ROUND TABLE ON SUSTAINABLE DEVELOPMENT

The Climate Challenge and Trade: Would border carbon adjustments accelerate or hinder climate action?

Background Paper for the
39th Round Table on Sustainable Development
25 February 2020
OECD Headquarters, Paris

Andrew Prag

This paper was prepared under the authority of Connie Hedegaard, Chair of the Round Table on Sustainable Development, and supervision of Žiga Žarnić, Project Leader and Advisor for the Round Table on Sustainable Development at the Organisation for Economic Co-operation and Development (OECD).

ACKNOWLEDGEMENTS

This paper was prepared by Andrew Prag, Special Advisor, OECD Environment Directorate.

The author would like to thank Connie Hedegaard (Chair, OECD Round Table on Sustainable Development), Richard Baron (Executive Director, 2050 Pathways Platform) and Žiga Žarnić (Project Leader and Advisor for the Round Table on Sustainable Development at the OECD) for their intellectual leadership and advice; and Amelia Smith for editorial and organisational support.

The paper benefitted from consultations with experts in the areas of climate change, trade and tax policies, notably Gregoire Garsous, Guillaume Gruère, David Haugh, Julia Nielson, Gregor Slokan, Susan Stone, Jonas Teusch, Kurt Van Dender and Shunta Yamaguchi.

The 39th Round Table on Sustainable Development is financially supported by the European Climate Foundation. Their contribution is gratefully acknowledged.

Table of Contents

Summary and questions for discussion

Recent developments in the climate change and trade spheres have brought the climate-trade nexus into sharp new relief. Some, but not all, countries are embarking on increasingly ambitious climate policy. This comes at a time when trade tensions between major economies have heightened, prompting unilateral tariff responses and contributing to a more regional, rather than global, approach to governing trade. These developments have sparked a renewed debate about the risks of "carbon leakage" and potential measures to address it.

Carbon leakage can occur when stringent climate policy, in particular carbon pricing, leads to emissions increasing in countries with less stringent regulation, due to relocation of production or capital. This would undermine the environmental impact of countries' climate efforts.

National commitments on climate change collectively fall far short of what is needed to achieve the goals of the Paris Agreement. Calls for accelerated decarbonisation have become more urgent in recent years, but national climate responses are increasingly divergent. The net-zero GHG emissions targets adopted by some countries imply deep emissions reductions across all sectors of the economy. This includes energy-intensive industries such as steel, cement and chemicals, where cost-competitive decarbonisation options are less available. If stringent emissions regulation is not matched in other countries, the risk of future carbon leakage increases.

At the heart of the fresh discussion is a potential change in the type of measure used to prevent carbon leakage. Currently, most such measures focus on supporting domestic producers through partial exemptions to carbon prices. The new discussion has been sparked by the European Commission's proposal to implement a type of border carbon adjustment (BCA) as part of the European Green Deal, in the event that international divergence on climate action continues to pose a risk of potential carbon leakage. BCAs differ from existing measures in that they would apply carbon-based charges to imports.

BCAs are controversial, and the potential effects and implications of any such measure will likely be highly scrutinised. Effects include not only the extent to which a BCA mitigates carbon leakage, but also implications for the economic sectors targeted both in terms of short-term cost impacts and longer-term drivers for innovation across different types of firms and sectors. Broader implications include potential reactions by trading partners worried about disguised protectionism, whether in the form of disputes through the WTO or other trade-related retaliation.

There is rich literature analysing how BCAs can be designed to overcome the significant legal, technical and political challenges to their implementation. However, there is so far limited real-world experience of BCA implementation. The California cap-and-trade system has a BCA in place for electricity, though changes in its design due to pressure from covered firms has compromised its effectiveness. Several legislative proposals for BCAs have been introduced in the US and EU, none of which have been implemented but all of which offer lessons for design of a future scheme. Numerous modelling studies also provide insights into the potential effects of BCAs, both for countering emissions leakage as well as economic effects on targeted sectors.

Nevertheless, key uncertainties remain as to whether BCAs are the most desirable instrument to tackle carbon leakage, even in the context of "net zero" climate ambition and heightened

trade tensions. One such uncertainty is whether and how BCAs can help to drive the technical innovation needed for deep decarbonisation of energy-intensive industry. Others include whether BCAs can really be effective at encouraging greater action from trading partners (rather than further heightening trade tensions), and how they can be designed for a world with different speeds of decarbonisation in line with the principle of "common but differentiated responsibilities".

More generally, given the political risks and potential downsides to implementing BCAs, there is still a question of what other trade measures could help to safeguard climate ambition and level the playing field internationally. For example, whether a new generation of plurilateral or bilateral agreements addressing issues such as fossil fuel subsidies and tariffs on environmental goods can play an important role.

Against this background, participants in the 39th Roundtable on Sustainable Development are invited to consider and discuss the following questions:

1) *Border carbon adjustment has been identified by the new EU Commission as a policy option. What are the positive and negative implications of introducing such a system?*

2) *What features of a border carbon adjustment mechanism would be necessary in order to make it work legally, technically and politically?*

3) *If divergence in climate ambition persists, what other promising policy approaches could counter risks of carbon leakage and support the transition to competitive low-carbon economies?*

1. The new landscape of trade and climate: what is different this time?

Arguments about the implications of countries' differing ambitions in climate policy are almost as old as climate policy itself, going back at least to the Kyoto Protocol in 1997. These implications include the risk of "carbon leakage" – the potential undermining of the environmental effects of climate policy due to production and investment shifting to jurisdictions with weaker regulation on carbon emissions – and the resulting implications for competitiveness of firms exposed to more stringent regulation.[1]

One potential solution to the risk of carbon leakage involves extending carbon regulation to imports. This has generated extensive academic and political debate over many years, as part of a broader discussion about the interaction of climate and trade policy. The Round Table on Sustainable Development addressed the issue specifically in 2009 (Stephenson and Upton, 2009) and trade and environment challenges more broadly in 2017 (Baron and Garrett, 2017). The latter meeting recognised a change in tone of international discussions on trade, coupled with an increasing sense of urgency on climate change and a strong emphasis on decarbonisation of all sectors, including energy-intensive industries. These trends have since intensified, creating a markedly changed landscape for trade and climate discussions.

Developments in both the climate and trade policy spheres means that a renewed discussion about the risks of carbon leakage in the coming years and decades, as well as constructive solutions to address it, is now timely.

Climate change policy – what has changed?

The climate change policy debate has been marked by recent urgent calls for accelerated decarbonisation, coupled with increasingly divergent national climate responses. Global emissions trends are at odds with the required steep reductions implied by the Paris Agreement, despite a halt in the rise of global energy-related CO_2 emissions in 2019 (IEA, 2020). While most countries remain committed to the Agreement (with the United States an exception), there is nonetheless highly divergent ambition on climate policy, including for Nationally Determined Contributions in the 2025-2030 timeframe, and long-term strategies to 2050.

An increasing number of countries and regions, including the EU, envisage targets of net-zero GHG emissions by 2050. The deep economy-wide transition implied by these targets requires a strong emphasis on innovation to allow industrial sectors to continue to thrive in a low-carbon economy over the longer term. Nevertheless, even in countries setting strong mid-term targets, social resistance to energy price rises is a widespread political concern, focusing attention on short-term financial burdens of the transition for consumers as well as for industry. Additionally, while ambitious objectives have been bolstered by rapid growth of renewables in recent years, accompanied by accelerating uptake of electrified transport,

[1] Several different channels for carbon leakage are identified in the literature (see for example Cosbey et al., 2019). The most politically sensitive is the competitiveness channel, whereby foreign goods gain a comparative advantage over domestic goods due to carbon costs, resulting in increased market share and shifting of capital investment overseas over time. Other channels include the energy market channel, whereby reduced fossil fuel demand in regulated regions decreases global prices and therefore increases emissions in unregulated regions, and the income channel, a potential secondary effect whereby the change in relative prices due to carbon regulation shifts consumption patterns.

progress has generally been slow across other sectors, in particular for energy-intensive industry.

International trade – what has changed?

Recent years have seen heightened tensions on international trade between major economies, with unilateral tariff responses seen as an increasingly normalised strategy. The World Trade Organization's dispute settlement mechanisms have run into difficulties, further contributing to a more regional rather than global approach to governing trade, with more emphasis on bilateral and plurilateral regional trade agreements than on further negotiations at the WTO. Emerging economies have become increasingly major forces in global trade, which has altered the balance of trade policy discussions for many reasons, including differing comparative advantages, regulatory capacities and starting points in terms of environmental and climate change regulation.

Border Carbon Adjustments back in focus

These factors have prompted a fresh debate about carbon leakage and measures to prevent it. In particular, border carbon adjustments (BCAs)[2] have come quickly back into focus. Concretely, as part of the European Green Deal proposal, the European Commission has stated its intention to implement a "carbon border adjustment mechanism" if key trading partners do not implement actions of commensurate stringency to those being employed in the EU (EC, 2019). While such measures are primarily about ensuring effectiveness of climate ambition, they cannot be completely disentangled from related concerns about maintaining competitiveness and driving the innovation needed for decarbonisation.

Border carbon adjustments have, so far, been more theoretical than practical. With some exceptions, no major measure has yet overcome the legal, technical and political barriers that face any proposed border carbon mechanism. Yet these barriers are not necessarily insurmountable. Compelling cases have been made in the literature that BCAs could be designed to be compatible with WTO rules – provided that they are aimed at reducing carbon leakage and not about protecting competitiveness – and that while no BCA has yet been tested in the WTO, related case-law supports this premise. The technical challenges are significant, but potentially solvable, in particular for BCAs starting with limited coverage.

An important topical question is whether the new landscape for trade and climate has changed to such an extent that political barriers can also be overcome whether other trade-related solutions are preferable to avoid heightened trade tensions. Other approaches are being actively pursued. For example, five small, trade-dependent countries are engaging in negotiations on a plurilateral approach, the Agreement on Climate Change, Trade and Sustainability (ACCTS) (IISD, 2019). This seeks to address a range of relevant trade measures such as reducing tariffs on environmental goods and services, agreeing reduction in fossil-fuel subsidies and promoting eco-labelling programs and mechanisms. More generally, there are other options in the toolbox of trade and climate policy measure (Box 1).

[2] The terms "border carbon adjustment" and "carbon border adjustment" are often used interchangeably. This paper employs "border carbon adjustment", as it is the most commonly used term. In the European Commission's December 2019 communication about the European Green Deal, a "carbon border adjustment mechanism" is proposed (European Commission, 2019).

Box 1. Wider trade and climate policy interactions

The interactions between climate change and trade are complex and varied. Trade has implications for climate change in that it influences GHG emissions both positively and negatively. The physical impacts of climate change are likely to alter trade patterns and affect trade infrastructure (Dellink et al., 2017). At the policy level, climate change policies may run the risk of contravening trade rules, and conversely, trade policies, both unilateral and international, may influence how countries design climate change policy.

The potential synergies and tensions between trade and climate policy have long been recognised and were noted both in the original text of the UNFCCC ("Measures taken to combat climate change … should not constitute … unjustifiable discrimination or a disguised restriction on international trade"; UNFCCC, 1992) and the founding discussions of the WTO. There is a rich literature documenting real and potential interactions and their implications (summarised by the IPCC in Stavins et al., 2014).

The underlying reasons for countries to implement BCAs include a perceived or real lack of a level playing field for sectors covered by stringent climate policy in one jurisdiction but not in another. There are, however, other approaches. The most conceptually simple (but hard to achieve in practice) is universal commensurate action to directly regulate carbon emissions in all major economies. But even this rather utopian option carries hidden complications, as different interpretations of what level of action or regulation is considered "commensurate" for different country contexts and capabilities may exist.

Countries could pursue other options to encourage a more level playing field, for example agreeing to phase out fossil fuel subsidies or environmentally harmful agricultural subsidies. Encouraging trade and creating markets for environmental goods and services crucial for decarbonisation is another type of tool, including reducing border tariffs on such goods and encouraging standards such as eco-labelling.

Source: The author, drawing on OECD/IEA/NEA/ITF, 2015.

2. The road to net-zero: the importance of a transition to low-carbon industry

The contrast between current global emissions trends and the sharp reduction trajectory required for the Paris Agreement objectives to remain feasible is increasingly stark. Responses can no longer be gradual and incremental. Step changes are required across almost all sectors of the economy, in particular the decarbonisation of energy-intensive industries such as steel, cement and chemicals.

In the power sector, where cheap renewables have led to a fairly well-advanced transition, the outlook for deep decarbonisation of energy-intensive industry has always been more challenging. Technical options are more limited and generally expensive, leading to some industrial activities being described as "hard to abate" sectors. Nevertheless, a pathway towards an industry sector aligned with net-zero emissions can be envisaged, as described in several European and global studies (e.g. European Commission, 2018) as well as

sector-specific studies (Wyns et al.,2018).[3] A recent economic study suggests that concerted action across the economy – including reduced demand for materials – can limit the overall economic impact of industrial decarbonisation (Mission Possible, 2019). However, policy support as well as significant technological and financial innovation will be required. The new Leadership Group for Industry Transition, launched at the UN Climate Action Summit in September 2019, highlights this urgent need for innovation and includes a commitment to "collaborate internationally to promote technology innovation".[4]

Energy-intensive sectors have often been classified as those most at risk of carbon leakage if stringency of carbon regulation remains divergent internationally. They are both sensitive to energy costs and exposed to international trade. They also operate with long investment cycles, due to the long-lived nature of industrial assets, meaning that investments made now will partially lock-in the emissions intensity of production in the period towards 2050. These concerns about carbon leakage, and the related implications for industrial competitiveness, have had a strong influence on climate policy to date, and in particular on the design of carbon pricing instruments (as noted previously by the Round Table on Sustainable Development; Stephenson and Upton, 2009).

Carbon pricing has long been recognised by economists as a core policy necessary to underpin an economically efficient transition to a low-carbon economy, provided that it is accompanied by well-aligned incentives across policy domains and supported by a package of policies for innovation. While different types of carbon pricing mechanisms have been spreading worldwide, with more than 50 schemes in operation (World Bank, 2019), almost all carbon prices globally have been too low to significantly align low-carbon investments with climate goals and encourage citizens and investors to make cleaner choices.[5]

One explanation for low carbon prices has been persistent concerns about short-term costs and potential leakage, in particular for energy-intensive industries, leading to weaker overall ambition of carbon pricing (the cap level or tax rate) and its design elements (in terms of exemptions or dilutions, as discussed below). The result is that, somewhat ironically, empirical evidence suggests that very little carbon leakage has yet occurred (see for example Dechezleprêtre et al., 2018). This equilibrium is likely to be broken, however, as governments put in place more stringent policy and regulation to set economies onto a net-zero path. Concerns about carbon leakage for energy-intensive trade-exposed firms are likely to intensify, along with implications for how carbon pricing contributes to broader effects on firms' comparative advantage and competitiveness globally.

---

[3] It is important to note that net-zero emissions does not mean zero emissions across all sectors. In most net-zero pathways, some residual emissions remain in energy-intensive sectors, offset by CO_2 removals elsewhere in the economy (see for example EC, 2018).

[4] There are signs of important technological progress in some sectors. One example is hydrogen-based steel-making, removing the need for coking coal in that process, such as the Hybrit process in Sweden. Another is the potential for capturing CO_2 emitted by the chemical reaction central to cement production, as being pioneered by Dalmia Cement in India. These are relatively rare examples, however, and the need for ongoing technical innovation in these sectors is strong.

[5] There is nevertheless evidence that carbon prices have acted to reduce emissions, for example in Sweden (Andersson, 2019) and more generally across the OECD (Sen and Vollebergh, 2018).

3. Approaches for safeguarding climate leadership: a fresh look at border measures for carbon

Measures to avoid carbon leakage have been built into most carbon pricing systems from the outset. However, these measures have usually been aimed at compensating or partially exempting domestic trade-exposed emitters covered by the regulation, rather than exerting influence internationally through policies targeting imports. Existing measures have included various forms of exemptions or dilutions of carbon pricing tools, such as continued free allocation for energy-intensive industries in the EU ETS. These exemptions have the potential to address leakage but also act to weaken the carbon price signal domestically, and can, if poorly calibrated, lead to windfall profits. There are many reasons that this approach has been chosen to address leakage, including not only trade-related concerns (avoiding potential legal challenges through the WTO and associated retaliatory measures) but also easier implementation at home.

As countries begin to embrace stronger climate ambition, the outlook for carbon pricing and other measures supporting a transition to low-emissions production becomes quite different. If countries pursue carbon pricing as a central policy tool to align with a net-zero pathway, the dilution effect of anti-leakage measures focused only on domestic producers is unlikely to remain a viable option. This will especially be the case if the international landscape of ambition on climate and standards remains highly divergent.

An alternative option to prevent carbon leakage is to switch from domestic carbon price exemptions to levelling carbon-based charges on imports. Border carbon adjustments can be exerted in a number of different ways, including through a border tax (in conjunction with a domestic carbon tax), or through a requirement for importers to submit emissions permits commensurate with the requirements imposed on domestic producers in an ETS, or through extension of other domestic regulations such as product standards. The choice of instrument may have implications domestically; in the EU law-making process, for example, a tax requires unanimous agreement of all member states, whereas an ETS-linked mechanism requires only qualified majority. Whatever the modality chosen, BCAs will need careful design in order to be legally, technically and politically feasible internationally (Cosbey et al., 2019; Mehling et al., 2019; Lamy et al., 2020).

Legal, technical and political challenges to BCAs

Legal design issues

BCAs must be designed to prevent carbon leakage and so safeguard the ambition of climate change objectives, rather than be targeted at addressing competitiveness concerns. The latter could be construed as disguised protectionism and therefore increase the chances that the border mechanism is challenged through the WTO or by other retaliatory trade measures.

While no BCA has yet been tested in the WTO, experts tend to agree that a BCA can be made compliant with WTO requirements, and that relevant WTO jurisprudence supports this. However, the specifics will depend on the type of BCA implemented. A BCA in conjunction with a carbon tax would likely be considered as a border tax adjustment (BTA). BTAs can be permissible under the WTO provided that the domestic and imported products covered are considered as “like products” and that imports are not considered less favourably than domestic products (the national treatment principle). A BCA implemented in conjunction with an ETS would likely be considered a domestic regulation, meaning that the assessment of

whether imported products are considered less favourably than domestic products extends to all aspects of the regulation, including for example emissions verification requirements (Cosbey et al., 2019). Additionally, all BCAs would need to satisfy the "most favoured nation" principle, which essentially prevents discrimination of products based on their country of origin.

Even if a BCA is found to violate GATT principles of non-discrimination, it may still be justified under the exceptions laid out in GATT Article XX and its chapeau. These exceptions allow for measures intended for environmental objectives to violate other GATT principles,[6] provided that the breach is justified by the desired end (tackling climate change) and is neither arbitrary nor carried out in a way that protects domestic interests over imports. This is why it is so important that BCAs are designed to tackle carbon leakage and not to enhance competitiveness of covered entities.

Technical design challenges

An effective BCA will need to solve a number of methodological and measurement challenges. The policy would need to define which products and sectors are covered, how to estimate the embodied emissions associated with imports, and what price level should be applied to those emissions. The design will also need to specify whether the measure applies only to imports, or whether exports are also covered in the form of an equivalent rebate.

Sectoral coverage and estimating embodied emissions

Theoretical studies have considered both general BCAs, covering all imports, and specific BCAs limited to sectors most at risk of carbon leakage (notably steel, cement and chemicals). Narrow sectoral coverage is usually considered preferable for several reasons, including improving eligibility at the WTO, simplifying the calculation of product-related emissions, and because most risk of leakage is concentrated in a few sectors. Even when limited to specific sectors, the selection criteria could still prove complicated to agree, given potential strong lobbying interest form specific sub-sectors and firms.

BCAs require an estimation of the emissions associated with the production of different goods. This presents a number of challenges. First, the scope of emissions included must be defined, for example whether only direct emissions are included, with a broader perimeter adding to the complexity of the measure.[7] Second, the characterisation of the emissions embodied in the upstream supply chain of traded products can be complex. This is true even for sectors such as steel and cement, where traded products contain relatively little product differentiation and

[6] Specifically, Article XXb (that the measure "is necessary to protect human, animal or plant life or health") and Article XXg (that the measure "relates to the conservation of exhaustible natural resources").

[7] The simplest approach would be to limit the calculation to direct emissions from production (e.g on-site coal and gas use, also called scope 1 emissions). However, indirect emissions (such as from electricity used in production, scope 2 emissions) are usually significant and need to be included for a BCA to be comprehensive, even though this adds complexity in terms of calculating the emissions intensity of electricity. The broadest scope would also include scope 3 emissions, embodied in the transport of goods and in the machinery used to produce them. While comprehensive, inclusion of scope 3 emissions is usually considered to be prohibitively complex.

relatively few steps in production. The calculation could quickly become unfeasibly complex for manufactured products with highly fragmented value chains.

Third, while emissions estimates would ideally be based on real emissions at each production site, a benchmark approach may be more practical, acting as a proxy for the real emissions embodied in each product. The choice between real emissions and a benchmark approach is a trade-off between data availability and quality, administration and compliance costs, WTO eligibility and how incentives may play out both for firms and whole sectors (Cosbey et al., 2019). If a benchmark approach is used, the choice of the benchmark will be a key design characteristic. The level of the benchmark could be set using either average sector emissions performance, or on emissions associated with best or worst available production technologies.[8] Regardless of the level of benchmark chosen, further key characteristics are the number of benchmarks per sector (for example, different benchmarks for electric-arc and blast-furnace steel-making) and whether benchmarks are differentiated according to country or regional characteristics. Both these dimensions need careful design to not infringe upon WTO principles of non-discrimination.

Importantly, the design of BCAs can also allow importers to demonstrate their own real, verified emissions performance if this is better than the benchmark, in order to reduce the magnitude of the BCA that they face. This approach may help to make the BCA more effective at incentivising firm-level improvements, and could also improve the eligibility of the measure at the WTO. However, it is not without challenges: firm-level differentiation may allow shuffling of production in an exporting country, so that best-performers export and high-emitters service the domestic market (see discussion of the California ETS below).

Adjusting for what price?

Once the level of embodied emissions has been determined, the price level will depend on the type of BCA being implemented. A BCA linked to carbon tax (i.e. a BTA) would allow relatively straightforward setting of the price level, as the price would be the same as the tax per tonne of CO_2 applied to domestic producers at the time of the import. It would be more complicated to determine the price level for a BCA to be applied in parallel to an emissions trading system, which has, by definition, a variable carbon price.

Moreover, when deciding the price level of a BCA, policy makers will need to decide how, if at all, to take into account carbon prices applied in countries of origin. Applying a BCA to the measured price differential between the implementing country and those targeted by the measure would help to improve the argument that the BCA exists primarily to reduce carbon leakage (Cosbey et al., 2019). This task is not straightforward, as carbon prices may apply only partially to some elements of production and may be overlapping or indistinguishable from effects of non-price regulations in those countries.

---

[8] While a benchmark based on technology levels may be simpler to apply, if the level is set at "worst" technology the measure may be challenged as being too stringent for developing countries. If it is set at "best" technology level the incentive for foreign producers to reduce emissions is weakened. The benchmark could also be based on the average performance of domestic emitters in the BCA-implementing jurisdicition, rather than global, as this may allow for more accurate determination and better data, even though it is perhaps less representative of production in foreign countries. A hybrid approach is also possible, with scope 1 emissions set at the implementing country level, and regional flexibility for scope 2 emissions (Cosbey et al., 2019).

Exempting exports?

In theory, BCAs could be designed to not only apply to imported products, but also to be applied in reverse as rebates to exports of products in those same sectors. This would avoid penalising exporters in foreign markets with less stringent carbon regulation. The legal and political rational for this is challenging, however. Such a measure would be more difficult to justify in the WTO, as it is less clearly aimed solely at reducing carbon leakage, and may also be harder to justify in environmental terms as encouraging global action on reducing GHG emissions. In the particular case of a BCA that requires importers to purchase and submit emissions allowances commensurate with requirements on domestic producers, the BCA would act to gradually reduce the supply of allowances available in the market (because they are purchased by importers), unless exports receive a rebate equivalent to the same level of emissions permits.

Securing political buy-in

Politically, BCAs would need to ensure support of key constituencies both at home and abroad. While producers in an implementing country would generally stand to benefit from a BCA, they may nonetheless see greater short-term benefits from continuing with existing carbon leakage measures, such as free allocation of ETS allowances, rather than a rapid switch to a BCA. A gradual phasing out of preceding carbon-leakage measures may be necessary, in sequence with the introduction of a BCA. In the EU, this may require reform of the free-allocation schedule of the EU ETS in parallel with the introduction of a BCA.

Internationally, application of a BCA may be met with hostility by trading partners even if it is designed in line with WTO principles. Transparency and predictability will be important elements to improve acceptability, including consulting with trading partners throughout development of the mechanism (Mehling et al., 2018). Design elements of the BCA could also help with bolstering acceptance internationally. For example, revenue raised through the measure could be allocated to supporting development efforts in developing countries (though to be compliant with WTO's non-discrimination principles, this too would need to be clearly justified as a development measure). Nevertheless, reactions to past proposed BCA-type measures have suggested that the risk of responses to a BCA are real, whether as challenges through the WTO or other trade-related retaliation.

A basis for climate clubs?

A key further element of international political dynamics of BCAs relates to who is imposing the BCA (a single jurisdiction acting unilaterally, or a group of countries acting together) and to whom the BCA applies (all other countries or those without commensurate policy on climate change). The notion of "climate clubs", popularised by Nordhaus (2015), suggests that countries could form coalitions based on joint commitments to climate action, with penalties imposed on countries not part of the club.[9] Analysts have proposed that such penalties could be imposed in the form of a BCA, implemented with the intention not only of preventing carbon leakage from countries within the club, but also to encourage greater participation and therefore greater overall ambition on emissions. Various forms of such clubs have been proposed, including through regional trade agreements or through clubs of carbon markets

[9] Nordhaus (2015) considers both a BCA-type penalty and a universal tariff applied to all imports from non-club members. While that analysis focuses on the latter, other club proposals are more specifically based on BCAs (van Asselt, 2017, for a summary).

linked through carbon prices. Whether or not real-world conditions could lead to the creation of a stable climate club based on BCAs is as yet unclear.

In terms of exempting countries from a BCA (whether a unilateral or club-based measure), exemptions would need to be designed in line with the WTO's non-discrimination principles. Exemptions to a BCA would be easier to justify at the WTO if applied based on performance (for example tangible price levels) rather than on policy applied (e.g. a target embodied in a Nationally Determined Contribution).

4. Border carbon adjustments in practice and theory

BCAs have been widely discussed in academic and policy circles for two decades. Nevertheless, there are very few real-world examples to draw upon, a symptom of the implementation challenges discussed above. To provide examples of the use and potential for BCAs, this section takes three approaches: 1) analysing a BCA implemented at the sub-national level (in the California cap-and-trade scheme); 2) assessing legislative proposals of BCAs that progressed to differing degrees but were not ultimately implemented; and 3) modelling studies assessing the potential economic and environmental implications of BCAs.

Border Carbon Adjustment in practice: electricity in the California cap-and-trade system

Only one BCA is in practice at present, operating at the sub-national level. California has a state-wide cap-and-trade system, covering around 85% of all GHG emissions in the state (ARB, 2015). While a free-allocation system is in place to counter carbon leakage from most trade-exposed covered sectors, a form of BCA is in operation for electricity. The California power sector is heavily interconnected with neighbouring states as part of the Western Interconnection (as well as parts of Canada and Mexico), and in 2015 more than a third of Californian electricity was imported, accounting for nearly 40% of GHG emissions from electricity consumed in the state (Pauer, 2018).

The high level of imports means that treatment of imported electricity is an important design element of the cap-and-trade system. Electricity is relatively straightforward in BCA design because it is a purely homogeneous product and data on emissions produced during power generation are generally available and of good quality. In California, importers of electricity are required to submit emissions permits for their imported electricity based on reported emissions intensity or a default factor for unspecified power generation sources (Mehling et al., 2019). However, the fungibility of electrons can prove problematic when designing a BCA, because market participants could undertake so-called "resource shuffling". This involves setting up contractual arrangements so that imported electricity subject to the BCA is contractually low-carbon, leaving high-carbon generation sources to be consumed by users in jurisdictions without high carbon costs. This could mean that GHG emissions rise overall even if emissions in the cap and trade system seem to fall. In other words, leakage is not prevented.

In California, the risk of resource shuffling was a key factor in the design of the BCA. While the original legislative proposal was designed to explicitly prevent such contractual shuffling, political compromise, in part due to pressure from covered entities, led to a weaker restriction on shuffling in practice (Pauer, 2018). The compromise process continued even after the cap-and-trade system came into operation. Some studies (summarised in Pauer, 2018) suggest that leakage due to shuffling is significant and could even lead to real emissions abatement

being similar to if the system did not cover electricity imports at all. The California experience highlights the challenges of ensuring buy-in of all stakeholders potentially impacted by a BCA, even in a sub-national context.

Proposed border carbon adjustment measures that were not implemented

Important lessons can be drawn from a number of proposed BCAs of various forms that were introduced as draft legislation but never implemented. This includes examples from both the US and EU.

Past European proposals for BCA

In the EU, there have been three proposals at the European level.[10] In 2007, as part of the proposed EU ETS reform for its third phase (2013-2020), the European Commission introduced a form of BCA that would have replaced the free-allocation provisions present in the first two phases. The proposal would have brought imports from trade-exposed sectors into the compliance perimeter of the scheme, and correspondingly exempted exports of products from the same sectors. However, the proposal was never adopted and the system of free allocation continued into the third phase of the scheme.

France tabled two other proposals, in 2009 and in 2016, following the signing of the Paris Agreement. The 2009 proposal was described as a "carbon inclusion" mechanism that brought imports into the compliance perimeter of the scheme, requiring them to purchase allowances for production phase emissions. The proposals took into account potential WTO concerns, in particular basing discrimination on countries that refused to participate in a future universal climate agreement to replace the Kyoto Protocol. The proposal did not however evolve into a formal legal proposal from the European Commission.

France's 2016 proposal focused on the cement sector, following previous industry-led initiatives to cover cement importers in the EU ETS, which came from the cement sector itself. A key difference was that the French proposal would have completely replaced free allocation for European cement producers, whereas the previous industry-led proposals suggested keeping some level of free allocation. The French proposal moved forward to become an amendment to the draft EU ETS reform for the fourth phase, but was ultimately voted down by the European Parliament. One reason for this was concern about WTO challenges because of interpretation of disguised protectionism.

Past United States proposals for BCA

In the United States, three national proposals have been put forward. The first was as part of the Low Carbon Economy Act, a cap-and-trade proposal in 2007. Originally put forward by the electricity sector, the proposal would have required imports to purchase allowances from a reserve pool, and would have excluded countries taking commensurate action and least-developed countries (Gov.Track US, 2020). The bill was rejected by Congress.

The second US proposal for a BCA, in 2009, was included in the Waxman-Markey bill, otherwise known as the American Clean Energy and Security Act, which passed the House of Representatives but was voted down in the Senate. The measure, focused on the iron and steel

[10] Note that the proposal to include non-EU flights within the EU ETS is not considered here to be a BCA. While it share some similarities with a BCA mechanism on imports, the proposal was in reality an extension of EU climate policies beyond the jurisdiction of the EU member states.

sector in particular, would also have required importers to purchase allowances from a reserve pool (starting in 2020) and would have also exempted countries with commensurate action (Condon and Ignaciuk, 2013). Most recently, the 2019 Energy Innovation and Carbon Dividend Act also includes a border adjustment measure in conjunction with a form of carbon tax, and includes text very clearly aiming to allow justification under the exception of GATT Article XXb (referring to protecting animal, plant and human life and to conserve exhaustible natural resources). In early 2020, Congress had not yet voted on the bill.

Modelling and other theoretical studies of border carbon adjustments

Over many years, the potential effects of BCAs on emissions leakage, economy and competitiveness have been assessed in many modelling studies (summarised in Condon and Ignaciuk, 2013; Stavins et al., 2014; Mehling et al., 2019). Several models find that unilateral application of stringent climate policy would lead to significant carbon leakage from trade exposed sectors (e.g. Bohringer et al., 2012; Balistreri et al., 2018). This is not necessarily in conflict with recent empirical studies suggesting little evidence of leakage to date, because carbon prices to date have generally been lower than those models.

In general, models of BCA implementation find that increased cooperation through other means, such as through linking emissions trading systems, is more economically efficient than unilateral application of a BCA. Nevertheless, the IPCC 5th Assessment Report included an assessment of modelling literature at the time and concluded that while BCAs could act to prevent leakage and enhance competitiveness for energy-intensive trade exposed sectors, there could be welfare losses in non-acting countries (Stavins et al., 2014) – an issue that one might revisit in light of the inclusiveness of the Paris Agreement, even if levels of ambition differ. Monjon and Quirion (2011) assessed different types of BCA and concluded that the most effective in reducing leakage would be a full BCA on covered sectors, including both imports and export rebates.

A 2012 OECD study assessing implications of a BCA in Europe concluded that BCAs could reduce carbon leakage if applied by a relatively small coalition of acting countries (because the leakage effect would be via adding to firms' operational costs rather than through declines in fossil fuel prices) (Burniaux et al., 2012). The study also found that while overall welfare losses due to a BCA were small, the measure would not necessarily curb losses by the energy-intensive sectors covered. This is partly because those sectors also import intermediate products with relatively high carbon-intensity, which would not be covered by the scheme.

5. Looking ahead – shaping the future nexus of climate and trade policies

Despite the limited practical policy experience of BCA implementation, the above analysis shows that the main technical, legal and political challenges regarding use of different types of BCA are fairly well characterised, at least in theory. While the current context of highly divergent national ambitions on GHG emissions trajectories and an arguably more confrontational global trading environment may have changed the political landscape for BCAs, there remain some key uncertainties that need to be clarified about the broader implications of carbon-related border measures. Some of these uncertainties are as follows:

- **Supporting innovation**: In addition to countering carbon leakage, in what ways would different forms of BCA support or hinder innovation? As highlighted above, technical innovation remains critical for achieving deep decarbonisation, especially for energy-intensive industry. BCAs would be layered on top of not only stringent domestic climate

policy but also other domestic measures specifically targeted at innovation, such as research and development funding, market creation through public procurement, public-private partnerships etc.

- **Encouraging stronger international cooperation:** although potential "climate clubs" have often been linked to BCAs as a means to positively encourage greater action from countries outside of the club, no such club exists in practice. In practice, would BCAs in conjunction with clubs really act to close the gap on divergent climate change ambition internationally, and if so what steps would proponent countries take to implement this? How would such a measure be made consistent with the principle of "common but differentiated responsibilities"?
- **Pursuing a cooperative rather than punitive approach:** BCAs are often interpreted as a confrontational measure, and seen by some potential proponents as a fall-back only if standards remain divergent internationally.[11] Could a BCA instead be designed to be a more positive, cooperative mechanism, aimed at stimulating competition and a "race to the top" across key industrial sectors globally? For example, a modular tariff system could offer individual firms (or groups of firms) variable discounts on a BCA, the closer their performance is to a benchmark based on best-available technologies. Such a system would seek to leverage current heterogeneous emissions performance between and among industries. However, a mechanism of this nature may be more challenging to implement both technically and politically (Banks and Fitzgerald, draft, 2020).

More generally, given the political risks and potential downsides to implementing BCAs, there is still a question of whether a new generation of plurilateral or bilateral agreements can help safeguard domestic climate ambition without recourse to BCAs. Regional Trade Agreements have increasingly included environmental provisions, including provisions related to climate change, but there is limited evidence on their effectiveness for reducing GHG emissions (OECD, 2007; George and Yamaguchi, 2018; Martinez-Zarzoso, 2018). New, more specific agreements could carry more promise. The plurilateral negotiations initiated by a group of small trade-dependent countries on the Agreement for Climate Change, Trade and Sustainability (ACCTS) is one early example focusing on fossil fuel subsidies, product certification and reducing tariffs on environmental goods.

Understanding these uncertainties will be important as governments continue to assess whether BCAs could be an effective means both to create a level playing field for sectors at risk of leakage and to ensure the smoothest transition towards net-zero emissions both regionally and globally. Overall, the current debate about carbon leakage in an uneven transition is perhaps best seen in terms of what next steps can be taken by countries seeking constructive solutions to implement their net-zero targets efficiently. Ultimately these steps need to become the basis for a an evolution in the general conditions for international trade, in which the global climate constraint can be fully integrated, while respecting countries' differences, approaches and capabilities.

[11] For example, Ursula von der Leyen, President of the European Commission, speaking at the World Economic Forum Annual Meeting in Davos in January 2020, said of the EU's proposed border carbon adjustment mechanism: "But I prefer to encourage our trading partners to work with us for a global level playing field, for the benefit of all of us." (EC, 2020)

REFERENCES

Andersson J. (2019), "Carbon Taxes and CO_2 Emissions: Sweden as a Case Study", American Economic Journal: Economic Policy, 11 (4): 1-30. DOI: 10.1257/pol.20170144.

Air Resources Board (2015), Overview OF ARB Emissions Trading Program. https://ww3.arb.ca.gov/cc/capandtrade/guidance/cap_trade_overview.pdf.

Balistreri, E. J., Böhringer, C. and Rutherford, T.F., (2018), "Carbon policy and the structure of global trade". *The World Economy*. 41(1), pp. 194-221. https://onlinelibrary.wiley.com/doi/full/10.1111/twec.12535.

Banks, G. D. and T. Fitzgerald (2020), "Addressing global emissions through trade policy", draft.

Baron R. and J. Garrett (2017), Trade and Environment Interactions: Governance Issues. Background paper for the 35th Round Table on Sustainable Development. http://www.oecd.org/sd-roundtable/papersandpublications/Trade%20and%20Environment%20Interactions%20FINAL.pdf.

Böhringer C., E.J. Balistreri, T.F. Rutherford (2012), "The Role of Border Carbon Adjustment in Unilateral Climate Policy: Overview of an Energy Modeling Forum Study (EMF 29)", 34 ENERGY ECON. Supp. 2, S97 (2012).

Burniaux J-M, J. Chateau and R. Duval (2013), "Is there a case for carbon-based border tax adjustment? An applied general equilibrium analysis", *Applied Economics*, 45:16, 2231-2240, DOI: 10.1080/00036846.2012.659346.

Condon, M. and A. Ignaciuk (2013), *Border Carbon Adjustment and International Trade: A Literature Review*, OECD Trade and Environment Working Papers, No. 2013/06, OECD Publishing, Paris. https://doi.org/10.1787/5k3xn25b386c-en.

Cosbey A. S. Droege, C. Fischer, C. Munnings (2019), "Developing Guidance for Implementing Border Carbon Adjustments: Lessons, Cautions, and Research Needs from the Literature," *Review of Environmental Economics and Policy*, Volume 13, Issue 1, Winter 2019, Pages 3–22. https://doi.org/10.1093/reep/rey020.

Dechezleprêtre, A., D. Nachtigall and F. Venmans (2018), *The joint impact of the European Union emissions trading system on carbon emissions and economic performance*, OECD Economics Department Working Papers, No. 1515, OECD Publishing, Paris, https://doi.org/10.1787/4819b016-en.

Dellink, R., et al. (2017), *International trade consequences of climate change*, OECD Trade and Environment Working Papers, No. 2017/01, OECD Publishing, Paris, https://doi.org/10.1787/9f446180-en.

European Commission (2018), "A Clean Planet for all A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy", https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773.

European Commission (2019), "Communication on the European Green Deal" https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640&from=EN.

European Commission (2020), Keynote speech by President von der Leyen at the World Economic Forum. https://ec.europa.eu/commission/presscorner/api/files/document/print/en/speech_20_102/SPEECH_20_102_EN.pdf.

George, C. and S. Yamaguchi (2018), *Assessing Implementation of Environmental Provisions in Regional Trade Agreements*, OECD Trade and Environment Working Papers, No. 2018/01, OECD Publishing, Paris, https://doi.org/10.1787/91aacfea-en.

GovTrack.us. (2020). S. 1766, 110th Congress: Low Carbon Economy Act of 2007. Retrieved from https://www.govtrack.us/congress/bills/110/s1766.

IEA (2020), Global CO_2 emissions in 2019. https://www.iea.org/articles/global-co2-emissions-in-2019 (Accessed 20 February 2020).

IISD (2019), Time to ACCTS? Five countries announce new initiative on trade and climate change. https://www.iisd.org/blog/time-accts-five-countries-announce-new-initiative-trade-and-climate-change.

Lamy P., G. Pons and P. Leturcq (2020), *A European Border Carbon Adjustment proposal*, Europe Jacques Delors, Policy Paper, March 2020.

Mission Possible (2019), Reaching Net-Zero Carbon Emissions From Harder-To-Abate Sectors By Mid-Century, http://www.energy-transitions.org/sites/default/files/ETC_MissionPossible_FullReport.pdf.

Moïsé, E. and R. Steenblik (2011), *Trade-Related Measures Based on Processes and Production Methods in the Context of Climate-Change Mitigation*, OECD Trade and Environment Working Papers, No. 2011/04, OECD Publishing, Paris, https://doi.org/10.1787/5kg6xssz26jg-en

Monjon, S. and P. Quirion (2011), "Addressing leakage in the EU ETS: border adjustment or output-based allocation?", *Ecological Economics* , Vol. 70, No. 11, pp. 1957–1971.

Nordhaus, W. (2015). "Climate Clubs: Overcoming Free-Riding in International Climate Policy." *American Economic Review*, 105 (4): 1339-70. DOI: 10.1257/aer.15000001.

OECD/IEA/NEA/ITF (2015), *Aligning Policies for a Low-carbon Economy*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264233294-en.

Pauer (2018), "Including electricity imports in California's cap-and-trade program: A case study of a border carbon adjustment in practice", *The Electricity Journal*. https://www.sciencedirect.com/science/article/pii/S1040619018302549.

Sen, S. & Vollebergh, H. (2018), "The effectiveness of taxing the carbon content of energy consumption", *Journal of Environmental Economics and Management*, Elsevier, vol. 92(C), pages 74-99.

Stavins R., J. Zou, T. Brewer, M. Conte Grand, M. den Elzen, M. Finus, J. Gupta, N. Höhne, M.-K. Lee, A. Michaelowa, M. Paterson, K. Ramakrishna, G. Wen, J. Wiener, and H. Winkler (2014), International Cooperation: Agreements and Instruments. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer,

O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Stephenson J. and S. Upton (2009), *Competitiveness, Leakage, and Border Adjustment: Climate Policy Distractions?*, discussion paper prepared for the OECD Round Table on Sustainable Development. https://www.oecd.org/sd-roundtable/papersandpublications/43441650.pdf.

World Bank. 2019. "State and Trends of Carbon Pricing 2019". Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/191801559846379845/State-and-Trends-of-Carbon-Pricing-2019.

Wyns et al., 2018, *A Bridge Towards a Carbon Neutral Europe*, Institute for European Studies, https://www.ies.be/files/Industrial_Value_Chain_25sept.pdf.