

# **Leveling or Mining the Playing Field?**

## **Implementation Problems of Carbon-Motivated Border Adjustment Taxes**

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## Summary of key issues and challenges

- Climate change policies and trade policy are on a collision course. Border tax adjustments are at the center of the debate and are being considered in many OECD countries, notably the United States and the European Union (EU). They will tax carbon emissions at the border with the aim of leveling the playing field between countries with different carbon emission limits.
- Border tax adjustments may be justified theoretically, but the challenges of implementation and its associated costs and incentives are a key determinant of the outcome. Implementation depends on complex administrative arrangements and controversial calculations of the embedded carbon in imported goods. Border tax adjustment schemes might mine rather than level the playing field.
- Implementation problems invite vested interests to influence the policy process and divert border adjustment taxes towards protectionist uses. Decision makers and academics alike have produced little evidence on implementation problems but appear to discuss the very complex border tax adjustment scheme with the implicit assumption that implementation problems can be solved if the need arises.
- The implementation problems are linked to the difficulties of calculating embedded carbon. This paper discusses a key question: How accurately can we measure embedded carbon and what will the inherent uncertainty do to trade policy when it triggers political economy forces?

## Summary of way forward

- Policy makers must be made better aware of the inherent risks of a border tax adjustment scheme. Knowledge about the risks will inform which products to include (if any) and how to best design implementation schemes to withstand rent-seeking activities.
- We have a large and largely ignored knowledge gap that can be filled by research combining expertise on the estimation of carbon footprints, political economy, and supply chain knowledge. Case studies of key sectors and how alternative measurement methodologies and datasets affect carbon footprints would shed new light on implementation problems. The costs of alternative implementation arrangements in terms of financial costs and opportunities for rent seeking must be investigated.

# Background

Climate change mitigation threatens to be very expensive. The policies must be smart by design to ensure that costs are minimized and gains maximized. Less smart policies will meet unnecessary political obstacles and will worsen the global economic effects of climate change (World Bank 2009). In this note, we will discuss whether trade clauses in climate change legislation constitute smart climate policy. Policy makers are considering erecting tariffs to tax products that have been produced without the respect of carbon emission limits. In climate speak, such tariffs are known as border tax adjustments (BTAs). Supporters argue that BTAs will level the playing field across countries. This note advances arguments that BTAs might mine rather than level the playing field. Supporters say that BTAs can tax pollution in the form of greenhouse gas emissions at the border, thereby making all countries pay the price of these emissions and not just the countries setting emission limits. In this note, we discuss the problem of implementing BTA regimes and find evidence to suggest that the uncertainty surrounding the calculation of the tax base constituted by cheap emissions might be too much to handle for the regulatory agencies. Rent-seeking interests will seek protection under a BTA scheme and will threaten to undermine the original good intentions of the scheme to ensure a level playing field.

The problem of BTA regimes arises because of a perceived clash between climate change and trade policy. The combat against climate change has become a political imperative. Therefore, when policy objectives clash, climate change mitigation policy tends to take precedence over other policies. In the case of BTAs, the urgent need to act on climate change has misled policy makers to ignore implementation problems and to discuss BTAs as if implementation is an issue that can easily be taken care of.

Many economists view tariff instruments such as BTAs with great suspicion, having noted a strong tendency historically that tariffs are used excessively and for questionable policy objectives. Some voices claim that BTAs are beneficial as they tax pollution in the form of greenhouse gas emissions. But the costs of their use have to be considered, such as administrative expenses and rent-seeking behavior that may lead to purely protectionist policies. The literature and policy makers alike are silent on these issues. Indeed, in the political debate in the United States and some other countries, it is difficult to foresee any climate change legislation that does not seek to address the problems of competitiveness and carbon leakage that BTAs are set up to address.

Climate change and trade policy clash because countries differ in their commitments to reduce greenhouse gas emissions. Countries considering the introduction of strict emission limits worry that their producers will suffer from the associated costs while producers in other countries get a free ride. Furthermore, the effectiveness of efforts to reduce global emissions are endangered if strict legislation in one country is cancelled out fully or partly by rising emissions elsewhere. The former concerns address competitiveness issues, and are a prime driver behind attempts to include trade clauses in climate change legislation in the United States and the EU. The latter effect is known as carbon leakage, because carbon, which is shorthand for all greenhouse gases, leaks out of the reach of the regulators.

There is little support for the concerns of competitiveness and carbon leakage among academics. Many worry that the concerns are overblown and state that no economy-wide harm will be done. Rather, it is argued, the concerns are minor, as they are only relevant for a handful of heavy industrial producers of goods such as steel, aluminum, paper, glass, chemicals, and electricity (Hauser et al. 2008).

The major BTA schemes currently under development are being discussed in the U.S. Congress and in the EU and are tied to the introduction of emission trading schemes (ETS). Neither the United States nor the EU has so far detailed how they will implement BTAs and the political decision making awaits the outcome of COP 15 in Copenhagen in December 2009. A climate change summit leaving major greenhouse gas emitters such as China, India, and Brazil without significant reduction commitments will intensify competitiveness concerns and increase the pressure on a BTA scheme in the EU, which already has implemented an ETS and, in the United States, if an ETS becomes a part of future climate change mitigation policy. Furthermore, competitiveness concerns will rise in the EU if the United States fails to put in place its own set of climate mitigation policies.

## The implementation problem

The implementation of a BTA scheme requires that someone sets the rules: identify sensitive sectors, the unit of analysis (for example, a country, industry, or company), and the time period of any analysis. In a second step, criteria will need to be established to evaluate whether a BTA is warranted. This will, as discussed below, necessitate a great deal of analysis requiring intensive data collection efforts and data will have to be validated as it is often missing in a generic form. Data will also have to be collected from actors with a strong interest in the result of the analysis such as companies under suspicion of enjoying the benefit of cheap carbon emissions. Third, the investigation process will have to be defined. Carbon dumping claims could be investigated following complaints from import-competing companies and industries. Alternatively, a more automatic procedure could be used that regularly surveys climate change mitigation policy and its cost effects in competing nations and subsequently takes decisions on whether to add BTAs to sensitive imports or not. Finally, an organization will have to be set up to run the system, adequately staffed with people that will work closely with industry to understand their concerns and at the same time will have to work sufficiently isolated from industry to make neutral decisions.

This process will be subject to lobbying from concerned industries at multiple levels. The WTO compatibility of a BTA scheme is much debated, but at a minimum it requires that whatever border measures are used must give the same treatment to foreign producers as to imports. The tax charged at the border must equal the 'tax rebate' enjoyed by foreign producers from not complying with carbon emission legislation. The authorities must know the amount of carbon emitted that would have been taxed in the home country and the price at which this carbon was emitted. This implies the calculation of the embedded carbon content in imports, a notoriously difficult exercise. The uncertainties that arise from the calculation may invite stakeholders to influence the process by information provision and advocacy for the choice of particular methodologies. The implementation problem is therefore linked intimately to the question of

how accurately we can measure the embedded carbon content and how the inherent uncertainty will invite stakeholders to influence trade policy.

## Identifying sensitive sectors

BTA schemes are discussed at a general level currently, under the assumption that if needed the tedious details of implementation can be worked out later. The EU has provided some indications of how sensitive sectors to be protected by BTAs might be identified. It reached a compromise on the future functioning of its ETS in April 2009. The compromise includes a procedure to identify sectors deemed sensitive to international competition in the event that carbon emissions become costly. It is very likely that the identification of sensitive sectors for BTA purposes will follow a similar procedure.

The European Commission will develop a list of sectors deemed sensitive on the basis of specific criteria. The list will be subject to a formal review every five years, but the Commission nevertheless may change the list on a yearly basis either on its own initiative or at the request of a member state. The Commission is furthermore obliged to consult stakeholders, including potentially concerned industries, which thereby get a formalized link to the implementation process that they may use as a lobbying device. The criteria to be used to identify sensitive sectors include thresholds for the direct and indirect additional costs induced by the implementation of the ETS system and thresholds for the intensity of import and export competition. Other criteria include the ability to pass on the costs of regulation to downstream economic agents and consumers.

An unpublished paper by the Commission discussed the methodology further and included a list of sectors that have provided or will provide information for the analytical process. The Commission's list is reproduced in table 1.

Table 1. Identification of sensitive sectors in EU policy process

Sectors currently being analyzed	Sectors that have provided information	Sectors that have announced that they will provide information
Aluminum	Ceramics	Man-made fibers
Steel and iron	Chemicals	Starch
Cement	Pulp and paper	Boards
	Magnesite and graphite	Manganese
	Potassium	Nickel
	Refineries	Expanded clay
	Zinc)	Textiles
	Tires	
	Copper	
	Glass	
	Aviation	

*Source:* European Commission (undated).

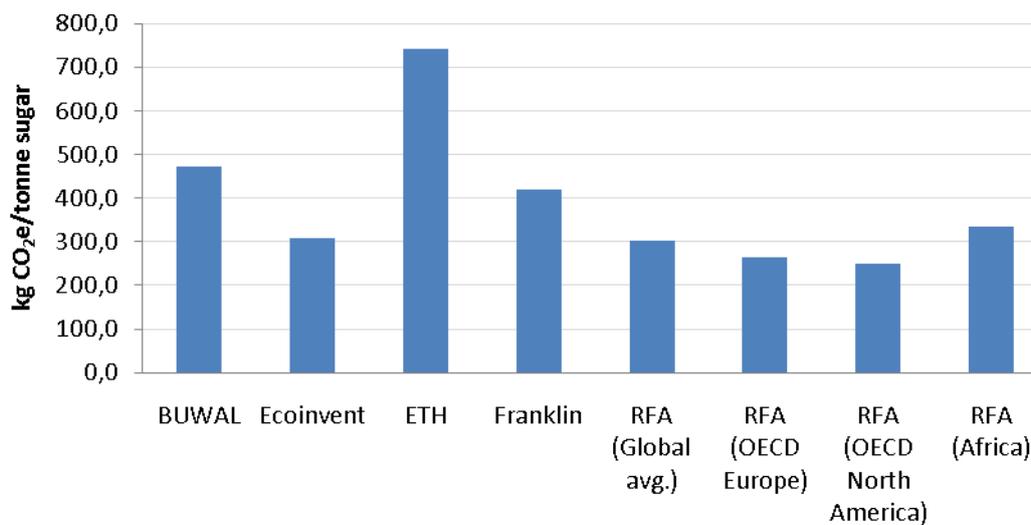
Note that the list contains more sectors than the ones normally identified by academic papers discussing competitiveness issues and carbon leakage. These additional sectors include tires, starch, man-made fibers, and textiles. The first two of these are agriculture-based, although the competitiveness concerns presumably are about energy use at the manufacturing level, while the latter are known for the extensive use of protectionist regimes in the past.

## Calculating embedded carbon

The ‘tax rebate’ enjoyed from not operating under carbon emission limits depends on the amount of carbon emitted that would have been taxed in the import country. As the types of climate policy under discussion currently seek to regulate energy-related carbon emissions, a calculation must be made of the embedded carbon emitted that can be linked to the untaxed energy consumption. This calculation will be done using a variant of life-cycle analysis (LCA). In an LCA, the total effect of a variable, in this context carbon that is taxed in the importing country, is measured throughout the supply chain, and the result when applied to carbon emissions is known as the carbon footprint of a product. For BTAs only carbon that has been taxed in the importing country may give rise to a cost advantage, therefore only taxed carbon is included in the carbon footprint for BTA purposes.

LCA is an evolving science. There are a number of competing methodologies that all depend on a large amount of information generated by actors in the supply chain. A recent World Bank study on the carbon footprints of food imported from developing countries analyzed the influence of data availability and methodological uncertainty on the carbon footprint calculations of export products (Brenton et al. 2009). The uncertainty pointed out by the World Bank study was partly specific to the agricultural products being studied but contained information relevant for other sectors. It showed a concerning lack of consensus about even very basic emission figures. This is illustrated in figure 1. The figure shows emission data for transport using a 16-ton truck, the most commonly used size. The emissions are measured in CO<sub>2</sub> equivalent (CO<sub>2</sub>e) units, which represent the global heating potential of all greenhouse gases emitted as if they were all carbon dioxide. Even for such a common variable in LCA, the available databases show a very large variation with the highest figure being roughly three times as large as the smallest one. The study furthermore pointed out that data was mainly available only in OECD countries. The generic data often used represented developing country conditions poorly.

Figure 1. Variation between different datasets in carbon emissions produced from transporting 1 metric ton of sugar 2,000 kilometers by road in a 16-ton truck



Data source

Source: Brenton et al. (2009).

Notes: BUWAL = Swiss Agency for the Environment, Forests and Landscape; ETH = Swiss Federal Institute of Technology, Zurich; RFA = Renewable Fuels Association.

**[[AU: Pls check abbreviations as defined in note.]]**

BTAs have so far been discussed mainly in relation to a number of heavy industry products such as steel, aluminum, paper, glass, chemicals, and electricity. Calculations of embedded carbon for these products are also subject to methodological disagreements among LCA analysts and depend extensively on data not commonly available. The extent of this uncertainty and the consequences for BTA schemes are not well known, as this aspect remains unexplored in the literature and policy discussions on BTAs. However some evidence does exist.

The variability of estimates make methods like triangulation, where outcomes are compared and averages sought using different assumptions and methodologies, common in scientific studies. Sensitivity analysis is also commonly applied in LCA for heavy industry use. This is an initial indication that estimates are made with a considerable degree of uncertainty. The diversity of production processes available is high. In aluminum, for instance, commonly reported emission factors range from 15 to 20 CO<sub>2</sub>e per kilogram of produced aluminum. The carbon footprint of a planned aluminum smelter in Greenland has been estimated at only 5.92 CO<sub>2</sub>e per kilogram of produced aluminum, mainly due to newer technology and access to carbon-efficient hydro-generated electricity (Schmidt and Thrane 2009). This also highlights the importance of the source of electricity, which depends on the source and technologies used. Hydro, wind, and nuclear power are much less carbon intensive than coal and oil. Another dimension is added when recycling is considered. Aluminum is well suited to recycling, and recycled aluminum only produces 5–10 percent of the carbon emissions of virgin aluminum.

The complexities involved increase as one moves away from raw materials and into more downstream products. The complex nature of global supply chains necessitates a calculation of where particular energy-related emissions take place and the associated cost saving if the emissions take place in countries with lax emission reduction targets. In the globalized economy this becomes a daunting task. Suppliers are typically shifted frequently and the basic information about input use including energy sources is not traded alongside the product.

The EU has acknowledged some of the administrative difficulties and costs resulting from the calculation of embedded carbon. The Commission has discussed the need for harmonizing member state procedures for monitoring, reporting, and verification in its ETS. More importantly, the Commission has also proposed to exclude small combustion installations from the scheme, because they would have difficulty dealing with the administrative burdens (Nordström 2009). Note that costs may increase in a multitude of ways when regulations such as BTAs are implemented. The costs alone of recording input use and emissions data can be considerable and may pose resource problems for companies in developing countries with little access to technical know-how. The Boxer Substitute Amendment of the Lieberman-Warner Climate Security Act discussed in the U.S. House of Representatives in the spring of 2008, for instance, requires foreign producers to track embedded carbon in the goods transported to the United States (van Asselt, Brewer, and Mehling 2009).

The opportunities offered for alternative use of data and calculation methodologies can be surprising. A BTA scheme may also risk carbon leakage, despite the fact that carbon leakage was the very motivation behind the scheme. Major developing country carbon emitters like China only export a very low percentage of their total production of targeted goods. The U.S. shares of total Chinese exports of aluminum, steel, paper, cement, and basic chemicals are all under 3 percent (Hauser et al. 2008). Thus, a simple reorganization of production whereby only exports using low-carbon energy such as hydro and nuclear energy are exported to the United States would make China comply with emission limits, naturally with no effect on global emissions. In this instance carbon emission would leak out of the regulatory influence within the exporting country.

The uncertainties involved may grant a greater role for politics and a smaller role for science and expert advice than commonly thought. Frankel (2008) offers the policy advice that implementation decisions should be delegated to independent panels of experts, rather than being made by politicians. However, the neutral role of experts is greatly reduced if science alone cannot determine universal values of key parameters such as embedded carbon. With competing methodologies and alternative datasets available, several scientifically correct estimates may be given and the choice between them cannot be made on the basis of science alone.

## The political economy of uncertainty

Uncertainty is caused by the long list of subjective judgments that has to be made in the process of implementing a BTA scheme. There are not only rights and wrongs in the choice of methodology and in the use of alternative datasets. High commercial stakes on the outcome of

the policy process invite rent seeking through the provision of data and influencing the choice of methodologies. The more elements of uncertainty are included, the more entry points exist to influence the policy process. The risk of capture by vested interests therefore increases with the complexities of supply chains including how far downstream in the supply chain BTAs are applied.

The uncertainty also becomes a key factor in the ongoing identification of sensitive industries. The identification process will be influenced in two directions, both fuelled by uncertainty, namely vertically (to include downstream products in the supply chain) and horizontally (to include new products).

Most observers recommend that BTAs only be applied to a relatively small number of raw materials emerging from heavy industries such as steel, aluminum, ceramics, chemicals, and paper. But the definition of a raw material is a blurry one. The drafts of legislations and other regulatory processes do not clarify the targets of the BTAs they discuss but typically leave the decision on limiting the scope of the BTAs to the implementation phase. The climate change policy proposal currently being discussed in the U.S. House of Representatives, for instance, leaves it to the initiative of the president to set the scope, which could mean the Environmental Protection Agency.

Aluminum offers an example of the difficulty of defining what constitutes a raw material. Aluminum is commonly mentioned because of the high energy intensity of its production. It does not exist in its pure form, but is manufactured from the ore, bauxite. Bauxite is first refined into alumina, which becomes itself the raw material for primary aluminum production. Primary aluminum is then commonly blended with quantities of iron, silicon, zinc, copper, and magnesium to produce aluminum alloys. The alloys are cast, rolled, extruded, or go through some other primary processing and become one of an extended family of inputs and finished products that contain aluminum. The content of embedded carbon varies. It is very high in a product like household aluminum foil. However, it is next to nothing in electricity, for which aluminum is used as a conductor in transmission lines because it can carry twice as much electricity per weight unit as copper.

Thus, we have a long series of products in which embedded carbon falls as we go downstream in the supply chain. All of these products may be traded including the bauxite ore and the intermediate raw material alumina. In particular, trade takes place because the aluminum smelters are not located where the ore is, but rather where the cheapest sources of energy are. From a climate change mitigation perspective, a BTA should be imposed while the embedded carbon content is still relatively high and for reasons of administrative ease at a point in the aluminum supply chain before products get too complex. The problem is that this precise point is difficult to identify. Is it before or after aluminum is alloyed with other materials? Or before it becomes an input into the car frame, or only after the car frame has been put on the car?

When facing production processes where the embedded carbon falls incrementally, we can foresee great difficulties for policy makers to decide where to draw the line. Many actors with a financial stake in the decision will be willing to help them. The line eventually drawn will create incentives in the countries affected by BTAs to process a few steps further than the cut-off

point. Naturally, this will cause producers in the country imposing a BTA to react. It will be difficult for policy makers to resist producers' calls for carbon protection as their arguments will be identical to the ones originally accommodated by the BTA—except that the amount of embedded carbon would now be slightly lower. This would set in motion a process of instability for the BTA scheme where the incentives to process further would lead to calls for an extension of the BTA scheme, which then in turn would lead to new incentives to process further and so forth. Presumably there is some point at which this political economy process will stop, some point where the embedded carbon content becomes so low that no one bothers or the regime implementing the BTAs becomes strong enough to resist demands. However, contrary to the (implicit) assumptions of some academic writers and many policy makers, there is no guarantee that this point will be before we are so far downstream the aluminum supply chain that the BTA scheme becomes very heavy in data requirements.

There is also a political economy risk of expanding protection horizontally. This risk is partly linked to the potential for manipulating the calculation of carbon footprints through methodology choices and through provision of favorable datasets. It is also linked to the erosion of the original argument for addressing competitiveness concerns. The first argument used is that we need to compensate heavy industry raw material producers because they face ETS-induced cost differentials over a certain threshold. That threshold is difficult to establish, and vested interests will produce arguments to lower it. The establishment of BTAs is equal to an acknowledgement of the political acceptability of adjusting for ETS-induced cost differentials. It will soon be difficult to resist similar arguments for adjusting for cost differentials caused by other types of climate change policy. This would mean the inclusion of policies targeting sectors not covered by the ETS. In the EU, for instance, less than half of total emissions are from the installations covered by the ETS. There is even a risk that if we establish a precedent for correcting for cost differentials induced by climate change policy, policy makers will find it hard to resist calls for correcting for the cost influences of other environmental policies. And the argument may be extended further to social or other policies. This list of regulations that have differentiated cost effects across borders is a very long one. BTAs may put policy makers on a slippery slope.

## Conclusions and identification of knowledge gaps

The text above reviews some problems with measuring taxed, energy-related, embedded carbon and discusses the likely political economy consequences of uncertainty. BTAs are a much-discussed but poorly defined policy instrument and we know little about its implementation. On one end of the spectrum, voices claim that BTAs can be measured out easily on a few products central to competitiveness and carbon leakage concerns. According to this view, this would level the playing field, install a sense of confidence in climate change policy among the public in general and concerned industries in particular, and even pressure reluctant nations to the climate negotiation table. On the other end, there is a range of methodological and data problems that will serve as an invitation for political battles. The problems identified may make the first view sketched above look naive. The political economy forces may drive legislators to the design of new 'anti-carbon dumping agencies' that will operate under great political pressure

while making a long series of subjective choices about methodology, data, processing, and trading practices.

So the big question is: are BTAs leveling or mining the playing field?

Answering this question will require knowledge about the feasibility of BTA schemes that have so far not been produced. We simply do not know much about implementation difficulties of BTA schemes. In particular, the scientific community developing the underlying measurement methodology, LCAs, is not in contact with the economists and lawyers currently analyzing a range of other issues regarding LCAs. We have a large and largely ignored knowledge gap that can be filled by research combining LCA expertise, political economy knowledge, and supply chain knowledge.

It is unclear whether the administrative difficulties and costs of BTAs are worth the trouble compared to the gain of reducing carbon leakage and losses of competitiveness. This question can only be answered by knowing both sides of the equation. Carbon leakage and competitiveness issues have been analyzed extensively but the implementation side is left out of the analysis. Filling the knowledge gap identified above would contribute towards correcting this imbalance. It would make policy makers better aware of what they are adopting if accepting a BTA regime.

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