Climate Policy Leadership in an Interconnected World

What Role for Border Carbon Adjustments?

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This report provides a broad and evidence-based analytical perspective of the debate around the possible role of a Border Carbon Adjustment (BCA) to deal with climate change. The new context of divergent climate ambition has led to a resurgence of interest in BCAs. The paper provides an overview of different policy instruments that can limit carbon leakage, with a particular focus on the BCA option, and offers a technical review of the literature and of the legal specificities around BCA as well as of alternative instruments. The report also analyses the issue of fragmented climate policies in the broader perspective of the trade-climate nexus and discusses how other policy measures – especially those related to trade – can help support climate objectives (for example, reducing the existing barriers to trade in environmental goods, and removing environmentally harmful and trade distortive subsidies).

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Executive summary

This paper was developed as an inter-directorate effort by the Centre for Tax Policy and Administration, the Economics Department, the Environment Directorate, and the Trade and Agriculture Directorate in the context of the 40th Round Table on Sustainable Development taking place on 20 October 2020. It intends to provide a broad and evidence-based analytical perspective of the debate around the possible role of a Border Carbon Adjustment (BCA) to deal with climate change. The paper offers a technical review of the literature and of the legal specificities around BCA as well as of alternative instruments. It outlines the costs and benefits of the various policy options with the view to inform policy discussion. It is not meant to be an endorsement of any particular BCA policy or alternative.

The Paris Agreement sets an ambitious collective objective on climate change, while allowing individual countries to set their own levels of ambition to reduce greenhouse gas (GHG) emissions. Widely divergent goals have led to concerns about achieving meaningful overall reductions in GHG emissions globally and subsequently to some countries pursuing stronger unilateral action. Such trends have been reinforced during the COVID-19 crisis.

Thus, many countries are considering which climate policies could show their effectiveness by minimising adverse carbon leakage, while ensuring their fairness by dampening any negative competitiveness effects. One of the policy options available to achieve these two goals is a border carbon adjustment (BCA).

Designing BCAs is challenging. Policy makers will have to make several critical decisions, most of them involving trade-offs between effectiveness and feasibility. There are risks that BCAs could be perceived as instruments for exerting leverage on other countries to increase the level of ambition of their climate policies. They could also be perceived by some as a form of “green protectionism”. Both concerns could lead to heightened geopolitical tensions, and affect global trade and investment.

Alternative policy approaches to BCAs, ranging from multilateral to unilateral approaches, could be implemented either instead of, or in parallel with, BCAs. While some of these may avoid some of the pitfalls of BCAs, their use also involves trade-offs. In particular, commonly implemented tools – such as free allocation of permits in emissions trading systems – imply a lower level of domestic climate ambition and are often incompatible with ambitious long-term climate objectives.

Any mechanism, BCA or its alternatives, needs to be designed carefully and take into account of countries’ commitment under the multilateral, rules-based, trading system and its transparent and enforceable nature. This is all the more important in today’s highly interconnected world and given the already difficult environment for global governance.

Furthermore, making ambitious climate targets viable, in a globalised world, goes beyond the issues of carbon leakage and competitiveness. Governments should also consider other areas where trade and climate policies can be mutually supportive. For instance, existing trade-related policies that lead to increased carbon emissions (such as fossil fuel subsidies) should be reviewed. More coherence in the trade and environment policy space reduces the risk of exacerbating a sense of unjust global burden-sharing on the climate issue, notably between developed and developing countries. This can in turn increase countries’ willingness to accept stronger commitments in climate negotiations. Ultimately, there is a need to restore trust in the multilateral systems (trade and climate) – especially in the wake of the COVID-19 crisis – so that they can both keep delivering substantial benefits.

1. The policy challenges of an interconnected but warming world

1. Climate change is a global threat that is expected to irreversibly affect all regions of the world, albeit to varying degrees. International co-operation on climate change is an essential part of the response. In the 2015 Paris Agreement, countries agreed on the ambitious collective target of limiting the global temperature increase to well below 2°C above pre-industrial levels. At the same time, the agreement allows countries to develop individual climate objectives through nationally determined contributions (NDCs), in part because of long-running disagreements among countries over who bears the responsibility for action – and its associated economic costs.

2. Such a nation-based approach means that the level of ambition to reduce carbon emissions can differ across countries, according to the agreed principle that countries should act in line with their “common but differentiated responsibilities and respective capabilities” (CBDR–RC). Collectively, countries’ commitments thus far have fallen far short of the stated global objective, and the window of opportunity to take the required action is closing fast, while impacts of climate change are already accelerating (IPCC, 2019^[1]). While most countries remain committed to the Paris Agreement, there is increasingly divergent ambition on climate policies (Stephenson et al., 2019^[2]), both for the 2025–2030 horizon of NDCs and in long-term strategies to 2050.

3. Like the Paris Agreement, the multilateral trading system, embodied in the World Trade Organization (WTO), also is the result of a negotiation process meant to ensure that global trade takes place under a rules-based system that is transparent and predictable. This trade regime has expanded global incomes, lifting millions out of poverty¹. The ensuing growth in trade and investment has made the world highly interconnected, especially through the rise of global value chains.

4. Whilst the multilateral trading system is geared towards setting rules for trade, environmental objectives have been considered since its inception. The WTO’s founding agreement recognises the importance of sustainable development, and protecting the environment in a manner consistent with a wide variety of national contexts (WTO, 1994^[3]). It is the stated ambition of WTO countries to co-operate towards achieving “win-win-win” outcomes that would benefit trade, the environment, and development – and help achieve the sustainable development goals (SDGs) of the UN 2030 Agenda for Sustainable Development. For example, global value chains have delivered steep cost reductions in technologies essential for tackling climate change, such as from renewable energy sources.

5. It is in this context of an interconnected but rapidly warming world, that some countries have announced their intention to embark on ambitious climate policies. These policy proposals necessarily require changes in behaviour for domestic businesses and consumers. The viability of these policies hinges on acceptance by their domestic constituencies, garnering citizens’ support as well as ensuring buy-in of key energy-intensive industries – including the ones competing with foreign firms.

6. The debate on the viability of such policies has so far been focussing on two issues (Condon and Ignaciuk, 2013^[4]). The first – relating to the effectiveness of climate policies at reducing global greenhouse gas (GHG) emissions – is carbon leakage, whereby foreign emissions increase because of the introduction of domestic climate policies (Reguant and Fowlie, 2018^[5]). The second – relating to the “fairness” of climate policies – is the potential

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¹ There is a vast literature on this subject. For an overview see Bhagwati and Srinivasan (2002^[134]).

loss of competitiveness of domestic firms due to increased costs *vis-à-vis* foreign competitors in countries pursuing less ambitious environmental objectives. The additional compliance costs associated with domestic climate policies risk eroding support from industry and civil society. The two issues are intertwined: ambitious policies undertaken in a few countries may lead to production moving to countries that are given a perceived “unfair” competitive advantage by virtue of a less ambitious domestic carbon policy, potentially further exacerbating carbon leakage.

7. However, it is useful to acknowledge that a much larger set of policies influence both climate outcomes and competitiveness. That is, making ambitious climate targets viable in a globalised world where foreign and local firms are subject to climate policies of differentiated stringency based on the CBDR-RC principle goes beyond the issues of carbon leakage and competitiveness associated with the recently increased climate ambition of some countries. Governments should strive for policy coherence and address all areas where trade and climate policies can be mutually supportive.

8. Taking this broad perspective is particularly relevant in the context of the current Covid-19 crisis, which requires domestic responses to be co-ordinated at the international level (OECD, 2020^[8]). International co-operation is important as domestic fiscal stimulus measures can spill over to other countries via international trade (Agrawala, Dussaux and Monti, 2020, p. 29^[9]). A lack of co-ordination can also lead to counterproductive policies and may therefore undermine trust in the multilateral system. And this is playing out against the backdrop of heightened tensions that have already strained the level of global co-operation, leading to mixed progress on trade (OECD, 2017^[10]) and climate issues (UNEP, 2018^[11]).

9. The objective of this paper is two-fold. First, it provides an overview of different policy instruments that can limit carbon leakage, with a particular focus on the option of border carbon adjustments (BCAs). The new context of divergent climate ambition has led to a resurgence of interest in BCAs (Prag, 2020^[12]). For instance, the EU announced the outline of the European Green Deal in December 2019, which includes the intention of introducing a BCA. BCAs are, however, controversial instruments. Some argue that they can help firms to compete on a level playing field and encourage more ambitious climate action across countries (Lamy, Pons and Leturcq, 2020^[13]). Others worry that they may be ineffective to limit carbon leakage (Zachmann and McWilliams, 2020^[14]), serve as disguised protectionist measures (Horn and Sapir, 2013^[15]), or violate the equity principles enshrined in the Paris Agreement (Ravikumar, 2020^[16]).

10. The second objective of this paper is to analyse the issue of fragmented climate policies in the broader perspective of the trade-climate nexus and to discuss how other policy measures – especially those related to trade – can help support climate objectives. Policy measures that are mutually supportive to trade and environmental goals include reducing the existing barriers to trade in environmental goods, as well as removing environmentally harmful and trade distortive subsidies (e.g. to fossil fuels, agriculture, energy-intensive industries).

11. The paper is structured as follows. Section 2 provides an overview of the adverse consequences of fragmented climate action. Section 3 discusses policy options to ensure that ambitious but divergent climate policies are viable. Section 4 focuses on how other policy measures in the trade and climate space can be more mutually supportive. Section 5 concludes by suggesting potential policy pathways to address the climate and trade conundrum, based on the collected evidence and discussions.

2. What are the effects of asymmetric climate efforts across countries?

2.1. Carbon leakage: definition, theory, channels

12. The pace at which countries are implementing policies to reduce greenhouse gas emissions differs widely, introducing significant and increasing heterogeneity in the stringency of climate policies across countries. This observation holds true even when comparing countries at similar levels of development, and can be seen both through explicit climate-related policies and targets and other policies with strong implicit effects. For example, in 2015, average energy prices (inclusive of taxes) across OECD countries differed by a factor of five between the lowest average after-tax price (USA) and the highest average after-tax price (Italy). Similarly, the OECD's Environmental Policy Stringency indicator, which is derived mainly from climate-related policies, was five times larger in Denmark than in Mexico (Figure 1). More specifically, the extent and the level to which countries have implemented carbon pricing policies also vary considerably across countries (OECD, 2018^[17]).

Figure 1. Heterogeneity of energy price (left axis) and Environmental Policy Stringency (right axis) across OECD countries in 2015

Note: The figure depicts values for 2015 or the latest data available before 2015.

Source: Sato et al. (2019^[18]) and the OECD environmental policy stringency (EPS) index in Botta and Koźluk (2014^[19]).

13. Divergence in the stringency of countries' climate policies (including carbon pricing) across countries may affect the relative production costs of firms, either by increasing input prices or by imposing the adoption of costly pollution-control equipment for firms located in the most stringent jurisdictions. This result raises the concern that cross-country differences in environmental policy stringency will reduce the competitiveness of some businesses and drive the specialisation of regions with low emissions prices into pollution-intensive activities, thereby altering the geographic distribution of industrial production.

14. This is a particularly troubling problem for global pollutants such as greenhouse gases, because abatement efforts could therefore be counteracted to some extent by increasing emissions in other regions. This problem, referred to as "carbon leakage", is defined as the increase in foreign GHG emissions that are induced by the introduction of domestic climate policy (Fowlie and Reguant, 2018_[20]). While net global emissions generally decrease in the presence of carbon leakage – i.e. not all domestic reductions are offset – it nonetheless undermines the efficacy of domestic climate policies and therefore firms' and citizens' support for such policies.

15. Carbon leakage can happen through two channels: (1) domestic climate policies may increase relative production costs, shifting production and its associated emissions to less-stringent regions by virtue of the law of comparative advantage (the *trade channel*); and (2) domestic climate policies will reduce domestic demand for fossil fuels so that, if the implementing region is large enough, global fossil fuel prices fall and cause an increase in demand for fossil fuels in the rest of the world (the *international energy price channel*).

16. Considering the *trade channel*, carbon leakage occurs if domestic firms experience an adverse effect on their competitiveness: production costs increase because of climate policies, leading to changes in countries' comparative advantages, trade flows, and therefore the location of emissions.² In addition, domestic firms in pollution-intensive sectors have incentives to migrate to countries with laxer environmental policies – through for instance foreign direct investment (FDI). Once relocated, these firms can produce the same goods at lower costs and export them back to implementing countries.³

17. These domestic economic impacts raise *competitiveness* concerns as production could be moving to producers that are given a cost advantage because of a relatively weak carbon policy. However, while intertwined, carbon leakage and competitiveness concerns are two different issues as they relate to two distinct variables: emissions and production costs respectively. This conceptual distinction has implications for the design of measures aimed at minimising carbon leakage, which are discussed in the next section.

18. Most of the policy debate on carbon leakage to date has focused on the trade channel, but the international energy price channel might be equally important. Indeed, a range of modelling studies have found that the international energy price channel typically induces more leakage than the trade channel (Kuik and Hofkes, 2010_[21]; Fischer and Fox,

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² It is important to note that production costs do not necessarily increase with the introduction of new, more stringent, climate policies. In fact, the same policies could create incentives to stimulate innovation in local firms, thereby improving their long-term competitiveness and potentially decreasing demand for imports and increasing exports. This effect is known as the Porter hypothesis (Porter and Linde, 1995_[132]).

³ In essence, domestic firms of implementing countries "offshore" their emissions to other countries, a process analogous to that of offshoring labour (Levinson, 2010_[126]).

2012^[22]). Border carbon adjustment mechanisms (and similar) can only address the trade channel.

2.2. Empirical evidence on carbon leakage

2.2.1. *Ex ante* modelling

19. A large number of *ex ante* analyses have assessed the potential impact of unilateral climate policy on carbon leakage based on computable general equilibrium (CGE) models (Lanzi et al., 2013^[23]; Burniaux, Chateau and Duval, 2013^[24]). Branger and Quirion (2014^[25]) conduct a meta-analysis of 25 studies while Carbone and Rivers (2017^[26]) conduct a systematic review of 54 published studies. The studies surveyed in both reviews considered emission-reduction targets in the range of 5% to 40% for the implementing country or region, with an average target of around 20%. The vast majority of studies predict that unilateral climate policy will result in some form of carbon leakage. The estimated leakage rates in Carbone and Rivers (2017^[26]) are consistently positive and typically in the range of 10% to 30% of the associated domestic reduction. The 25 studies surveyed by Branger and Quirion (2014^[25]) report leakage rates from 2% to 41%, with an average of 12%. Both sets of authors report a positive correlation between abatement target and leakage rate, implying the higher the target, the higher the leakage.

20. Therefore, *ex ante* modelling analyses suggest that climate action already envisaged by some economies within their NDCs (such as the European Union's 2030 target of -40% GHG emissions) could lead to non-negligible, although partial, carbon leakage. These results are obtained even before considering new, even more ambitious action such as the proposed 50-55% emissions reduction target by 2030 in the EU, as part of a longer-term trajectory towards net-zero emissions by 2050.

2.2.2. *Ex-post* analyses

21. Compared with the extensive CGE literature, few empirical studies have sought to estimate the magnitude of the effect of climate policies on carbon leakage based on actual data. In the absence of carbon pricing policies in most countries, changes in relative energy prices have provided a relevant source of variation to analyse the impacts that climate policies may have on firms' location decisions and trade flows, since instruments such as carbon pricing generally increase energy prices. Because emissions embodied in trade flows – the most relevant metric to work with when empirically addressing the carbon leakage issue – are hard to calculate, most of these studies have generally relied on more available proxies such as trade and investment volumes. Such shortcuts however come at the cost of being unable to derive conclusions on the actual changes in emissions and, as a consequence, on whether production has shifted to places with higher carbon intensities.

22. Aldy and Pizer (2015^[27]) estimate how net imports change in response to energy prices with a detailed panel of US state-level manufacturing production data covering 450 sectors between 1979 and 2005. They find that the effect of energy prices on net imports is statistically significant only for energy-intensive sectors, particularly iron and steel, chemicals, paper, aluminium, cement and bulk glass. The magnitude of the effect is small, however, with an increase of between 0.1% and 0.8% in net imports for these energy-intensive industries as a result of a hypothetical price of USD 15 per tonne of CO₂ imposed unilaterally in the US.

23. Sato and Dechezleprêtre (2015^[28]) examine how the energy price difference between two trading partners influences bilateral trade flows using a panel dataset covering

42 countries and 62 manufacturing sectors over 1996-2011. They find that a 10% increase in the energy price gap increases bilateral imports by 0.2% on average and that, overall, changes in relative energy prices across time explain only 0.01% of the variation in trade flows. Sato and Dechezleprêtre (2015^[28]) use their estimates to evaluate the degree to which stricter carbon pricing policies in Europe would affect trade patterns and find that a EUR 40-65/tCO₂ price of carbon in the EU ETS would increase Europe's imports from the rest of the world by only 0.04% and reduce exports by 0.2%.

24. Relatedly, using a sample of listed firms from 9 manufacturing sectors in 24 OECD countries over the period 1995-2008, Garsous, Kozluk and Dlugosch (2020^[29]) find that energy prices are not a main driver of outward FDI. They find that, while the FDI elasticity of energy prices differs significantly from zero for firms that experienced an increase in the domestic energy prices relative to Chinese energy prices, the overall effect is small. If the difference in energy prices between OECD countries and China had remained constant over the study period, the average international-to-total-assets ratio of firms would be 25%, very close to the observed value of 28%.

25. A few studies have sought to empirically assess the impact of the European Union Emissions Trading System – the world's largest carbon market – on carbon leakage. For example, Dechezleprêtre et al. (2019^[30]) use data from the Carbon Disclosure Project, which reports the (self-declared) emissions of multinational businesses disaggregated by geographical region. Theoretically, multinational firms should be driving carbon leakage as they can easily shift production across existing subsidiaries. However, Dechezleprêtre et al. (2019^[30]) find no evidence that the EU ETS led to a displacement of carbon emissions from Europe to the rest of the world during the period 2007-2014.

26. Naegle and Zaklan (2019^[31]) analyse the impact of the EU ETS on carbon emissions embodied in traded goods using data from the global trade analysis project (GTAP). They find no evidence that the EU ETS caused any increase in net imports (either in value or in terms of embodied carbon emissions). The effect is precisely estimated and close to zero. These findings confirm earlier insights on specific sectors. For example, Branger, Quirion and Chevallier (2017^[32]) focus on two energy-intensive sectors – cement and steel – and find that there was no significant impact of the EU ETS on net import demand. They therefore concluded that there was low likelihood of carbon leakage in the short term.

27. Since emissions-intensive sectors tend to be capital-intensive, the impact of investment decisions on output and emissions can take several years to become apparent. For this reason, several studies have considered the impact of environmental regulation on FDI decisions, which could be indicative of *future* carbon leakage. Two studies (Koch, 2016^[33]; Borghesi, Franco and Marin, 2019^[34]) analyse whether the EU ETS led regulated firms to increase investment in plants in unregulated (or lower regulated) countries, focusing respectively on Germany and Italy. Borghesi, Franco and Marin (2019^[34]) find that the EU ETS had a small positive effect on the number of new subsidiaries abroad held by Italian multinationals, but a larger impact on production taking place in foreign subsidiaries (the intensive margin), especially in trade-intensive sectors. Koch (2016^[33]) also found evidence that the EU ETS encouraged outward FDI of German multinationals. However, the effect was concentrated on a small subset of firms that were less capital-intensive and therefore likely to be more geographically mobile.

28. Finally, there is a large empirical literature on the competitiveness effects of environmental policies more generally. Various measures of competitiveness have been used, including employment, productivity, investments, and firm profits. Dechezleprêtre

and Sato (2017^[35]) provide a review of the recent empirical literature and find the cost burden of environmental policies to be very small. The evidence shows that taking the lead in implementing ambitious environmental policies can generate statistically significant but small adverse effects on trade, employment, plant location, and productivity in the short run, this effect being driven by pollution- and energy-intensive sectors.

2.3. Conclusion: limited leakage to date

29. Overall, the ex-post empirical literature finds, if any, only a small effect of climate policies on carbon leakage and competitiveness – see Ellis, Nachtigall and Venmans (2019^[36]) for a review. This is especially the case when compared with other determinants of trade and investment location decisions, such as transport costs, proximity to demand, quality of local workers, availability of raw materials, sunk capital costs, and agglomeration effects – i.e. other country characteristics that define production costs. Moreover, the impacts tend to be concentrated on a subset of sectors for which environmental and energy regulatory costs are significant – a small group of industrial sectors characterised by highly energy-intensive production processes, a limited ability to fully pass through pollution abatement costs to consumers (whether due to regulation or international competition), and a lack of innovation and investment capacity to advance new production processes. Therefore, carbon leakage and competitiveness issues seem empirically to represent a risk only in this small but important subset of sectors.

30. This literature, however, has been, by definition, based on *past* climate policies, which have not embodied the same level of ambition that is now being put forward by some countries. Thus, while carbon leakage and competitiveness effects of climate policies have been very modest so far, increased policy stringency divergence in the future may amplify these issues. The small effects identified may therefore partly reflect the low stringency of climate policies to date. Yet threats posed by climate change require policies that lie outside the bounds of past experience. Another explanation for the small effects observed so far is that climate policies are designed so as to prevent potential competitiveness effects. A large number of climate policies have compensation mechanisms in place, perhaps the most prominent example being the EU ETS which has, at least during its first 10 years of existence, widely allocated emissions permits for free. The next section reviews border carbon adjustments and other instruments that are being used or could be used to address differences in policy stringency.

3. Ensuring that ambitious climate policies are viable in a globalised economy

31. Climate policy to date has been shown to have limited impact on firms' competitiveness and location decisions. However, the impact on emissions is still too low to curb climate change, so that some countries are now seeking more ambitious regulatory regimes. The viability of ambitious climate policies requires governments to secure acceptance by their domestic constituencies – citizens and industries alike – including by minimising adverse carbon leakage (ensuring effectiveness) and competitiveness effects deemed unfair (ensuring fairness). To achieve this goal, many policy instruments are available. This section reviews them with a focus on border carbon adjustments (BCAs), which have been discussed for many years, but so far rarely been implemented.

3.1. BCAs as possible instruments to ensure effectiveness and fairness of ambitious climate policies

32. A BCA (also sometimes called a carbon border adjustment mechanism) can be defined as “a measure applied to traded products that seeks to make their prices in destination markets reflect the costs they *would have* incurred had they been regulated under the destination market’s greenhouse gas emission regime” (Cosbey et al., 2012^[37]). The adjustment inherent in that measure is usually conceived as applied to either just imports, or both imports and exports.⁴

33. It is potentially misleading to refer to BCA as “a single measure” since it usually consists of several components, or parts.. It comprises a wide variety of possible measures, with different variations defined by the choices made by policy makers in the face of at least seven critical decision points, for example covering the scope, measurement methodology, use of revenues and so on. Following a brief review of the legal and economic literature on BCAs, this section considers each of those decision points in some detail, considering the trade-offs and interlinkages they involve.

3.1.1. Effectiveness of BCA at minimising carbon leakage

34. Böhringer, Balistreri and Rutherford (2012^[38]) summarised the results of 12 different multi-sector multi-regional CGE modelling exercises that assess *ex ante* the impacts of BCAs in conjunction with an emissions reduction target of 20% among industrialised nations.⁵ Leakage in the reference case (no BCA) ranges from 5%-19 %. The introduction of a BCA reduces leakage rates by about one-third – with final leakage values ranging from 2%-12 %, depending on design choices. A survey of the literature by Condon and Ignaciuk (2013^[4]) confirms this result from a number of mostly CGE studies predicting that BCAs would be partially effective at preventing leakage.

35. Branger and Quirion (2014^[39]) conducted a meta-analysis of over 25 *ex ante* studies in energy-intensive trade-exposed (EITE) sectors, with different specifications of BCA regimes. They found a range of leakage rates from 5% to 25% (with a mean of 14%) in scenarios without BCA, falling to -5% to 15% (mean 6%) when a BCA is implemented. They also found that the most important features for a BCA to effectively prevent leakage are: a broad EITE sectoral coverage (a decrease of 10.7 percentage points in the leakage rate compared with a narrow coverage), a rebate for exports (a decrease of 4.1 percentage points), and a precise measurement of embodied carbon emissions based on foreign specifications rather than blunt default domestic-based factors (a decrease of 2.7 percentage points). By contrast, Böhringer, Balistreri and Rutherford (2012^[40]) found that allowing exports rebates in the BCA regime does not prevent leakage as much as a broad sectoral coverage (at least for countries that are net exporters of EITE goods). They also suggested that BCAs may be relatively more effective in reducing leakage than alternatives like

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⁴ The adjustments for exports will take the form of the rebate, at the point of export, of any charges levied under a carbon pricing scheme for which a BCA regime adjusts at the point of import.

⁵ The assumption is that reductions are relative to 2004 and achieved in 2020.

output-based rebates – e.g. a grandfathering approach, wherein firms receive emission allowances according to their (historical) emissions.⁶

36. Overall, *ex ante* studies indicate that leakage in EITE sectors would increase under more ambitious climate policies and that BCA would be at least partially effective at reducing such leakage. The dearth of actual policies with high levels of ambition and the use of BCAs or alternatives to address leakage mean that *ex post* analysis has not yet been possible.

3.1.2. Compatibility of BCA with the current multilateral system of trade rules

37. The multilateral system of trade rules intends to ensure that international trade takes place on a non-discriminatory, transparent and predictable basis so that all countries, irrespective of their relative economic weight, benefit from it. For a BCA to be accepted internationally, one important condition is therefore to be compatible with WTO rules, which, as analyses show, depends crucially on its design. This subsection briefly surveys this literature and addresses the following: issues specific to BCA as a tax or BCA as a regulation, including both treatment of imports and exports; issues related to national-treatment and most-favoured-nation (MFN) obligations and; issues related to GATT Article XX exceptions.

BCA as an accompaniment to a carbon tax

38. With respect to imports, if a BCA regime was to accompany a domestic carbon tax, it might be categorised as a “customs duty” under GATT Article II. If so, and the BCA resulted in an importing country exceeding its tariff bindings for the imported product it would breach GATT Article II.⁷ This will not occur, however, if the border tax adjustment satisfied GATT Article II:2(a), which explicitly allows charges on imports that are equivalent to certain internal taxes on like domestic products. The literature on these issues is well established – see for instance OECD (2006^[41]). But to be allowed under Article II:2(a) several conditions must be met.

39. First, the border tax adjustment must be imposed on a specific product or on an input to that product (“in respect of an article from which the imported product has been manufactured or produced in whole or in part”). One complication is that a carbon tax is actually imposed on carbon dioxide emissions, which are not strictly an input but rather a by-product of the production process and not physically present in the final good. To date, there is no jurisprudence or consensus in the literature on whether Article II:2(a) permits

⁶ To the extent this is true, it should be more so as the underlying climate measures increase in ambition. For one thing, the closer the economy comes to net zero carbon emissions, the less there is to rebate. For another, as more ambitious carbon pricing imposes a greater burden of adjustment, there is less economic and political viability in protecting high-emitting EITE sectors and shifting that burden onto the rest of the economy.

⁷ The first categorization question is therefore whether a border adjustment is considered an import tax subject to GATT Article II or an internal tax subject to GATT Article III. An internal tax that is applied to imports at the border will still be treated as an internal tax subject to Article III, rather than a customs duty or other charge subject to Article II (see Ad Note to GATT Article III). The Appellate Body has said that the categorization is based on what triggers the obligation to pay the charge – i.e. whether the tax obligation accrues because the product is imported, or because of an internal factor, such as domestic resale or use.

the border adjustment of taxes on carbon dioxide emissions associated with the production of a product (Holzer, 2014^[42]).⁸

40. Second, Article II:2(a) requires that the tax be imposed in a manner that is consistent with the provisions of Article III:2, which calls for national treatment with respect to internal taxes or other charges. This means that the amount of the adjustment could not exceed the tax rate levied on like domestic products and raises a threshold question of defining the domestic products and tax rates that would be taken as a reference.

41. Indeed, in line with the obligations in Article III:2, the BCA as applied to imports must not treat a foreign product less favourably than a “like” domestic product. Most analysts agree that high-carbon and low-carbon products that are otherwise directly competitive or substitutable would be considered “like”, while others consider that high-carbon and low-carbon products might be considered unlike in which case the national treatment obligations in Article III are not triggered (Pauwelyn, 2007^[43]; Howse, 2000^[44]).⁹ More recent WTO case law could suggest that even where products are “like”, differential treatment is not discriminatory if it could be explained by factors unrelated to the foreign origin of the product and that the application of this reasoning to BCAs would mean that carbon taxes that adversely affect high-carbon imports compared to low-carbon domestic products would not be discriminatory (Pauwelyn, 2013^[45]).

42. However, there is, again, no consensus on this issue (Holzer, 2014^[42]; Trachtman, 2016^[46]). Moreover, even where the taxes applied to imports and like domestic products are based on carbon content rather than origin, and even assuming that this in itself is not discriminatory, there is still the possibility for WTO-inconsistent discrimination if the measurements of carbon content of imports and domestic goods are made in a way that disadvantages imports. For this reason, some commentators argue that a system most likely to comply with GATT Article III would tax imports according to the lowest rate assessed on the cleanest like domestic product (Mehling et al., 2019^[47]).

43. With respect to exports, footnote 1 of the WTO Agreement on Subsidies and Countervailing Measures (SCM Agreement) allows for the exemption of exports from some taxes borne by like domestic products, or the rebate of such taxes, specifying that they should not be deemed export subsidies. Subsequent case law has made clear that these taxes must be indirect, so the discussion in footnote 6 of this paper in relation to Article III:2 is also relevant to BCA applied to exports.

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⁸ While the GATT Working Party on Border Adjustments noted that there was a “convergence of views” that Article III:2 allows for adjustment of indirect taxes such as sales taxes, but not direct taxes such as payroll taxes (General Agreement on Tariffs and Trade (GATT), 1970^[48]), there was no consensus on the treatment of a third category of taxes – “taxes occultes”, or hidden taxes – which, significantly, includes among others taxes on energy consumed in production. Some analysts argue that a carbon tax would be considered an indirect – and therefore adjustable – tax (Holzer, 2014^[42]; Cosbey and Fischer, 2014^[121]; Pauwelyn, 2007^[43]; Wooders and Cosbey, 2010^[120]; Hoerner and Muller, 1996^[133]) while others (Low, Marceau and Reinaud, 2011^[53]; Goh, 2004^[122]) argue that the distinction is not relevant, since it does not answer the question of whether a tax on an input not physically present in the final good would qualify.

⁹ This view points, among others, to the fact that, in addition to the product’s physical characteristics and their “end-uses in a given market”, a determining feature can include “consumers’ tastes and habits”, i.e. whether consumers perceive those products as alternative to one another.

44. As with the adjustment on imports, the question arises as to whether export adjustment can be allowed for taxes on inputs not physically present in the final product. A reading of SCM Annex I item (h) together with footnote 61 of Annex II suggests that adjustment on exports can be made for a prior-stage cumulative indirect tax on energy as an input.¹⁰ Many countries in fact use this sort of regime for carbon taxation.

45. There is reason to believe that, however this question is answered on the import side, there should be equality of treatment with rebates applied on the export side (and vice-versa). The report of the WTO's Working Party on Border Tax Adjustments noted agreement "that GATT provisions on tax adjustment applied the principle of destination identically to imports and exports" (General Agreement on Tariffs and Trade (GATT), 1970_[48]).^{11,12}

46. Likewise, if ultimately allowed, any rebate or exemption would have to be no greater than the amount actually paid by the domestic producer, and would have to be offered on the same terms to all domestic producers covered by the carbon tax (Holzer, 2014_[42]). Such a rebate or exemption would need to correspond to the amount paid for products with similar levels of emissions if emissions are considered a sufficient factor for making products "unlike"; but it has also been argued that if high-carbon and low-carbon products are deemed "like", the *no-greater-than* requirement would imply that the amount of the adjustment could not exceed the lowest tax rate levied on domestic producers – i.e. the rate assessed on the cleanest producer (*Ibid*).

BCA as an accompaniment to an emissions trading system

47. If a BCA regime accompanies an emission trading system (ETS) rather than a carbon tax, for example requiring that importers purchase allowances from such a scheme or equivalent, it could be considered a form of domestic regulation under GATT Article III:4, although some argue that it could also be an adjustable tax covered by Article III:2 (Mehling et al., 2019_[47]).¹³ In both cases, the same requirement of national treatment of imports would apply here, with respect this time to laws, regulations and requirements affecting each product's internal sale, offering for sale, purchase, transportation, distribution or use (McLure, 2011_[49]; Ismer, 2009_[50]; Bartels, 2012_[51]; Hufbauer,

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¹⁰ Prior-stage taxes are taxes imposed on goods and services that might be used in the making of a product. Cumulative taxes are those that accumulate at each stage of the value chain. There is no mechanism to credit a purchaser at any stage for the taxes paid at previous stages.

¹¹ The destination principle of taxation says that consumption taxes on products should be levied in the countries in which they are consumed. This principle is followed in practice with value-added taxes, which are typically levied on domestic and imported goods, and which are refunded to producers at the point of export.

¹² That said, for a rebate at the point of export does not have a strong environmental rationale and it seems to work against the polluter pays principle. Therefore, its inclusion in a BCA regime might weaken the chances that such a regime would survive a GATT Article XX challenge (discussed below) (Mehling et al., 2019_[123]; Hufbauer, Charnovitz and Kim, 2009_[52]).

¹³ Note also that if a BCA regime accompanies an ETS it could also be a "technical regulation" and subject to the requirements for WTO-consistent technical regulations in the Technical Barriers to Trade Agreement.

Charnovitz and Kim, 2009^[52]).¹⁴ Imported products would have to receive regulatory treatment no less favourable than like domestic products, so that the above-mentioned question of whether the goods are like would again arise, as well as the question of whether distinguishing among them constitutes a discrimination in breach of national treatment obligations under Article III. The difference in treatment on grounds of environmental considerations may be easier to establish in the context of regulations under GATT Article III:4 than for taxes under Article III:2 (Mehling et al., 2019^[47]).

48. In contrast, a BCA on exports, taking the form of a rebate on the costs of, or an exemption from, applicable ETS regulations, would be subject to the provisions of the SCM Agreement, and could be considered a prohibited export subsidy if it were contingent upon export performance and in excess of the cost of those regulations borne by products consumed domestically.

Most-favoured-nation obligations

49. Irrespective of whether the BCA accompanies a carbon tax or an ETS, Article I of the GATT will apply. Article I prohibits discrimination among imports on the basis of the country of origin in any sort of customs duties, charges, or regulatory treatment as described in Article III. If a BCA regime differentiates (estimated) levels of embodied carbon emissions in imports based on the country of origin of the products, rather than on objective emissions-related criteria applicable to all countries, it would likely violate the MFN principle (Pauwelyn, 2013^[45]). Similarly, any differentiation in export rebates under a BCA based on the destination country rather than its emissions-related characteristics, would constitute a violation of Article I (Holzer, 2014^[42]). In addition, special treatment for some countries – e.g. signatories to a given treaty – in the assessment of charges at the border could also be seen as a breach of the MFN principle, unless participation to the treaty provides an objective test, applicable to all, for assessing the countries' emissions-related characteristics.

50. However, BCA discrimination in favour of developing countries and exclusions for least developed countries might be allowed under the WTO's Enabling Clause, as long as the criteria for exemption are based exclusively on development indicators, and countries in similar conditions are treated the same way (Holzer, 2014^[42]; Low, Marceau and Reinaud, 2011^[53]). Some have even emphasised that differentiation between countries where different (development) conditions prevail is required by the chapeau of GATT Article XX and related case law¹⁵ (van Hasselt, Brewer and Mehling, 2009^[54]; Pauwelyn, 2007^[43]).

The GATT Article XX exceptions

51. If a BCA is found to be inconsistent with GATT Articles II:2(a), III:2, III:4 or I, GATT Article XX (General Exceptions) provides that a measure may nonetheless be permitted if it is:

- (b) necessary to protect human, animal or plant life or health;

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¹⁴ It has been argued that a BCA in an emission trading system could in fact be considered a tax (Pauwelyn, 2007^[43]; Cendra, 2006^[56]) in which case the considerations discussed above would apply.

¹⁵ See EC-Tariff Preferences, AB report, para.173.

(g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption.

52. Most analysts see sub-paragraph (g) of Article XX as easier to comply with, given the need to prove necessity in sub-paragraph (b) (Horn and Mavroidis, 2010^[55]; Cendra, 2006^[56]). WTO case law¹⁶ – even though it does not establish legal precedent – suggests that clean air is an exhaustible natural resource; and that a measure “relating to” the conservation of such resources needs to display a close relationship to their conservation, a connection between the means and the ends, and not be “disproportionately wide in its scope and reach in relation to the policy objective of protection and conservation”¹⁷. Therefore, any BCA needs to be able to demonstrate that its elaboration and implementation actually address climate change. As such, any breach of GATT provisions under a BCA must be justified by a strong environmental rationale. A BCA explicitly aimed at preserving the competitiveness of domestic producers would likely fail to meet the criteria of sub-paragraph (g) (Bacchus, 2010^[57]).

53. If a BCA regime can be justified on these exceptions, it proceeds to the test of Article XX’s chapeau, which asks how the measure is applied in practice. The chapeau states that no breach of GATT obligations can be justified under the exceptions of Article XX, if it constitutes an arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Therefore, the implementation of a BCA cannot be carried out so as to protect domestic interests’ *vis-à-vis* foreign producers nor differentiate among various producers in an arbitrary or unjustified manner.

54. The question of whether the design of a BCA policy is arbitrary or unjustified hinges on the particular context and details of every case. However, case law on Article XX provides an indication of the issues that might be relevant. For example, a country may fail to satisfy the chapeau of Article XX if it:

- Requires specific policies as a basis for exemption from the BCA, as opposed to requiring that the foreign producers achieve some given level of climate performance;
- Implements exemptions or calculates adjustment levels based on the country of origin, rather than on the basis of objective criteria applicable to all countries, which may include the implementation by the countries of emissions-related policies, or be linked to the environmental performance at the level of individual producers;
- Implements the BCA without having tried to negotiate in good faith to reach some multilateral solution to the problem of carbon leakage. Negotiations under the UNFCCC could arguably be considered steps in this direction;
- Implements a BCA that fails on the criterion of good governance – i.e., transparency, due process, etc. – if the result effectively makes the regime more arduous for foreign producers; or
- Allows exemptions from coverage of the BCA (e.g. for parties that have ambitious climate goals under the UNFCCC’s Paris Agreement) or for specific domestic producers) that are not based on – or are inconsistent with – the objective of mitigating climate change by preventing leakage.

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¹⁶ US-Gasoline, para.6.37.

¹⁷ US-Shrimp, AB report, paras 136 and 141.

55. Importantly, while GATT Article XX can provide justification for breaches of GATT obligations, most analysts agree that it does not cover breaches of obligations in other WTO Agreements. For example, a BCA considered to provide a prohibited export subsidy under the SCM Agreement, having failed to satisfy SCM conditions such as SCM Art.8.2(c) (adaptation of existing facilities to new environmental requirements), or Annex I (h), (i) exceptions, would have no recourse to GATT Article XX.

3.1.3. Implementation challenges

56. As noted above, a BCA can vary considerably in design as a result of choices made by policymakers. Decisions are made at each point in the design phase, which will affect the features, and thereby the final shape, of the regime. Ultimately this means there are many possible BCA regimes.

57. This section explores the most important of these decision points, explaining in depth the implications of each:

- Scope of carbon emissions coverage
- Scope of product coverage
- Scope of geographic coverage
- Scope of trade coverage (imports and exports)
- Measurement of embodied carbon
- Crediting for an exporting country's climate policies
- Use of revenues

Scope of carbon emissions coverage

58. The scope of emissions covered is fundamentally important, as it will have implications for the other aspects of a BCA regime. The WRI/WBCSD GHG Protocol¹⁸ uses a delineation that has become standard, dividing emissions into three types:

- Scope 1: Direct emissions, generated by industrial processes and any other on-site activities.
- Scope 2: Indirect emissions associated with energy (i.e., electricity, heat or steam) imported from off-site.
- Scope 3: All other indirect emissions in the life cycle of the products produced, including those associated with any intermediate goods, transport of goods to market, emissions in end use and disposal of products produced. It includes also emissions associated with leased assets, franchises and investments.

59. In principle, the coverage of any BCA regime should conform to the coverage of the policy instrument it accompanies. That is, if a carbon tax is applied on scope 1 and 2 emissions, so too should an accompanying BCA regime.

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¹⁸ The GHG Protocol jointly developed by the World Resources Institute and the World Business Council for Sustainable Development establishes comprehensive global standardised frameworks to measure and manage GHG emissions from private and public sector operations, value chains and mitigation actions. See <https://ghgprotocol.org/> for more details.

60. Theoretically, covering scope 3 emissions is attractive as it provides an estimation of the full life-cycle emissions of covered products. However, doing so is challenging. Emissions in transport – included in scope 3 emissions – offer an example of conceptual complication. If we assume that domestic transport costs are covered under the carbon tax or ETS that a BCA accompanies, does it follow that the BCA should account for unpriced carbon emissions from international transport? Not if the objective is to avoid leakage (or even competitiveness impacts).¹⁹ The costs faced by foreign producers for international transport do not create a risk of leakage, which happen if domestic climate policies increase production costs above those faced by foreign producers.

61. Perhaps more importantly, scope 3 emissions pose daunting methodological and administrative challenges. Many global value chains are complex, involving hundreds of inputs from many countries, some of which are themselves the product of other extensive value chains. The costs of trying to compile data on associated emissions (if it were possible) could easily outweigh the benefits.

Scope of the product coverage

62. Product coverage under a BCA regime can be broad – reaching far enough to cover, for example, manufactured goods and agricultural production – or narrow, such as including only a small number of energy-intensive, trade-exposed sectors such as steel, aluminium and cement.

63. If the objective is indeed to address leakage concerns, the criteria for product coverage should be two-fold:

- High GHG-intensity (since domestic carbon pricing disproportionately affects such products); and
- High trade exposure (since consumers can easily substitute imports for such domestic goods in the event that carbon pricing makes them more expensive).

64. While there have been various proposals to use only one of the two criteria, using both would be necessary. Vulnerability to leakage requires both being adversely affected by domestic carbon pricing and being unable to pass the associated cost increase along to consumers without being undercut by imported competition.

65. As noted above, these criteria can be specified to include few or many sectors. Broader coverage is preferable from the perspective of preventing leakage. However, the broader the coverage, the more difficult the calculation of embodied carbon emissions, particularly if it expands to cover a number of final manufactured goods. While the upstream production stages of manufactured goods can generate a significant amount of emissions, final stages tend to have low amounts of carbon relative to value added, meaning any price signals transmitted by carbon pricing and BCAs might have little impact. Therefore, there is a point in the production of a good past which the breadth of coverage will yield too little gain relative to the costs of administering the scheme. The challenge is finding that point.

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¹⁹ This is not to say that emissions from the international transport of goods should be ignored. Ideally, they would be subject to their own, global, carbon tax or emissions trading system.

66. Narrow coverage is more administratively feasible. There is a “usual suspects” list of fewer than 20 highly energy-intensive trade-exposed (EITE) sectors.²⁰ However, narrow coverage has a greater probability of creating leakage and competitiveness problems for downstream producers who are not covered by the BCA, but pay higher prices than their foreign competitors for their covered inputs such as steel and aluminium.

67. Even slight changes in the specified criteria could have significant financial implications for sectors that would inevitably be on the boundary of coverage. This implies that intense lobbying should be expected around the decision of where to set those boundaries. Accordingly, the criteria need to be established objectively, based on an assessment of expected leakage, and be impervious to political discretion (though regular reviews should be conducted per regulatory best practice).

Scope of the geographical coverage

68. A BCA regime might simply cover all countries equally or could feature exemptions for some countries. Such exemptions could be designed to apply incentives (or leverage) for other countries to ramp up their climate ambition, and are sometimes seen as an argument for pursuing BCAs in the first place. An increasingly broad group of exempted countries essentially becomes a “climate club” (Nordhaus, 2015^[58]).

69. If pursued, country-based exemptions might be premised on the exporter’s national-level climate ambition or its performance in pursuing that ambition. If applied towards that goal, these exemptions should define qualifying conditions applied to all countries that are transparent, objective, and impervious to bureaucratic discretion.

70. This approach might prove contentious as the country implementing a BCA will have to deliver a unilateral judgement on the adequacy or comparability of climate action undertaken by other countries. While relatively straightforward for pricing policies, the judgement becomes much more complex for broader climate policies, and is further complicated by the principles of the UNFCCC and the Paris Agreement. The bottom-up approach of NDCs under the Paris Agreement was designed to allow countries to set their own commitments in line with their capacity to act. Therefore, judging these pledges inadequate might be seen by some as tantamount to deeming the UNFCCC approach inadequate, which could weaken this process. However, the elaboration process of NDCs does not imply that any of them is in any sense “adequate”. In fact, as of today, it is known with certainty that the aggregate effects of the current round of NDCs are inadequate to achieve the Paris Agreement targets.

71. Exemptions might also be extended to countries based on their level of development. The principle of common but differentiated responsibility and respective capabilities (CBDR-RC) suggests that those that have contributed least to the current stock of atmospheric GHGs, with least capacity to address the climate challenge, should be called on to do less in terms of mitigation. As noted above, differentiation based on development considerations may be allowed under the WTO’s Enabling Clause. By that argument,

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²⁰ While subject to much discussion and controversies, Cosbey et al. (2012^[37]) provide a tentative list of EITE sectors: milling of wet corn, yarn, iron or steel; rendering of meat or meat by-products; the mining of iron ore, copper ore, nickel ore; the smelting and refining of non-ferrous metals; and the manufacturing of whey, pulp and paper, chemicals and petrochemicals, fertilisers, porcelain, glass, ceramics, cement and lime, mineral wool and ground or treated mineral earth, electrometallurgical ferroalloys, iron or steel pipes and tubes, primary aluminium, and carbon and graphite products.

exempting least developed countries (LDCs) from the coverage of BCAs would be appropriate and would be unlikely to face a challenge for breaching obligations under GATT Art.I (most-favoured nation principle), not only on account of the Enabling Clause, but also because of political considerations. In anything but a very broad scope of product coverage, LDCs are likely to have few goods that would be implicated. However, this differentiation is more controversial in the case of other developing countries, both in the context of the CBDR-RC and in the framework of the WTO.

72. Country-based exemptions would need to be designed to prevent the trans-shipment of goods from covered countries through exempted countries. This is not an impossible challenge, and such regimes are in place for most RTAs as part of their rules-of-origin requirements. However, it would add a layer of complexity to any BCA. Unlike a rules-of-origin regime, a BCA regime would ideally focus on more than just value-added as a criterion, as a simple value-added criterion might miss covering exempt-country imports produced with low-value, high-GHG inputs imported from non-exempt countries.

Scope of trade coverage (imports and exports)

73. A fundamental design question is whether a BCA regime would apply to just imports, or to both imports and exports.

74. Application to exports would involve rebating, at the point of export, any charges levied under a carbon pricing scheme for which a BCA regime adjusts at the point of import. Such a rebate would serve to protect the competitiveness of the implementing country's covered sectors in global markets. From an environmental perspective, however, it would work against full-cost accounting of carbon emissions in the products of domestic firms, unless those externalities were being internalised through some climate policies in the countries to which they are exported.²¹ From a more dynamic environmental perspective, including exports might save relatively clean firms with strong export profiles that otherwise would have been put out of business by their loss of market share abroad – thereby preventing leakage.

75. If rebates on exports formed part of a BCA that accompanied a carbon tax, the practice would probably be considered legal under the WTO's SCM Agreement, provided the BCA were ruled an indirect tax, similar to a VAT. If the BCA accompanied an ETS, however, refunding the costs imposed by a regulatory regime would entail significant legal uncertainty, and could be considered a prohibited export subsidy under the SCM Agreement if the rebate was judged in excess of the costs borne by like products sold domestically.

76. If a BCA regime granted country-based exemptions for imports, it would make intuitive sense to not issue rebates on exports destined to exempted countries. The goods exported to those countries would presumably be competing in a market with carbon pricing policies similar to those of the implementing country. Not applying such pricing to those exports would arguably constitute an unfair subsidy. But such a system would be practically unworkable since there is no way to prevent goods exported to a non-exempted country from being re-exported to exempted countries. Also, this practice would risk being challenged as a violation of the WTO's MFN principle.

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²¹ From a domestic market perspective, it could also result in distortions as firms may find exporting more advantageous and make fewer goods available domestically.

Determination of embodied carbon emissions

77. Measuring or estimating the carbon emissions embodied in imports can rely on a broad array of methods.

78. A **product-based approach** would attempt to estimate the actual carbon emissions embodied in each imported product covered by the BCA scheme. This approach would involve, for each shipment, carbon emissions disclosure by the exporter. Emissions associated with energy use would ideally be calculated on location-specific measures of the marginal or average carbon-intensity of the various power sources used; or where not possible, using common emission factors such as those published by the IPCC. In addition, such an approach should, in principle, be based on a robust, internationally transparent, consistent and equitable method for measuring the carbon footprint of products in different jurisdictions. Doing so reduces the risk of carbon-footprint measurements acting as discriminatory or unjustified barriers to trade or a factor encouraging unfair competition between imported and domestic goods (Gruère, 2013^[59]). Many OECD countries have firm-level regulatory requirements for carbon emissions reporting in national law, which could provide a broad basis for product-level reporting. These regulations, however, usually do not apply to all sectors and may not yield information that would allow for a differentiation by production chain or input sources.

79. While a product-based approach is arguably the best at preventing leakage and at transmitting price signals to foreign producers, it has two main drawbacks. First, it would entail a highly complex regime, difficult to monitor and very costly to both exporters and government of the implementing country. Its complexity and difficulty would increase as the scope of emissions covered increased. Covering scope 3 emissions such as those from intermediate goods, for example, would make such a regime particularly challenging. Second, the incremental burden of reporting emissions placed on foreign producers is potentially enormous if they report to different standards, or they do not report at all.

80. A **sector-based approach** would assign a default value for carbon intensity, based on sectoral characteristics. The default value could be set at best practice – for example, assuming all production is of a carbon intensity as low as the 90th percentile of the sectorial distribution – or average practice, or worst practice levels for carbon intensity. There are some inherent tensions among these choices. On the one hand, a best-practice default value establishes a weaker environmental standard, giving less protection against leakage and competitiveness impacts, since it would inevitably assume lower carbon intensity than is actually achieved by many producers. Such a default is also a very blunt instrument in terms of giving foreign producers price incentives to improve performance. On the other hand, a best-practice default value would be less politically controversial and might stand a better chance to be accepted by trading partners than more punitive defaults. A worst-practice default value would be exactly the reverse: more controversial, more likely to breach WTO law but highly effective as a means to protect against leakage and competitiveness impacts.

81. There is also a choice to be made as to the locus of practice. The default could correspond to sectoral performance in the implementing country – which is administratively simpler, for example using the benchmarks of the EU ETS for the case of the EU – or to sectoral performance at the global level. The full implications of this choice would depend on the relative carbon-intensity of global production compared with the BCA-implementing country.

82. This approach could allow foreign producers to challenge the assigned defaults. That is, a producer with a lower carbon-intensity than their assigned value could present

third-party verified data proving their superior performance and be charged accordingly. Such a provision would provide incentives for foreign producers to improve their carbon intensity and improve the potential of any BCA regime to pass a GATT Article XX challenge by diminishing the arbitrary nature of an assigned default value.

83. However, such a provision suffers from many drawbacks. First, it would allow scope for “resource shuffling” – a process by which, in the worst case, all existing low-carbon production is exported to the BCA-implementing country, and all high-carbon production is re-routed to the remaining buyers, with no final change in the volume of high-carbon goods produced. There is some evidence of this occurring in the unique currently functioning BCA on electricity in California (Prag, 2020^[12]). Second, the costs of verification and certification could be disproportionately high for small producers in developing countries where assessment and certification infrastructure is deficient (OECD, 2005^[60]; Moïsé and Steenblik, 2011^[61]), adversely affecting these producers (Brenton, Edwards-Jones and Jensen, 2009^[62]; Bowlig and Gibbon, 2009^[63]; Edwards-Jones et al., 2009^[64]). Finally, experience has shown that certification is subject to foot-dragging by importing countries in a way that makes the process expensive for exporters, or collusion by importers (looking after their supply chains, as has been the case in the palm-oil industry) to green-wash the results (Lange and Bundy, 2018^[65]; Cazzolla Gatti et al., 2019^[66]).

84. **A hybrid approach** would make some specific aspects of the default value dependent on variables from the exporting country. It could complement a sector-based approach, for example, by blending a single sectoral value for scope 1 emissions – e.g. the average global carbon intensity of the sector – with a value for scope 2 emissions based on the carbon-intensity of the relevant energy matrix in the exporting country – e.g. the local average grid emission factors in electricity markets where production takes place rather than national averages.²² Such an approach would yield a more accurate value for the embodied carbon emissions in imported goods as scope 2 emissions tend to vary more by country than do scope 1 emissions. However, calculating and constantly updating different country-level energy emission factors in all covered countries would add a level of complexity to a BCA regime though there is some experience of this through the Clean Development Mechanism offsetting scheme. And if the benchmark were country-based, it might make the resulting regime more vulnerable to a challenge under GATT Article I – Most Favoured Nation Treatment.

Crediting for climate policies

85. A BCA regime could credit foreign producers for the carbon pricing they have already been subject to domestically, which is sensible from a leakage-prevention perspective.²³ As well, from the perspective of fairness (and perhaps WTO legality), it

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²² For energy intensive production like aluminium, the precise source of energy can be known because of the scale of industrial usage.

²³ Strictly speaking, there could be leakage to a foreign country that has exactly the same climate policies and carbon pricing regime as the implementing country. As defined above, carbon leakage is “the increase in foreign carbon emissions that are caused by the introduction of domestic climate policy.” Even if country A introduces a climate policy that is identical to the pre-existing policy of country B, this change could still cause an increase in emissions in country B. However, this is not the sort of leakage that a BCA should be designed to prevent since even if emissions increase in country B, their associated externalities would eventually be internalised through climate policies in

would be undesirable for foreign producers to be double charged for the carbon embedded in their goods.

86. If credit were granted, it could be done narrowly – only taking into account carbon pricing regimes – or more broadly – to also cover other climate policies – with cost implications for producers. In the case of carbon-pricing policies, the credit should match the carbon price in the exporting country (up to the level of the domestic carbon price, which would be equivalent to zero adjustment). Where that price takes the form of a tax, this adjustment may be straightforward. In the case of an ETS, the price should most appropriately be the market price for allowances, even though permit allocation rules could be taken into account too.²⁴ In the case of broader climate policies, crediting would be more challenging. It is difficult and subject to controversies to calculate the equivalent price of regulatory policies such as emissions standards – although it has been done (Gillingham and Stock, 2018^[67]; Enkvist, Nauclér and Rosander, 2007^[68]).

87. The more fundamental challenge may lie in deciding which regulations to cover. Many regulations that increase the cost of carbon-intensive production are not ostensibly climate policies. For example, removing VAT refunds for energy-intensive goods may be part of a national economic restructuring strategy for moving up the value chain; relatively high excise taxes on some carbon-intensive fuels could be part of revenue-raising policies. Should the impact of such policies be credited? It would, moreover, be difficult to keep abreast of all such regulatory measures in all the countries covered by a BCA regime.

88. Moreover, if the BCA is seen as a way to charge emissions embodied in imported products in line with a domestic carbon pricing regime, then it is not obvious why there should be adjustments for costs borne outside that regime. Taken to its logical conclusion, this principle suggests that the BCA should equalise all costs, levying adjustments not only for the domestic carbon pricing, but also for all domestic policies – both climate-related and non-climate-related – that increase costs for EITE producers. Such an approach would be at odds with the norms of international trade, which see regulatory costs and direct taxes as inevitable (and non-adjustable) costs of doing business in each sovereign state.

89. In addition, any system of crediting creates a risk that countries with strong climate policies (and high credits) become trans-shipment hubs through which goods could flow to the implementing country from producers in countries with weak climate policies (and low credits).

90. The alternative to crediting is simply to grant no credits. Such a solution would be administratively much simpler but would suffer from the faults discussed above: poor alignment to the objectives of preventing leakage and loss of competitiveness; and lack of “fairness”. However, if every country in the global trading system implemented a BCA covering both exports and imports, not crediting policies in the country of export would fail on the fairness criterion. The assumption would be that domestic carbon charges would have been refunded at the export point, making unnecessary a crediting at the import point.

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that country, which is sensible from an environmental perspective and consistent with the definition of BCA provided above.

²⁴ In practice, the price could be based on a rolling average daily price of allowances. Using day-to-day pricing would lack predictability because of fluctuations in the weeks between export and arrival at the point of import. However, determining the carbon price of a foreign country is not a given and is subject to controversies. The OECD’s *Taxing Energy Use and Effective Carbon Rates* publication series provide comparable data on carbon prices and effective carbon rates across OECD and G20 countries (OECD, 2019^[129]; OECD, 2018^[17]).

This is the existing international dynamic for value-added tax, which most countries use. Of course, this approach would work only if a similarly large number of countries were applying BCAs.

Use of revenues

91. BCA-implementing countries have several options in deciding where to direct the revenues collected under a BCA regime. The most fundamental choice is whether to retain the funds domestically – or within a commercial block – or to transfer them abroad. As some countries seek to align their stimulus packages for recovery from the COVID-19 crisis with their environmental goals, there could be a stronger argument for retaining revenues domestically.

92. Options for transfer abroad include international funds directed at climate action, such as the UNFCCC's Green Climate Fund and Adaptation Fund. Any such transfers would have to be transparently accounted for as additional to existing climate finance. Collected revenues could also be transferred to the exporting countries, possibly with the agreement that they would be spent on building capacity to develop and adapt to carbon pricing.

93. Such international transfers present an opportunity to align the workings of a BCA with the principle of CBDR-RC. They might also help justify that the BCA is aimed at environmental objectives rather than economic protection of domestic firms – a distinction that would be important in the event of an appeal to the GATT's Article XX exceptions. International remittance might, however, make the regime less appealing to domestic constituents even if they benefit from its protection. Even without such transfers, a BCA can be seen as an inequitable shifting of the climate mitigation burden from implementing countries to covered countries. This is especially true for developing countries, which will experience a negative welfare effect as BCAs are implemented in developed economies' markets that they heavily depend on (Böhringer, Müller and Schneider, 2015^[69]; Babiker and Rutherford, 2005^[70]).

94. If the funds are retained within the implementing jurisdiction, they might be directed to firms covered by carbon pricing, with the objective of increasing their adaptation to carbon pricing. However, such a policy is controversial. For instance, the WTO considers illegal the distribution of anti-dumping and countervailing duties to the domestic companies that had requested or supported the imposition of those duties.²⁵ Such payments would doubly compensate the disadvantage of domestic companies vis-à-vis imported products covered by the BCA: by adjusting the carbon pricing of the imported products through the BCA, and by offering the payments. Moreover, the latter provide an additional competitive advantage that would also play in respect of other imported products not subject to the BCA. In that sense, these payments could distort competition in the domestic market and would risk being challenged as subsidies under the SCM Agreement. Alternatively, the funds might be less targeted, while still working to facilitate a low-carbon transition – e.g. on national programmes for low-carbon innovation. Or the funds might simply be directed into general revenue in the country or region of import.

95. In sum, the use of BCA revenues could be seen as an opportunity to signal environmental objectives, which might be useful in a WTO legal context and for domestic

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²⁵ See the WTO ruling on the piece of U.S. legislation commonly known as the "Byrd Amendment". https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds217_e.htm

and international political acceptability. Revenues use can help strengthen political support, but the precise modalities should depend on specific circumstances, with environmentally related spending as one option among others. Revenues use can help reduce the inequitable impacts of BCA where these exist (Sager et al., 2020^[71]; Böhringer, Carbone and Rutherford, 2018^[72]), and better align a BCA regime with the UNFCCC principle of CBDR-RC (Mehling et al., 2019^[47]).

3.1.4. Applied analysis: a comparison of two BCA proposals

96. This section analyses two concrete proposals for a BCA, describing the decisions made at each point discussed above and assessing their resulting strengths and weaknesses. The two proposals come from Mehling et al. (2019^[47]) and Flannery et al. (2018^[73]). They were selected because they are both detailed enough to be assessed in depth and they differ on many key decision points. They are depicted in Table 1.

Table 1. Two BCA proposals

	Mehling et al., 2019	Flannery et al., 2018
Scope of emissions coverage	Scope 1 and 2 emissions	Scope 1, 2, and 3 emissions
Scope of product coverage	Narrow - EITE; trade intensity and carbon intensity	Narrow - EITE, plus fossil fuel producers
Scope of geographical coverage	No country-based exemptions	No country-based exemptions
Scope of trade coverage	Imports only	Imports and exports
Determination of embodied carbon emissions	Scope 1 - global average, scope 2 - average grid emissions factors	Calculate an emissions index for each specific producer or a national sectoral average. Includes both direct emissions and embodied emissions. Embodied emissions only include the major sources, down to a <i>de minimis</i> level of significance – similar to narrowing the product coverage to EITE. Do this for both imports and exports.
Crediting for climate policies	Price based only (eventually non-priced as well)	None
Use of revenues	To developing countries for climate efforts, or to build capacity for MRV	No recommendations, but suggest into general revenues.

Sources: Mehling et al. (2019^[47]) and Flannery et al. (2018^[73]).

97. Mehling et al. (2019^[47]) recommend a regime that could accompany either a tax or an ETS. Pragmatic concerns dictate that it would cover only scope 1 (direct) and scope 2 (indirect, energy) emissions, and would be applied only to EITE sectors (based on the criteria of trade-intensity and carbon emissions intensity). Mindful of international trade rules, it would not feature country-based exemptions and would cover only imports. Embodied emissions would be determined using a hybrid method, with scope 1 emissions based on global average sectoral performance, and scope 2 emissions based on average grid emissions factors in electricity markets where production takes place rather than national averages. Only price-based climate policies would be credited, with a view to eventually also including non-price-based policies. Revenues would be directed to developing countries via either funds to help them address mitigation and adaptation, or to help build local firms capacity to measure, report and verify their carbon emissions.

98. By focussing on EITE sectors only, this regime's inability to cover emissions embodied in inputs raises concerns for leakage and competitiveness in downstream sectors. But such a narrow coverage is at the same time a virtue in terms of administrative feasibility. The decision not to grant country-based exemptions is commendable for trade law and political reasons. The hybrid method for determining embodied carbon is a solution that also aligns reasonably well with trade law, especially when combined with the option (offered here) for foreign producers to challenge the baseline with third-party verified data. Crediting for price-based policies in foreign countries follows a fairness perspective and is in line with leakage prevention rather than competitiveness protection. Coverage of imports only is arguably a function of the fact that the regime is designed to potentially be used with an ETS.²⁶ The decision to remit revenues to developing countries is sound from the perspective of CBDR-RC, and would stand up well in a GATT Article XX defence, but may be difficult from a domestic political perspective notwithstanding the protection conferred by the BCA regime.

99. By contrast, in the context of a carbon tax applied to a few key EITE producers – e.g. fossil fuel producers and, steel and aluminium manufacturers – based on the carbon content of their product and process emissions, Flannery et al. (2018^[73]) recommend an accompanying BCA regime on exports and imports.²⁷ It would cover scope 1, 2 and 3 emissions. Export rebates would be based on the full amount of tax paid by individual EITE producers for specific goods – i.e. all incidence of climate-related taxes on their intermediates along the supply chain as well as any tax paid on direct emissions.

100. Where estimating the amount of product emissions is impossible, a national sectoral average would be used. Charges on imports of EITE products would follow the same rules: asking for data on emissions – both emissions embodied in the full (upstream) supply chain and process emissions – and taxing them as domestic producers would be charged. If individual producers' data are unavailable, a national sectoral average would be applied. There would be no country-based exemptions and there would be no crediting for climate policies in covered countries. The authors make no recommendations for the use of the revenues, but suggest putting them into general revenues, where the tax revenues would also go.

101. The key advantage of covering embodied emissions along the value chain is offering protection to downstream producers, a feature that the Mehling et al. (2019^[47]) proposal is unable to do. As mentioned above, a concern is that data requirements from foreign producers may run into significant challenges, especially for developing and least developed countries' exporters. The decision to adopt narrow product coverage avoids, in principle, dealing with complex value chains. The lack of country-based exemptions is commendable from a trade law and political perspective. However, not crediting climate policies in other countries is problematic from the perspective of fairness and does not

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²⁶ If an ETS is considered a regulation – which is likely – then rebating the costs of that regulation at the point of export would risk being challenged as an export subsidy under the SCM Agreement (See section 3.1.2).

²⁷ Precisely, Flannery et al. (2018^[73]) propose an upstream tax on GHG emissions – rather than CO₂ emissions only – on fossil fuel producers and a few other EITE sectors like steel and aluminium. For emissions associated with fossil fuels combustion, the tax will be paid “upstream”, directly by fossil fuels producers based on the carbon content of produced fossil resources, thereby flowing through the chain linking suppliers, producers and customers to affect the entire economy. Process emissions are paid by EITE producers – e.g. steel and aluminium producers are charged for emissions from processing limestone or alumina.

comport well with the objective of merely seeking to avoid leakage. Export coverage is a sensible design choice, since the regime is designed to accompany a tax. The lack of recommendations on the use of revenue is arguably a wasted opportunity to make the regime more politically acceptable, and to make it more viable in a GATT Article XX defence.

3.1.5. Implications for the design of BCA regimes

102. Drawing on both the literature surveyed above and the assessment of regime design options, this section summarises lessons for the design of BCA regimes.

103. On the objectives of a BCA regime, Cosbey et al. (2012^[37]) describe three possibilities: minimising leakage; protecting the competitiveness of domestic firms; and exerting leverage on other countries to take more ambitious climate action. Many of the regime permutations described above demonstrate the inherent tensions that exist among these objectives. For example, country-level exemptions might be useful for exerting leverage, but they are too blunt an instrument in terms of preventing leakage.

104. The discussion in the previous sections suggests that minimisation of leakage is the only objective of the three mentioned that may be in line with WTO law – a major consideration. It is therefore preferable to select it as the sole objective of BCA regime.

105. Designing BCAs in order to minimise carbon leakage but not specifically to protect domestic competitiveness is thorny as the two issues are intertwined.²⁸ In the case of a BCA applied to imports, the adjustment should be commensurate to the amount of emissions associated with the imported products – the scope of which is to be aligned with the domestic carbon pricing regime. Therefore, foreign countries with low-carbon production methods – e.g. jurisdictions with a comparative advantage in terms of emissions intensity based on natural assets, like the availability of hydro power – should stay competitive in the domestic market even after emissions were charged at the border. Carbon leakage would be minimised as production could only shift to these low-carbon jurisdictions – and not to high-carbon intensities countries with low carbon pricing. By contrast, if the adjustment was arbitrarily high – e.g. by applying inaccurately high rates not commensurate with the true value of emissions – the comparative advantage of low-carbon jurisdictions would be wiped out. In this instance, the BCA regime would de facto protect domestic competitiveness rather than aiming at carbon leakage minimisation, and could well be regarded as motivated by economic concerns only. Hence the importance of transparent and predictable decision-making process with methods for determining the adjustment, for example, being publicly available (Cosbey et al., 2012^[37]).

106. BCAs have the ability to contribute to the core objectives of the Paris Agreement by reinforcing the global response to the threat of climate change. However, if the objective of a BCA regime is to exert leverage on other countries to adopt more ambitious climate policies, it will involve an assessment of the adequacy of climate efforts of those countries. A fundamental feature of the Paris Agreement is to allow countries to nationally determine their contribution and strive to augment it, in line with countries' circumstances and the principle of CBDR-RC. Therefore, using BCAs as an incentive for foreign countries to commit to bolder climate action could be viewed as conflicting with such a bottom-up approach that enables countries to find their own balance of commitments on mitigation,

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²⁸ See Section 2 for a discussion on the interaction of carbon leakage and competitiveness effects.

adaptation and means of implementation. These considerations matter for the design of BCAs given the potential for ensuing geopolitical tensions.

107. Regarding the scope of carbon emissions coverage, there is an inherent tension between feasibility and the ideal regime. While excluding scope 3 emissions – most importantly, emissions embodied in intermediate goods – may create both a risk of leakage and competitiveness issues for downstream manufacturers, there is no viable alternative within a BCA regime. Besides, including emissions from international transport does not seem advisable, since a lack of carbon pricing for those emissions does not create risk of leakage.

108. Granting country-based exemptions from coverage also requires caution. Country-based exemptions would violate GATT Article I and the MFN principle, and while exemptions on development grounds for LDCs should be easy to defend under the Enabling Clause, exemptions for other developing countries may prove more controversial. Moreover, the unilateral nature of determining the adequacy of other countries' climate action might make such exemptions difficult to justify under GATT Article XX. Finally, a BCA with such exemptions would have to work to avoid trans-shipment of goods through the exempted countries.

109. Adjustment for exports would help prevent leakage, though significantly less than does adjustment for imports, but the very uncertain status of such adjustment under WTO subsidies law where the underlying regime is regulatory – e.g., an ETS – would argue against its use. In addition, reverse leakage concerns arise if exports are bound for a jurisdiction with strong climate policies.²⁹ However, unless a critical mass of countries implements a BCA, the destination principle of taxation does not serve well.

110. Some crediting for climate policies in other countries seems necessary to avoid double-charging for embodied carbon emissions in traded goods. Crediting for price-based policies would address this problem and, while difficult, would be feasible. Crediting for regulatory policies, however, would not only be more difficult but also would have less merit since targeted emissions would fall outside the scope of what is being adjusted for. Furthermore, any crediting system creates trans-shipment risks as products can be re-routed through credited countries before reaching the implementing country. Addressing this risk would make the regime more complex to administer.

111. Any BCA regime would necessarily be imperfect and incomplete, which may give rise to the need for complementary measures. If the decision were to be made to limit the scope of product coverage, arrangements outside the BCA regime would need to be considered to address the concerns of downstream manufacturers and processors. Similarly, if it were to be decided to limit the scope of trade coverage to just imports, some means apart from the BCA regime would need to be considered to support exporters likely to be adversely affected on global markets. In any such arrangements, of course, national rules on state aid and international rules on subsidies should be respected.

112. Ultimately any BCA must be the product of a series of compromises among the potentially feuding objectives of feasibility, effectiveness, legality, and political acceptability. An obvious implication is the need to carefully assess the BCA against the various alternatives available for achieving the same ends.

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²⁹ Such leakage would not be a problem if the destination country were using BCA as well.

3.2. Alternative instruments to BCAs

113. BCAs are only one type of policy instrument available to pursue the objective of ensuring the effectiveness and fairness of ambitious climate policies in a globalised economy. This section reviews alternative instruments that could be implemented either instead of or in parallel with BCAs, depending on the instruments. Some of these measures are the result of an internationally co-ordinated effort, whereas others are implemented unilaterally. The former include:

- international sectoral agreements (e.g. CORSIA in international aviation),
- linking existing carbon markets across borders (e.g. cap-and-trade agreement between California and Quebec).

114. The unilateral instruments include:

- excise taxes on domestic consumption of specific carbon-intensive goods, instead of border measures³⁰;
- distributing free permits to firms subject to an emissions trading systems;
- compensating producers for input-cost increases caused by mitigation policies (e.g., compensation of electricity price increases in the EU ETS);
- preferential rates (e.g., setting a lower or zero carbon tax for specific users);
- abatement payments.

3.2.1. Internationally co-ordinated efforts

115. These policy options require international co-ordination between two or more countries and may not be feasible to address the short and mid-term challenges of carbon leakage and competitiveness concerns. However, these options should be carefully assessed when considering the use of BCAs, as they may be introduced in parallel and could in some cases facilitate the introduction of a BCA for certain sectors.

International sectoral agreements

116. While there is no internationally agreed definition to date, sectoral agreements generally entail international commitments by governments or economic actors to control emissions from a specific sector in a co-ordinated fashion.³¹ One example is in international aviation which, along with shipping, is not included in NDCs under the Paris Agreement. The International Civil Aviation Organization (ICAO) adopted a package of measures to achieve the (non-binding) goal of carbon-neutral growth of aviation from 2020 onwards. Key within this is the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), an offset scheme for airlines, which reduces costs of compliance but is not strictly relevant to leakage discussions.³²

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³⁰ Neuhoﬀ et al. (2016_[125]) discuss the pricing of carbon emissions through excise taxes under the term consumption charges.

³¹ Studies on global sectoral agreements include Dröge (2010_[127]) and Baron et al. (2007_[128]).

³² For the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), see: <https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx>

117. A related initiative is the sectoral agreement on maritime shipping under the International Maritime Organization (IMO).³³ In April 2018, members adopted a climate change strategy for international shipping, aiming to reduce GHG emissions from the shipping sector by 50 percent by 2050 compared to 2008 levels. The strategy represents a framework to curb carbon intensity of ships, and to reduce carbon intensity and GHG emissions from international shipping activities.

118. An example initiated from the private sector side is the Cement Sustainability Initiative.³⁴ The initiative was established in 1999 and brings together 24 major cement producers with global operations in over 100 countries collectively representing around one third of global cement production. Members focus on measuring, managing and minimizing the impacts of cement production and consumption on climate change and other sustainability criteria. The initiative was transferred to the Global Cement and Concrete Association (GCCA) in 2019 and continues to undertake sustainability efforts under the GGCA Sustainability Charter, which *inter-alia* commit members to develop climate change mitigation targets, publish targets and progress, and conduct annual reporting activities.

119. In principle, sectoral agreements may be a relevant alternative to BCAs to mitigate emissions and address carbon leakage in sectors that have high carbon intensity. In practice, only a limited number of agreements have emerged so far in supporting the objectives of the Paris Agreement. The effectiveness of such approaches will also depend on the degree of commitments by governments, the willingness of the sector, and the involvement of both developed countries and developing economies.

120. These measures, which could be agreed bilaterally or among several countries at once, could also be implemented in parallel with BCAs, as a criterion to exempt certain countries from the BCA regime due to commensurate action on climate change. As discussed above, country differentiations based on such a transparent and objective criterion would likely be less prone to challenge.

Linking existing carbon markets across borders

121. Another international approach to reduce the cross-country heterogeneity of climate policies is to link carbon markets across borders. This results in convergence of prices across the linked jurisdiction and therefore greatly reduces the risk of carbon leakage at least for the covered sectors and linked trading partners. A precondition is the existence of carbon markets that cover a comparable range of sectors with similar ambition and similar design features – e.g. similar levels of scope and ambition so that carbon price levels are comparable. There are two examples so far of integrated carbon markets: that between California and Quebec and between the EU and Switzerland.³⁵

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³³ For IMO's initial strategy on reduction of GHG emissions from international shipping, see: <http://www.imo.org/en/MediaCentre/PressBriefings/Pages/06GHGinitialstrategy.aspx>.

³⁴ See: the Cement Sustainability Initiative (CSI), <https://www.wbcsd.org/Sector-Projects/Cement-Sustainability-Initiative/Cement-Sustainability-Initiative-CSI>.

³⁵ See: Agreement on the Harmonization and Integration of Cap-and-Trade Programs for Reducing Greenhouse Gas Emissions, between California, Quebec and Ontario (2017), <https://news.ontario.ca/opo/en/2017/09/agreement-on-the-harmonization-and-integration-of-cap-and-trade-programs-for-reducing-greenhouse-gas.html>

122. Linking carbon markets faces both technical and political challenges. On the technical side, the implications of linking carbon markets for carbon leakage and domestic abatements will depend on policy design - key design issues affecting the effective price level such as the overall emissions cap and the proportion of permits allocated for free to participants as well as functional elements such as requirements for monitoring and verification. Politically, there may be resistance to linking schemes between countries with very different marginal abatement costs (such as one developed and one developing countries). While economically efficient, such linking could lead to large financial transfers to the country with the lower abatement costs, with implications for jobs and investments. In some ways, this recreates challenges usually associated with carbon leakage.

3.2.2. *Unilateral instruments*

Excise taxes

123. Domestic excise taxes on certain carbon intensive products – e.g. steel, cement, non-ferrous metals – are by definition trade-neutral as they are levied on the domestic consumption of goods. Excise tax rates could be based on the average carbon content of the goods or alternatively on product benchmarks, which already exist for many emissions trading systems. In both cases, the rate is set irrespective of the origin and does not violate the MFN principle. Many countries already have experience with differentiating taxes by CO₂ emissions and other environmental criteria, as they levy CO₂-differentiated vehicle registration taxes.

124. Excise taxes can ensure, much like BCAs combined with domestic carbon pricing, a price on the emissions of domestic and imported goods. As a result, low-carbon versions of goods become more competitive than high-carbon goods. For instance, compared with steel, wood becomes more competitive as an input in the construction industry, and pozzolanic cements gain competitiveness over clinker-based cements. Unlike sophisticated but administratively complex versions of BCAs however, a simple implementation of excise taxes would only price the average emissions or benchmark emissions of goods. Thus, on their own, such excise taxes do not create incentives to switch to a cleaner production method of a given carbon-intensive good, such as steel or aluminium. From a decarbonisation perspective, such taxes would therefore need to be complemented by additional incentives, including carbon prices.³⁶

125. A related instrument are feebates (also called a bonus-malus schemes), which levy a sliding scale of fees (excise taxes) on products (or activities) with above-average emissions and a sliding scale of rebates (subsidies) for products (or activities) with below-average emissions. They have been shown to substantially encourage the uptake of cleaner motor vehicles – e.g. in France (D'Haultfœuille, Givord and Boutin, 2014^[74]) – as consumers shift to less polluting vehicles to benefit from the rebate and avoid the tax. The strength of the incentives to reduce emissions depends on amount by which feebates make low-carbon products cheaper than high-carbon products. Feebates are typically designed to be revenue neutral – the fees collected on carbon-intensive products are used to subsidise

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³⁶ Neuhoﬀ et al. (2016^[125]) propose to combine an emissions trading system that allocates permits for free based on product benchmarks with excise taxes on carbon intensive products, where the excise taxes rate is derived from the product benchmark. The idea is that permit prices provide a marginal incentive to improve the carbon efficiency of existing products and that the excise taxes encourage the consumption of more carbon efficient goods.

the cleaner alternatives – even if in fact they have sometimes turned out to be costly (Teusch and Braathen, 2019^[75]). Unlike pure excise tax schemes, they therefore generally do not raise government revenues that could be used for other purposes, including redistribution. However, the fact that feebates provide both carrots (i.e. the rebate) and sticks (i.e. the fee) may increase the public acceptability of this instrument.

Free permits, producers compensation, and preferential carbon rates

126. Unlike BCAs which impose a high level of climate ambition on both domestic and foreign producers alike, free permits, producer compensation, and preferential rates relax domestic ambition for trade-exposed domestic firms. In other words, while BCAs help level the playing field of climate policies by elevate them to the (higher) domestic level of ambition, these instruments aim to accomplish the same aim by decreasing the ambition to the lowest common denominator. Through lowering ambition, they may increase political support from actors that find it hard to quickly reduce their emissions through new technologies or behavioural change.

127. Allocating free permits to industries subject to an emissions trading systems provides support to domestic firms competing with foreign producers not subject to the ETS, but reduces domestic abatement incentives. In theory, free permits retain abatement incentives at the margin as they have an opportunity cost. However, there are conceptual arguments (Flues and van Dender, 2017^[76]) and empirical evidence (Brouwers, Schoubben and Van Hulle, 2017^[77]; Venmans, 2016^[78]; Martin. R., Muuls and Wagner, 2012^[79]) suggesting that free permits in fact weaken abatement incentives, in particular by weakening incentives to invest in low-carbon production technologies. The extent to which abatement incentives are weakened depends on permit allocation rules (Flues and van Dender, 2017^[76]).³⁷ Free allocation of permits has also been linked to windfall profits (Sijm, Neuhooff and Chen, 2006^[80]).

128. Compensating producers for input-price increases caused by carbon pricing policies contributes to level the playing field for exporters of goods with carbon-intensive inputs, but reduces incentives for cleaner production.³⁸ For example, compensating an electric-arc steel producer for a cost increase in coal-based electricity caused by a domestic carbon price, reduces the producers' incentives to switch to renewable power sources. Depending on the design of the mechanism, input-cost compensation can also narrow the base of emissions that are effectively priced.

129. Similarly, preferential carbon rates provide few, if any, incentives for emissions abatement in sectors that benefit from them. The extent to which reduced rates weaken

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³⁷ Flues and Van Dender (2017^[76]) analyse the discrete choice of a firm to invest in low- or a high carbon production technology. They find that free permit allocation generally weakens the incentives to invest in low-carbon production technologies, except for the hypothetical case of a pure lump-sum allocation. Permit allocation rules in existing emission trading systems grant free permits based on historical emissions and on product benchmarks. For these cases the average permit price, i.e. the marginal permit price times one minus the share of freely allocated permits, reveals the strength of the abatement incentive where it comes to lumpy investment choices in a market that is not perfectly competitive.

³⁸ In a number of countries participating in the EU emission trading system firms receive compensation for the increase in electricity costs that is caused by the emission trading system in addition to the free allocation of emission permits. The aim is to avoid potential leakage from indirect cost increases.

abatement incentives depends on their magnitude, with zero rates eliminating incentives for emission reductions.

Abatement payments

130. While not a substitute to BCAs, and a possible alternative (or complement) to unilateral carbon taxes or trading system, abatement payments are another mechanism that can limit carbon leakage. Abatement payments follow principle of beneficiary pays rather than polluter pays (OECD, 2019^[81]). Instead of making carbon-intensive goods more expensive, they directly support clean production by incentivising firms to invest in low-carbon assets. While fundamentally different in terms of the distribution of rent, these policies can provide the same marginal abatement incentives as a carbon tax (*Ibid.*). However, they are generally less effective than carbon pricing in mitigating emissions in the medium to long term as they do not encourage structural change or exit from the sector.³⁹ Importantly, because they do not increase production costs, they do not result in carbon leakage, nor do they encourage other jurisdictions to strengthen their climate policies.

131. Abatement payments require sufficient funding and a proper and efficient design for the allocation of payment, which can be costly. The administrative burden could be high due to the potential complexity of these schemes. However, if existing permit allocation rules exist, abatement payments can be more efficiently disbursed but still require some mechanism to measure and verify emission reductions.

132. The main sector in which abatement payments have been used is the agriculture, forestry, and land use (AFOLU) sectors. This is due to different factors, including the fact that, unlike other GHG emitting activities, food production is not eligible for major production cuts if it is to feed a growing population.⁴⁰ Australia's Emission Reduction Fund (ERF) may be the best-known example. The ERF allocates money to landholders, offering funds to those providing the highest cost-effective GHG mitigation opportunities. Landholders are therefore rewarded for their efforts, and can still compete with non-abating industries. As the OECD (2020^[82]) points out, the ERF does have limitations, and is more effective for forestry than for agriculture (OECD, 2020^[82]). At the same time, carbon offset schemes are following the same general principle (paying for reduced emissions). These schemes have been multiplying in the AFOLU sector, as seen with the offset schemes implemented in California and provinces of Canada (*ibid.*). They are often associated with emissions trading systems, suggesting that the same mechanism could be used in the European Union for carbon sequestering sectors.

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³⁹ Abatement payments do not reduce profits and, unlike taxes, do not induce producers to exit the sector. Indeed, if payments overcompensate producers for their abatement costs, they can encourage new producers to enter the sector, thereby reducing the effectiveness of the policy (OECD, 2019^[81]).

⁴⁰ Abatement payments are also more acceptable in the agriculture sector, as they do not reduce farmers' revenue and can be easier to implement in some countries given existing agricultural support systems.

3.2.3. *WTO compatibility*

133. The WTO compatibility of the alternative measures in place to date has not been contested, but this does not imply that they are not open to challenge in the future.⁴¹ Free permits or cost compensation could be considered as a subsidy specific for exporting industries, depending on the allocation rules.

134. The simultaneous implementation of a BCA and free permits or cost compensation – i.e. regarding instruments as complements rather than substitutes – may be more likely to be perceived as going beyond pure leakage objectives compared with the case of free permits where there is no BCA. By contrast, excise taxes on carbon intensive products irrespective of their country of origin are straightforward from a WTO perspective. Excise taxes already exist for many goods. Abatement payments that only cover the additional cost of mitigation are likely to be WTO compatible.⁴²

3.3. Conclusion: a range of policy instruments with different strengths and weaknesses

135. The tools that are or could be pursued to ensure the effectiveness and fairness of ambitious climate policies in a fragmented world – including BCAs – have different strengths and weaknesses, which are summarised in Table 2. This table suggests that some instruments may be more appropriate than others in a given context, and that policy makers could usefully combine different approaches to exploit complementarities where they exist. For instance, a country with a broad-based ETS may impose additional excise duties for carbon-intensive products such as steel, cement and bulk chemicals in order to incentivise a switch to cleaner alternatives. In addition, it could grant abatement payments to increase ambition, either broadly or targeted towards sectors where additional support for cleaner production is deemed necessary or where production is considered essential. However, inconsistencies between instruments should be avoided. For instance, implementing both a border adjustment and granting free allowances will undermine the credibility of the stated goal since these two measures equally aim to minimise carbon leakage.

136. Instruments used to date to address carbon leakage have tended to weaken abatement incentives. Granting preferential rates to sectors deemed at risk of carbon leakage perform the worst against this criterion. Against this background, border carbon adjustments work better as they do not require the granting of preferential rates or the allocation of free permits, and therefore enable stronger domestic mitigation. Additionally, excise taxes or feebates that are differentiated by products' carbon contents could encourage a shift towards categories of cleaner products in cases where other instruments fail to provide such incentives.

137. In the presence of asymmetric climate ambition, tools that can be applied unilaterally allow more ambitious countries to implement their more stringent climate policies while limiting the risks of eroding support from industry and civil society at large. Most policies addressed in Table 2 allow for such domestic climate policy leadership, but

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⁴¹ Or that they would be found conform to WTO commitments if they were contested in the future. WTO cases require a country (or several) to actually press charges. There are many factors – including political economy ones – that influence whether countries bring cases.

⁴² For a discussion on the WTO legality of payments for environmental services in agriculture, in the context of the EU, see Per Hasund and Johannson (2016^[124]).

some come at the cost of reduced effectiveness, potential trade tensions, or other side effects in the space of international climate negotiations.

138. Instruments based on collaborative efforts, international sectoral agreements and linking existing carbon markets, could in principle create abatement incentives across participating countries but they face their own political challenges, and the effectiveness of multilateral instruments tends to be limited by the difficulty of agreeing on high levels of climate ambition among a large group of countries.

Table 2. Ensuring the effectiveness and fairness of ambitious climate policies in a fragmented world: strengths and weaknesses of selected instruments

Instrument	Can be applied unilaterally	Maintains domestic abatement incentive	Avoids carbon leakage and asymmetric cost increases for domestic producers	Is WTO compatible	Administratively within reach	Generates revenues for domestic government	Incentivises foreign firms to invest in clean production	Incentivises foreign countries to price carbon emissions	Allows scaling to level of development of foreign countries
Preferential rates	Yes	Weak (depending on size of discount)	Moderate to strong (depending on size of discount)	Strong	Strong	Weak (foregone revenue, depending on size of discount)	No	No	No
Free permits	Yes	Weak to moderate (depending on extent and design of free allocation)	Moderate to strong (depending on share of free allocation)	Strong (has not been challenged)	Strong	No (foregone revenue)	No	No	No
Compensating for input-cost increases	Yes	Weak to moderate (depending on extent and design of cost compensation)	Moderate to strong (depending on size and breadth of compensation)	Strong (has not been challenged)	Strong	No (requires government spending)	No	No	No
Abatement payments	Yes	Strong in theory, moderate in practice	Strong	Strong (has not been challenged)	Strong	No (requires government spending)	No (but this may occur with the related instrument of carbon offsets)	No	No
Feebates	Yes	Moderate (encourages switch to cleaner product categories; but does not provide abatement incentives at the margin)	Strong (but does not address potential leakage by accompanying carbon price)	Strong	Strong	No (if revenue neutral design)	Moderate (strengthens export market for cleaner products)	Weak	No
Excise taxes on carbon-intensive products, such as steel, cement & bulk chemicals	Yes	Moderate (encourage switch to cleaner substitutes; but not the	Strong (but does not address	Strong	Strong	Strong	Moderate (strengthens export market	Weak	No

		use of cleaner production processes for a given product)	potential leakage by accompanying carbon price)				for cleaner products)		
Narrow BCA (Mehling et al.)	Yes	Strong	Moderate	Moderate to strong (depends on design)	Strong	No	Moderate	Moderate	Strong
Broad BCA (Flannery et al.)	Yes	Strong	Strong	Moderate to strong (depends on design)	Weak	Strong	Strong	Strong	Moderate
International sectoral agreements	No	Strong in principle but weak in practice due to difficulty of reaching ambitious agreement	Strong	Strong	Moderate	Variable (depends on agreement)	Strong	Strong	Strong (existing agreements include such provisions)
Linking existing carbon markets	No	Variable ⁽¹⁾	Variable ⁽²⁾	Strong	Weak	Variable (depends on market)	Strong	Strong	Strong

Note 1: Linking carbon markets generally maintain or strengthen domestic abatement incentives, however they may weaken these domestic incentives in certain circumstances depending on their design.

Note 2: Linking carbon markets aims to reduce carbon leakage effectively, however, this will depend on the overall scope and coverage of the schemes linked. This depends on the initial carbon markets that are being linked.

Source: Authors' elaboration.

4. Considering the broader international policy landscape in support of ambitious climate goals

139. Making trade work for the environment, and more specifically mitigating GHG emissions, requires taking a more integrated policy approach than adopting instruments aiming at minimising carbon leakage. Policy makers should address the trade-climate nexus from a broader perspective and consider other areas where trade and climate policies can be mutually supportive, or where existing government policies run counter to their stated climate ambition.

140. Current trade rules are the outcome of negotiations that aim to secure fairness in global trade and investment. The resulting multilateral system is in principle designed to unlock prosperity from an open world economy, which will benefit large and small countries alike. Notwithstanding these efforts, the current lack of an international level playing field is among the factors that most affect the allocation of trade benefits (OECD, 2017^[10]).

141. This is in part because many existing policy measures in the trade and environment area contribute to tilting the playing field and stir public concerns about the benefits of globalisation. If policies discussed in the previous section are implemented unilaterally, on top of an already distorted global market and in isolation of other possible policy actions, they risk exacerbating a sense of unjust global burden-sharing, notably as between developed and developing countries. Seeking policy coherence in the trade and environment area is therefore a matter of policy effectiveness as it eases these tensions and reduces the risk of pushback from other countries – not only in the context of trade, but also in their willingness to accept greater commitments in climate negotiations. Ultimately, it is also a matter of restoring trust in the multilateral systems (trade and climate), which can keep delivering substantial benefits (OECD, 2018^[83]).

142. In addition, the Covid-19 crisis calls on governments to provide a coordinated response (OECD, 2020^[8]). A unilateral approach of trade and environment issues may therefore be at odds with the strong international co-operation required to overcome these unprecedented challenges. Additionally, if properly designed, economic recovery packages are an opportunity to put the world on a low-carbon trajectory aligned with ambitious climate objectives (IEA, 2020^[84]; OECD, 2020^[85]; Hepburn et al., 2020^[86]). Therefore, measures that can deliver positive outcomes on both trade and the environment should also be implemented to support – and to ensure consistency with – the international effort towards the reconstruction of a greener global economy.

143. This section provides recommendations in policy spaces in which action is needed.

4.1. Remove environmentally harmful subsidies to lower GHG emissions, while increasing government revenues

144. Certain subsidies can be harmful to the environment, “either by incentivising an activity that directly harms the environment, or indirectly by reducing the cost of an activity that uses inputs that impose a heavy burden on the environment” (OECD, 2017^[87]). In addition, because they incentivise production or the use of certain inputs, some of these subsidies are also economically inefficient and trade-distorting (*Ibid.*). These subsidies should be reformed to ensure that new initiatives are effective and not providing inconsistent signals. Such reforms are also necessary to level the playing field; countries

that seek to encourage others to adopt higher environmental standards should remove their own environmentally harmful support policies, for their position to be credible and acceptable to others. Furthermore, removing such government support would contribute to global solutions while generating public funds for other purposes with greater impact and generate win-wins for both trade and the environment.

4.1.1. Agriculture

145. Agriculture is directly responsible for 12% of global GHG emissions with, and up to 23% of emissions from land-use change and forestry included (IPCC, 2019^[11]). It is also a heavily subsidised sector. In 2017-19, total net transfers to individual agriculture producers exceeded USD 536 billion annually for the 54 countries monitored by the OECD (OECD, 2020^[88]). More than half of these transfers support the use of inputs like fertilisers, and output such as livestock or rice production, creating incentives for GHG-intensive production methods that also generate other negative environmental externalities (Henderson and Lankoski, 2019^[89]; DeBoe, 2020^[90]). At the same time, these subsidies are among the most trade-distorting forms of support. Redirecting support towards innovation, general services for agriculture, and measures that encourage agriculture to be more environmentally sustainable, would help reduce GHG emissions and contribute to a transition towards more sustainable, resilient, and productive agriculture and food systems (OECD, 2019^[91]; OECD, 2019^[92]).

4.1.2. Industrial sectors

146. Recent evidence has shown that government support can be an important driver of excess capacity in certain energy-intensive industrial sectors, such as the aluminium value chain (OECD, 2019^[93]). Such support can have important trade and environment implications as it translates into distortionary measures that contribute to generating an excessive amount of carbon emissions. Energy subsidies, in particular, can generate such distortions by making fossil-fuel based production techniques cheaper than cleaner types of production processes. Indeed, the OECD estimates that production support for fossil fuels increased 38% in 2019.⁴³

147. In other words, unfair trade practices undermine well-being at large. As governments support unprofitable firms – state-owned or otherwise – that crowd out better performing companies, it diminishes economic prosperity underpinned by the rules-based multilateral system. In addition, inefficient firms generally tend to demonstrate poor environmental performance (Dechezleprêtre and Kruse, 2018^[94]).

148. Thus, abandoning such practices is necessary to both curb carbon emissions (OECD, 2019^[81]; OECD, 2018^[95]) and ensure that firms compete on a level playing field (OECD, 2019^[93]). Governments have an important role to play in negotiating the rules that ensure that private and state-owned firms compete on the same terms (Kowalski and Perepechay, 2015^[96]). Much more also needs to be done to enforce those rules.

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⁴³ <https://www.oecd.org/fossil-fuels/data/>

4.2. Remove trade barriers to mitigate climate change

4.2.1. Enhancing trade in environmental goods and services

149. International trade in environmental goods can accelerate the diffusion of environmental technologies to countries where they are most needed (WTO - UN Environment, 2018^[6]; World Bank, 2017^[97]). Open markets can improve access to new technologies that make local production processes more efficient and environmentally sound. This is especially true when environmental goods embody a complex knowledge and know-how that are hard to replicate in importing countries.⁴⁴ In other words, by bringing new technologies that displace older and dirtier ones in countries where they are needed, trade is an essential channel of dissemination of the means for improved environmental outcomes.

150. Governments should remove existing trade barriers that encumber this diffusion process. While tariffs are found to be low on average for finished environmental products (Garsous, 2019^[98]), their many inputs may cross borders multiple times as they go through the global supply chains, thereby causing costs associated with tariffs and non-tariff barriers to escalate. Better market access should therefore focus on improving conditions for the trade of components and capital goods necessary to produce environmental goods, not just the finished products (WTO - UN Environment, 2018^[6]).

151. An acute issue relates to policies supporting the deployment of renewable energy that are often associated with discriminatory trade measures. Well-known examples are local content requirements (LCRs), which require a minimum percentage of locally manufactured inputs in renewable-energy projects. Evidence suggests that LCRs are misleading policies. First, they are associated with a loss in international competitiveness in the countries imposing the measures, thereby undermining the growth and innovation opportunities that come from a diverse economy (Stone, Messent and Flaig, 2015^[99]). Second, policy-makers sometimes mistakenly believe that they face a choice between protecting jobs in the local domestic manufacturing industry and having access to top-notch renewable energy technologies on international markets (Hughes and Meckling, 2017^[100]). However, manufacturing represents only a small percentage of employment in the development of a typical renewable energy project – 17% for onshore wind farms (IRENA, 2017^[101]) and 23% for solar PV plants (IRENA, 2017^[102]) – while the rest is accounted for by locally provided services such as operation and maintenance. Therefore, local job creation can be boosted through renewable energy projects, which can be underpinned by performant renewable energy equipment found in international markets.⁴⁵

152. Much can also be done in the area of environmental services. In particular, as Covid-19 stimulus packages are being deployed, there is scope for governments to provide financial support to improve energy efficiency in buildings, which would create new jobs,

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⁴⁴ See [COM/TAD/ENV/JWPTE(2020)9] for a case study on the wind-turbine manufacturing industry.

⁴⁵ In addition, on the political economy side, the increasing use of protectionist policies like LCRs in the renewable-energy sector has led to trade tensions and to a rise in trade-related disputes, both via the WTO and domestic trade remedy channels (Lewis, 2014^[117]; Asmelash, 2015^[118]). Between 2010 and 2014, twelve trade cases have been challenged at WTO, making renewable energy one of the main sectors with trade-related disputes (Lewis, 2014^[117]).

improve energy affordability, and reduce carbon emissions (IEA, 2020_[103]).⁴⁶ Architecture and engineering services delivered by foreign firms specialised in designing resource-efficient homes or other buildings can play an important role in increasing the efficiency of those measures. In many countries, however, these sectors show high barriers to trade, including restrictions on the movement of people – e.g. economy-wide limitations on natural persons seeking to provide services on a temporary basis – and restrictions on foreign entry – e.g. limiting the ownership of architectural and engineering firms to locally qualified architects and engineers.⁴⁷

4.2.2. *Trade and the circular economy*

153. Fragmented domestic policies are unlikely to achieve a sound transition towards a global resource-efficient and circular economy. Producers involved in multiple markets, such as global value chains, cannot afford to be exposed to widely differing regulations. Strengthening international co-operation is therefore necessary (OECD, 2016_[104]). This implies revisiting trade disciplines and considering global or regional standards on recyclability, reparability, eco-design, requirements to provide information on chemical and material composition of products, and mutual recognition of schemes like extended producer responsibility (EPR) (Yamaguchi, 2018_[105]).

154. In addition, as many countries respond to the Covid-19 crisis on a massive scale, governments have a unique opportunity to reshape the future of energy (IEA, 2020_[106]). But such a transformation of the energy systems will put strains on raw materials extraction – most notably materials such as cobalt, copper, nickel and rare earths that are necessary for the manufacturing of renewable energy equipment and batteries (IEA, 2020_[107]) –, which has adverse environmental consequences, including on climate outcomes (OECD, 2019_[108]). In addition, concerns emerge about the geographical concentration of the supply sources for such materials (IEA, 2020_[107]).

155. Facilitating trade in secondary materials⁴⁸, which are substitutes to primary materials, can therefore improve supply security of inputs key to the energy transition and enable a more circular economy. In addition, trade in recyclable products enables economies of scale for new technologies being developed in the recycling industry.⁴⁹ It also allows to tackle environmental issues in countries with inadequate recycling facilities – e.g. developing countries. However, significant trade barriers persist and impede such trade flows. For instance, export restrictions affect 40% of traded copper waste and scrap, 30%

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⁴⁶ Emissions associated with the energy consumption of households account for approximately 6% of global carbon emissions from fuel combustion.

⁴⁷ See the OECD Services Trade Restrictiveness Index (STRI) webpage for more details – <http://oe.cd/stri>.

⁴⁸ Secondary materials offer substitutes to primary materials that suppress the need for extraction, and allows for energy efficiency gains. For example, recycling metallic waste and scrap requires 60-97% less energy to produce the most commonly used metals (International Resource Panel, 2013_[130]).

⁴⁹ For instance, Northvolt, a Swedish battery manufacturer, and Norsk Hydro, a Norwegian aluminium company are teaming up to open car battery recycling plants. A pilot plant will be launched in 2020 followed by the establishment of a full-scale recycling plant in 2022. The scalability of this project – and the technologies underpinning it – depends on the volume of batteries that will be recycled in the plants (Milne, 2020_[131]). Trade in secondary materials, or in this instance batteries, can help achieve the targets.

of aluminium, and 20% of iron and steel waste and scrap (Korinek, 2019^[109]). Removing these barriers is therefore necessary to achieve ambitious climate goals and to ensure consistency with other policies that aim to attain them.

5. Concluding remarks

156. Given the urgency of the climate issue, it is important and timely that countries are strengthening their climate objectives. As a global challenge, climate change is ideally addressed by all countries engaging in climate-change mitigation efforts that are collectively aligned with the global objective but differentiated among countries according to their respective capabilities – i.e. following the CBDR-RC principle set out in negotiations under the UNFCCC. However, the reality is that, taken collectively, current nationally determined contributions (NDCs) are not enough to avert the looming effects of climate change (UNEP, 2018^[11]).

157. Effective and long-term recovery from the Covid-19 crisis requires a functioning multilateral system based on co-operation and trust. Policy responses to the current crisis can and should seek to strengthen societies' resilience against a variety of risks, including those related to climate change.

158. Given this it will be important to keep working through the multilateral process to ratchet up ambition of NDCs in a coordinated way, as part of economic recovery packages. Meanwhile, given slow progress of negotiations, it is welcome that some countries are considering stronger unilateral climate policies, for example to better align with the emissions trajectories implied by the collective long-term goal of the Paris Agreement.

159. Unilateral increases in climate policy stringency are at risk of reduced effectiveness to the extent that this leads to carbon leakage – i.e. emissions increasing in foreign jurisdictions because of stringent domestic climate policies. Policy makers pursuing ambitious climate objectives should weigh the pros and the cons of the available measures aimed at minimising carbon leakage. When assessing such policies, interactions between climate- and trade-related goals, and their implications on equity and burden sharing should be considered.

160. Border carbon adjustments (BCAs), which can take many different forms, are one option among others. Increasingly divergent national mitigation objectives may make BCAs more appealing as countries seek to shore up domestic support for ambitious mitigation policies. Nevertheless, their introduction could result in trade and environment conflicts, especially if they are perceived as tools for green protectionism or exerting leverage on other countries for more ambitious climate policies. BCAs require careful design involving many trade-offs – e.g. between environmental effectiveness and administrative feasibility, or between domestic public support and potential geopolitical challenges.

161. Alternatives to BCAs, ranging from multilateral to unilateral approaches, are available and may avoid some of the pitfalls of BCAs, although their use also involves trade-offs. Alternative tools may be easier to implement and carry lower risks of conflict with other countries or international trade rules. However, commonly implemented tools – such as free allocation of permits in ETS – imply a lower level of domestic climate ambition and are likely therefore incompatible with ambitious long-term climate objectives. Similar to BCAs, the design of alternatives matters in determining their effects on domestic and foreign industries and their propensity to reduce carbon leakage.

162. Ultimately, this discussion sheds light on the complexity of designing environmental policies that effectively address carbon leakage issues in a multilateral system that aims to level the playing field so that all countries can draw benefit from global trade. However, the paper suggests that, where necessary, carbon leakage can be limited despite this complexity. In addition, this paper argues that trade can work for the environment if policy makers are consistent in their treatment of climate objectives in the global economy. To ensure policy coherence and make climate actions fully effective, governments should design trade-friendly comprehensive climate packages that address the elimination of environmentally harmful subsidies and the removal of trade barriers that will help diffuse environmental technologies. These measures could help to reduce emissions as well as to improve trust in the multilateral systems for both trade and climate, thereby alleviating the need for potentially controversial trade-related instruments to address carbon leakage.

163. This report also helped identify areas where more research is needed. This encompasses evaluating the impacts of specific GHG mitigation policies on carbon leakage and competitiveness, and empirically assessing the cost-effectiveness of the wide range of instruments and approaches outlined in this paper as applied to specific regions and sectors. It also includes considering how to form coherent policies that are best able to balance the different interests in a politically feasible manner. For BCAs, another research need is a better understanding of emissions measurement challenges and data gaps for products that may be covered under such a regime, and methodologies for how climate policies in foreign countries could be taken into account. The OECD is well placed to explore these issues, relying on its accumulated knowledge and data, its multi-sector analytical capacity, and its ability to foster constructive dialogues among policymakers with different views on trade and environment.

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