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A look inwards: Carbon tariffs versus internal improvements in emissions-trading systems

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ABSTRACT

Subglobal climate policies will be the norm for some years to come. However, several options exist for improving the efficiency of domestic emissions regulation. A prominent but contentious policy option for improving the external efficiency is the implementation of carbon tariffs on non-regulating regions. This is thought to reduce carbon leakage and increase domestic production, albeit at the cost of non-regulating countries. In contrast, internal efficiency improvements can be more collaborative in type. Among others, they include extending and linking of domestic emissions-trading systems. This study compares the relative economic impacts of those policy options if Annex I countries would follow one or the other. The study uses a computable-general-equilibrium model of the global world economy and develops a set of emissions-trading and carbon-tariff scenarios with various degrees of sectoral and regional coverage. For a globally effective Annex I emissions-reduction target of 20%, the results indicate that linking Annex I countries' domestic emissions-trading systems and expanding their sectoral coverage could yield greater global welfare improvements than implementing carbon tariffs on energy-intensive goods imported from non-Annex I countries. While non-Annex I countries would be significantly better off without facing carbon tariffs on their exports, Annex I countries could gain from either policy. The relative gains from linking and extending the sectoral coverage of domestic emissions-trading systems are greater for early policy implementation within a large Annex I coalition of climate-regulating countries, while late implementation within a small coalition would yield greater relative welfare gains from imposing carbon tariffs. The results suggest that, in addition to the political benefits, there exists an economic rationale for substituting the external efficiency improvements associated with implementing carbon tariffs with internal ones associated with extending Annex I countries' emissions-trading systems.

1. Introduction

Current climate policies are fragmented and subglobal. Emissions abatement efforts are dichotomously divided between industrialized Annex I countries with legal emissions reduction commitments and developing non-Annex I countries without such commitments. The subglobal implementation of carbon pricing and the resulting price differentials between implementing and non-implementing countries have raised several concerns in the implementing countries. Some worry that domestic industries might suffer competitive disadvantages vis-à-vis international imports from non-abating countries. Others stress the risk of carbon leakage, i.e., increases in emissions in non-implementing countries through shifts in consumption demand and production, which could undermine the effectiveness of domestic emissions-reductions efforts (Dröge et al., 2009).

In this context, some Annex I countries have proposed to implement carbon tariffs on imports from non-Annex I countries that have not agreed to adopt binding emissions-reduction commitments. Levying an import tariff in proportion to the carbon content of the imported good is thought to reduce carbon leakage and to preserve the competitiveness of domestic industries vis-à-vis international imports from non-abating countries (van Asselt and Biermann, 2007).

From a theoretical perspective, implementing carbon tariffs is thought to increase the cost-efficiency of subglobal climate policies (Hoel, 1996; Markusen, 1975). This is expected to benefit Annex I countries as carbon leakage is compensating through the comparatively cheaper emissions reductions in the exporting non-Annex I countries. However, while some numerical economic analyses indicate that implementing carbon tariffs could partially reduce carbon leakage and increase domestic consumption in the tariff-implementing regions (Böhringer et al., 2011; Burniaux et al., 2010; Winchester et al., 2011), their distributional effects make them politically contentious. They are likely to place considerable burden with significant welfare losses on developing countries on whose exports the tariffs are imposed (Babiker and Rutherford, 2005; Dröge and Kemfert, 2005; Mattoo et al., 2009; Springmann, 2012). This could have significant political and legal repercussions. For example, China denounced plans for carbon tariffs as trade protectionism for domestic industries, illegal under WTO

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law and threatened with trade war should carbon tariffs be adopted (Voituriez and Wang, 2011). More broadly, the political tensions arising from the adoption of carbon tariffs could further impede negotiations for a global climate agreement within the United Nations Framework Convention on Climate Change (UNFCCC).

Politically, carbon tariffs divide countries into potentially tariff-imposing Annex I countries with legal emissions-reduction commitments and potentially targeted non-Annex I countries without legal commitments. However, this distinction is not as clear-cut as it may seem. For example, several non-Annex I countries, such as China and South Korea are considering implementing emissions-trading schemes within this decade (Hood, 2010). On the other hand, many Annex I countries have not yet adopted comprehensive carbon-pricing policies and the emissions-trading schemes that exist, such as the European Union Emissions Trading Scheme (EU ETS) and the Regional Greenhouse Gas Initiative (RGGI) in the USA are plagued by problems of overallocation of emissions permits (World Bank, 2011).

Before extending domestic emissions regulation through the implementation of carbon tariffs, it might therefore be more appropriate for Annex I countries to further the improvement of domestic climate policies and the linking of existing and planned emissions-trading schemes. This would circumvent the political and legal problems associated with carbon tariffs and, in addition, be more in line with the UNFCCC principle of common but differentiated responsibility.[1] While each of those two policy trajectories may have different political goals,[2] either trajectory could be used from an economic perspective to increase the cost-efficiency of domestic abatement efforts in Annex I countries. Carbon tariffs induce *external* efficiency improvements by indirectly regulating those non-Annex I emissions that are associated with the production of export goods, whereas the expansion and linking of emissions-trading systems in Annex I countries induce *internal* efficiency improvements by enabling a more efficient sectoral and regional distribution of abatement efforts across Annex I countries.

It should be noted that, in principle, internal and external efficiency improvements could be pursued together. For example, Grubb (2011) argues that the implementation of carbon tariffs on non-Annex I countries could provide an initiative for reducing the free distribution of emissions allowances to trade-exposed industries as is the current practice within some Annex I countries. In that case, external efficiency improvements would go hand in hand with internal ones. However, the fierce political debate surrounding carbon tariffs with references to potential trade wars suggests that this policy option bears great political risks which could obliterate any potential efficiency improvements and, in addition, have further repercussions on initiatives for improving the internal efficiency of abatement efforts. For example, the divergent opinions that exist across Annex I countries on the desirability of carbon tariffs would likely hamper the ETS-design harmonization that is needed for different emissions-trading systems to be linked.

More generally, the policy options of implementing carbon tariffs and extending the coverage of Annex I countries' emissions-trading systems have different incentive structures which make them incompatible as long-term policy trajectories on the international level (across Annex I countries, as well as globally). Carbon tariffs are perceived as politically confrontational which is inconsistent with those cooperative initiatives that are aimed at linking different emissions-trading systems, in the long term, between Annex I and non-Annex I countries but, given the range of differing opinions on carbon tariffs, also within Annex I countries in the short term. On the other hand, initiatives aimed at linking emissions-trading systems across Annex I countries can be interpreted as a first step towards pursuing further linkages with those emissions-trading systems that are emerging in non-Annex I countries, something which would remove the basis for carbon tariffs being implemented.[3]

This study analyzes whether besides the political appeal, there exist also an economic rationale for pursuing internal efficiency improvements from linking emissions-trading systems in Annex I countries over the external efficiency improvements following from imposing carbon tariffs on non-Annex I countries. Theoretically, the linking and extending of emissions-trading schemes equalizes marginal-abatement costs between the regions and sectors covered. This leads to gains from trade in emissions allowances and associated increases in consumption and welfare in those regions and sectors (see, e.g., Tietenberg, 2006). While the outcome could, in principle, be different in second-best (real-world) settings (Babiker et al., 2004), several model studies have indicated the benefits from extending the coverage of emissions trading systems. For example, Weyant and Hill (1999) indicate significant benefits from emissions-trading across all Annex I countries for a cost-efficient fulfillment of their emissions-reduction obligations under the Kyoto Protocol, whereas Böhringer et al. (2005, 2009) and Klepper and Peterson (2004) highlight the cost-saving potential of extending the sectoral coverage of the EU ETS.

This study builds on those earlier assessments and analyses the potential gains from extending the sectoral and regional coverage of emissions-trading systems within Annex I regions vis-à-vis the implementation of carbon tariffs by Annex I countries on energy-intensive imports from non-Annex I countries. While each of those policies has been assessed before separately, no strict comparison of the policies' relative effects and their respective trade-offs has been made in a numerical setting. This study intends to fill this gap. For that purpose, it uses a computable general equilibrium model of the global world economy which tracks changes in trade flows, carbon-dioxide (CO_2) emissions, as well as economic output and prices. The study develops a set of indicative emissions-trading and carbon-tariff scenarios, and it analyzes the trade-offs along each policy trajectory in terms of a cost-effectiveness analysis of attaining a specified (global) emissions level. Although the focus of this study is on the policies' economic impacts, in particular on welfare, it also assesses their effects on GDP, the production and exports of energy-intensive goods, and carbon leakage.

The analysis is structured as follows. Section 2 describes the structure of the computable-general-equilibrium model, as well as the database and aggregation used in this study. Section 3 highlights the model scenarios and policy trajectories defined for the analysis. Section 4 presents the results of the main scenarios, while Section 5 includes a comprehensive sensitivity analysis that evaluated some of the key abstractions made in the study's main scenarios. Section 6 concludes.

2. Model description

This paper utilizes an energy-economic model of the global economy. It is based on the GTAP7inGAMS package developed by Thomas Rutherford (2010) and extended by an explicit representation of the energy sector and a carbon market in line with Rutherford and Paltsev

[1] Within the UNFCCC, Annex I countries have pledged to technically and financially support developing countries in their abatement efforts, which can be considered inconsistent with raising new emissions-related tariff barriers.

[2] The direct political reason for expanding and linking emissions-trading systems is to increase the cost-efficiency of abatement efforts. On the other hand, the stated political reason for implementing carbon tariffs is to achieve a reduction in carbon leakage and to preserve the competitiveness of domestic (in particular energy-intensive and trade-exposed) industries. However, both of those reasons are connected to the economic rationale of increasing the cost-efficiency of domestic abatement efforts, since leakage reductions and better terms of trade associated with increased competitiveness can be seen as constituting an increase in the cost-efficiency of domestic abatement efforts.

[3] For example, the EU is supporting the creation of an OECD-wide emissions-trading system within this decade and envisions the possibility of linking it with emerging emissions-trading systems in developing countries by 2020 (EU Commission, 2009).