# *The Great Green Wall: Understanding Policy Options for Carbon Border Adjustments*

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## ABSTRACT

National transitions away from fossil fuels and towards advanced energy sources can be undermined by firms offshoring production to evade carbon taxes or regulations, referred to as "carbon leakage." To advance these transitions, in lieu of a globally set carbon tax, some policymakers have proposed carbon border adjustments, a type of duty placed on goods that are made in less environmentally restricted countries. This paper seeks to examine the research and proposals for carbon border adjustments and provide a guide for policymakers on the efficacy and design of such border adjustments.

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## ACKNOWLEDGEMENTS

This author would like to sincerely thank Professor Anil Nathan for his guidance in the development of this paper. He would also like to thank the *Policy Perspectives* editorial team, Professor Nina Kelsey, Associate Editor Grace Wofford, and editors Kody Keckler, Evan Linett, and Lancy Downs, for their valuable insight and assistance throughout the editing process. Finally, he would like to thank his family and his partner Caroline for their encouragement and support.

# BACKGROUND

Few issues have ascended to the forefront of the public consciousness and policy debate as prominently as climate change. With each passing year, warnings of the catastrophic consequences of a climate crisis grow more dire. According to the United Nation's Intergovernmental Panel on Climate Change, the world is on track to expend its remaining "carbon budget," or the maximum allowance of carbon emissions necessary to keep warming below 1.5 Celsius, by 2030 (IPCC 2022, 274). The window of opportunity to act on climate change is rapidly closing, putting the planet on track for ecological destruction, such as crop failures, extreme weather events, and the destruction of natural ecosystems.

The damage of the coming catastrophe will likely devastate the global economy if the global community does not enact mitigation efforts. Research conducted by the reinsurance giant Swiss Re estimates that the ecological damage of expending the global "carbon budget" will drive a 14 percent reduction in global economic output by 2050, amounting to a $23 trillion dollar loss in global wealth (Flavelle 2021). Known as an externality among economists, the overwhelming social costs of carbon emissions imposed on ecological systems and society are not internalized by emitting firms or represented in market prices. As such, economists have become more sympathetic to carbon-pricing policies, proposing market mechanisms like carbon taxes, tradable permits, or even emission regulations, to increase the cost of emissions on emitting firms to remedy market failures.

Despite the global implications of climate change that will be brought on by a collective failure to meet emissions targets, many of these carbon pricing policies are left to national and regional governments to set. In the absence of a "field-tested" international standard across global economies, carbon pricing policies and emission reduction policies face systemic challenges. Without broad adoption of an international carbon standard, national-level carbon pricing policies "create(s) incentives to outsource production of carbon-intensive products to countries with lower climate protection ambitions," a trend now commonly referred to as carbon leakage (Kolev 2021, 311). This subversion of carbon taxes and regulations not only produces adverse economic outcomes in the form of trade disadvantages, but it can also undermine the effort to reduce global carbon emissions. As a result, domestic policies that target carbon emissions will need parallel policy frameworks or mechanisms that can level the economic playing field and disincentivize carbon leakage.

## *THE CARBON BORDER ADJUSTMENT*

Carbon border adjustments (CBA) have emerged as a promising avenue to successfully deter carbon leakage. Conceptually, CBAs would operate alongside familiar carbon pricing schemes, such as a carbon tax or tradeable permits system. Under this system, foreign products imported from nations with low or no carbon pricing schemes would be subject to the receiving nation's carbon tax price, or an import-CBA upon arriving at the border. As will be discussed later in this paper, CBAs also have hypothetical applications to domestic firms exporting their products to less-regulated foreign markets in the form of a rebate, or an export-CBA (Campbell, McDarris, Prizer, 2021). In principle, these taxes and subsidies would account for carbon leakage and potential competitive disadvantages by readjusting traded goods to the domestic price of carbon. Despite having not been implemented before, proponents argue that CBAs would reduce some of the adverse economic distortions that arise from carbon pricing policies by leveling the playing field for domestic firms in the international economy. Indeed, when researchers used economic modeling to examine the effects of carbon-pricing with and without CBAs, they found improved welfare outcomes for implementing nations (Condon and Ignaciuk 2013, 7). By improving the economic effects of carbon pricing policies, CBAs elevate the case for implementing these policies. Furthermore, when compared to uniform tariffs against emitting countries, research suggests CBAs are

significantly more effective at reducing carbon leakage (Zhang et al, 2020). Since no country has yet to fully implement a CBA as part of their climate change policies, there is a risk that poor design of the tariff could reduce its effectiveness. While still relatively untested in practice, early economic research has underscored the great promise of CBAs and their potential in reducing near-term trade disadvantages within carbon pricing nations and long-term economic losses as a result of increased emissions.

Perhaps spurred by the promise, the European Union became one of the first markets to implement a CBA to pair with their carbon pricing scheme. On March 15, 2022, the European Council agreed to enact a carbon border adjustment mechanism (CBAM) as part of their "fit for 15" agenda (European Council 2021). Implemented alongside the preexisting permitting scheme, European Trading System (ETS), leaders believe that CBAM will insulate European firms from market displacement by American and Asian exporters that are unbound by the financial responsibilities of ETS. Since January 1, 2023, importers seeking access to the European common market will need to report their emissions starting, and they will begin paying a carbon-based duty starting in 2026. while firms based in nations with pre-existing pricing schemes may be exempt (Hamer, Gambaro, Basilico 2021). As structured, the European CBAM would insulate the continent's producers from the competitive advantages of firms in its largest trading partners with a smaller effective price of carbon, such as the United States.

While the case for a tariff on carbon-intensive goods in the form of border adjustments is straightforward in theory, designing an effective CBA can be more complex. Much like any policy in practice, the devil is in the details, and the CBA mechanism is no exception. Thus, the implementation of an effective CBA revolves around the degree to which its design accounts for critical-problem points. The CBA's construction presents a unique challenge to policymakers, as its elements must not only minimize trade distortions, but also comply with the World Trade Organization's international trade laws. Understanding these tradeoffs is a critical predicate to designing a CBA best equipped to meet the goals of policymakers.

## KEY DESIGN CONSIDERATIONS FOR CARBON BORDER ADJUSTMENTS

This section will overview a series of non-exhaustive policy questions pertaining to CBA design and implementation that have been discussed in the literature and will present some of the more promising options where possible.

### *CAN A CARBON BORDER ADJUSTMENT BE IMPLEMENTED WITHOUT A CARBON TAX?*

Theoretically, the concept of a CBA would be used by nations that have implemented some form of explicit carbon pricing. Yet not all nations that have taken action to reduce carbon emissions have done so through the creation of an explicit carbon price, and some are unlikely to adopt one. While outside of the original intent for a CBA, even countries that act without implementing carbon taxes can still witness the carbon leakage and trade disadvantages that were impetuses for carbon border adjustments. Avoiding these potential trade and climate barriers has motivated some lawmakers in the US, a nation with no national carbon tax or pricing system, to propose CBAs. One such effort, the FAIR Transition and Competition Act of 2021, was introduced to both chambers of Congress and would levy a carbon fee on roughly 12 percent of US imports in several selected industrial sectors by 2024 (Suzuki 2021). While several states have implemented more explicit carbon pricing policies, the lack of a national carbon price in the US has made the proposal to levy carbon fees on imports unorthodox within the existing CBA discourse.

Designing such a CBA model effectively would no doubt be complicated, and any differential economic effect from explicit pricing policies is unclear. However, policymakers lacking a comprehensive carbon pricing scheme can create an alternative form of "equivalency" by establishing a workable carbon standard against which they can evaluate foreign products. This standard can come in the form of a level of exempt emissions, products over which could face fees, or in the form of regulatory marginal costs incurred by domestic firms (Pizer and Campbell 2021, 7-8). While administratively complex, establishing a carbon equivalency standard allows policymakers to operate proactively in policy landscapes, in adjusting foreign products to the unobserved, yet still impactful carbon pricing policies imposed by ambitious regulations and permitting. The equivalency standard remains an emerging policy pathway within economic literary bodies and is still likely to create significant economic distortions generally mitigated by conventional carbon price policies.

## *HOW CAN CARBON BORDER ADJUSTMENTS BE WTO COMPLIANT?*

No policy discussion related to foreign trade can ignore the international rules established by the World Trade Organization (WTO), which underpin the process for global market integration. Traditionally, the WTO has viewed CBAs with skepticism and as potentially running afoul of established international trade laws. Despite the WTO's historical stance, significant leeway remains for implementation (Panezi 2016). To be fully compliant under WTO rules a country will need to have an objective methodology that does not subject foreign firms to higher prices than those domestic firms face, nor can it discriminate between similar goods in different countries (Campbell, McDarris, and Pizer 2021). This poses a serious barrier to full compliance for CBAs, especially in countries such as the US that have no explicit carbon price.

The legal strategies available to policymakers seeking to circumvent WTO legal guardrails, apart from full compliance, include securing a qualified exemption and framing CBAs as countervailing duties. Under the General Agreement on Tariffs and Trade (GATT) Article XX, member nations can be exempt from WTO rules with measures that are "necessary to protect human, animal or plant life or health" and are not arbitrarily applied to discriminate between countries where similar conditions prevail or constitute a "disguised restriction on international trade" in any form (World Trade Organization 2022). Compliance along Article XX exemptions would involve excluding a broad swath of nations with established carbon regulations but are still of "similar conditions" under the GATT. This could play a limiting role for policymakers striving to create a "Universal" CBA capable of precisely targeting and quantifying carbon leakage across diverse regulatory regimes. Alternatively, decisionmakers could frame the failure to restrict or price carbon emissions amounts to an "actionable subsidy." Through this lens, WTO rules can be legally redressed with a countervailing duty (CVD), a type of tariff permitted to offset an unfair subsidy from a trading partner, which would take the form of a carbon border adjustment (Aldy 2021). The WTO's stance on the legal merits of either argument remains uncertain, however either could prove to be a fruitful legal justification giving lawmakers enough room to implement a CBA in the short-term and confront potential challenges once the WTO provides feedback or the GATT is further reformed.

## *HOW BROAD SHOULD THE SCOPE OF A CARBON BORDER ADJUSTMENT BE?*

The scope of the CBA's design remains a critical question posed throughout developmental discussions. One of the critical questions posed in the early stages of CBA design is the extent of the policy's scope. Unlike domestic taxes, which tend to be broadly applied, tariffs are typically limited to specific industries and products. When establishing a CBA policymakers will need to specify the degree of foreign trade that will be subject to the taxes and rebates.

For example, the European Union specifies the scope of its CBAM policy to industries of high carbon-intensity (Hamer, Gambaro, Basilico 2021). This comports with the theoretical cause for implementing such a policy, to prevent carbon leakage. The bicameral effort in the US uses the term energy-intensive and trade-exposed (EITE) sectors, which was generated by an interagency report, originally proposed for the Waxman-Markey cap-and-trade bill, and covers a list of 46 sectors, such as aluminum, steel, and iron (Suzuki 2021). While there is a noticeable degree of overlap between the industries covered by the European CBAM and the American CBA proposed by FAIR Transition and Competition Act, the examples demonstrate existing political precedents to define the reach of a CBA's tax burden: energy-consumption and exposure to competition from foreign trade. These dimensions are intuitive for applying CBAs given the problem of "carbon leakage" related to offsetting emissions and losses from trade.

While limiting CBAs to industries based on EITE is effective, there are alternative methodologies for determining scope. Researchers at Resources for the Future have argued that an EITE approach is limited by its sole use of sectoral economic data, and present The Greenhouse Gas Index (GGI), which "keeps track of cumulative GHG emissions (and therefore GHG taxes paid) to produce specific products manufactured in a specific, covered manufacturing facility or operation (e.g., to produce natural gas, cement, or petrochemicals)," as a more comprehensive alternative. This index would not only cover products in existing EITE sectors, but also several carbon intensive products that are produced in non-EITE designated sectors (Flannery 2020). The imposition of a novel policy tool such as a carbon border adjustment is an opportunity for policymakers to adopt a nuanced approach for measuring energy intensity in the economy and extend tax treatment along a more holistic range of products.

## *HOW SHOULD A CBA BE ADMINISTERED?*

Even policies with the strongest backing in theory can become ill-fated when it comes to implementation, and CBAs are no different. While taxing imports based on their carbon footprint to bring their cost in line with domestic goods is intuitive as a concept, regulators are likely to encounter significant information asymmetries, which could elicit administrative complications. Solving for the imperfect information that a regulator may have about the carbon emissions associated with a certain product that was sourced from abroad is of cardinal importance for policymakers. Given the costs faced by higher emissions, foreign producers may be incentivized to misreport or underreport data on carbon emissions. While national and international bodies can and should take action to strengthen transparency, the issue of imperfect information will remain an ongoing challenge for implementation. The result of the policy could be an adverse selection by which bad actors that hide carbon emissions end up with a stronger position in the market due to poor emissions reporting.

While there is no best practice established as consensus for such a novel policy, the literature does suggest a few options for policymakers to determine carbon emissions endogenously. As the first market to implement a carbon border adjustment, the European Union's CBAM provides the first example of addressing the challenge of imperfect information. According to the European Council's published guidance, embedded emissions are determined based on a formula that should use actual values where possible (European Council 2022, 87). In instances without reliable data, regulators(?) will rely on default values calculated and tabled for each nation based on estimated carbon emissions, the Council writes (ibid.). While imperfect, the process of using estimations for the emissions level of specific products based on existing aggregated data for trading partners provides an administrative option in lieu of reliable data. This approach can also serve as the best short-term method for assessing carbon adjustments while a stronger regulatory infrastructure is established. For instance, the US' International Trade Administration has an Office of Enforcement and Compliance that could be well-suited to subsume the role of evaluating and investigating

data submissions by foreign firms (Flannery at al 2020). Thus, a combination of utilizing existing data to create estimated values in the near term, while building on existing trade enforcement infrastructure in the long term provides the best workable model for addressing the knowledge asymmetry inherent in applying domestic regulations to foreign products in the form of border adjustments.

## *HOW SHOULD THE REVENUE OF A CARBON BORDER ADJUSTMENT BE USED?*

While the utility of this excise tax is to correct the international market's inability to accurately price carbon emissions, CBAs are likely to generate notable revenue. While governments can simply include revenue earned from CBAs in their general funds, there are proposals for specific uses for these funds that could produce varying macroeconomic effects. In one study, researchers found that border adjustments are likely to make imports more expensive and thus lower demand, but may also have the effect of lowering global investment by imposing the cost of carbon pricing policies abroad, which could lower domestic output (McKibben et al. 2018, 35). Under this scenario when revenue was returned to households in a lump-sum rebate there was a net negative effect on employment and production. However, a "carbon tax-swap" that involved offsetting the CBA with reduced taxes on investment had a moderating effect and improved trade outcomes (McKibben et al. 2018, 35). This early research was the first to find alternating macroeconomic effects of a CBA depending on the usage of its revenue. While the revenue options were not fully exhausted in the researcher's modeling, its prevailing insight is to offset the CBA with supply-side boosts rather than boosts to demand.

Subsidies allotted to firms exporting to foreign markets with low or no carbon prices offer another option for nations to generate revenue from CBA schemes. Often called export-CBAs in economic literature, these subsidies operate under the same pretenses as carbon tariffs: carbon prices imposed by a single nation create competition on unequal footing among firms in the international market place, disadvantageous to taxed firms in both domestic and export markets. The subsidies would thus act as rebates so that domestic firms can remain competitive in foreign markets that operate with less ambitious carbon pricing. Researchers examining the effects of carbon regulation on cement producers in the US modeled policy outcomes under various trade policies and found that a mixture of carbon border fees and rebates for exporting producers had the highest welfare outcome for the American market (Fowlie et al. 2016, 300). Specifically, exporter rebates were shown to offer greater observed macroeconomic outcomes for domestic producers and the broader economy due to their ability to provide appropriate supply-side boosts when the market faces contracting imports.

Yet a concern with implementing export subsidies to producers is that such a policy could remove the incentive for producers to lower emissions. To control for this outcome, policymakers would be wise to formulate an export-CBA less as a rebate, to be determined based on a firm's tax liability, and more as a subsidy, to be determined based on a firm's production. One model for such a policy regime of carbon border taxes and an export subsidy found that "the subsidy goes beyond merely restoring [domestic firm's] export margin: it applies to goods for which [the implementing economy] would not have been competitive in the absence of any carbon policy" producing optimal boosts in macroeconomic conditions (Kortum and Weisbach 2021, 25). Using the revenue from a CBA to provide good-specific subsidies for exporters provides one of the best options for policymakers based on the existing research. The feasibility of implementing such a regime alongside a carbon tariff is dependent on how policymakers approach the aforementioned issue of WTO-compatibility, as those who argue that the CBA takes the form of a countervailing duty would not be legally protected in implementing an export subsidy. For nations implementing carefully designed

CBAs as a qualified exemption under GATT Article XX, these nations may be better suited to provide export-CBAs, but still have to contend with legal challenges and potential retaliation from trading partners.

## ALTERNATIVES TO CARBON BORDER ADJUSTMENTS

As this paper suggests, CBAs show promise for remitting carbon leakage and insulating firms from unfair competitive advantages given to firms in foreign markets. It is worth noting that, as a novel policy with less real-world case studies from which to draw best practices, policymakers do have alternatives to CBAs. For policymakers wary of undue hampering of free-trade or the possibility of igniting a trade war, one possible alternative is to create a climate club of nations that have established common standards for carbon pricing. First proposed by Nobel prize-winning economist William Nordhaus, a climate club would involve a bloc of countries committed to pricing carbon entering into a comprehensive agreement to reduce barriers to trade and technology transfers with uniform tariffs imposed on those outside of the club (Koester, Hart, and Sly 2021). This would allow nations that are similarly committed to carbon mitigation to benefit from each other and ignite cross-border innovation all while preventing the free-riding effect advantaging firms in unregulated markets.

This policy could take the form of an economy-wide carbon club agreement, or a narrower sectoral agreement that focuses on one or more energy-intensive industries. Such an agreement recently took shape between the US and the European Union in the form of the "green steel deal" which would involve American and European steel sectors setting common emissions goals and placing restrictions on imports into the shared market space (Keating and Gerdes 2022). This deal is a first of its kind, and presents an opportunity for replication. Still, the level of global cooperation required to make comprehensive climate agreements challenges their feasibility. Taking unilateral action, at least in the short term, may be preferable for policymakers especially since the European Union's CBAM was a motivating factor for the bilateral agreement being made. Thus, a multinational climate club that encapsulates the world's carbon reducing economies represents a long-run goal for policymakers.

Independent of any multinational coordination in the international sphere, alternatives to CBAs could take the form of domestic rebates that are unlinked to trade. Included in the original Waxman-Markey cap-and-trade bill, output-based rebates (OBR) would entail payments made to vulnerable firms based on their level of production relative to an emissions benchmark. Once policymakers have established a per-unit emissions benchmark, they will rebate the cost of the carbon tax up to that benchmark, firms whose emissions exceed the benchmark will face a net-loss as the marginal cost of the tax will exceed the marginal revenue from the rebate and firms with emission below the benchmark will have a net-gain from the policy (Kaufman et al. 2020). This strategy allows for the same incentive structure to reduce carbon emissions while providing scalable assistance to trade-exposed firms. OBRs have the advantage of being easier to implement for policymakers as they don't rely on evaluating carbon emissions for foreign products based on reporting data. Additionally, the policy is least likely to provoke an adverse reaction from trading partners or face challenges at the WTO given its domestic orientation. Still, the policy would require a firmer commitment to carbon pricing than CBAs, because this policy can only be implemented effectively with full pricing (carbon tax) or partial pricing (buyable permits). Policymakers that wish to stick to non-pricing strategies, specifically emissions restrictions and environmental regulations, would have a hard time implementing output-based rebates as an alternative to carbon border adjustments.

## CONCLUSION

Climate change is the defining issue of our time and responding effectively is of utmost importance to human life and prosperity. Creating strategies that can account for carbon leakage is of paramount importance for policymakers that are reticent about the costs of imposing unilateral carbon pricing strategies. In some ways, the fate of Pigouvian taxes, or taxes applied on products based on their negative externalities, in an integrated global economy are tied to the debate on carbon pricing and leakage. Without strategies to appropriately adjust socially mispriced foreign goods, policymakers will be more limited in their ability to address negative externalities in the economy.

Fortunately, CBAs represent a promising policy for reducing carbon-leakage and leveling the playing field for firms in more ambitious carbon markets. If designed well, CBAs would provide policymakers an opportunity to address carbon leakage directly, making the broader toolkit of climate policies more effective. The challenges of designing CBAs are notable, and policymakers must be aware of the varying effects that may be produced by differently designed policies. Ultimately, policymakers will need to balance the tradeoffs between different design features to craft a policy that best reflects their means and goals.

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