

Unilateral measures and emissions mitigation: Two models

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A Fundamental Difficulty

- Multilateral cooperation limited by free riding in the presence of weak transnational property rights and negative externalities (Shapley and Shubik (1969), Starret (1972)).
- By delaying participation (or not complying) a deviating country or (coalition) will continue capture the short-term benefits from continuing with high carbon economic activities but pass a significant portion of the costs to others (other countries, future generations).
- A stable multilateral accord may only repackage existing unilateral measures.

Unilateral measures

Although participation in compliance to a broad-based multilateral initiative may be hard to achieve on a wide enough scale to achieve these targets, there are already numerous unilateral initiatives underway to cut emissions.

Technology is defined broadly here to include not only process and physical tech innovations but also the associated behavioural/ cultural changes that go along with those innovations

Although low emissions may not emerge as the outcome of majority voting at a national level (at least in large countries), unilateral measures may well exist at various sub national levels in decentralized political systems that empower individuals and communities.

Model 1: Unilateral Initiatives and incentives to delay adoption

Even if it isn't in their direct short-term interest, by anticipating that such activities will generate a similar response from others, some entities might be willing to undertake unilateral measures.

By undertaking unilateral measures certain entities demonstrate both the feasibility of collective action and lower the cost of cutting emissions for all other entities as well: requires a critical mass of entities to act before other entities in other countries switch.

But which ones? Incentives to free ride: delay adoption (Dutta, Ghosal and Ray (2005))

Solution: adopt a mechanism design approach to selecting the pivotal group of countries that (a) ensure that other countries switch if all countries in the pivotal group; (b) each country in the pivotal group is individually pivotal.

Model 2: Unilateral Actions and Global Learning

A simple model of global learning which demonstrates the following:

- (i) while a country as a whole may be unwilling to commit to broad-based multilateral initiatives to cut emissions, agents within countries may undertake a variety of unilateral initiatives to cut emissions,
- (ii) learning, over time, can result in a greater proportion of individuals switching to low carbon activities over time than in the case where it is absent,
- (iii) single countries on their own may never get to the point of switching completely to low emission activities while
- (iv) a suitably designed learning process which builds on, and strengthens, positive spillovers across nations is more likely, over time, to deliver a global switch to low emissions.

The model

- Countries: $i = 1, \dots, n$.
- Emissions: $e_{ij}^t \in \{0, 1\}$.
- Fraction of individuals in country i cutting emissions unilaterally: γ_i^t .
- Global learning:

$$\gamma_i^t = \min\{\gamma_i^{t-1} + \lambda_i (G_i(\sum_j \rho_{ij} \gamma_j^{t-1}) - \gamma_i^{t-1}), 1\},$$

$$i = 1, \dots, n, \rho_{ii} = 1, \rho_{ij} \geq 0.$$

Main Result

- Countries are globally strongly connected if between any two countries there is a chain of countries with positive spillovers.
- **Proposition:** *Suppose globally strongly connected and in some country there is a positive fraction of individuals willing to undertake unilateral actions. Then, after some finite time period, all countries will undertake to cut emissions.*
- Speed of convergence.
- Failure of convergence when nations aren't strongly connected.

Technology and the Global IP Regime

Role for Policy: Coordination, Structure and Mechanism Design.

Central to the model is the idea of a global learning process, in which technology, innovation and intellectual property rights could all figure prominently in.

In the context of post-Copenhagen negotiations this requires an alteration to the way technology transfer works on a global scale similar to that proposed under paragraph 11 of the Copenhagen Accords could potentially be key.

This proposal, which was presented by the G77 and China in Copenhagen, sets out a fast-track process for the diffusion of relevant technologies to either high emissions areas or places where adaptation is a critical concern.

Multilateral Climate Technology Fund

- Governed by an Executive Body on Technology which will operate under the authority of the COP.
- Largely financed by Annex II countries but supplemented by Annex I contributions (contributions to the Fund would count towards a country's Bali Roadmap responsibilities).
- Key advantage: amount of funding provided is not dependent on the price of carbon, allowing the flow of funds to be much more stable than otherwise.
- Proposal also sets out to accelerate the rate at which research and development on such technologies is conducted and to finance it through venture capital and aid in rapid commercialization and diffusion whereupon, presumably, a portion of the funds devoted to the innovation would be recovered back into the multilateral pool.

Implementation: Key Issues

Little discussion so far of verifiability aside from the fact that the Executive Body would examine each case.

Ensuring “additionality”: Arose with the Clean Development Mechanism (CDM) under the Kyoto Protocol, firms would delay adoption of cost-effective low carbon technologies to benefit from CDM or use CDM to adopt technologies that they would have funded from capital markets or internal funds in any case (Olsen (2007), Wara and Victor (2008)).

Missing in this proposal thus far is the issue of what sort of conditions should be attached to these payments to ensure 'additionality'/ value added.

In the case of carbon mitigation technologies these conditions could be in the same terms as are commonly being made by nation states: time bound carbon emission or carbon intensity targets, and this could be particularly useful in key sectors such as energy, infrastructure, transport and heavy industry.

Interaction with prevailing IP regime

- How would it interact with the currently existing intellectual property rights regime?
- Fast track diffusion: innovations of the type needed particularly in the key sectors mentioned above typically have to go through years, and sometimes decades, of testing and red tape before they can become commercially available.
- This process of testing and red tape, along with issues of adaptive capacity in countries that technologies diffuse to, is one of the main issues that raised the need for a fast-track diffusion process in the first place.

Links and Spillovers

- The US and the EU would be especially important because of their central role in the generation of innovation and technology transfer.
- China and India would be important because of the size of their populations and potential for emissions mitigation.
- For example, existing "clean coal" power plants and carbon capture technologies can be developed and further refined in the US and EU with a subsequent transfer to China under the mechanism proposed where it would have a significant impact on cutting emissions.
- Other links may reflect structural similarities, land use patterns, existing patterns of carbon consumption, etc.
- Efficient distribution of funds would require targeting by characteristics such as the degree of spillover by type of technology and by targeting countries that have the greatest potential to generate spillover effects.
- A Strategic Planning Committee within the proposed Executive Body on Technology: to encourage the type of technologies needed in generating positive spillovers across countries are both likely to be costly and trade-offs may become necessary.

Venue

- A further complication: COP has not officially adopted this proposal.
- The phraseology within it assumes that the Mechanism will answer to the authority of the COP.
- As stated before, the way things played out in Copenhagen suggests that it may be possible to move this process forward more effectively and efficiently through a body other than the COP and the UNFCCC such as the G20 or even just the US and the BASICs.

Potential Impact of Proposals

- But despite these complications the proposal has the potential, if the spillovers we mention can be created in sufficient strength, to speed the convergence to a global low carbon regime significantly, particularly if the largest global actors in the climate change issue indicate a willingness to become involved.
- In terms of the model, an example: with sufficiently strong spillovers, voters in country i could choose to cut emissions to zero anticipating that a majority in all other countries would switch if they made the switch first.
- This is an easier proposition to make and has usually been the case in international environmental efforts, as the spillovers would be economic and developmental as well as environmental.

Trade and Emissions Mitigation

- If such cross-country spillovers occur on the level this proposal would need in order to be considered a success, and almost inevitable question arises of what this would do to trade flows.
- If this Mechanism is to be a central feature of global climate change adaptation and mitigation efforts the implication is for a further rise in globalization and, to a limited extent, some integration between the trade and climate change spheres.
- This would have a number of benefits, not the least of which is giving the private sector incentive to be active on the climate change issue through the proliferation of innovations necessary for a global low carbon paradigm.
- It also suggests an eventual renegotiation proof enforcement mechanism in the form of trade sanctions or increased protectionism (or even the threat of such) against free riders or those who refuse to participate.