Linking sound economics with global politics

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Stabilizing the world's climate entails a massive, global policy push. That, in turn, implies coordination at an unprecedented scale. Progress on such a coordinated, global, 'top-down' solution has been slow, to put it mildly. It's no wonder then that emphasis has shifted toward a more 'bottom-up' solution. Policies, after all, are enacted at the national, regional, or local level. And each country or jurisdiction needs to find its own, ideal policies *before* then linking up with others.

There's a lot to that logic. In particular, basic economics shows how linking of domestic emissions trading systems can only be good: it allows for more ambitious climate action at lower cost than separate domestic policies.[2] That reasoning is sound. However, it does not absolve us of thinking hard about the political dynamics that have made a global climate deal so difficult. The need for coordination does not go away in a bottom-up approach to climate policy. It merely moves to a different plane.

We'll first discuss the fundamental economic argument for linkage before diving into the politics.

1. The economic case for linking

The economics of linking are sound: the bigger the market, the larger the potential benefits. Marginal costs of abatement vary within and across countries. So do levels of ambition. The greater is the sum of the differences, the larger the potential gains from trade.

To formalize the standard economic argument for linkage, consider two countries, one developed and one developing. Assume the developed country faces a high marginal abatement cost curve, MC_H, whereas the developing country's curve is much lower, MC_L.

Assume that the developed country faces a high initial emissions reduction target, X_H^0, whereas the developing country faces a lower target of X_L^0. Total abatement across both countries will equal $\Sigma X^0 = X_H^0 + X_L^0$ (Figure 1).

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[2] See, for example, Burtraw *et al.*, 2013; Green, Sterner & Wagner, 2014; Jaffe, Ranson & Stavins, 2010; Jaffe & Stavins, 2008; Metcalf and Weisbach, 2012; Ranson & Stavins, 2012; Stewart *et al.*, 2013.

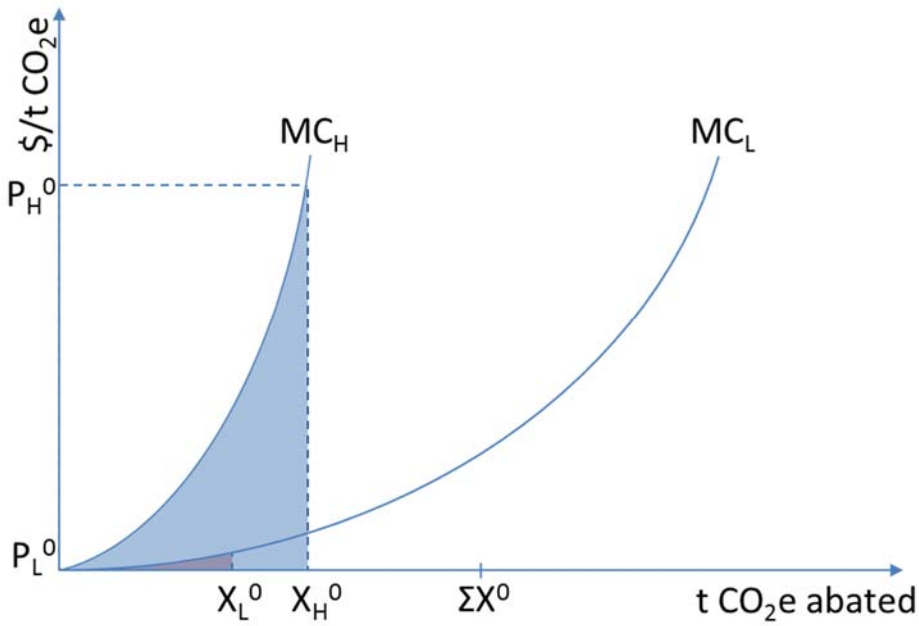

Figure 1— Initial allocation of abatement commitments and costs for high and low-abatement cost countries.

Figure 1 shows a world without trading, where the large shaded area under MC_H represents the total cost of emissions abatement for a given level of emissions reduction in the developed country, and the small shaded area under MC_L represents the total abatement cost in the developing country.

The developed country faces significantly higher costs than the developing country. In particular,

$$P_H^0 >> P_L^0,$$

and, thus, given $X_H^0 > X_L^0$ assumed above,

$$\int_0^{X_H^0} MC_H \gg \int_0^{X_L^0} MC_L.$$

Linkage across the two countries, then, could potentially decrease overall costs significantly while keeping the initial abatement target intact (Figure 2).

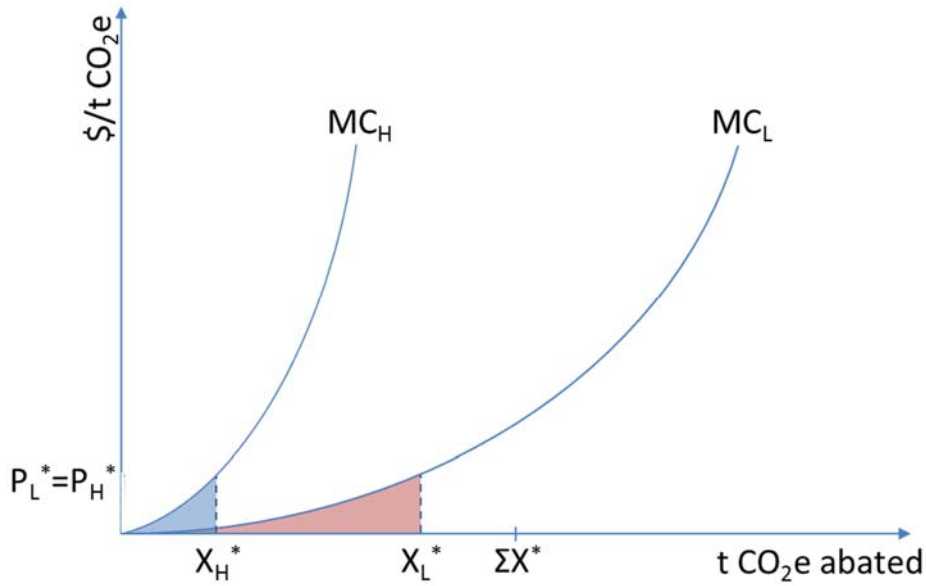

Figure 2—Efficient allocation of abatement commitments with trading.

Overall abatement across both countries, ΣX^*, equals the initial position from Figure 1, ΣX^0, yet total costs are much lower. Trading allows for the same level of emissions reduction at lower cost, as represented by the significantly smaller combined shaded areas in Figure 2. (Alternatively, much more abatement could have been achieved for the same total cost, if only most of the money were spent in the developing country, with lower abatement costs.)

Figure 3 takes the precise areas from Figure 1 and Figure 2 and shows their relationship more directly. The top line comes from Figure 1, showing the initial abatement commitment and costs. The bottom comes from Figure 2, showing the final abatement commitments and costs for the developed and developing country, respectively.

Total abatement remains the same,

$$X_H^0 + X_L^0 = X_H^* + X_L^*,$$

but there are potentially large gains from trade:

$$\int_0^{X_{H^0}} MC_H + \int_0^{X_{L^0}} MC_L \gg \int_0^{X_{H^*}} MC_H + \int_0^{X_{L^*}} MC_L.$$

The total abatement costs without trading are much larger than the total costs with trading, despite equal overall abatement efforts across both regions.

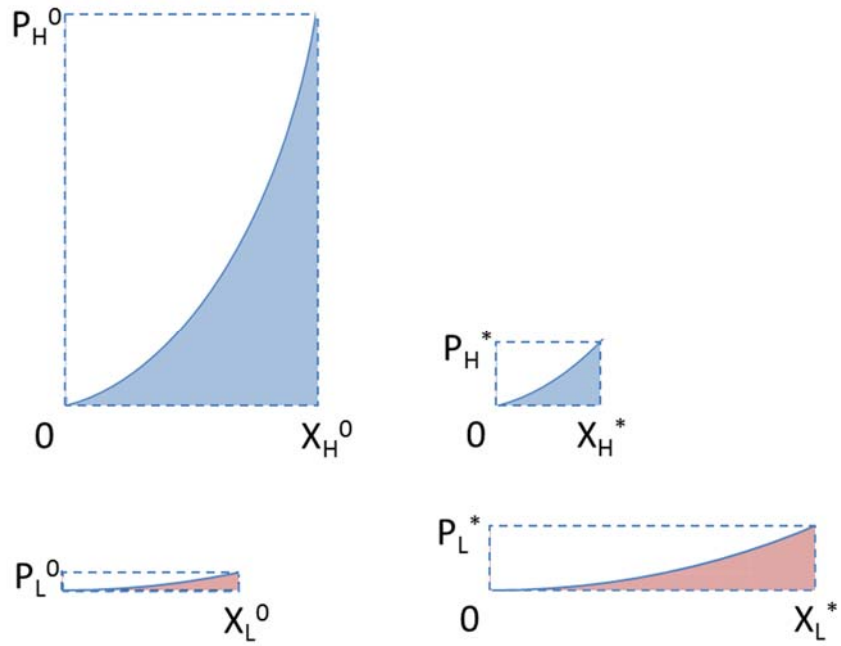

Figure 3— Abatement and costs by high and low-cost countries (top and bottom, respectively), before and after trading (left and right), taking the precise areas from Figures 1 and 2.

While overall abatement cost declines under trade, it is important to note that linking across jurisdictions will create winners and losers both within and across cap-and-trade systems. Within a particular cap-and-trade system, net buyers will stand to gain if the post-linkage market price is lower than prior to linkage. Similarly, net sellers will stand to gain if the post-linkage market price is higher. This creates natural constituents for linkage as well as natural opponents within any cap-and-trade system.

Linkage also generates winners and losers across cap-and-trade systems. In economic terms, this implies a *potential* Pareto improvement from trading. While total abatement costs across both countries are significantly smaller after trading, costs to the developing country will rise.

To turn this potential Pareto improvement into an actual one requires monetary transfers from the regulated entities in the developed country to those in the developing one. These financial flows must be greater than the additional cost to the developing country, yet smaller than the cost savings from the developed country:

$$\int_0^{X_{L^*}} MC_L - \int_0^{X_{L^0}} MC_L \leq transfers\ across\ regulated\ entities \leq \int_0^{X_{H^0}} MC_H - \int_0^{X_{H^*}} MC_H\ .$$

These financial flows across regulated entities are potentially large and could lead to significant overall cost savings, amounting to half of overall abatement costs (Dellink *et al.* 2010). Domestic political objections to transferring wealth abroad could prevent

some jurisdictions from linking, or they could lead jurisdictions to weaken their domestic policies in the first place.

This point is worth emphasizing. It is generally assumed that the low-income country has the opportunity to 'save' on overall costs by abating more. But the incentives for doing so depend on money going from covered entities in high-income nations to those in developing ones. Financial flows—both within the private sector and among governments—are also at the heart of the politics. It is not surprising that the developing world advocates for much bigger overall transfers than the developed world, a fundamental difference in negotiating positions that has made a global grand bargain extremely difficult.

2. Economics meets politics

As long as there are differential marginal abatement costs across nations, linked markets can be both economically more efficient and environmentally more effective than separate systems. It's hard to find fault with the economic logic that linked jurisdictions can jointly achieve greater reductions at lower cost.

Insights from both political science and economic practice, however, suggest reasons to be more cautious. The assumptions of our simple model ignore important political dynamics, which, if not addressed, could ultimately undermine the promised benefits of linked domestic carbon markets. These problems are especially likely among jurisdictions with wildly different marginal abatement costs, where environmental and economic gains from linkage could, in theory, be largest. In particular, linkage will encounter four potential obstacles that need to be considered.

First, success requires that participating jurisdictions do not game the system by setting unambitious caps in order to maximize short-term, domestic economic gain at the cost of overall environmental effectiveness. Second, successful linkage needs to be compatible with other domestic policy objectives. Third, it requires political support for potentially large financial flows across jurisdictions. Fourth, any successful market linkage demands close regulatory coordination, which becomes increasingly difficult as more jurisdictions—in particular those with unequal marginal abatement cost curves and differential regulatory capacity—join a linked market system.

2.1 Different levels of ambition

Flexibility can be both the impetus for and the downfall of linkage. A stringent domestic target makes linkage more attractive because it allows for purchasing cheaper allowances from abroad. However, the same logic applies to setting the domestic climate target in the first place. Each country has an incentive to set an unambitious target, and gain from selling cheap credits to the wider market. If targets were set in stone, that would not be too great a problem But, of course, they aren't. Domestic climate targets

are the result of intense internal political negotiations. The possibility of linking then adds another complicating factor.

A pure bottom-up approach, in short, may afford *too much* flexibility in one of two ways. First, each jurisdiction could simply choose an unambitious cap in the first place. Second, a given jurisdiction could lower its level of ambition if compliance becomes too costly.

For a real-life example of the problems an unambitious cap can create in a cap-and-trade system, look no further than the trial phase of the EU Emissions Trading System (ETS). From 2005 to 2007, individual member states were able to set their own emissions reduction targets (Ellerman, Convery & De Perthuis, 2010). The individual country-level caps were then added together to get to the system-wide cap. Unsurprisingly, countries set caps above what they actually needed, in order to minimize the short-term costs of cap and trade on their industries. The result: over-allocation of allowances in Phase I, and a significant drop in prices in April 2006, once that over-allocation became evident to market participants.

Importantly, while allowance prices for Phase I decreased significantly (eventually approaching zero, because Phase I allowances could not be used in future periods), futures prices for Phase II allowances held comparatively stable. In Phase II, the ETS became closer to a top-down arrangement. Though based on earlier domestic allocations, Phase II allocations no longer allowed member states to set their own caps. Instead, the European Commission was given the authority to change member state's proposed caps. The allocation mechanism resembled something much closer to a top-down 'targets and timetable' approach.

A further problem is that too much flexibility after two systems link can lead jurisdictions to lower their previously stated levels of ambition. If allowances become sufficiently scarce, then linked jurisdictions can raise caps or increase the availability of credits from other markets. In the former, the trading entity essentially prints money by creating more allowances (Victor and House 2004).[3] In the latter, regulated entities can seek offset credits in other markets—presumably with lower prices—allowing them to meet reduction requirements without much change in their own level of emissions.

Enhancing supply through either raising caps or opening markets to offset credits has two effects. First, and most obviously, it reduces the level of ambition of climate change policy. A higher cap means less abatement. Lowering levels of ambition domestically is also likely to spark a race to the bottom in linked systems. Raising caps within a given cap-and-trade market means reducing its marginal cost of abatement; thus, that market has less to gain from purchasing credits from other linked markets. As marginal costs of abatement equalize across markets, gains from trade among linked jurisdictions approach zero. Jurisdictions that choose not to raise their caps will face

[3] This can, of course, go either way; states could also decide to *lower* caps, making environmental targets more ambitious. The Regional Greenhouse Gas Initiative recently took such a step, announcing plans to tighten its caps by 45%. The EU is considering similar steps around "backloading" allowances and, thus, temporarily tightening its own cap.

higher costs. In turn, this may spark a race to the bottom. In this sense, the 'bottom-up' approach quickly creates interdependencies among linked markets where collective action is needed to avoid beggar-thy-neighbor policies—precisely the dynamic that has plagued the international process.

This 'race to the bottom' is most likely to occur among trading jurisdictions with widely different marginal abatement cost curves. Two developed-world jurisdictions with similar levels of ambition, marginal abatement costs and overall system designs may find it relatively easy to overcome this obstacle. However, there is little economic gain in terms of lower overall abatement costs from such a link. Instead, the economic advantages come from having a larger overall market and, thus, increasing the fungibility of allowances. This logic, for example, applies to the link between California and Quebec, where the dynamics described here are largely absent. They become more pronounced as the wealth gap between countries widens.

2.2 Competing domestic objectives

The logic for linkage relies on the simple assumption that each jurisdiction wants to reduce overall, short-term compliance costs. It's not difficult to believe that this assumption usually holds. Yet, linkage will produce winners and losers within (and across) given jurisdictions; not everyone will necessarily benefit from lower compliance costs. In a jurisdiction with higher costs relative to its linked counterparts, those with high marginal costs of abatement will be pleased by the lower permit costs after linkage. However, potential permit sellers—that is, those with low costs of abatement—will lose out, since they may be undercut by cheaper allowances purchased abroad. Thus, although overall costs would be reduced by linkage, within each country, these costs will be unequally distributed.

Then there is a potentially even more fundamental problem. Some, like the EU, are clearly not acting from a desire to minimize short-term economic costs. In fact, the very act of being a first-mover on climate change like the EU implies shouldering higher costs now for greater benefits later. As a result, some countries may be skeptical about linkage simply because they want to maintain a relatively high domestic carbon price in the short run. Jaeger *et al.* (2011), for example, shows an inherent time tradeoff: steeper emissions targets now may result in cheaper abatement costs in the future. Following this line of thought, lower short-term prices achieved through linkage may not be in the strategic interest of all. Countries that wish to spur innovation or that have strong renewable energy sectors may not wish to lower the price of carbon in the short-term.

That said, linkage is, in fact, part of the EU's overall climate policy plan toward "global cooperation on climate change."[4] The EU then serves both as an example for why the simple economic logic for linkage may well be too simple, and why political reasoning is just as crucial. The politics sometimes undermines the simple economic logic and at other times reinforces the drive toward linkage. In the final analysis, even

[4] *International Carbon Market* (2014).

politically motivated linkage will face issues of lower levels of ambition as well as the subsequent two barriers: the need for financial flows, and the potential loss of regulatory autonomy.

2.3 Need for supporting financial flows

The economic logic of linkage rests on differential marginal costs of abatement and the resulting international monetary transfers (section 1). As soon as it is cheaper to abate in one country over another, permits are bought and sold on the international market. This activity is akin to a financial transfer between trading entities.

Large scale financial flows of capital—especially from developed to developing countries—of course, are likely to face the same obstacles as those that occur through a top-down agreement. The negotiations around mobilizing $100 billion per year from developed to developing countries by 2020 for mitigation and adaptation, from both public and private sources, provides one example of the difficulties embedded in such a negotiating process. Only a fraction of the $100 billion has been committed from public sources, and even less of that has been disbursed.[5] Setting up one of the funding vehicles, the Green Climate Fund, has been an extremely contentious process (Abbott and Gartner 2011).

In essence, full linkage among a broad swath of developed and developing countries and jurisdictions will effectuate the very same types of financial flows that have been controversial in the Copenhagen Accord and also, for example, the Clean Development Mechanism. Assuming similar levels of ambition, the size of the eventual transfers in bottom-up situations will likely be similar to those required for a top-down deal.

2.4 Loss of regulatory autonomy

Lastly, linking markets also implies linking governing mechanisms. Governments need to agree on what to do and how to do it. That goes for seemingly mundane design questions and for much more fundamental questions: Will links be one-way or two-way? Will they include offset credits or allowances? Will full banking and borrowing be permitted? Will there be limits on the number of allowances or credits permissible from other markets? Since design choices in one jurisdiction will affect policy in another, these decisions could be contentious, to say the least. They clearly lead to loss of regulator autonomy.

Two key regulatory challenges emerge. First, linkage requires robust regulatory frameworks. Carbon markets create a unique commodity. The metric ton of CO_2e is entirely a policy creation which requires careful and sustained oversight. Measurement,

[5] See the UNFCCC Finance Portal for Climate Change for the most updated figures: http://www3.unfccc.int/pls/apex/f?p=116:8:5075510030800287. See also: Buchner *et al.* (2012).

monitoring, reporting, verification, compliance, and enforcement issues are paramount. Linking jurisdictions need to agree on standards as well as on controls for quality and quantity of third-party offset credits. Jurisdictions with lax compliance will likely see the price of their allowances drop, and environmental effectiveness decline.

A second challenge that compromises regulatory autonomy is the increased interdependence among linked jurisdictions. Larger trading systems achieved through linkage would increase liquidity. However, they will also propagate any possible early mistakes in system design. At the extreme, the collapse of one system—either because of design flaws, regulatory uncertainties, or other economic or political circumstances—could have serious impacts on linked markets.

Threats to regulatory autonomy will prompt linking jurisdictions to negotiate for favorable designs. Some linking jurisdictions will push to lock-in favorable rules; others may want flexible rules that can be amended to ensure favorable circumstances in the future. Late-comers may lobby for changes in the rules, or be dissuaded from joining altogether.

The appeal of bottom-up markets is, in some way, to experiment with and see the effects of different ETS designs. Linking markets may prematurely lock in these designs and set *de facto* standards across large, international trading systems. One fear is that early linkage of markets will lock in design standards that have yet to withstand the test of time or, worse, create a race to the bottom when it comes to setting overall regulatory standards.

3. A path forward: An incremental approach to linkage

The 'top-down', Kyoto-style approach to setting targets and timetables failed largely because countries couldn't agree on how much to do and how much to spend. The 'bottom-up' approach of letting countries set their own levels of commitments would seem at first glance to avoid much of those problems. However, such an approach still clearly needs strong coordination, and can run into issues of its own.

As states develop their national climate policies, we will see a combination of bottom-up arrangements and top-down negotiations. As different domestic systems try to link, they will confront issues related to the level of ambition, oversight and policy design. Some of these coordinating challenges may be easier than others. The setting of the overall cap in each jurisdiction, for example, is likely the most visible process, which will raise different questions from other less visible design decisions such as the verification of third-party offsets.

This bottom-up process may create a renewed interest in and impetus for more globalized agreements. International climate architecture could do worse than mimic the EU's 'model.' Right now, we are in the global equivalent of something akin to the EU's Phase I, where each country sets its own level of ambition. The Durban Accord and mandate to negotiate a global set of ambitions by 2015, to become effective by 2020,

already points the way toward Phase II, where there is some loose coordination of caps. Most importantly, everyone from climate negotiators to domestic politicians designing their own domestic systems, should keep the global equivalent to EU-ETS's Phase III in mind—a hierarchical system with a firm, global cap on emissions.

Until then, linkage ought to be taken for what it is: a potentially important but also limited step toward a more globalized climate policy. Early linkages reveal the political if not the economic advantages of such arrangements. That said, bottom-up systems will not be able to avoid the very real issues that have haunted top-down negotiations for so long. The larger the economic advantages to linkage, the greater will be the visibility of issues such as overall levels of ambition, supporting financial flows, regulatory autonomy, and competing domestic objectives.

We are in the experimental phase of a potentially far-reaching undertaking: creating a global market for carbon. Given the complexity of this project, it is only prudent to proceed with caution. The simpler are the linkage arrangements, the better. One way forward may well be to place limits on early linkages, in order to minimize potential risks, while still learning from the process. By only allowing a certain amount of allowances to flow between linked markets, or by starting slow, with short-term linkages, jurisdictions can protect themselves from potential negative consequences. Markets engaged in linkage should first focus on creating sound infrastructure for global carbon markets, a process that begins at home.

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