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How to Design a Border Adjustment for the European Union Emissions Trading System?

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Keywords: Carbon Leakage, Border Adjustment, Border Tax Adjustment, EU ETS, Competitiveness

JEL Classification: Q38

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Abstract

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Introduction

Whether or not an agreement is reached at the ongoing UNFCCC climate negotiations, it is very unlikely that a single global price for greenhouse gas emissions will prevail. First, some countries may refuse to ratify the future treaty. Second, the treaty will certainly put different types of targets on countries with different development levels, following the principle of common but differentiated responsibilities. Third, parties to the treaty will most likely remain free to choose whether or not emissions from greenhouse gas (GHG) intensive industries are regulated under an emission trading scheme or under other policy measure.

In this context, industry groups in the EU will certainly continue to argue the threat imposed by the European Union Emissions Trading Scheme (EU ETS) against their international competitiveness. Whilst evidence is limited or even inexistent (Ellerman et al., 2009; Hourcade et al., 2008; Reinaud, 2008), in theory, a persistent CO_2 price differential may indeed change trade patterns and induce carbon leakage, thus lowering the environmental efficiency of the EU ETS.

For this reason, Directive 2009/29/EC, which revises the EU ETS, includes some provisions to limit carbon leakage. The main one is the continued free allowance allocation to the "sectors or subsectors which are exposed to a significant risk of carbon leakage" (Article 10a-12). However, the Directive also states that "By 30 June 2010, the Commission shall […] submit to the European Parliament and to the Council […] any appropriate proposals, which may include […] inclusion in the Community scheme of importers of products which are produced by the sectors or subsectors [exposed to a significant risk of carbon leakage]. In other words, the Directive mentions, although cautiously, a border adjustment (BA) for GHG –intensive imports[3].

In the USA, the Waxman-Markey bill adopted by the House of Representatives includes more concrete provisions. If no international agreement on climate change has been reached by January 1, 2018, the president of the United States is required to set up an "international reserve allowance program." From 2020 on, imports in a covered sector would be prohibited unless the importer has obtained an "appropriate" amount of emission allowances from the international reserve allowance program. This requirement can also be qualified of BA. It would not apply, however, to imports from countries that (1) have signed an international agreement with the United States that imposes economy-wide restrictions on greenhouse-gas emissions that are at least as stringent as those in the United States; (2) have signed a multilateral or bilateral emission-reduction agreement with the United Sates for the sector in question; (3) have an annual energy or greenhouse-gas intensity in that sector that is less than or equal to that of the equivalent U.S. sector; (4) are classified as the least-developed of developing countries; (5) are responsible for less than 0.5 percent of total global greenhouse

[3] Recital 25 of the Directive further adds that "an effective carbon equalisation system could be introduced with a view to putting installations from the Community which are at significant risk of carbon leakage and those from third countries on a comparable footing. Such a system could apply requirements to importers that would be no less favourable than those applicable to installations within the Community, for example by requiring the surrender of allowances. Any action taken would need to be in conformity with the principles of the UNFCCC, in particular the principle of common but differentiated responsibilities and respective capabilities, taking into account the particular situation of least developed countries (LDCs). It would also need to be in conformity with the international obligations of the Community, including the obligations under the WTO agreement."

gas emissions and less than 5 percent of U.S. imports of covered goods in the sector (James, 2009; van Asselt and Brewer, 2010).

A BA is a trade measure designed to level the playing field between domestic producers facing costly climate policy and foreign producers with no or little constraint on their GHG emissions. A growing body of literature (e.g. Ismer and Neuhoff (2007), Godard (2007), Demailly and Quirion (2007, 2008), Mattoo et al. (2009) as well as some stakeholders (ETUC, 2008)) have come to the conclusion that a BA may effectively prevent climate policies from negatively impacting European industry competitiveness, although some analyses come to the opposite conclusion (Weber and Peters, 2009, and references therein).

BAs are also sometimes presented as a way for the EU to induce other countries to participate in an international climate protection agreement (Stiglitz, 2006). However some experts come to an opposite conclusion since a BA may be seen as a trade sanction by developing countries and threaten the goodwill in international climate negotiations (Droege et al., 2009).

As a trade measure, a BA may be contested before the World Trade Organisation (WTO). Here again, recent analyses conclude that the design details of a BA will be key in determining whether it would be accepted by a WTO dispute panel (De Cendra De Larragan, 2006; Pauwelyn, 2007; Cosbey, 2008; UNEP and WTO, 2009).

This paper does not intend to conclude on the opportunity for the EU to implement a border adjustment. Rather, its aim is to discuss the main design options of a BA in complement to the EU ETS, to evaluate their capacity to limit carbon leakage and their likelihood to be accepted by a WTO dispute panel. When relevant, we also discuss whether these design options are more likely to inhibit or to favour the international climate negotiation, and their administrative cost.

Throughout this paper, we assume that allowances are auctioned. Firstly, a BA is much more difficult to justify under free allocation than under auctioning. Secondly, with a BA the European industry does not suffer from a competitive disadvantage (or much less so), there is thus little rationale for free allocation, which creates economic distortions (Matthes and Neuhoff, 2008). Godard (2007) and Genasci (2008) make proposals for a BA in case of a hybrid allocation with both freely allocated and auctioned allowances.

The rest of the paper is structured as follows. The first part aims at clarifying the notions of competitiveness and carbon leakage, used throughout the paper. In the second part, we list and discuss the different elements that require being defined, in order to implement a BA in complement to the EU ETS. More precisely we discuss: whether it should be based on taxes or allowances (2.1) whether it should cover only imports or also exports (2.2); the targeted products (2.3); the adjustment base (2.4); the countries covered (2.5); the enforcement issues specific to the border adjustment (3.1); and finally the administration cost (3.2). A last part concludes and offers further research questions.

1. Competitiveness and carbon leakage – what are we talking about?

Competitiveness is a loosely-defined word, which is often considered as meaningless at the macroeconomic level (Krugman, 1994). At the sectoral level, the Krugman critique does not apply but "competitiveness" is employed with very different meanings. On the basis of a

literature survey, Alexeeva-Talebi et al. (2007) argue that competitiveness at the sectoral level resides in (i) “ability to sell” and (ii) “ability to earn”. The EU ETS increases the production cost of European producers in GHG intensive sectors, some of which are exposed to international competition. If European producers pass-through the cost to consumers, then they may lose some market shares vis-à-vis foreign producers, thus reducing their ability to sell. If they do not pass through costs on the other hand, then their market share may be unaffected at least in the short-run, but their profit will shrink due to their lower ability to earn and in the long run investments may shift outside of Europe (compared to a reference scenario). European industry will then lose some market shares in both European and foreign markets, with two main consequences: job losses and an increase in GHG emissions in non-European countries, i.e. carbon leakage.

Yet carbon leakage is not limited to this "GHG-intensive industry channel". Moreover in most general equilibrium models the larger part of leakage occurs through the "energy prices channel". That is, climate policies decrease the international prices of oil, gas and coal, hence increase their use in countries without a climate policy. This mechanism has nothing to do with "competitiveness" and prevails also in sectors sheltered from international competition. We do not mention it further since a BA obviously cannot prevent this kind of leakage (Barker, Bashmakov et al., 2007).

The leakage channel we deal with, i.e. the GHG-intensive industry channel, has two components: operational leakage and investment leakage (Graichen et al., 2008). Operational leakage is a short and medium-term concern, which comes from the relocation of production from existing installations to production facilities outside the scheme. Investment leakage could occur if there was a redirection of investments from Europe to regions without similar climate policies. It takes place in the longer run but it could be more important than operational leakage in capital-intensive industries like primary aluminium or steelmaking.

In addition to the limitation of the carbon leakage, other elements contribute to ensuring environmental efficiency of the European climate action. As we already underlined, a BA must not destroy the goodwill of the international negotiations on climate, which would compromise the possibility of reaching an agreement. The broader the participation to such an agreement, the more efficient the EU action on climate preservation. Yet the possibility of a multilateral climate agreement will also depend on the demonstration that it is possible to implement an ambitious mitigation policy without condemning its heavy industry (Godard, 2007). The implementation of a BA could thus also contribute to reaching a multilateral agreement.

Consequently, these elements are strongly connected. In particular, the goodwill in multilateral climate negotiations can be maintained only if the different parties are convinced of the EU’s good faith that its main motivation to implement a BA is to reduce GHG emissions and not job destructions in exposed industry. This is also very important in the WTO context: article XX of the GATT authorizes some exceptions to the GATT general principles for environmental reasons, not for competitiveness reasons. [4]

[4] According to the paragraphs (b) and (g), WTO members may adopt policy measures that are inconsistent with GATT disciplines but necessary to protect human, animal or plant life or health (paragraph (b)), or relating to the conservation of exhaustible natural resources (paragraph (g)). For a GATT-inconsistent environmental

2. Design options for a border adjustment to the EU ETS

2.1. Tax- or allowances-based BA

Until the mid-1990's, discussions on border adjustments were led in the context of proposed GHG taxes. Under a GHG tax, the adjustments would take the form of a tax on some imported products, and of a tax exemption on emissions entailed by the production of products exported by the EU. The implementation of a border tax adjustment in complement to the EU ETS has been the option examined in first in the literature, possibly because such adjustments already existed in other contexts and were authorised by World Trade Organisation's rules (De Cendra De Larragán, 2006; Ismer and Neuhoff, 2007). But recent analyses conclude that an adjustment imposing to surrender allowances to the importers could also be authorised by the WTO depending on the precise design adopted (Pauwelyn, 2007). Ismer (2008a) envisages an allowances-based BA for exports as well.

Two options would thus be possible: the BA on exports and imports can correspond to a price-based measure such as a tax on carbon-intensive imports and a refund for carbon-intensive exports, or to an allowance-based measure so that importers would be forced to surrender allowances for emissions induced by the production of imported products, while EU firms would be exempted to surrender allowances to public authorities for the emissions (or a part of their emissions) entailed by the production of goods exported outside the EU. An allowance-based BA is preferable for two reasons: first, this option avoids evaluating a tax level that is complex to determine and probably contestable to the end; second, it is more transparent and ensures a more similar treatment between European and non-European firms.

2.2. Should the border adjustment cover imports, exports or both?

A border adjustment can be applied either to imports, exports or both. A BA on imports would impose a cost on some GHG-intensive products imported in the EU market, while a BA on exports would correspond to a kind of rebate on GHG-intensive products exported.

An adjustment on imports has the objective to avoid or limit competition distortions in the European markets between European and non-European countries due to the unilateral climate action taken by Europe. An adjustment on exports is targeted to level the playing-field in non-European markets. In both cases, the aim is thus to impose to European and non-European installations an equal treatment in terms of carbon cost: wherever their origin, all the products consumed in the EU would bear carbon cost, while the products consumed outside of the EU would not. Consequently, European consumers would pay more for the products they consume. Hence the principle of common but differentiated responsibilities would be respected, but the burden would be partially shifted from EU producers of GHG-intensive products (workers and stockholders of these firms) to EU consumers of these products.

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measure to be justified under Article XX, a member must prove that its measure falls under at least one of the exceptions (e.g. paragraphs (b) and/or (g)). Moreover, the manner in which the measure is applied is important: in particular, the measure must not constitute a "means of arbitrary or unjustifiable discrimination" or a "disguised restriction on international trade". (UNEP and WTO, 2009)

A BA both on exports and on imports would limit carbon leakage the most, although both the EU ETS revised Directive and the U.S. Waxman-Markey bill only mention a BA on imports. However, as we shall see now, the exports part may be more difficult to justify in case of a WTO dispute.

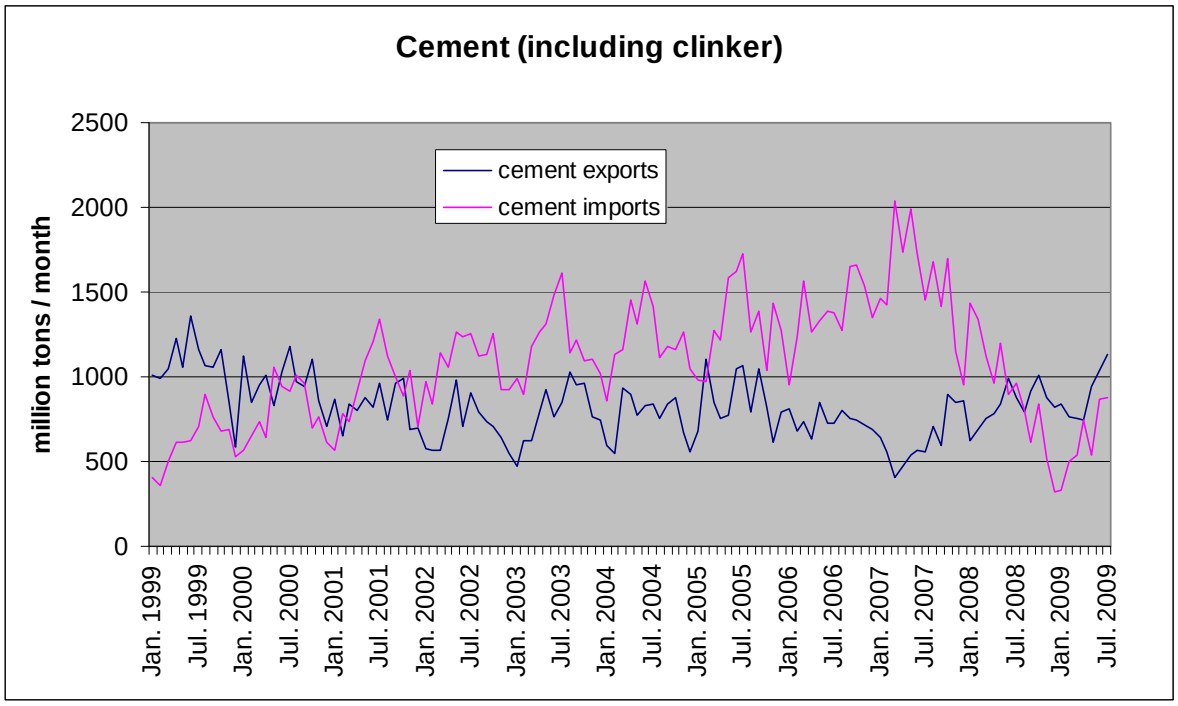
Indeed, as mentioned above, to use article XX of the GATT, the EU should demonstrate that the goal of the BA is to preserve the climate, i.e. to decrease the world GHG emissions. Although a BA on importations would clearly reduce global GHG emissions, a BA on exports could either increase or decrease them. Moreover, it will depend on the situation of reference retained. Indeed, depending on the inclusion of the EU ETS or not in the business-as-usual scenario, the conclusions can differ. Anyway, it is delicate to demonstrate in a persuasive way that the BA on exports will limit world GHG emissions.

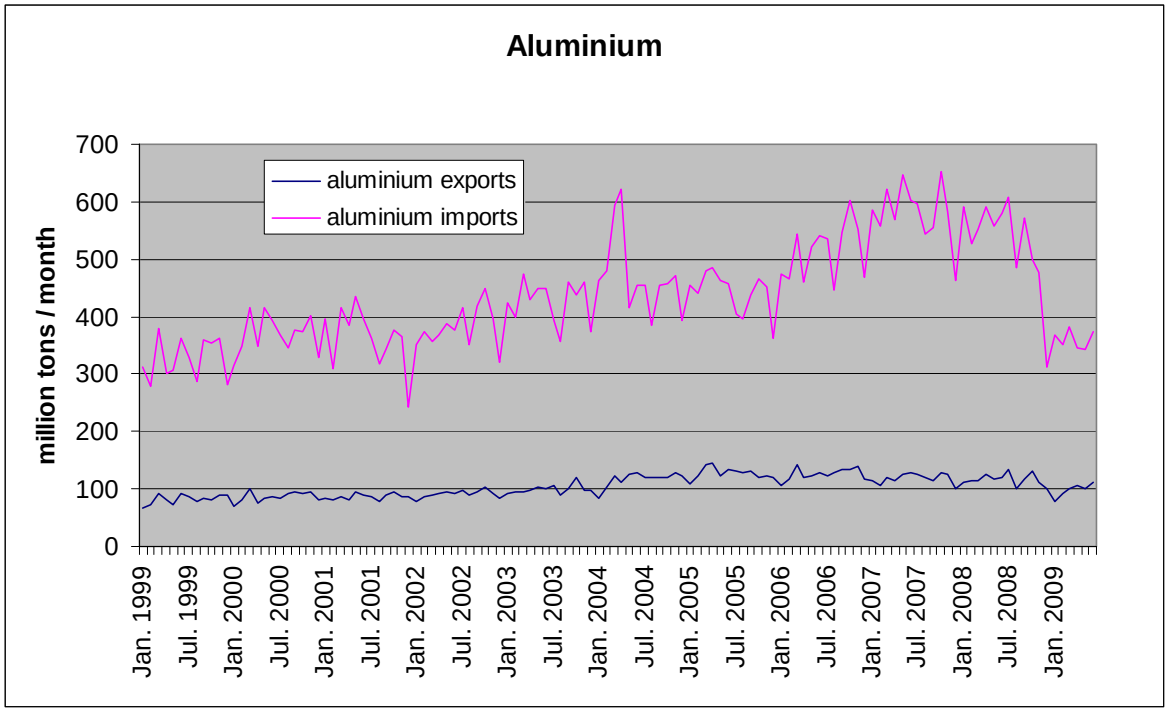
In addition the import part of the BA has the advantage of generating public receipts, which may be redistributed to exporting countries. The latter would then probably be less likely to interpret the BA as a protectionist policy if the revenue coming from the importations are used for instance to finance some projects of mitigation and/or adaptation in the developing countries.

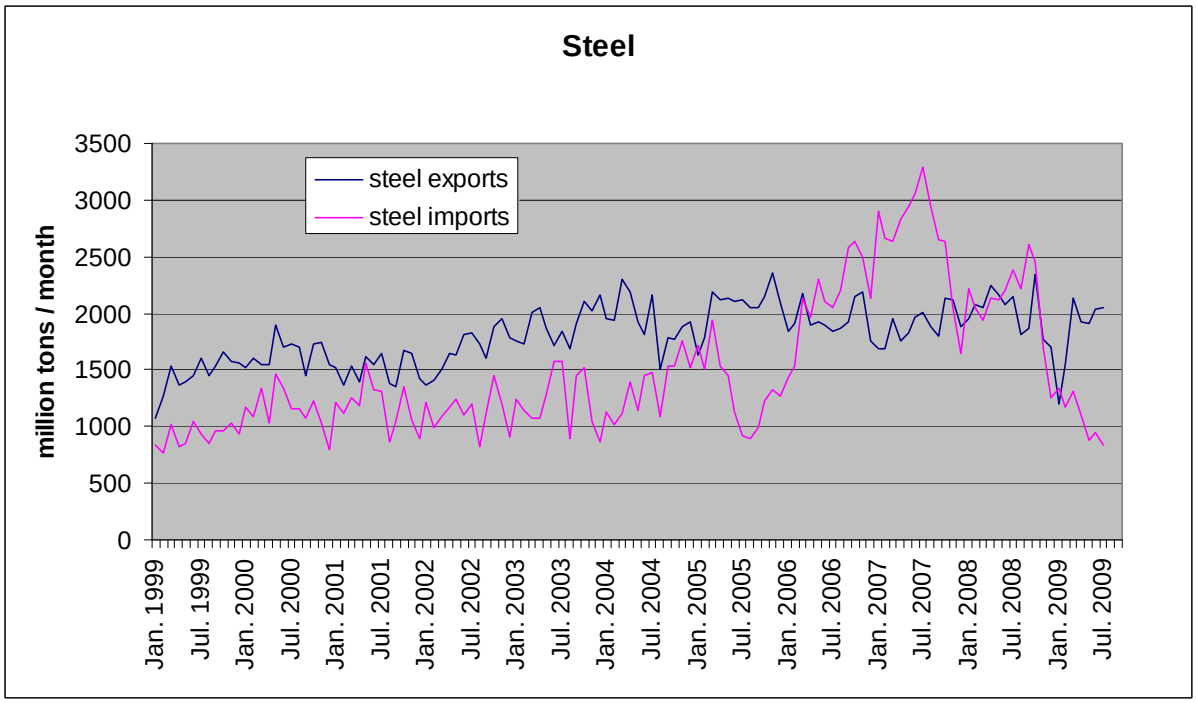
Another option – possible if the BA is justified under article XX – to increase the acceptability of a BA on imports could be to exempt from this BA products subject to a sufficient export tax in their country, which is currently the case for steel in China, although not for climate reasons. Currently the sum of the export tax and of the VAT repayment cuts for exports amount to 65 US$/t CO_2 for steel in China, well above the current CO_2 price in the EU ETS (Wang and Voituriez, 2009). Unfortunately no similar option is available to increase the political acceptability of a BA on exports.

Suppose now that a BA on imports is set without a BA on exports. Would leakage differ a lot compared to a full BA? The answer depends on the sector and on the business cycle. Figure 1 provides extra-EU27 imports and exports for cement, aluminium and steel. For aluminium, imports are more than twice higher than exports, so in this case not having an export BA would not necessarily lead to a significant increase in carbon leakage. For cement the answer depends on the business cycle: when it is high in Europe, such as in 2007, imports are also much higher than exports, but when it is down, as since mid-2008, exports and imports are almost equal. Having the full BA would be therefore important. For steel, except in 2006 and 2007, exports are higher than imports so here again having the full BA would be important.

Figure 1. Extra-EU27 imports and exports of cement, aluminium and steel







Source for cement and clinker and for aluminium: Eurostat ComExt database (codes HS 2523 and 76). Source for steel: Eurofer, aggregation of flat and long products.

Monjon and Quirion (2009) address this issue. They examine different designs of a BA in complement to the EU ETS, some covering both imports and exports and others covering only imports, and evaluate their efficiency to limit carbon leakage. They develop a static and partial equilibrium model, which represents four sectors: cement, aluminium, steel and electricity. Without a BA, the climate policy modelled by the authors entails a leakage-to-reduction ratio of 10%, meaning that for each tonne of CO_2 emissions reduced in the EU,

another 100 kg are emitted in the rest of the world. With a BA on both exports and imports, the leakage-to-reduction ratio becomes negative, at -5%, meaning that emissions in the rest of the world decrease following the EU climate policy[5]. Finally, with a BA on imports only, the leakage-to-reduction ratio becomes almost nil. Hence, although a full BA is obviously more efficient, a BA limited to imports may be seen as satisfactory.

2.3. Targeted products

There is a relatively large consensus about the products that should be covered: it must concern the products for which a persistent CO_2 price differential can induce big changes in trade patterns, i.e. the sectors of the economy which (i) face high cost impacts due to direct CO_2 emissions (combustion and process) and/or indirect emissions from electricity and (ii) are very exposed to international competition. Indeed the risk of significant carbon leakage exists only in these sectors. The 2009 ETS Directive sets criteria to determine sectors "at significant risk of carbon leakage". Using these criteria, the European Commission is finalizing a list of 164 exposed sectors or sub-sectors (European Commission, 2009b). Compared to the Commission original Directive proposal, these criteria were modified by the Council in order to include more sectors following an intense industry lobbying.

According to the studies by Hourcade et al. (2007) on UK data, by CE Delft (2008) on Dutch data and by Graichen et al. (2008) on German data, a much shorter list of sectors, limited to steel, cement, aluminium[6] and some chemicals is likely to be enough to tackle the bulk of leakage.[7]

Moreover, it is important to limit the BA to a small number of products, i.e. those for which the risk of carbon leakage is really high and thus compromise environmental efficiency of European action. Firstly, this contributes to show the good faith of the EU for international climate negotiations but also for WTO. Secondly, this limits the administrative burden of the BA.

A more delicate issue concerns the downstream products because imposing a BA on CO_2-intensive products but not on downstream products could induce a change in trade pattern of the latter products, and lead to carbon leakage. For instance, imposing a BA on steel but not on cars could in principle incite firms to produce cars outside of the EU and import them to EU. Houser et al. (2008) give some interesting figures highlighting what is at stake: "[…] the United States imported 36,9 million tons of steel in the form of final goods like automobiles and toaster ovens, more than the 30 million tons in actual steel products

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[5] This spillover is due to the following mechanism: the EU climate policy increases the price of cement, steel and aluminium in Europe, which decreases the consumption of these materials, hence their imports to the EU. Cement, steel and aluminium production in the rest of the world thus decrease, reducing CO_2 emissions.

[6] Aluminium is not currently included in EU ETS but suffers of an increase of electricity price and is more exposed to international competition than most other materials. From 2013, direct emissions, including PFC, of the aluminium facilities will be covered by the EU ETS.

[7] The criteria used to determine the sectors "at significant risk of carbon leakage" in EU are the following: (1) a trade Intensity over 30%, or (2) additional CO_2 cost over 30% of gross value added, or (3) trade Intensity over 10% and additional CO2 cost over 5% of gross value added. Using these criteria, the EC has found: (1) 117 sectors show a trade intensity above 30%; (2) 27 sectors have both CO_2 cost above 5% and trade intensity above 10%; (3) Two sectors have CO_2 cost above 30% with trade intensity below 10%. (Bergman, 2009)

imported that year." Weber and Peters (2009) provide other figures that point to the same conclusion. The point is then to examine if the downstream products are traded in large volumes between EU and the rest of the world and to evaluate the extra cost they would support if the upstream products (e.g. steel) they consume were covered by a BA.

For the cement sector, only clinker and cement have to be included since the downstream products (concrete or concrete elements) are little traded, having an even lower value per tonne than cement or clinker.

For the steel sector, more products have to be included: at least products included in groups 72 and 73 of the Harmonized System nomenclature[8] should be included. How far a BA should include more downstream products is a question that must be analysed further with caution. Of course, the BA cannot apply to any manufactured product containing steel – and does not have to. For example, according to ADEME (2007), the emissions related to the use of steel and aluminium in a car of 1 ton is around 1.6 ton of CO_2. If we suppose a CO_2 price of 30€-50€ and even if we assume that the cost pass-through is complete in the electricity, steel and aluminium sectors, the cost increase to produce a car is between 48 and 80€. This is negligible compared to the price of a car. Hence cars do not need to be included and the same probably stands for other transport materials and for appliances. The fact that, at least in the US (Houser et al., 2008; Weber and Peters, 2009), more CO_2 is embodied in imports of final products than in imports of basic products does not mean that a border adjustment limited to basic products would not be effective: what matters for the efficiency of a border adjustment is not the total CO_2 embodied in imports, but the additional embodied CO_2 that would be imported under a climate policy without border adjustment, compared to what would happen under a climate policy with a border adjustment.

However for some steel and aluminium products (like a car body or a soft drink can) whether they should be included deserves further attention.

Another difficult issue is whether steel scrap should be included. As stressed by Ismer and Neuhoff (2007), scrap can be considered as a semi-finished steel product, since it has already been produced in an integrated steel plant from iron ore and fossil fuel, so it has embedded emissions just like any steel product. However, scrap can originate from steel whose the emissions have been covered or not by an ETS. For instance, scrap from packaging can originate from steel produced only a few months or a few years ago, hence emissions have been covered by the EU ETS. But, scrap from building materials originates from steel produced decades ago, hence emissions have *not* been covered by the EU ETS. Scrap from cars and appliances are in an intermediate situation. So whether covering scrap by a BA grants an equal treatment between imported and domestic products is debatable.

To minimise leakage, however, scrap should be covered by the BA since in the case of steel, a part of leakage could come from the international scrap market: the EU ETS could increase scarp imports to the EU, as making steel from scrap generates much less emissions than steel from iron ore. As a consequence, the international price for scarp will increase, reducing the share of scrap in steelmaking in the rest of the world (Mathiesen and Maestad, 2004). The same issue applies to aluminium scrap.

[8]Available from the World Customs Organization, http://www.wcoomd.org/.

2.4. The adjustment base

2.4.1 The issue of indirect emissions

Electricity is an input factor for many products. The increase in the electricity prices induced by the EU ETS can be problematic to the electricity-intensive sectors exposed to international competition, especially aluminium. A BA on aluminium can limit carbon leakage from this sector only if the BA is applied also to the indirect carbon emissions attributed to the electricity inputs. But, as stressed by Ismer and Neuhoff (2007) "in integrated electricity systems it is technically impossible to identify the origin of an electric energy delivery", so indirect emissions related to electricity require a distinct treatment.

Taking indirect emissions into account for BA on imports boils down to increasing the quantity of allowances that the importers must surrender. Taking the national average CO_2 emissions per MWh ratio of the exporting country (a figure available from the IEA, 2009) is the simplest option. A more complex but more accurate solution would be to estimate a marginal emission factor for the electricity system of the exporting country. If the EU uses its own methodological tools, the exporting country is likely to contest the results. Fortunately, such a tool has been developed by the CDM Executive Board (2009), which is elected by the Parties to the Kyoto Protocol, i.e. almost all countries in the world apart from the U.S. Moreover, this tool is used by many CDM projects, which are approved by both the Annex I country and the host country; it would be difficult for a country exporting to the EU to claim that this tool is biased if it has approved a CDM project using this very tool before. However, more research would be required to assess the suitability of this tool for this particular purpose.

Concerning exports, the same options may be used.

2.4.2 Evaluating the amount of emissions imputed to imports

Whichever its form, a BA requires assessing the amount of emissions (direct and possibly indirect) imputed to imported and exported products. This is particularly problematic for imports because most of the non-EU production installations have no obligation to declare – and thus do not know precisely – their CO_2 emissions.

A first option is to ask importers to provide certified information on the carbon content of the products they want to import in the EU, but it is difficult to oblige importers to do so since for a small importer, the administrative burden could be high in proportion of its sales.

Another option is to use the average emissions per ton in the exporting country for every product covered by the BA, but this value could be difficult to compute, especially if the country is reluctant to participate.

Rather, Godard (2007) and Ismer and Neuhoff (2007) propose to use the Best Available Technology (BAT) "being actually used in industrial plants worldwide." However in many cases the BAT entails almost zero emissions: think of steel made with sustainable charcoal in Brazil or of aluminium made with hydro power in Canada. Thus some technologies have to be excluded from the BAT, otherwise the BA will have no effect at all – a point acknowledged by the authors mentioned above. Hence Ismer and Neuhoff (2007) propose to label BAT "a technology that is commercialised, perhaps by requiring a certain market share on the world markets of the products build with the BAT production process". Godard (2007) rather proposes to "refer to the BAT within the predominant category of technology in use in Europe for each type of product (steel, cement, etc.)".

The easier way to define a BAT for this purpose is certainly to use the product-specific benchmarks that the European Commission is currently defining for the goods produced by sectors that will receive 100% free allowances from 2013 to 2020 because they are "deemed at significant risk of carbon leakage". These benchmarks are computed on the basis of the average of the 10% European plants with the lowest emissions. Draft benchmarks should be available by May 2010 and they should be adopted by December 2010. 42 product-specific benchmarks are currently being defined for the sectors which have been considred as deemed to be exposed to a significant risk of carbon leakage (European Commission, 2009b)[9]. Although defined for a different purpose, i.e. to set the amount of freely allocated allowances, they are a good candidate to define the amount of emissions that would be imputed to imports. These benchmarks only cover direct emissions, so if the BA is to account for indirect emissions due to electricity, a different approach must apply for these emissions, as discussed above in section 2.4.1.

In most sectors, the average importer would pay less per tonne of CO_2 actually emitted than the average EU firm. Hence, European producer would still be at a disadvantage. However, Demailly and Quirion (2008) using a world model of the cement industry, show that a BA based on the best available technology (whose emissions, in this case, are 80% of the average) is almost as successful in preventing leakage than a BA based on actual emissions. Moreover, foreign countries could hardly claim that they are discriminated by the BA since their exporting firms would have to buy fewer allowances per ton of CO_2 actually emitted than European producers.

Yet a particular exporting firm, whose unitary emissions may be lower than the EU benchmark, could make the claim, e.g. a Brazilian steelmaker using charcoal, or an aluminium producer using hydro power. Hence a final issue is whether a particular exporting firm that is able to prove (through independent third-party verification) its emissions to be lower than the reference value, could be allowed to use this value instead. Godard (2007) and Pauwelyn (2007) discuss such an option, which has potentially two advantages.

First, it can potentially induce foreign exporters to reduce their unitary emissions. Yet very few plants (if any) are designed to export specifically to the EU. Materials exported to the EU are produced in plants designed primarily for the domestic market and/or also for other export markets. Hence it is unlikely that significant abatement will be induced by this option. Moreover, materials produced by the least GHG-intensive processes will be exported to the EU while other, more GHG-intensive materials, will be sold in other markets. World emissions would not decrease.

A second and more convincing advantage of this option is to increase the likelihood that the WTO accepts the BA. Indeed this principle has been applied in the US Superfund legislation for the tax on imports produced with certain chemicals and has been accepted by the GATT panel in charge of the dispute (Pauwelyn, 2007).

Whether or not verified emissions from individual exporters can be used as the adjustment base is thus a matter of trade-off between the efficiency to tackle leakage and the likeliness to pass a WTO dispute.

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[9] According to the European Commission (2009a), additional product benchmarks could be considered. An up-to-date presentation of these benchmarks is provided by Neelis and Eichhammer (2009).

2.4.3 Evaluating the amount of emissions imputed to exports

Similar choices have to be made for products exported from the EU. A first option would be to use the real emissions of the plant to evaluate the rebate on exports. This would be equivalent to a complete exemption from the EU ETS for production exported to the rest of the world. The drawback of this option is that the high emissions plants would serve for the exports while the low emission plants would be used for domestic consumption, thus there would be no incentive for EU exporters to reduce their emissions. As a consequence, in a WTO case, it would be difficult for the EU to demonstrate that the export part of the border adjustment has an environmental rationale, i.e. that it reduces world emissions, which is necessary to use Article XX of the GATT

A better option would be to fix the level of adjustment at a uniform level and not to vary the level of adjustment according to the process or according to the plant. As for the import part of the BA (cf. section 2.4.2 above), and for the same reason, the product-specific benchmarks developed by the European Commission are a good candidate to fix the adjustment level. Nevertheless, this option may be incompatible with the WTO Agreement on Subsidies and Countervailing Measures because firms with unitary emissions lower than the benchmarks will be de facto subsidised (Reinaud, 2008). However, this is the case with free allowances: since the beginning of the ETS, some EU facilities have received more allowances than their emissions, so they are de facto subsidised. According to James (2009, p. 7), “if the allowances are then resold on the carbon market, they would likely represent an actionable subsidy” for the WTO. However, this risk did not prevent the European Union from going on with free allowances.

The safest option (with respect to the WTO) could be to mix these two options: a BA on exports could be based on the minimum between the EU product-specific benchmark and the real emissions. This option would allow respecting the WTO texts while keeping the incentive to reduce emissions from exporting firms.

2.5. Countries covered

Whereas the European debate on a BA in complement to the EU ETS has been motivated by the non-ratification of the Kyoto Protocol by the United States and the fear not to reach a post-Kyoto agreement (van Asselt and Biermann, 2007), China and the other emerging economies are the source of much of the concern in the US climate policy debate (Committee on Energy and Commerce, 2008). In both cases, the BA would not be applied to all the commercial partners in the same way. This discrimination among the countries depending on whether they have implemented a climate policy, or are committed in a multilateral climate agreement, would certainly be incompatible with the most-favoured-nation principle of the WTO (GATT, Article I) (Godard, 2007; Pauwelyn, 2007).

Moreover, if the EU sets a BA only for countries which do not ratify the next climate treaty, or without a significant climate policy, it would not necessarily solve the leakage problem. Assume for example that Japan ratifies the treaty and implements a climate policy but no BA and that Russia does not ratify the treaty and implements no climate policy. Then the effect of the EU BA would be that Russia would sell steel to Japan, and Japan to the EU. Leakage would still take place from the EU to Russia, and in addition emissions from international

shipping would increase, although for low-value products, such as cement, transportation costs would limit this behaviour.

Hence Pauwelyn (2007) proposes to apply the same BA to all commercial partners.[10] However if a commercial partner implements a comparable climate policy, its exports to the EU would pay twice the CO_2 price while exports from the EU to this country would not pay it at all.

The ideal solution would thus be a multilateral BA, in which every country with a comparable climate policy would implement a similar BA; the adjustment would then only take place with countries that do not have a BA themselves. Three options may be thought of: (i) the BA could be part of the next climate treaty (Ismer, 2008b; van Asselt and Brewer, 2010); (ii) there could be a distinct treaty on BA; (iii) a unilateral initiative, perhaps from the US or the EU, could be joined by the other countries.

3. Administration of the system

3.1. Enforcement issues

As explained above, we propose that if the EU decides to implement a BA, it takes the form of an obligation for importers of GHG-intensive goods to surrender allowances. One option is to require the importers to purchase the allowances on the market or at the same auctions as EU emitters, and surrender them in the same way. This option offers the most similar treatment with domestic producers but could induce a significant risk of free-riding. Indeed an exporter from a third country could choose to sell GHG-intensive goods in the EU without buying the allowances. It could do so for up to one year and four months, since it would be required to surrender allowances only on 30 April after the end of the year during which it exported these goods. Admittedly, once found in non-conformity, this firm could be banned from exporting to the EU, but such a sanction is unlikely to deter non-compliance. Indeed, a firm willing to export to the EU, once found in non-compliance, may go on exporting through a dummy company and it seems difficult for the EU to sanction this behaviour.

Hence the EU should force the exporter to surrender allowances when the exported product is registered at the EU border. Admittedly an exporter could complain that it cannot benefit from a possible drop in the CO_2 price between the export (say, in year n) and the time when domestic producers have to surrender the allowances (30 April of year n+1). This possibility does not really matter insofar as the prices could also increase and the importers always have the possibility to buy an option. Moreover, for import VAT too, the surrendering takes place straight away at the frontier upon importation, while other taxable persons have to pay it monthly.

[10] If the article XX is used, then different development levels of countries must be taken into account and can imply different BA depending on the commercial partner (von Asselt and Biermann, 2007).

3.2. Administration cost

Here we do not discuss the costs related to the negotiations with EU's commercial partners to be sure that no other better option is possible. Nor do we discuss the costs of possible disputes before the WTO.

The management of the BA requires gathering and regularly updating the data necessary to evaluate the CO_2-emissions content of imports and exports. The administrative burden of BA rises proportionally to the number of goods to which the BA is applied. Moreover, the work of data management can be more or less important depending on the options adopted finally. In particular, it would rise if indirect emissions are also taken into account, especially if the marginal emission factor for the electricity system of the exporting country is estimated (cf. section 2.4.1 above). It would also rise if, instead of, or in addition to a product-specific benchmark, the emissions of a particular exporting firm or plant are taken into account in the BA (cf. sections 2.4.2 and 2.4.3). Finally, this work would increase with the number of targeted products (cf. section 2.3).

In particular, a BA based on the product-specific benchmarks that are currently computed by the European Commission to define the amount of allowances allocated to the sectors deemed at risk of carbon leakage, and limited to a part of these sectors, would require very little additional administrative work. Moreover the types of equipment used in heavy industries change slowly, which lowers the updating work. An updating of the figures on a 5-year basis would be enough and would limit the management cost of the mechanism.

The Dutch example of the Benchmarking Covenant illustrates this issue. The aim of this policy is that companies should come to rank among the top ten percent worldwide in terms of energy efficiency. To define the target, an international benchmarking must be decided. 97 industrial and 6 power generating companies (managing 232 plants) from 10 different industrial sectors are participating to this policy. They have identified the Top Global Performers for their processes (528 different processes) with the help of independent consultancies. Effective supervision is crucial for the implementation of the covenant. The Benchmarking Committee is responsible for the whole implementation. The Benchmarking Verification Bureau has been specially established to monitor the practical aspects of the covenant since 2001. This independent bureau verifies for each company all the different stages in the benchmark process. Currently in 2008, only 14 staff (including secretary staff and 2 managers) work at this bureau. The benchmarks are updated every four years.

Conclusions

Whereas several papers recently addressed the pros and cons of border adjustments, few elaborate on the design of such systems. From this survey on the design issues of a border adjustment, we find no reason to conclude that they would be unmanageable. Moreover, we conclude that some design options seem clearly preferable. In particular, (i) the import adjustment should take the form of a requirement to surrender allowances rather than of a tax; (ii) this obligation should apply when the imported product is registered at the EU border, not four months after the end of the year as for domestic emitters; (iii) the general rule to determine the amount of allowances per ton imported should be the product-specific benchmarks that the European Commission is currently elaborating for a different purpose (i.e. to determine the amount of free allowances in the EU ETS); (iv) the export adjustment

should take the form of a rebate on the amount of allowances a domestic emitter has to surrender; (v) the adjustment does not have to apply to consumer products such as cars or appliances, but mostly to basic materials.

However, more analysis is clearly required on some issues, mainly (i) the precise products coverage, especially for chemical products and for downstream steel and aluminium products; (ii) whether steel and aluminium scrap should be included; (iii) whether foreign firms which can prove that they have lower unitary emissions than the EU average should have a lower adjustment; (iv) how to quantify indirect emissions from electricity; (v) how to make the border adjustment multilateral, i.e., to have it cover all countries participating in the climate agreement; (vi) whether or not the receipts from the import adjustment be earmarked for exporting countries, and whether or not an exemption should be made for products covered by a similar export tax in their country of origin.

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