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Border Carbon Adjustment: Not a Very Promising Climate Policy Instrument

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Introduction: Border Carbon Adjustments and Reasons for Implementation

While a globally uniform price on carbon would be efficient to reach a given emission target from an economic point of view, carbon pricing so far is only fragmented. In Europe, the EU Emission Trading System (ETS) generates a carbon price for energy intensive industries; climate policy outside Europe remains "piecemeal", with only some other countries giving producers a price signal to avoid emissions through direct or indirect climate policies. The principle of "common but differentiated responsibilities" to reduce emissions has been endorsed in the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, however the emissions of regions without emission reductions requirements now exceed emissions from regions with reduction requirements (Annex I countries). Future climate policy should therefore also reach out to those emissions today uncovered.

Differences in the carbon price between countries can potentially lead to relocation of production and emissions. Such "leakage" reduces the effect of emission reductions as part of the emissions are not reduced but shifted to another location. On a similar account, the fragmented carbon prices can lead to losses in international competitiveness for firms covered by a carbon pricing regime. Fears of competitiveness losses and leakage are most prominently voiced in sectors which can be characterized as energy-intensive and trade-exposed (EIT). If energy prices are increasing, these sectors lose competitiveness vis-a-vis their foreign counterparts not subject to a carbon price. Especially sectors whose output is heavily traded on international markets are subject to a higher risk of relocation. Production relocation could then result in reductions of employment in regulating countries.

As a supplement to unilateral climate policy, border carbon adjustments (BCA) are proposed as a measure to reduce the negative impacts on competitiveness and to induce lower leakage rates. BCAs would require foreign producers importing into a country with carbon pricing to either buy carbon allowances or to pay a price for the embodied CO_2 emissions at the border. The embodied emissions refer to the emissions caused but the production process of the imported good. This leads to an equalization of carbon prices from the producer's view, and reduces the risk of relocation. In order to also avoid that firms are at a competitive

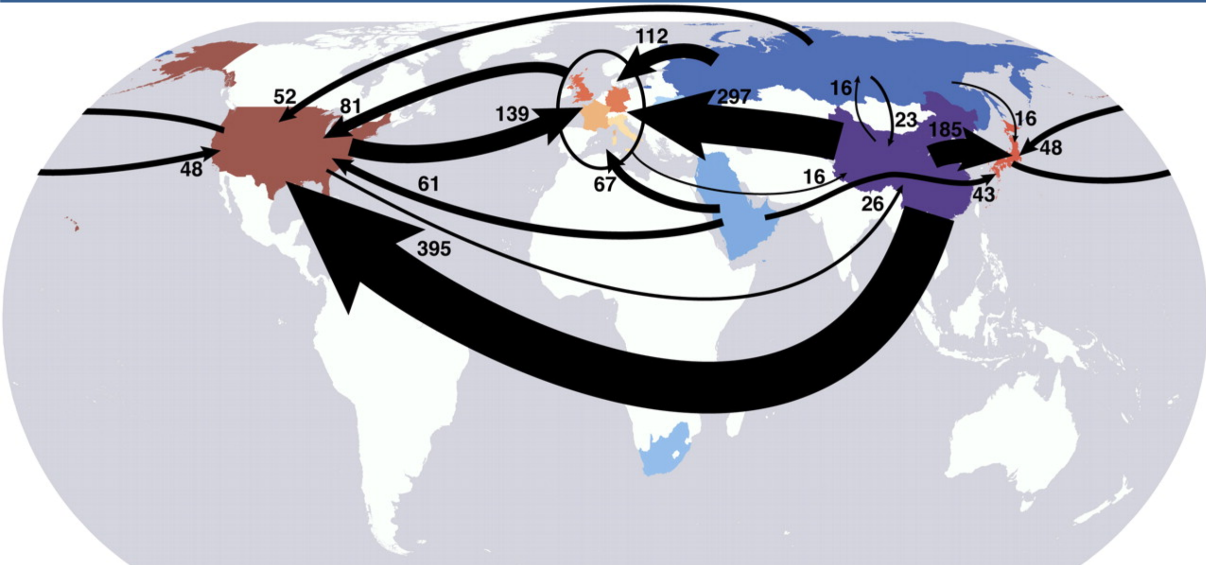
[1] This Kiel Policy Brief is based on a recent model comparison study (Böhringer et al., forthcoming b), in which the Kiel Institute for the World Economy participated with their DART model (Weitzel et al., forthcoming). This Policy Brief draws on fruitful discussions with experts and policy makers during an RFF/ENTWINED workshop in Washington, DC in September 2012.

disadvantage when competing to sell on markets in non-regulated regions, export rebates for the cost of carbon embodied in exports can supplement border measures on imports ("full BCAs"). Full BCAs would mimic emission pricing on a consumption basis because all goods consumed in the regulated region would be subject to the same carbon price. This broadening of the basis for carbon pricing to imports of the regulated region leads to global efficiency gains which can serve as justification for BCAs.

If BCAs were to be implemented, questions remain how to calculate the emissions embodied in traded goods. In general, there exists a trade-off between a practical approach and more complete inclusion of emissions (Böhringer et al., forthcoming a). The most complete calculation would not only include direct emissions from the production process of the final good but also emissions caused by the production from (all) intermediate inputs that enter the production process. Figure 1 shows the overall emissions embodied in trade flows between selected regions. While developed countries (e.g. USA, EU, and Japan) are net importers of CO_2 embodied in trade, China is the largest net exporter. BCAs can be understood as tariffs levied on these trade flows. (Net) exporters of carbon (blue regions in figure 1) would thus be faced with a tariff and can be expected to lose.

Sometimes BCAs are also seen as a potential threat in climate negotiations in order to induce a broader participation in a climate regime. The idea behind this is that countries are better off joining a climate coalition rather than being faced with BCAs. There are however legal issues mainly associated with WTO regulations that might render such an approach infeasible.[2]

Figure 1:
Emissions embodied in trade for selected countries and regions (Mt CO_2 accounting for emissions of all intermediate inputs for the year 2004).



Source: **Davis et al. (2010).**

[2] Legal issues are not discussed in this policy brief, see Böhringer et al. (forthcoming a) and Cosbey et al. (2012) for a more detailed discussion on practicability and legality of BCAs.

A recent modelling comparison with 12 participating economy-climate models (Böhringer et al., forthcoming b) analysed the effects of border carbon adjustments. Core of the analysis were the effectiveness of BCAs to reduce leakage, the scope for efficiency gains through BCAs and the burden shifting from a climate coalition (in the simulation consisting of all Annex I regions except Russia) to non-abating regions. In a more specific paper, Weitzel et al. (forthcoming) disentangle the sources for burden shifting into an environmental and strategic effect. In this Policy Brief, we present some findings of the model comparison and draw policy conclusions.

Efficiency of BCAs

BCAs can improve global efficiency, i.e. the total cost of reducing global emissions to a given target. This is because BCAs broadens carbon pricing of unilateral climate policy and CO_2 emissions are subject to carbon pricing not only for goods produced at home, but also stemming from the production of imported goods. As the model comparison shows, the global cost savings are however only moderate. For a (relatively modest) emission reduction scenario in which all Annex I countries reduce their 2004 emissions by 20 %, BCAs reduced the total abatement costs by on average 8.5 %, i.e. less than one fifth (with a range of close to 0 to 18 % in the different models). Since the models ignore any implementation costs for BCAs (such as calculating embodied emissions for a given good and levy the carbon price at the border) cost savings in reality are likely to be even lower. In general, better targeting of emissions embodied in a traded good (i.e. by approaching the total amount of emissions along the whole production process) leads to somewhat higher efficiency gains, but again, this comes at the trade-off of higher implementation costs (Böhringer et al, forthcoming a).

One reason for the only modest efficiency gain is that BCAs are a relatively blunt policy instrument. Instead of being a tax on the carbon content of inputs, BCAs are levied on the final good, i.e. constitute an output tax. Targeted taxes on emissions would give producers a signal to avoid these in the production process if this is less costly than paying the carbon price. If the tax is levied on the final output however, this signal is blurred. Ideally, BCAs could be designed such that individual producers receive the full signal. This might however not always be practical, as individual firm specific carbon coefficients might be costly to obtain. If a country average is used, then there is a smaller incentive for the individual firm to reduce emissions.

The model comparison revealed that other policies aiming at increasing internal efficiency of the existing emission trading systems have a potential for higher efficiency gains (Springmann, forthcoming and Lanzi et al., forthcoming). Possible avenues for improving the current systems' efficiency are extending the sectoral or regional coverage. This is a target that the EU is already aiming for. In the communication in advance of the 2009 COP conference in

Copenhagen the EU commission stated “the EU should reach out to other countries to ensure an OECD-wide market by 2015 and an even broader market by 2020.”[3] Along this line, the EU is currently negotiating to link the EU ETS with the Australian counterpart. The use of the Clean Development Mechanism also can serve as an indirect link to countries without reduction targets as the price signal is conveyed on international carbon markets.

Environmental Effectiveness and Leakage Rates

Environmental effectiveness of unilateral climate policy is reduced when emissions which are avoided in the regulated region are emitted elsewhere. The amount of emission increases outside the coalition relative to the reduction inside the coalition is referred to as leakage rate. The model comparison results show that BCAs reduce leakage rates from 5–19 % to 2–12 %.[4] Mainly this is due to the effect that production relocation is reduced and carbon intensive imports do not have an advantage over domestic production under BCAs. This holds for a scenario with relatively modest climate policy. More stringent climate policy therefore leads to higher leakage rates but also a higher impact of BCAs.

However, there is a second channel through with leakage occurs. If emissions are reduced in some regions unilaterally, global energy demand will reduce. This leads to lower energy prices globally, which in turn leads to rebound effects as lower prices lead to a more energy intensive production in unregulated regions. This shift to a more energy intensive production occurs in all sectors. Despite the finding that the fossil fuel price change dominates the production relocation channel, leakage from the former channel cannot be efficiently addressed with BCAs (Boeters and Bollen, forthcoming).

Furthermore, BCAs are proposed to target specific sectors and could realistically only be based on less than full-lifecycle embodied CO_2 emissions. Incomplete coverage thus not only comes at a cost for efficiency, but also for reduction in leakage; although the impact from different policy designs is found to be rather small.

Strategic Use of BCAs

While BCAs are not able to deliver large cost savings or leakage reductions, BCAs are able to considerable shift the adverse welfare effects from regions with to regions without climate policy. BCAs shift the burden because the import tariffs improve the terms of trade in favour

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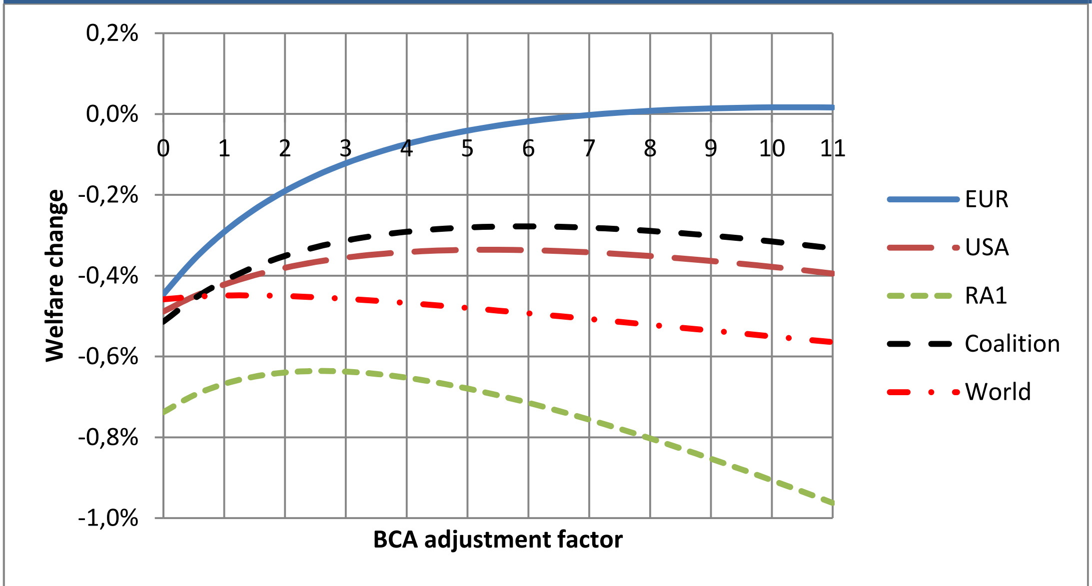
[3] See EU COM (2009) 39 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0039:FIN:EN:PDF).

[4] The macro results are shown to be robust on the sectoral aggregation. However, for a few, very narrowly defined sub-sectors which are more energy intensive and trade exposed than the average EIT sector there can be a more pronounced risk of production relocation (see Caron, forthcoming).

of the climate coalition. Furthermore, if the coalition is aiming for a given global target (as in the model simulation) the coalition has to abate less at home when leakage is reduced. Hence, there are two channels though which a climate coalition can benefit when implementing BCAs.

As there is considerable leeway in the design of BCAs (e.g. what emissions to include or whether to calculate them on firm or country level), the question arises what design would be in the interest of a climate coalition. In our simulation we assume that the climate coalition consists of all Annex I regions except Russia. Figure 2 shows the welfare changes relative to a scenario without any climate policy in the coalition regions as well as for the coalition and the world as a whole.[5] On the horizontal axis we vary the BCA rates by multiplying the carbon price in the coalition with a fixed factor, such that zero stands for no border adjustments and unity for the carbon price in the coalition levied on the direct emissions and indirect emissions from electricity only. Without BCAs, all regions suffer a welfare loss, Europe (EUR) being least affected while the composite region RA1 (Rest of Annex I except Russia) suffers most. Implementing BCAs (i.e. moving from zero to one on the horizontal axis in figure 2) leads to a reduction in the welfare losses for all countries. Europe benefits most from BCAs, almost halving the (relatively small) welfare losses from climate policy without BCAs.

Figure 2:
Discounted and cumulated welfare changes until 2020 relative to a scenario without climate policy. BCA adjustment factor of zero means no BCA, BCA factor of 1 means BCAs at the carbon price of the climate coalition.



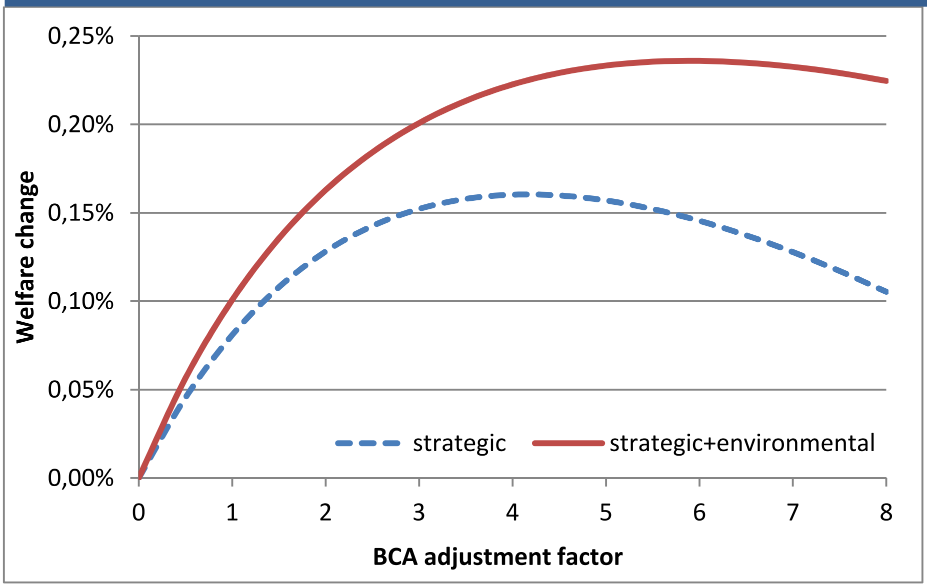
[5] We do not include damages from climate change, hence this cannot serve as a cost-benefit analysis on how much climate policy is optimal. Rather we show the change relative to the baseline without climate change to relate the gains from BCAs relative to the cost of climate policy.

From the figure it is obvious that for all regions in a climate coalition there is an incentive to overstate emissions embodied in trade and to levy BCA rates higher than justified by simple calculations. The level which maximizes welfare differs across regions and is highest in Europe, but for all coalition regions under consideration in our study, throughout 2020 the incentive is given to increase the BCA rates. While global welfare is increased until BCA rates of slightly above the carbon price in the climate coalition (we do not include full life cycle CO_2, i.e. CO_2 emissions associated with production inputs other than electricity), for rates above this point only welfare redistribution occurs but no (global) efficiency gains. Coalition regions hence gain at the expense of non-coalition regions. Thus it is necessary to ensure that this policy measure is not misused as a substitute for backdoor trade policy.

It is also possible to disentangle the strategic (terms of trade gains) and the environmental (reduction of leakage) motives of BCAs. This is done by comparing a scenario in which global emissions are held fixed (coalition countries can emit more domestically if leakage is reduced and thus have lower abatement costs) with a scenario in which coalition emissions are held constant (coalition cannot exploit leakage motive by emitting more at home, but is still making use of the terms of trade effect). Thus the first scenario is capturing the total effect, while the latter singles out the strategic effect and switches off the environmental motive.

Figure 3 shows that the for the climate coalition the strategic effect dominates the environmental effect at BCA rates equal to the carbon prices in the coalition. This also explains why coalition countries are better off with BCA rates above those that maximize global efficiency. Only for very high rates does the environmental effect become more important than the strategic effect. This holds for all sub-regions in the coalition, the highest share of strategic effect for a BCA equal to the carbon price in the coalition can be observed for Europe.

Figure 3:
Welfare changes for the climate coalition at different BCA rates.



Since the strategic gain of the climate coalition comes at the expense of the non-coalition, we check whether BCAs can be designed in a way to make non-coalition countries become indifferent between being faced with BCAs and joining the climate coalition. Generally the welfare losses from BCAs differ significantly across non-coalition regions and mainly driven by globally reduced fossil fuel prices and energy demand. Especially Russia and other energy exporting countries suffer, while the welfare losses for energy importing countries like China or India are only modest. While the former therefore would prefer a (global) coalition over BCAs, the latter would not. Even rather high BCA rates would not change this significantly. Only additional compensation payments could make China and India equally off under a global climate coalition than with being outside and facing BCAs. However, if BCAs serve as a credible threat, compensation required compensation payments are smaller than in the absence of such threat. Without this threat, compensation payments need to achieve equally well outcomes for scenarios with a global coalition and being outside the coalition without facing BCAs.

Discussion and Conclusions

The model comparison shows that border carbon adjustments (BCA) can only be expected to lead to moderate (global) efficiency gains and reductions in leakage. This is mainly due to a relatively blunt implementation – more specific calculation can help to improve BCAs, but this comes with the downside of higher implementation costs. BCAs could however be exploited as a backdoor trade policy instruments since it leads to terms of trade gains.

While in the model comparison countries facing BCAs are assumed not to take counter-measures, this must not necessary be the case in reality. The inclusion of aviation into the EU ETS can serve as an example. Its nature is very similar to BCAs because extraterritorial emissions are treated under EU legislation. Rather than waiting for the success of an international approach under the International Air Transport Association (IATA), the EU went ahead and included emissions from aviation into the EU ETS starting from 2012. The emissions regulated include the full flights to and from Europe, not only intra-European flights or the part over European air space. Only if other countries have comparable legislation on aviation, there can be exceptions to avoid double taxation. Despite the fact that initially a share of 85 % of emissions are handed out for free and emission prices currently are low, there is strong opposition, especially in China and the USA. The USA is currently in the process to pass a law prohibiting US aviation firms to buy emission rights. Similar opposition could arise due to the implementation of BCAs in industrial sectors.

Especially if BCAs are used to strategically change terms of trade in favour of countries in a climate coalition, this might potentially back-fire also because the WTO is likely to allow BCAs only for environmental reasons. Furthermore, BCAs do not work very well as a threat to induce more countries to join a climate coalition. It could overall well be the case that BCAs are not a building block for a large-scale global agreement but rather a stumbling stone. Furthermore, BCAs are commonly proposed with a clear division of regions engaging in climate policy and those who abstain from it in mind. Climate policy in recent years has however weakened this clear distinction between Annex I and non-Annex I countries. For example, China and other developing and emerging countries have taken on (non-binding) commitments in recent climate negotiations. Also since explicit carbon prices are not directly comparable to measures such as renewable energy promotion an objective calculation of BCA rates would further be hampered. BCAs could reinforce the division into Annex I and non-Annex I rather than coming closer to global climate agreement which includes emissions also from emerging economies.

Given the limited efficiency gains and leakage reduction, we do not consider BCAs as an instrument of choice in international climate policy. Policies aimed at broadening the basis of carbon pricing and aiming as much as possible for a single carbon price, e.g. though linking of different emission trading schemes or extension of CDM are better suited to reduce emission leakage and negative competitiveness effects. Also, empirical evidence, e.g. in the context of the European Emissions Trading Scheme shows that negative competitiveness effects of unilateral climate policy need not be dramatic. Probably the better choice in the moment is to accept some leakage and at the same time strive for larger climate coalitions.

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