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Possible carbon adjustment policies: An overview

Cecilia Bellora & Lionel Fontagné,

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CEPII
20, avenue de Ségur
TSA 10726
75334 Paris Cedex 07
+33 1 53 68 55 00
www.cepii.fr
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Possible carbon adjustment policies: An overview

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DIRECTORATE-GENERAL FOR EXTERNAL POLICIES
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European Parliament

BRIEFING

Possible carbon adjustment policies: An overview

ABSTRACT

The new European Commission has announced policies to reduce greenhouse gas emissions drastically. Reaching an ambitious target for a global good – the climate – would require a common price for carbon worldwide. This however clashes with the free-riding problem. Furthermore, unilateral policies are not efficient since they lead to carbon leakages and distort competitiveness.

To tackle these issues, the European Union can rely on different policies. Firstly, a carbon pricing of imports can combined with an export rebate to constitute a 'complete CBA' (Carbon Border Adjustment) solution. Alternatively, a simple tariff at the border can compensate for differences in carbon prices between domestic and imported products. A consumption-based carbon taxation can also be contemplated. Last, a uniform tariff on imports from countries not imposing (equivalent) carbon policies may help solving the free-riding problem.

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Authors: Dr. Cecilia Bellora and Prof. Lionel Fontagné, Centre d'Etudes Prospectives et d'Informations Internationales (CEPII)

Official Responsible: Mario DAMEN

Editorial Assistant: Jan MUYLDERMANS

Feedback is welcome. Please write to: mario.damen@europarl.europa.eu or wolfgang.igler@europarl.europa.eu.

To obtain copies, please send a request to: poldep-expo@europarl.europa.eu

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1 Introduction

The European Union (EU) initially sought to reduce its emissions through unilateral and international commitments (in particular the Paris Agreement), implemented through a cap and trade system applied to carbon-intensive industries. The new Commission, in office since December 2019, has announced more ambitious policies aiming at drastically reducing GHG emissions in the near future. Carbon neutrality in 2050 is the ultimate target of a series of complementary policies, with an intermediate target for 2030 of 40 % reduction in emissions compared to 2005.

Reaching such a target for a global good (the climate) with minimal distortions would *a priori* require imposing a *common price for carbon worldwide*. There are many reasons why this may not be feasible. In particular, rich countries have accumulated a stock of emissions over the past centuries and should support a stronger effort, while poor countries need to catch up in terms of income in order to reach the technical level they need to efficiently cap their emissions.

However, a differentiated approach faces several intrinsic obstacles:

- The EU contribution to worldwide emissions is too limited to make a meaningful difference if other big players adopt different policies.
- Alleviating the global threat on climate reduces incentives for other countries to engage in similar policies. There is an incentive compatibility problem: the last country to implement a climate policy would benefit from inaction. It would attract activity (direct leakage hypothesis) and carbon-intensive firms (pollution haven hypothesis), benefit from lower energy prices (indirect leakage hypothesis) and benefit from a cost advantage (level playing-field argument).
- The free-riding would increase the effort required of the EU to reach a given reduction in global emissions.
- This policy has negative impacts on the competitiveness of EU production in emitting sectors and, potentially, in downstream sectors as well. Therefore, European firms may lose competitiveness both in their domestic markets and in third markets (exports).

To sum up, unilateral carbon policies face distortions caused by two different types of players: countries that free-ride and producers that choose where to produce according to the differences in relative prices of carbon. Ideally, policymakers need two different policy instruments, one for each problem.

Thus, not only will a *local* policy (restricted to EU member states, for instance) hardly fix a *global* issue, but the inaction of non-participating countries will render this policy ineffective.

Central to this discussion is a problem of carbon leakages.

- *The direct leakage problem* can be explained as follows. In Europe, sectors under constraint displace their production in regions where the constraint is less binding (or even absent). In such cases, imports of goods produced in opting-out countries just replace domestic production in the EU. The global emissions due to production do not decrease (unless production technologies abroad are less GHG-emission-intensive than in the EU), while transportation produces additional emissions.
- *The indirect leakage problem* is related to energy markets: by reducing their demand in fossil energy, regulating countries depress its price, which leads indirectly to higher emissions by non-constrained countries (Felder & Rutherford, 1993; Böhringer, Voß, & Rutherford, 1998)[1]. These additional emissions constitute the 'indirect leakages'. Curbing emissions in Europe results in reduced demand for fossil fuels worldwide. Since the EU is a large importer of fossil fuels, its reduced demand leads to decreasing prices on international markets. Facing lower prices for fossil

[1] Felder & Rutherford (1993) and Böhringer, Voß & Rutherford (1998) originally identified this source of leakages.

fuels, all the regions that do not implement an environmental policy increase their use of fossil fuels and, as a result, their GHG emissions.

The current state of the relevant policies in the EU is as follows:

- The EU currently regulates emissions from the energy-intensive manufacturing sectors and from power and heat generation through the Emission Trading Scheme (ETS).
- Free allowances were initially granted to high-emitting industries in order to smooth the cost of enforcing this new policy and alleviate the induced competitiveness issue.
- Member states implement national carbon taxation systems that mainly deal with services and non-tradeable goods (housing, transport).
- No measures at the border have yet been introduced.
- The EU is facing a dynamic problem: reducing emissions today is less expensive than reducing emissions tomorrow, meaning that one might prefer a *higher* contemporaneous price of carbon in order to curb emissions as soon as possible, which goes against acceptability and competitiveness in absence of adjustment at the border.

Against this background, the EU Commission needs to design a *new policy* aiming at:

- Significantly *reducing European emissions* (meaning that its impact on production and consumption must be visible),
- *Addressing leakages*,
- *Incentivising* other countries to join its efforts.

We review in this note the possible policies at stake and their economic and environmental consequences.

2 The different policy options

Beyond the cap and trade system that is currently in force, the measures that the EU can now contemplate and combine are as follows.

2.1 Measures implemented at the border

- *Carbon pricing of imports:* the EU imposes a carbon price on its imports. *Importers have to pay an import tax. Alternatively importers have to purchase EU ETS allowances*. In both cases, this is typically what is called Carbon Border Adjustment (CBA), although the term can be used with different meanings in the related studies. This instrument *partially* tackles the competitiveness issue and the direct leakage problem. The base of the ETS allowances or of the tax is subject to debate. Ideally, the amount to be paid by importers should be based on the carbon content of the imported good. However, the carbon content of imports is notoriously difficult to measure, in particular in the case of complex value chains. Using alternative and observable bases like the average carbon content of the same product in the EU would strongly reduce the effectiveness of the instrument. Note that when importers buy allowances in the ETS, they directly influence ETS prices and, hence, the costs for domestic producers.

- The previous instrument can accordingly be combined with an *export rebate* (as for a VAT) to constitute the so-called 'complete CBA' solution. Hence, the complete CBA combines 'compensation' of imports and rebate on exports[2]. Combining a cap and trade system with free allowances instead of a CBA to reduce the burden on domestic producers, as done so far, is not efficient. *Free allowances act as an output-*

[2] The simple solution of capping domestic emissions with a tax and introducing a tariff at the border has been proposed in the 70s (see Markusen, 1975).

based rebate (an implicit subsidy to production), meaning that the output of emitting industries is accordingly above the social optimum in the EU (Martin et al., 2014).

- A *tariff that compensates for differences in carbon prices*. Its level is set to compensate for the difference in the carbon price used in the exporting country and the one used in the EU. It is important to note that, with respect to the World Trade Organisation definition, this is not a countervailing duty. This instrument differs from the CBA which relies on a tax or on an extension of the cap-and-trade system to importers. A tariff compensating for differences in carbon prices comprises all the limitations of the CBA (Böhringer, Carbone, and Rutherford, 2016). It would necessarily be applied on a discriminatory basis, which can be challenged at the WTO.

- A *uniform tariff on imports* from countries not imposing (equivalent) carbon policies targeting free-riders and based on the environmental exception of the GATT. To incentivise other countries limiting their emissions and implementing their own climate policy, the EU could set an additional import tax, small and uniform (a few p.p., for instance 2 %), on all goods imported from countries without policies or with policies having low ambitions[3]. This is not a carbon tax, in the sense that it is set whatever the good and whatever its carbon content. This mechanism only marginally reduces the leakage rate but the tax constitutes a *measure to incentivise countries* to join a club of countries sharing ambitious climate policies and to discourage free-riding. The additional cost for countries outside the club make them indifferent between bearing the cost of implementing a policy of reduction of emissions as members of the Club, or pay the tariff and not investing in climate policies. The advantage of such an instrument is that it distorts less (no differences across exporters and sectors) than other solutions proposed. The disadvantage is that it has little bite with countries with which trade volumes are small.

2.2 Measures implemented domestically

- *Consumption-based carbon taxation.* Taking stock of the legal uncertainties related to instruments that affect international trade, relying only on a combination of domestic instruments is an option. A carbon tax on consumption would target all goods, whatever their domestic or foreign origin. Tax revenues could be redistributed to production sectors, to support cleaner production technologies. Efficiency in terms of both mitigation and competitiveness of this instrument is balanced by political economy considerations of acceptability. Notice that although combining a tax at the border with a rebate on exports is 'like' a consumption tax[4], the two differ since taxation at the border is exerting a pressure on foreign exporters, hence strategically leading them to cut their export price.

- *A consumption tax can be combined with free allowances* (Böhringer, Rosendahl, & Storrøsten, 2019). *This combination is equivalent to a tariff if the good is imported* (Dixit, 1985). This is perfectly WTO-compatible and avoids the shift of consumption towards imported goods, thus fixing the direct leakage issue. It does not fix the indirect leakage problem.

3 Pros and cons of a CBA

A central proposal in the debate is the Carbon Border Adjustment (CBA). As said, we define 'complete CBA' here as the combination of a cap and trade system with a tariff at the border based on carbon content of products, and an export rebate. Notice that a cap and trade approach is preferable to a tax at the border

[3] Such a policy has been proposed by Nordhaus (2015).

[4] A complete BCA can be considered as equivalent to a consumption tax if i) the BCA taxes carbon at the exact same price as the domestic tax; ii) the carbon tax is fully passed onto the consumer by producers and iii) there is full rebate for exporters. Then such a combined BCA design is *a priori* equivalent to a consumption tax. Domestic producers and foreign producers pay the carbon tax when selling their products to domestic consumers, while no producer (domestic or foreign) pays the tax when serving foreign consumers.

because it is similar to the policy imposed to local producers, hence respecting the national treatment condition of the GATT.

- Pro-CBA argument #1: Game theory provides a rationale for implementing such a policy in the event of the uncooperative behaviour of non-participating countries. Because non-participating countries do not put a price on carbon, they implicitly subsidise carbon-intensive industries. A CBA would change the pay-offs of this game, meaning the benefits of non-cooperating (Helm, Hepburn, & Ruta 2012).
- Pro-CBA argument #2: A CBA would also reinforce the political acceptability of carbon taxation in regulating countries. Because imports are also taxed, it is easier to tax domestic producers.
- Pro-CBA argument#3: a CBA can fix the direct leakage problem if imposed on the actual carbon content of imports.
- Con-CBA argument#1: the actual carbon content of imports is not observable due to the complexity of value chains and because the exporter has no incentive to disclose it.
- Con-CBA argument#2: Whether such arguments match the legal constraints at the WTO is an open question that we will disregard here. But there are associated risks.
- Con-CBA argument#3: CBA will not fix the indirect leakage problem. Given the US decision to leave the Paris Agreement, the European Union must consider this argument seriously.

The efficiency of the CBA indeed depends on the policy environment on which it is implemented, in particular on the policies adopted both in the EU and in other countries. This environment has changed several times since the beginning of the 2000s, changing the potential contribution and the opportunity cost of a CBA. We structure our analysis following this evolution (the Kyoto Protocol, the ETS and the Paris Agreement), as reported in economic studies, to evaluate the relative importance of the pros and cons cited above according to the policy context.

Before moving to the survey, a brief reminder of the changes in global and European climate policies at stake is worth recalling. The Kyoto Protocol entered into force in 2005. It sets emission reduction targets for 36 industrialised countries for the period 2008-2012. To comply with its commitments, the EU put in place the ETS in 2005, covering heavy energy-using installations and, later on, internal airlines. The Doha amendment to the Kyoto Protocol that should cover a second commitment period, from 2013 to 2020, has been signed but not ratified yet. A separated instrument, the Paris Agreement, has been adopted in 2015. All the 195 parties that have signed the Paris Agreement contribute to climate change mitigation (contrary to what was set in the Kyoto Protocol), according to the Nationally Determined Contributions (NDCs) they report every five years. The European NDCs set an emission target also for sectors that are not covered by the ETS: these sectors have to cut their emissions by 30 % compared to 2005. Adding this target to the 43 % reduction in the emissions by ETS sectors result in a commitment of cutting emissions by 40 % below 1990 levels by 2030.

Only 36 industrialised countries committed to reduce their emissions under the Kyoto Protocol, such that leakages were expected to be large. In this context, a CBA should aim at reducing leakages while preserving, at least partially, European competitiveness. If we abstract now from the policies by countries other than the EU, the size of leakages depend on the level of ambition of the European climate policy and of its main instrument, the ETS. In the first phase of implementation of the ETS, the target seemed to be quite low, and leakages were expected to be small. In such a context, a CBA proves to be quite inefficient, in particular as an incentive for other countries to implement climate policies. Finally, under the Paris Agreement, climate policies should be more widespread. However, the withdrawal of the United States from the Agreement raised the question of the role of a CBA in dealing with a large country and emitter becoming a free-rider.

4 CBA under Kyoto

In 2010, a first study (Elliott, 2010) has compared a carbon emission pricing applied worldwide, a carbon emission pricing applied in Annex B countries only[5], and the latter solution combined with a complete CBA.

- A carbon emission price applied worldwide delivers a 40 % reduction in global emissions in 2020 with the highest tax rate.
- Applying the carbon emission price in Annex B countries only is much less efficient as it would achieve only one-third of the above reduction in emissions.
- There is a *leakage* here, in the range of *15 % to 25 % depending on the level of the tax (higher tax, higher leakage)*.
- A complete CBA (as defined above) changes the results as follows: production (consumption) increases (decreases) in Annex B countries and decreases (increases) in non-Annex B countries, which is the purpose of the policy.

This work has been replicated with various assumptions. Comparing the outcome of different models provides ranges for carbon leakages under the Kyoto Protocol (Böhringer, Balistreri, & Rutherford, 2012):

- The leakage rate ranges between 5 % and 19 %, with an average value of 12 %, under unilateral policies.
- Implementing a CBA reduces this to a range of 2 % to 12 %, with a mean value of 8 %.
- The CBA reallocates the abatement effort across regions and, in this respect, is cost-saving at the global level.
- CBA also helps improving the competitiveness of regulated industries, at least in their domestic markets.

An important element to assess whether the CBA is efficient as a policy is to take into account the opt-out of the United States (Babiker & Rutherford, 2005):

- With the US opting out, there are much *larger leakages (30 %)*, concentrating on the US (one-third of the leakages).
- A tariff at the border (not exactly a CBA as discussed above) barely reduces the leakage (28 % instead of 30 % globally) and has virtually no impact on the US-induced leakages (10 % instead of 11 %). This result is confirmed also under the Paris Agreement.

5 CBA under ETS

We now examine the impact of a CBA in presence of the *implementation of the ETS*, in a world where other countries do not implement any climate policy (Veenendaal, & Manders, 2008). In this framework, leakages depend on the ambition level of the EU. The numbers presented here are based on a study that assumes that the ETS target is an emission level reduced by 20 % in 2020, with respect to 1990.

- Leakages are limited, they are *estimated at 3 %*.
- A complete CBA would halve output and employment losses in the EU emitting sectors and reduce leakages to 0.5 %.
- A reason for why leakages are so small is the limited impact of the ETS with low ambition on the carbon price within the EU, with in turn limited impact on competitiveness and thus limited leakages.

[5] The Annex B of the Kyoto Protocol set binding emission reduction targets for 36 industrialised countries and the European Union, over the period 2008-2012. The countries not listed in the Annex B have no binding commitment, under the principle of the 'common but differentiated responsibility and respective capabilities'.

- Importantly, *border adjustment,* by increasing the cost of imports, can stop the increase in imports, if they are set based on the average emission of the exporting country.
- But border adjustment *does not prevent the decrease in European exports to third countries* (Kuik & Hofkes, 2010). Actually, *it even exacerbates these losses*: the European market becomes a less attractive destination for exporters, which divert their shipments to other regions, where competition become fiercer. Because of this increase in competition in third markets, EU exports of steel decrease by around 9 % with an EU ETS with a CBA based on average foreign carbon content. In the case of an EU ETS without any border adjustment, they decrease by around 8 %.
- Although *a CBA* indeed reduces leakage going through the 'trade channel' it *is not efficient in reducing overall leakage since it does not address the indirect leakage channel*. Interestingly, while CBA almost totally cancels sectoral leakages, its impact on overall leakage is limited, reducing it from 10.8 % to 8.2 % in the best case. Half of the overall leakage (5.9 p.p.) comes from the indirect channel: the emissions increase in the sectors that generate electricity, where emission intensity increases because of reduced fuel and other primary energy prices.
- The *implementation of a CBA may trigger retaliation* by the most affected trade partners. Exports of the main partners of the EU (in particular the US and China) may decrease by -0.3 % to -2.4 % because of the implementation of CBA. Retaliation would then change the distribution of gains across sectors in the economies involved (the EU as well as the countries that retaliate), while it would not affect aggregated impacts on macroeconomic indicators and on emissions (Fouré, Guimbard, & Monjon, 2016).

The take-home message is that a *CBA reduces sectoral leakages significantly only if based on foreign emissions*, which is actually very difficult to implement. In other words, *a CBA based on EU emissions is inefficient in curbing leakages*. It also opens the door to retaliation by big traders.

6 CBA under the Paris Agreement

How would a CBA impact emissions under the Paris Agreement?

- The unconditional pledges taken by the signatories of the Paris Agreement lead to a decrease in global emissions of 27 %. The cost of this policy, 1.17 p.p. of world GDP in 2030, is limited.
- This includes the environmental and economic costs of *leakages, amounting to 5 % of the overall emission reductions* (without any border adjustment) but not the benefits of a slowdown in the global temperature increase (Fontagné, & Fouré, 2017).

The withdrawal of the US from the Paris Agreement however profoundly modifies this picture (Bellora & Fouré, 2017).

- *An additional tariff could be targeted on US exports* and based on the carbon content of exported goods. It resembles a CBA but since it targets a specific exporter, it has a retaliatory dimension and is of a same spirit as an anti-dumping duty.
- Would all the signatories of the Paris Agreement apply such instrument, this would curb US exports by 3 % and global emissions by only 1.7 %.
- The decrease in emissions mainly comes from the transportation sector.

The take home is that *the withdrawal of the US from the Paris Agreement raises a systemic issue*: the US being a large country, where exports represent only a small share of domestic production, even a carbon tax on its exports is not effective in avoiding free-riding and limiting the impact on global GHG emissions.

7 CBA design: possible options

The previous chapters have shown that there is a possible *trade-off between the complexity of the implementation and the efficiency of a CBA, and that the withdrawal of the US from the Paris Agreement raises a systemic issue that cannot be addressed with a CBA*.

- Complexity arises because the carbon intensity is, for the same good, different across exporters.
- Complexity arises because the input-output relationships possibly involve a series of other countries with or without carbon policies.
- Efficiency is conditional to the taxation of the actual carbon content of imports.
- Level playing field requests a rebate on exports.

When designing a CBA not relying on the participation in the EU ETS, two main points are under discussion: the taxation *base* (i.e. the reference on which the CBA is applied) and the *level* of the adjustment.

Regarding the taxation base, there are 6 alternatives for setting *the reference for the carbon content to impose*, and it has to be computed for each imported good. Three levels can be considered: max, min, average, and the computation can be based on observable emissions (domestic ones) or foreign emissions (either declared or assumed):

- The max/min/average emissivity of EU producers;
- The max/min/average emissivity of foreign producers (all together or by country).

Solutions to be envisaged are as follows (Böhringer et al., 2012):

- Complex and detailed CBAs, covering more GHG and more goods, are more efficient, especially when the climate coalition is small (which will be the case if the EU alone implements a CBA).
- The administrative burden can be reduced by using regional averages for carbon content, instead of country- and product-specific values.
- Such detailed schemes are however exposed to retaliation because targeted foreign exporters will lobby for retaliation.
- Conversely, a CBA with narrow coverage (and a low taxation rate) will trigger less retaliation, but is inefficient.

Once the taxation base is set, the following important issue is the *level of the adjustment* to be applied. The question is whether a CBA can fully compensate for the difference between domestic taxation of carbon and imported goods. The problem is that the EU is a big trader. As such, taxation of imports (whatever the mechanism is) has a strategic dimension (Weitzel, Hubler, & Peterson, 2012; Balistreri, Kaffine, & Yonezawa, 2019; Böhringer, Lange & Rutherford, 2014).

- The EU would extract rent from the exporting country, because the reduced market access will incentivise foreign exporters to reduce their price.
- The increase in the price of the carbon-intensive goods would then be reduced, leading to increased consumption and inefficiency of the policy.
- The CBA could be challenged at the WTO as a strategic tool of protection: this strategic component is inconsistent with commitments under the General Agreement on Tariffs and Trade (GATT).
- To avoid this problem the level of the adjustment at the border would have to be much (i.e. around 20 %) *below* the internal taxation of carbon. Accordingly, any WTO-consistent tax would miss both the objective of level playing-field and climate change mitigation.
- If the EU decided to bypass this legal argument and set a compensation at the border above the optimal level of taxation, this would indeed curb leakages. However, the potential for decreasing leakage decreases at higher tariff rates.

Finally, in relation to the question of the tax base and level, one of the key questions discussed previously is to find a way to incentivise abatement efforts in the firms outside the coalition. One way to escape this problem is to include importers in the ETS. This is however raising technical issues and legal questions beyond this briefing note. Incidentally, notice that if importers are included in the ETS, they generate a higher demand for allowances, resulting in higher prices. Higher prices affect also EU producers purchasing allowances on the same market. These higher prices increase the cost of producing for export markets, which can be tackled with an export rebate, but also for the domestic market, in that case the export rebate is not a solution. Furthermore, with the participation of EU importers, the market for allowances would be more liquid but it would be much more difficult for the regulatory bodies to use the prices of allowances to set an emission target.

8 Conclusion

Designing a CBA raises a trade-off between complexity and efficiency. A low taxation of carbon at the border, partially compensating the internal carbon price, would help making carbon taxation politically sustainable. But it would hardly meet the environmental objective and would only partially fix the competitiveness issue.

A complete compensation of carbon content at the border raises issues in terms of information, cost of administration, potential retaliation and even consistency with respect to the WTO law due to the strategic dimension of the tax at the border. Bypassing this trade-off would request incorporating importers in the ETS system. All these problems of design are reinforced by the opting out of the US.

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