number of states, including California, Minnesota, Massachusetts, and Florida, have announced long-term targets of reducing emissions by approximately 80% from recent levels (Pew Center on Global Climate Change, 2008).

Well before Kyoto, Wigley, Richels, and Edmonds (1996) estimated that to achieve atmospheric stabilization of CO_2 concentrations between 350 and 450 ppm, emissions would have to be reduced to roughly 15–30% of their 2000 levels.[4] Baer, Athanasiou, and Kartha refer to “the recommendations of the Scientific Expert Group (2007) or the Stern Review (2006), both of which put 450 ppm CO_2-equivalent as their lowest recommended stabilization target. Yet both acknowledge (following for example Meinshausen, 2006) that 450 ppm CO_2-equivalent has at best even odds of keeping below 2 °C warming, and something like a 20% likelihood of exceeding 3 °C warming. And as James Hansen and colleagues (2006, 2007) among others have warned, the destabilization of the Greenland Ice Sheet is possible even before global mean warming reaches the 2 °C level, potentially causing up to seven meters of sea level rise, over centuries or, perhaps, much more quickly” (2007, fn. 1, p. 90). Destabilization of the Greenland ice sheet is only one possible nightmare scenario — others include warming-induced release of methane from the tundra or offshore clathrates (Hall and Behl, 2006) and interruption of the ocean circulation patterns that makes the climate of the lands adjacent to the North Atlantic temperate (Marotzke, 2000; Lenton et al., 2008). Reducing the risk of these potential planetary catastrophes is the overriding reason to keep atmospheric concentrations of GHGs within safe bounds. Hence, in the modeling that follows the utility functions will be *calibrated* so that reduction of emissions to approximately 20% of current global levels is optimal from a welfare standpoint.

This leaves the question of how to distribute the cuts and their costs. A number of proposals have been put forward to allocate emissions reductions globally on an equitable basis. Thus, Baer, Athanasiou, and Kartha (2007) recommended assigning the reductions based on a combination of historical responsibility and ability to pay. Uzawa (2003) notes that an

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[1] The actual success of the EU in meeting even the very modest Kyoto target is doubtful. See EurActiv (2007); Dombrovskis (2008).

[2] According to Weitzman, “[f]rom inductive experience alone, one cannot acquire sufficiently accurate information about the probabilities of extreme tail disasters to prevent the expected marginal utility of an extra unit of consumption from becoming infinite for any utility function with relative risk aversion everywhere bounded above zero” (2008, pp. 3-4; see also Weitzman, 2007). Cline in (1992) showed how even a small probability of future climate catastrophe could tilt a conventional cost-benefit analysis strongly in the direction of immediate action to reduce emissions (pp. 302-305).

[3] This is a consequence of the Second Fundamental Theorem of Welfare Economics, stating that “we can achieve any desired Pareto-optimal allocation as a market-based equilibrium using an appropriate lump-sum wealth distribution scheme” (Mas-Colell et al., 1995, p. 551).

[4] The pre-industrial concentration of CO_2 was 278 ppm (Meinshausen, 2006, p. 266).