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MAKING BORDER CARBON ADJUSTMENTS WORK IN LAW AND PRACTICE

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ABSTRACT

This paper addresses issues relating to the creation of border carbon adjustments (BCAs) as part of a carbon tax. A carbon tax that is imposed only in the U.S. could put American firms at a competitive disadvantage. A BCA could level the playing field so that U.S. and foreign-firms face the same greenhouse gas tax cost of producing for consumption in any given country. The BCA would tax the carbon content of imports and rebate carbon tax costs on U.S. exports. While simple in concept, BCAs raise numerous issues in practice. Although solutions are available, they are unlikely to be elegant.

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INTRODUCTION

Some U.S. firms use proportionately more energy than other firms do, and they compete in international markets. These firms and their products are called energy-intensive and trade-exposed (EITE). All else equal, a greenhouse gas (GHG) tax (a carbon tax, for short) imposed in the United States and not analogously in other countries could put American-made EITE goods at a competitive disadvantage. These anti-competitive effects of a carbon tax can reduce domestic political support for establishing a carbon tax. Once a unilateral carbon tax is in place, international competition can lower the tax's environmental benefits by driving production, new investment, and emissions to countries with less ambitious climate policy, a shift known as emissions leakage.

Ideally, U.S. diplomats would leverage a domestic carbon tax into comparable action by other countries, including major trading partners and competitors. Some countries are already pricing carbon and are contemplating how to manage concerns by their own EITE firms. In practice, differences in countries' climate ambitions are likely to persist, so managing the effects of disparate policies could be important for many years. While today's global carbon prices are generally very modest (where they exist at all), the impacts on EITE firms are also modest. These challenges will intensify significantly as countries' climate policies apply more broadly and more ambitiously across their economies.

Draft U.S. carbon tax bills and other proposals attempt to manage this problem with border carbon adjustments (BCAs). An import BCA would apply a charge to imported emissions-intensive goods. An export BCA would pay domestic producers for the carbon tax-related costs they incur in making goods they export from the United States.

A host of practical design questions arises. To which products should BCAs apply, and from what countries and on what basis? Under what conditions could or should BCAs be suspended? Which responsibilities should fall to which agencies, and how might stakeholders appeal determinations made by federal agencies? What kind of emissions or economic data would BCA administrators need, and how can the program remain simple enough to administer feasibly? What constraints do World Trade Organization (WTO) rules impose on the design of a BCA program? What would be the implications for the United States if other countries applied similar measures to U.S. goods? How can the system take account of the continuously evolving landscape of technologies being used and climate policies around the world? Neither the scholarly literature nor draft legislation converge on a policy design consensus.

I address only some of these questions in this paper, drawing on input from legal scholars, economists, trade policy experts, corporate and labor stakeholders, and others. My hope is to inform the design of BCA provisions of U.S. carbon tax legislation so that they are effective, legal, and feasible to administer. Not all of these questions are easily resolved, however, and I leave a number of important issues for future work.

To be sure, BCAs are not the only way to address competitiveness and emissions leakage. Alternatives to BCAs include output-based rebates and sector-specific carbon tax discounts or exemptions.[1] Other policies can complement BCAs, most importantly vigorous diplomacy to induce other countries to at least match the United States' climate ambition. In addition, a carbon tax that starts modestly and increases gradually will allow all firms, not just those that are trade-exposed, to lower emissions before the domestic carbon price becomes more ambitious. A carbon tax can also substitute for less efficient regulatory measures that would not allow for border adjustments. Finally, a carbon tax could provide revenue that could allow lower taxes (or prevent tax increases), providing a pro-growth boost that can partly offset the potential macroeconomic drag of the carbon tax.

Leaving aside the multiplicity of ways to address leakage, this paper focuses on BCAs for three reasons. First, border adjustments appear consistently in draft U.S. carbon tax legislation and prominent proposals by climate advocates. Indeed, some argue that a BCA provision of some kind would be an essential component to successful legislation.[2] Second, Böhringer, Carbone, and Rutherford (2012) suggest that BCAs are relatively more effective in reducing leakage and promoting global cost-effectiveness than alternatives like output-based rebates. Finally, while BCA design may superficially appear intuitive, within the policy design lurks a thicket of competing objectives, legal pitfalls, administrative headaches, and unintended consequences.[3] This necessitates a careful review of the options in the spirit of resigned pragmatism.

An elegant solution will likely elude us. First, policymakers can only hope to anticipate and counteract some of the myriad ways enterprising actors will game the system. Second, measures designed to deter gaming will likely complicate the administration of the program or incur some other tradeoff. And approaches that simplify administration would inevitably under- or over-compensate some domestic firms and over- or underprice emissions from some imported products. Moreover, approaches that would maximize the diplomatic value of BCAs may be more subject to WTO violations. Finally, the United States should be mindful that whatever approach it adopts might well be applied by other countries with respect to U.S. products. Policy approaches that might seem attractive unilaterally might appeal somewhat less in a multilateral framework.

WHY INCLUDE BCAS IN A CARBON TAX BILL?

At least three potential motives apply to BCAs: reducing emissions leakage; preserving the competitiveness of U.S. manufacturers; and pressuring trading partners with less stringent climate policies to catch up.[4] These motives reflect proponents' underlying goals of better environmental results and fairer distributional outcomes.

Emissions leakage and competitiveness concerns arise from the uniquely intense incidence of the tax on EITE firms. In economics jargon, the statutory incidence of a tax falls on the person or company that gives the tax payment directly to the government. In contrast, the economic incidence of a tax falls in the lap of the person holding the hot potato after the initial taxpayer and others in the supply chain pass their costs along (Saez 2017). For example, under current law U.S. fuel distributors pay an excise tax to the federal government

on gasoline upon taking it from bulk storage terminals. They pass that cost through to their customers, and the tax ends up embedded in the retail price of gasoline (Federal Highway Administration 2018). The statutory incidence falls on the fuel companies, but the economic incidence is on everyone who fills up their tanks and those further down the chain, perhaps riding in taxis and Ubers. For most goods with GHG emissions in their supply chain, a carbon tax will work the same way and eventually pass through to consumers in higher prices.

However, shareholders and workers of firms that make EITE goods will likely bear relatively more of the economic incidence of a unilaterally-imposed carbon tax than other firms will bear. If they try to pass their carbon tax burden along, foreign competitors without those costs can undercut them. Such competition threatens both exports and domestic products that compete with imports, especially fungible commodities like ordinary aluminum or cement. If the U.S. carbon tax drives a product's market share to foreign competitors, emissions from that product would rise abroad, potentially by more than they fall domestically. At the same time, American workers would lose jobs and wages and shareholders would lose wealth. Accordingly, members of Congress would include BCA authority in their bills in the hope of preempting emissions leakage and competitiveness losses and to garner support from powerful constituencies.

Emissions leakage can also come from another economic force that BCAs cannot prevent. Price-based leakage occurs when major energy-using countries shift back their demand for fossil fuels and global prices for those fuels fall as a result. Lower global fuel prices increase consumption by countries that do not control their emissions. So, while BCAs can help lower competition-driven leakage, border adjustments have no direct effect on leakage that results from depressed global fuel prices. For that, we need other tools like vigorous diplomacy to promote coordinated global climate action.

Some see BCAs as potential leverage in that diplomatic engagement. One can imagine negotiations in which the United States (having adopted a carbon tax) grants countries it deems sufficiently climate-ambitious an exemption from its BCAs. This scenario might start with bilateral or small multilateral agreements and expand until more and more countries are inside the climate club.[5] In this way, the threat or impact of border adjustments, assuming they survive WTO adjudication, could pressure everyone to price carbon – or at least the carbon in their exported products.

BCAs have their downsides. Even if the environmental and distributional motivations are well-intended, BCAs may not raise overall social welfare relative to the same carbon tax without BCAs (Kortum and Weisbach 2017, p. 423). To complicate matters, McKibbin et al. (2018, p. 6) show that the welfare benefits of import BCAs can depend on how the government uses the carbon tax and import BCA revenue. Böhringer et al. (2016) note that whether or not BCAs

> "can be designed in a manner that is legal under current international trade agreements is an ongoing and intensively contested debate. Moreover, the task of calculating tariff rates based on foreign pollution levels is likely to be difficult and contentious. For both of these reasons, there may be a risk to disrupting the regime of relatively free trade that has emerged under the …WTO if climate and trade policies are linked via carbon tariffs."

Others also argue BCAs could backfire by introducing a controversial and divisive measure in the already fraught multilateral climate process (Cosbey et al. 2012). The international friction that arose following the European Union's imposition of an aviation emissions levy, a BCA-like policy, is instructive. Moreover, using BCAs as diplomatic leverage on the poorest countries could violate the principle of common-but-differentiated responsibilities within the United Nations Framework Convention on Climate Change (UNFCCC).

Despite these concerns, if BCAs are necessary to passing a U.S. carbon tax package, it behooves us to figure out how to do them well.

HOW LARGE IS LEAKAGE LIKELY TO BE?

Research suggests that emissions leakage is likely to be small relative to total U.S. GHG emissions reductions, even for an ambitious unilateral carbon tax. Trade patterns derive from multitudinous factors, and the vast majority of products employ a wide range of inputs other than fossil energy. Aldy (2017) reviews the literature on emissions leakage from a U.S. carbon price. Most studies he cites report emissions leakage of less than ten percent, and many studies project less than five percent leakage, even for energy-intensive industries alone. For example, a multi-model study that analyzed a policy scenario that delivered, on average across a dozen models, a carbon price of $\$40/tCO_2$, found that the energy-intensive, trade-exposed industries' output fell by about 2.5 percent (Böhringer, Balistreri, and Rutherford 2012). Some studies find negative leakage, i.e., that a carbon tax in the United States reduces emissions in other countries. For example, McKibbin et al. (2018) find that under a unilateral carbon tax in the United States, emissions in China fall on net. This happens because the carbon tax lowers U.S. economic growth, slows GDP growth in China, and reduces the demand for energy in China more than emissions rise in China from competitiveness effects.

In light of this evidence, arguably the primary goal of BCAs is to address the economic and political concerns of the most vulnerable industries, not to prevent emissions leakage.

WHAT SHOULD A BCA ADJUST, EXACTLY?

Intuitively, an export BCA would compensate domestic producers that export their goods for the increase in their costs of production that result from the carbon tax. Likewise, an import BCA would charge importers for the carbon emitted in the production of the products they sell in the United States. In practice, a BCA program can only adjust what administrators can observe, measure, monetize, and administer. I leave aside the WTO issues associated with setting a BCA and focus on the economic forces at play.[6]

Let us start with how a carbon tax would affect U.S. EITE firms and the potential role of an export BCA. When the federal government imposes a tax on GHG emissions, at least four channels of outcomes can affect domestic EITE firms. I endeavor to list them in order of most observable and adjustable to least observable and adjustable. First, some firms bear the incidence of their direct carbon tax liability, a transparent amount they

transfer to the federal government. The only measurement challenge is determining how much of the tax liability they incur specifically in the process of producing goods for export. Second, firms bear the incidence of the carbon tax embedded in the price of their inputs. For example, if a steelmaker uses coal to smelt steel and the tax applies to upstream coal producers, the steelmaker pays more for coal than it would without the carbon tax. A BCA program can assume that all (or a set percent) of the coal producer's carbon tax passes through to the steelmaker and then rebate that tax when the domestically-produced steel is exported. I use the word "rebate" loosely here. This would not be a refund of a direct tax liability. Rather, the BCA would account for costs paid indirectly through purchased inputs. The same loose terminology applies throughout this discussion.

Other production cost increases might be less straightforward. Electricity, capital goods, and raw materials might all be more expensive after the carbon tax. They might also be more expensive owing to the BCA on emissions-intensive imported inputs. For example, suppose a U.S. manufacturer uses imported aluminum to make products for export. If an import BCA applies to the imported aluminum, then in principle the export BCA could rebate that additional expense to the U.S. manufacturer.

Third, to the extent that EITE firms reduce direct GHG emissions or shift to cleaner inputs, they bear the costs of those investments. For example, suppose a steelmaker adopts a technology that uses electricity instead of coal (Irfan 2013). Then it bears the cost of converting to the new technology and its operating costs (including any carbon tax embedded in the electricity price). It is hard know which of these costs relate directly to emissions abatement because firms are always adopting process improvements, and some of those abatement costs could also reduce emissions from domestically-consumed goods, not just exports. In addition, the process change may shift some direct emissions to indirect emissions in the form of increased electricity demand. However, to the extent an investment truly lowers overall GHG emissions and is new and additional to what would happen without the policy, it is a real cost to the firm that it cannot pass along to foreign purchasers – a cost, but not a tax liability.

In the short run, most of the costs of the carbon tax will the direct and indirect tax liabilities. As low-emissions technologies become prevalent even in exporting sectors, costs attributable to GHG abatement could rise. That said, even if abatement costs were measurable and significant, accounting for them in setting the export rebate may not be legal under the WTO, and in any case it is not standard practice to compensate exporting firms for the costs of other kinds of regulatory burdens. This may be one of those issues that is best addressed after experience shows whether the problem warrants a solution, perhaps using other policy instruments.

Fourth, like all firms, EITE companies will feel the ripple effects of the carbon tax through the economy in the supply and demand for nearly everything; this is what economists call general equilibrium effects. These effects can be positive or negative and are nearly impossible to anticipate or measure with any precision in practice.

Administrative feasibility limits how much the BCA can account for these myriad increased costs. Where policymakers draw the fence around adjustable costs also significantly affects the incentives of firms. Suppose the export BCA adjusts only for direct and indirect carbon tax liabilities embodied in the exported product. Then a firm's export rebate could shrink when it lowers its emissions, undermining incentives to abate. Likewise, firms using a range of production processes would have the incentive to export their most carbon-intensive products. The policy could set the border adjustment based on embodied emissions for all production of a given product by a particular firm. That would limit the returns to export shuffling, but could involve tracking tax burdens for far more goods than those that end up exported. It could also induce firms to spin off their higher emissions production into a separate export-intensive firm. If the export rebate could account for abatement costs, then complete compensation for those costs would undermine the firm's incentive to minimize its costs of abatement, at least as far as its exports go.

Policymakers could peg export BCAs to measures like current or historical U.S. industry averages or best practices, rather than firm-level behavior. Such benchmarks would simplify the administration of the program, but then BCAs would diverge from firms' actual costs; some would be overcompensated and some undercompensated. A U.S. EITE firm that already uses a low-emissions process could get an export rebate even though its production costs have not significantly increased as a result of a tax, simply because its domestic counterparts use a dirtier process. Such overcompensation would raise a potential WTO violation. This illustrates the policy design challenge of determining which firms and goods should be eligible for export rebates and the size of the rebates.

Similar challenges arise in setting import BCAs with the added problem of accounting for emissions in other countries. Consider a glassmaker in Country X. A particular glass may be produced in Country X in a variety of ways, some clean and some dirty. Suppose Country X's glass is subject to an import BCA upon entry into the United States. The import BCA could price the carbon in the firm's production process at the applicable carbon tax rate in the United States.[7] This approach would require considerable information about the production process, but it would reasonably mirror the tax applicable to comparable production in the United States. Of course, Country X could shuffle which goods go to export, steering its cleanest glass to the United States (or wherever has the lowest import BCA). This could justify using a firm-level average for emissions attributable to production of all of the relevant glass.

Just because an import BCA taxes the imports of GHG-intensive products does not mean it necessarily addresses a competitiveness issue. For example, suppose U.S. production of a particular glass product involves only clean energy. If the import BCA applies anyway, it would give the U.S. firm a new advantage relative to its foreign competitors. This is not necessarily unfair; it would be analogous to the advantages other low-emitting firms would have over their dirtier domestic competitors. In such a case, the BCA on imports is less about preventing leakage and more about internalizing external costs and boosting the overall cost effectiveness of

the carbon tax policy. In any case, policymakers need to decide whether domestic or foreign emissions trigger the import BCA.

In conclusion, the BCA could adjust all sorts of things. The choice among them balances a host of tradeoffs across compensating firms for their actual costs to preserve competitiveness, preventing export shuffling, preserving incentives to abate emissions, preserving incentives to minimize abatement costs, and minimizing administrative burden.

ARE THERE PRECEDENTS FOR A US BCA PROGRAM?

At present, no working examples of national-level BCAs exist.[8] In general, countries with existing carbon taxes or cap-and-trade systems either have carbon prices that are small enough not to raise significant competitiveness concerns or they use other means to protect EITE industries, such as exempting them from the carbon pricing system.[9]

Some subnational carbon pricing programs and proposals have grappled with competitiveness and leakage issues, and some include BCA-like provisions.[10] One important example is electricity. To avoid distorting sources of power, a BCA should price the carbon emissions generated in the production of imported electricity.[11] However, utilities may buy power from a multi-jurisdiction grid, obscuring the imported power's carbon intensity. Policymakers in California had to figure out how to border adjust power imports from other states and Mexico. Their chosen approach distinguishes imports from a specified generation source, i.e. one owned by or contracted by the importer, from other unspecific sources. They assigned emission factors to all the specified sources based on their generation technologies. Unspecified imports receive a default emissions factor that corresponds to the emissions from a relatively efficient natural gas combined-cycle power plant (Bushnell et al. 2014). Although a relatively low border adjustment might underprice the emissions from the unspecified power sources, it reduces the incentives to import cleaner power to California and sell more carbon-intensive power elsewhere, a shift known as resource shuffling.

KEY POLICY DESIGN CHOICES

BCA programs appear in all recent carbon tax proposals in the United States.[12] This section reviews seven of them and identifies their key policy design decisions, comparing and contrasting the proposals' different approaches. At least six economy-wide carbon-pricing bills have been introduced since 2015. The four bills in Table 1 would accomplish this through a tax (sometimes labeled as a fee). In the first row, the table lists the identical bills sponsored by Senators Whitehouse and Schatz in the Senate and Representatives Blumenauer and Cicilline in the House. Table 1 excludes two other recent carbon pricing bills because they include border adjustment language that is very similar to that in Rep. Larson's. One is the 2015 bill sponsored by Rep. McDermott that would sell emissions permits.[13] The other is H.R. 4889 sponsored by Rep. Beyer and 24 other House members in 2018, which would establish a cap-and-trade program for GHGs.[14]

TABLE 1

Recent Carbon Pricing Bills and Proposals

Legislation	Date Introduced	Sponsors & Cosponsors/supporters
American Opportunity Carbon Fee Act of 2018 (S.2368/ H.R. 4926) (Whitehouse-Schatz/Blumenauer- Cicilline)	2/5/2018	Sen. Whitehouse (D-RI) and Sen. Schatz (D-HI) Rep. Blumenauer (D-OR) and Rep. Cicilline (D-RI)
The America Wins Act (H.R. 4209) (Larson)	11/1/2017	Rep. Larson (D-CT) Cosponsored by 20 representatives (20 D, 0 R).
Tax Pollution, Not Profits Act (H.R. 2014) (Delaney)	4/6/2017	Rep. Delaney (D-MD) Cosponsored by Rep. Cartwright (D-PA) and Rep. Polis (D-CO)
Climate Protection and Justice Act of 2015 (S. 2399) (Sanders)	12/10/2015	Sen. Sanders (I-VT)
Climate Leadership Council (CLC) Carbon Dividends	N/A	Supported by (inter alia): James Baker III, Martin Feldstein, Ted Halstead, N. Gregory Mankiw, Henry Paulson Jr., George Shultz, Thomas Stephenson, Rob Walton
Citizens' Climate Lobby (CCL) Carbon Fee and Dividend Policy	2/2017	Citizens' Climate Lobby
RFF-Georgetown Framework Proposal	3/2018	Written by: Brian Flannery, Jennifer Hillman, Jan W. Mares, and Matthew Porterfield

Table 1 also lists three prominent carbon-pricing proposals, two by advocacy organizations and a third by a team of scholars at research institutions. The Climate Leadership Council (CLC) brings together high-profile Republicans, scholars, business leaders, and environmental leaders. The CLC proposal, "The Conservative Case for Carbon Dividends" offers broad principles for legislative design, including a rising carbon tax, rebates to households, regulatory reform, and BCAs.[15] Citizens' Climate Lobby (CCL), a non-partisan grassroots organization, also promotes a border-adjustable carbon fee that would rebate the revenue back to American households.

Scholars affiliated with the non-partisan research institution Resources for the Future (RFF) and Georgetown University (Flannery et al. 2018) propose a detailed framework for what the authors describe is an effective and WTO-compliant border carbon adjustment program. The authors contemplate an upstream GHG tax that applies broadly to the carbon emissions associated with the production and use of fossil fuels. The coverage could also include GHGs released in industrial processes where feasible, e.g., CO_2 emissions from calcination of lime. The direct tax liability would fall on fossil fuel producers, both for their direct emissions in the production process (e.g., from flaring and fugitive methane emissions) and for the carbon content of the fuels they produce. The proposal centers on how to track the pass-through of the carbon tax from those with the statutory tax liability down to EITE industries that bear the economic incidence. The authors propose requiring firms at each stage of the supply chain to measure and pass along the cumulative carbon tax liability, much like how a value-added tax works. If this chain-of-custody accumulation of the tax liability works as designed, then the export BCA can equal the final tally for American manufactured goods upon export. The framework contributes importantly to the literature by describing how to exploit and expand existing data collections to implement BCAs and by exploring some of the thorny details of BCA determinations, such as how to account for cumulative emissions associated with recycled materials.

The BCA provisions in these proposals differ in important ways, including in the sets of goods subject to BCAs and the size of the adjustments. The proposals also differ in the conditions under which import BCAs would be reduced or suspended and their approaches to the revenues and expenditures associated with the adjustments. In some cases, the proposals are silent on these policy design questions, leaving their resolution to regulatory authorities.

The proposals discussed here convey their authors' firm view that BCAs should feature in a final carbon tax bill. The discussion below analyzes four of their key policy choices:

1. Which traded goods will be subject to a BCA? Most bills set threshold screening criteria that establish the universe of goods that authorities will assess for possible border adjustment.
2. What is the magnitude of the border adjustment for different products? This decision determines how authorities set import charges and export rebates for particular goods, before any adjustments or suspensions.
3. Under what conditions are the BCAs adjusted or suspended, for example owing to the climate policies in the trading partner country?
4. How does the policy use the revenue from import BCAs and where do the funds for export rebates come from?

WHICH TRADED GOODS WILL BE SUBJECT TO A BCA?

Most proposals set preliminary criteria for potential inclusion in the BCA program. They then apply a separate method for determining the magnitude of the BCAs. This two-stage process usefully limits the universe of

goods for which authorities must make more complicated determinations. Table 2 below reports the screening criteria for five of the proposals in Table 1. As Table 2 shows, most proposals use equivalent criteria for import and export goods and restrict adjustable goods to those that are "energy-intensive" or "carbon-intensive." Some bills include a list of goods that authorities may amend based on specified criteria. CCL (not shown in Table 2) does not specify criteria for adjustable exports or imports other than that they be "carbon-intensive trade-exposed goods crossing in either direction" (Citizens Climate Lobby 2018). The CLC proposal does not specify eligibility criteria for BCAs.

TABLE 2

Screening Criteria

Legislation	Imports	Exports
Whitehouse-Schatz (S.2368/ H.R. 4926)	Energy-intensive manufactured goods: Any manufactured good (other than any petroleum product or fossil fuel) for which not less than 5 percent of the cost of which is attributable to energy costs, as determined by the Secretary of the Treasury.	Same as imports
Larson (H.R. 4209)	Carbon-intensive goods: A good that is a primary product or a manufactured item in which one or more primary products are inputs and the cost of production of which in the United States is significantly increased by the bill. A 'primary product' means— (A) Iron, steel, steel mill products (including pipe and tube), aluminum, cement, glass (including flat, container, and specialty glass and fiberglass), pulp, paper, chemicals, or industrial ceramics, and (B) Any other manufactured product that the Secretary determines is sold for purposes of further manufacture, and generates, in the course of the manufacture of the product, direct and indirect carbon-dioxide emissions that are comparable (on an emissions-per-dollar of output basis) to emissions generated in the manufacture or production of primary products identified in (A).	Same as imports
Delaney (H.R. 2014)	Any good that would have had an increased cost from the carbon tax had it been produced in the United States.	Not specified
Sanders (S. 2399)	Carbon pollution-intensive good: A good that is (as identified by the Administrator, by rule) iron, steel, a steel mill product (including pipe and tube), aluminum, cement, glass (including flat, container, and specialty glass and fiberglass), pulp, paper, a chemical, or an industrial ceramic.	N/A
RFF-Georgetown Framework Proposal	None specified; The analysis focuses on firms within the 45 North American Industry Classification System (NAICS) Codes that a U.S. federal interagency study identified as EITE, along with coal mining, oil and gas production, electricity generation, petroleum refining and industrial gases.*	Same as imports

*The Effects of H.R. 2454 on International Competitiveness and Emission Leakage in Energy- Intensive Trade-Exposed Industries (December 2, 2009). https://www.epa.gov/sites/production/files/2016-07/documents/interagencyreport_competitiveness-emissionleakage.pdf

In a more numerical approach, the Whitehouse-Schatz bill would border adjust only manufactured goods (other than any petroleum product or fossil fuel) for which energy costs comprise at least five percent of their overall production cost. The CLC proposal (not shown in Table 2) suggests a similar test for export BCAs only. Neither proposal specifies what kinds of energy should go into the cost ratio. If all energy costs count toward eeting the energy threshold, then imported manufactured products that are energy-intensive but produced with

zero-emissions hydropower, for example, would meet the screening condition. Likewise, exported energy-intensive products that incurred no emissions and no carbon tax liability conceivably could meet the condition. Again, however, this stage of the program only identifies goods potentially subject to the adjustment; the magnitude of the adjustment involves different criteria, discussed below.

In principle, a good can be GHG-emissions-intensive without being energy intensive if it involves significant emissions of a non-CO2 GHG or CO2 emissions from a chemical process rather than fuel combustion. An energy-related test like the one in the Whitehouse-Schatz bill could inadvertently exclude such goods from the BCA program.

The Whitehouse-Schatz bill leaves (arguably appropriately) many implementation details to the Secretary of the Treasury, including how to measure costs of energy and overall production to test against the five percent threshold. The bill also does not specify the scope of products included in a test. For example, is the five percent by industry (e.g., all steel), by firm (all of Firm A's steel), or by production facility (a particular steel plant operated by Firm A)? The bill is also silent on whether the test applies separately for import BCAs and export BCAs, and for imports whether the test applies separately for each country. In other words, if a product meets the greater-than-or-equal-to five percent energy cost test overall outside the United States, but not in Norway, is the good from Norway still potentially subject to the import BCA? If domestic products are energy-efficient, but their foreign counterparts are energy-intensive, can domestic producers still receive an export BCA? Regulators would also have to determine the specificity of a good and how far down the production chain that the energy test applies (e.g., steel vs. cold-rolled steel pipe).

The hard threshold of five percent assures highly energy-intensive firms that their products would pass the screening criteria for an export BCA and clarifies which foreign competitors would be subject to an import BCA. On the other hand, in theory such a bright line could lead some firms on the margin to increase their energy consumption to qualify for the export BCA. Regulators could anticipate this gaming behavior by stipulating that the relevant threshold is energy-cost-share as of a certain past date or that it applies to all of the firm's production (not just exports). Without specific legislative language explaining how the test works, broad discretion could invite litigation.

The bill by Representative Larson limits BCAs to specific primary products (metals, cement, glass, pulp, paper, chemicals, and industrial ceramics) and products manufactured with them. An additional criterion is that the goods' total cost of production is "significantly increased by the bill." Under this approach, screening would require authorities to determine both the definition of "significantly" and the scope of costs "increased by the bill." The scope presumably includes direct and indirect carbon tax liabilities and import BCAs on inputs. Abatement costs might be more debatable. The bills also give discretion to include other manufactured goods if they involve comparable emissions-to-output-value ratios.

The bills sponsored by Representatives Delaney and Larson center BCA eligibility on whether there was any increased cost of production "from the carbon tax," had the good been produced in the United States. This could suggest that only the direct and indirect costs of the tax apply in the test, but that the increased cost of production does not need to be significant.

Unlike the other bills, Sen. Sanders' specifies the goods that would be BCA-eligible, without regard to increased costs of production. The bill labels all the primary goods as "carbon pollution-intensive." However, in practice some of these goods can be produced with low-carbon energy. This raises an ambiguity as to whether primary goods that are not carbon-intensive would meet the screening criterion. Also unlike the other proposals, the Sanders bill would not make other manufactured products border adjustable, just the listed primary goods.

Other than the CCL proposal, which would limit BCAs to "trade-exposed" goods, none of the proposals specifically screen out emissions-intensive goods that are not heavily traded. Instead, some bills list specific products consistent with the NAICS codes cited in the interagency report.

The RFF-Georgetown framework clearly includes electricity generation in the border adjustment program (Flannery et al. 2018, p. 14). Most of the other proposals refer to "manufactured goods" or "primary products." It is unclear whether the bills discussed above would apply BCAs to traded electricity, but arguably they should.[16]

BCA MAGNITUDES: INTRODUCTION AND IMPORTS

Much of the literature on the design of BCAs deals with determining how large the border adjustments should be. A host of considerations applies, including how to ensure the BCAs are WTO compatible, how to get around information limitations, how to preserve efficient incentives, and how to update them over time. Another consideration is whether or how to reduce or suspend BCAs under certain conditions, such as a change in the climate policy within the trading partner country. This subsection discusses proposed ways to determine the base value of import BCAs for the countries to which they apply. The following two subsections discuss analogous export BCA determinations and the conditions under which BCAs might be reduced from their base values or suspended altogether.

A number of authors note the challenge in parsing out the emissions that are involved in production for domestic consumption and export. As Flannery et al. (2018, p. 10) note:

> "Because of the large variety of production methods employed in many sectors, and the regional variation of emissions associated with sources for purchased electricity, it seems appropriate to use firm, not sector averages to determine the domestic rebate for specific products. To meet WTO criteria, it is essential that the rebate for exported products does not exceed the value associated with cumulative GHG emissions of producers (US GHG tax times PCGE for the product). Firm-wide averages could simplify the issues associated with provenance of exported products."

However, this would leave open the option for firms to restructure themselves such that new independent entities trade the goods with the most advantageous BCAs. Cosbey et al. (2012, p. 17) recommend basing export rebates on sector-wide, rather than firm-specific calculations so that firms do not expect larger rebates when they emit more GHGs. Flannery et al. (2018) and others describe the multiplicity of separate BCAs if the policy divides them up by product and country of origin. For example, Kortum and Weisbach (2017) note that 1,500 separate products fall within the 44 industry codes that a 2009 interagency report identified as EITE. If those products flow in from 10 countries, as many as 150,000 different import BCAs could apply. And that assumes that for products of a given company the BCA derives from the national average of emissions associated with the imported product. A system of firm-level appeals could produce many more.

Let us turn now to import adjustments in the proposals in Table 1. Assuming a good has passed the screening criteria in Table 2, the magnitudes of the import adjustments are governed by the language in Table 3. Although their exact text differs, most proposals include in their import BCA an estimate of the direct and indirect tax liabilities the foreign producer would have had if the same emissions in its supply chain occurred within the United States. The Whitehouse-Schatz and Delaney bills include language to that effect. The Larson and Sanders bills also include in the adjustment calculations the increased costs domestic producers would face from import BCAs on inputs to their production.

TABLE 3

Base Import BCA Magnitudes

Legislation	Import BCA Magnitude
Whitehouse-Schatz (S.2368/ H.R. 4926)	…an amount equal to the cost of the good that would be attributable to the carbon fee imposed on inputs used in the manufacturing of such good if the inputs used in manufacturing the good were subject to such fees.
Larson (H.R. 4209)	…equivalent to the cost that domestic producers of comparable carbon-intensive goods incur as a result of— (1) the carbon tax paid by manufacturers, producers, and importers of taxable carbon substances, and (2) carbon equivalency fees paid by importers of carbon intensive goods used in the production of the comparable carbon intensive goods in question.
Delaney (H.R. 2014)	…equivalent to the carbon tax that would have been imposed at any point in the supply chain of that good, had that good been produced in the United States.
Sanders (S. 2399)	…equal to the cost that a producer of a good that is comparable to the carbon pollution-intensive good and is produced in the United States incurs as a result of— (1) any fee imposed by the carbon fee— (A) paid by the producer of the comparable good with respect to a carbon-polluting substance used in the production of the comparable good; or (B) paid by a person that imported a carbon-polluting substance used in the production of the comparable good; and (2) any fee imposed by the border adjustment paid by a person that imported a carbon pollution-intensive good that was used in the production of the comparable good. The amount of the border adjustment fee is— (A) determined annually; and (B) determined differently for each good, based on class of good and country of origin taking into account the quantity of GHG emissions released during the manufacturing and transportation of the good to the United States.
CLC	Imports … would face fees on the carbon content of their products.
CCL	"Carbon-fee-equivalent tariffs shall be charged"
RFF-Georgetown Framework Proposal	…equals the average value PCGE for an importing firm's entire domestic production of a product (or the national sector-average if firm-specific information is not available) multiplied by the US GHG Tax), where for product P produced in an EITE sector by a specific manufacturer, PCGE denotes Cumulative GHG Emissions (CO_2-e per tonne of product) along the entire supply chain to produce and, in the case of fossil resources, to utilize the product. It includes contributions both from inputs purchased from EITE suppliers, as well as process emissions (if any) from on-site activities of the manufacturer, and the carbon content of produced coal, oil and natural gas.

The Sanders bill is less clear. The bills set the import BCAs equal to the cost to a domestic producer of the same good from its direct and indirect carbon fee liabilities and the import BCAs in its supply chain, but then says that the BCA amount depends on emissions released in the good's manufacture abroad. If domestic producers have different emissions intensities than foreign producers of the same goods, it is unclear which emissions determine the import BCAs.

The proposals do not specify the level of aggregation that applies in determining the emissions associated with an imported good. They do not rule out using firm-level or national averages, but they do not specifically allow for it either.

Kortum and Weisbach (2017, p. 430) emphasize that any particular BCA calculation is a snapshot of current emissions and production patterns. This raises the question of whether and how to update the product list and BCA amounts. Sen. Sanders' bill calls for annual updating. All of the other bills express screening criteria and BCA determination in either the present tense or an indeterminate past tense: "5 percent of the cost of which is attributable to energy costs"; "equivalent to the cost that domestic producers of comparable carbon-intensive goods incur as a result of… the carbon tax paid…" This appears to leave the precise updating process to implementing authorities, but it also implies at least periodic updating. Because the implementation and performance of the program will evolve after passage of the bill, policymakers might consider whether regular reports to Congress would be useful.

TABLE 4

Base Export BCA Magnitudes

Legislation	Export Magnitude
Whitehouse-Schatz (S.2368/ H.R. 4926)	A refund equal to the amount of the cost of the good attributable to the carbon fee imposed on inputs used in the manufacturing of the good.
Larson (H.R. 4209)	A refund equivalent to the cost that domestic producers of such carbon intensive goods incur as a result of— (1) the carbon tax paid by manufacturers, producers, and importers of taxable carbon substances, and (2) carbon equivalency fees paid by importers of carbon intensive goods used in the production of the comparable carbon intensive goods in question.
Delaney (H.R. 2014)	A refund equal to the cost associated with the carbon tax.
Sanders (S. 2399)	N/A
CLC	Exports … would receive rebates for carbon taxes paid.
CCL	Carbon-fee-equivalent rebates shall be used to reduce the price of exports to [countries without comparable Carbon Fees/Carbon Pricing]. "[E]xported fossil fuels don't get any special border treatment. Our proposal does not include a refund for U.S.-produced fossil fuels that are exported…"*
RFF-Georgetown Framework Proposal	Equivalent to import BCAs. The export rebate equals the average value PCGE for a firm's entire U.S. production of a product. See Table 3 for the definition of PCGE.

*Citizens Climate Lobby (2018)

BCA MAGNITUDES: EXPORTS

Export BCAs have the potential advantage of requiring information only from U.S. data sources. Table 4 reports the rules for setting export BCAs.

For the most part, the proposals set BCA magnitudes more closely to the direct and indirect carbon tax burden than they do the eligibility criteria. For example, the Whitehouse-Schatz approach makes all products that meet an energy-intensity threshold eligible for an export BCA, yet sets the rebate amount to equal the carbon tax incurred in making the product. This means that goods produced with large amounts of renewable energy would be eligible (in principle), but no export BCA would apply because renewable energy incurs no carbon tax. This is not a problem exactly, but consistent criteria would probably make more sense.

BCA MAGNITUDES: CONDITIONS UNDER WHICH BCAS ARE REDUCED OR SUSPENDED

Policymakers could apply a wide variety of criteria to exempt products from border adjustment. For example, Cosbey et al. (2012) list options including whether the trading partner is party to a multilateral climate agreement, has a national emissions cap, has taken some other adequate climate action, has a sector-specific emissions cap, or is deemed "least developed." Imposing BCAs only on imports from and exports to countries without a comparable carbon price might greatly simplify the system because a large percentage of U.S. imports of carbon-intensive trade-exposed goods are from developed countries, which are more likely to impose a carbon price (Kortum and Weisbach 2017, p. 436).

Most of the proposals in Table 1 would reduce or suspend BCAs in certain circumstances, as reported in Table 5. Only the Whitehouse-Schatz proposal scales the BCA with the carbon price imposed on products produced by the trading partner. All of the others either eliminate the BCAs entirely or, in the case of the Flannery et al. (2018) framework, apply them regardless of other countries' climate policies. In principle, scaling BCAs to other countries' policies makes sense because it would provide an incentive for them to strengthen their policies on the margin. However, it would likely complicate the administration of the program significantly because countries can have carbon prices that differ across industries (such as in Sweden), across time (such as in a cap-and-trade program), and across sub-federal jurisdictions (as Canada is planning). The policy could necessitate so many simplifying assumptions that the effectiveness of the marginal incentives may be rendered moot.

Most of the proposals suspend export BCAs for U.S. goods sent to countries with comparable carbon pricing systems. However, this condition by itself does not eliminate export competition for U.S. companies. For example, suppose a U.S. chemical manufacturer competes in export markets with firms from all over the world, and it receives an export BCA from the U.S. government accordingly. Now suppose Country A to which the U.S. firm exports adopts a carbon tax identical to that of the United States. The American firm is now (carbon-wise) on a level playing field with the domestic firms in Country A, but not necessarily with chemical manufacturers in Country B, in which no carbon constraint applies. In fact, Country A may have no chemical manufacturers, so the adoption of the carbon price by Country A may have no effect on the competitiveness of U.S. manufacturers' chemicals in Country A. The playing field for imports into Country A would only be level if Country A adopts an import BCA that equivalently taxes U.S. firms' competitors and exempts the U.S. firm that pays a comparable carbon tax.

TABLE 5

BCA Reductions or Suspensions

Legislation	Export BCA	Import BCA
Whitehouse-Schatz (S.2368/ H.R. 4926)	The amount of the refund shall be reduced by the amount, if any, of fees imposed on such goods or comparable domestically produced energy-intensive manufactured goods by the foreign nation or governmental unit to which such good is exported.	Reduction in fee.--The amount of the equivalency fee shall be reduced by the amount, if any, of any fees imposed on such energy-intensive manufactured goods by the foreign nation or governmental units from which such good was imported.
Larson (H.R. 4209)	Border adjustments end if (1)(A) an international agreement requiring countries that emit greenhouse gases and produce carbon intensive goods for international markets to adopt equivalent measures comes into effect; or (B) the country of export has implemented equivalent measures; and (2) the border adjustment is no longer appropriate.	
Delaney (H.R. 2014)	Not specified	
Sanders (S. 2399)	Similar to Larson (H.R. 4209): Border adjustments end if (1)(A) in the case of a country that adopts and ratifies an international agreement requiring countries that emit greenhouse gases and produce carbon pollution-intensive goods for exportation to adopt substantially equivalent measures, that agreement takes effect; or (B) the country has implemented substantially equivalent measures, as determined by the President; and (2) the Secretary of Treasury determines the import fee no longer appropriate.	
CLC	Border adjustments do not apply to exports to countries with comparable carbon pricing systems	Border adjustments do not apply to imports from countries with comparable carbon pricing systems
CCL	Border adjustments do not apply to imports/ exports from/ to countries with comparable carbon pricing/ carbon fees	
RFF-Georgetown Framework Proposal	Not applicable. The BCAs apply to imports from and exports to all nations at full value, regardless of climate policies abroad.	

Also, as Cosbey et al. (2012, p. 18) note, U.S. firms can easily avoid losing their export rebates to Country A. They can send their products first to Country C and trans-ship them from there to Country A. Recognizing the reality of global competition could significantly complicate the drafting of an export BCA suspension.

The language in the Whitehouse-Schatz bill suggests that the only thing exporting countries need to do to qualify for a full exemption from the import BCA is to equivalently price the carbon embodied in their export products. This levels the playing field, matching the import BCA to the competitive pressures.

Other proposals are more ambiguous as to what the actions by other countries must be and how BCAs may be turned on or off. For example, the Larson and Sanders bills can be read to imply that import BCAs for products are either all on or all off. But the language mixes plural and singular: "Border adjustments" end if … the country of export has implemented equivalent measures; and (2) the border adjustment is no longer appropriate." Does that mean equivalent measures for all carbon economy-wide, all carbon in all exported products, or the carbon in a specific product for which a single border measure may be lifted? And this leaves aside the challenge of defining what is "equivalent."

The RFF-Georgetown framework stands out in its application of BCAs to all countries no matter their climate policies. This tightly adheres to WTO rules:

> "Rebates and import charges are determined in the context of the indirect domestic tax on GHG emissions associated with the product;
> - Import charges are applied without discrimination based on national origin;
> - Objective international standards are used to determine domestic rebates for exports and border charges on imports;
> - Rebates for products do not exceed the amount of the indirect domestic tax;
> - Import charges on products do not exceed the amount of the indirect domestic tax on like products."[17]

Although this approach obviates using BCAs directly as negotiating leverage, it also obviates violations of Most Favored Nation provisions in WTO law. And, it avoids complicated determinations of which countries, firms, and products are eligible for discounts or BCA suspensions. As Flannery et al. (2018, p. 8) note, this approach gives other countries an incentive to adopt carbon taxes as opposed to less efficient policies so that they can rebate their carbon fees upon export to the United States. Perhaps when a critical mass of countries equivalently price carbon, the world could do away with BCAs. In the meantime, this approach would be workable and legally solid.

REVENUE AND EXPENDITURES ASSOCIATED WITH BCAS

Import charges raise revenue and export rebates require spending. The net result may be positive or negative, depending on the details of the program and would certainly vary across sectors. Illustrating the potentially large fiscal effects, Flannery et al (2018, p. 10) estimate that if a tax of $20 per tonne of fossil fuel-related CO_2 emissions had been applied in the United States in 2016, the sum of export rebates would have been $20 billion and import charges $40 billion. Table 6 reports the few proposals that specify how funds from import BCAs would be used; none specify a source of funds for rebates. Table 6 cites the 2015 bill by Rep. McDermott, which differs from Rep. Larson's bill in this regard.

The bill by Senator Sanders, which includes only import BCAs, creates a dedicated fund for the revenue. The fund uses the money to support energy efficiency initiatives and a nationwide network of manufacturing extension partnership centers (National Institute of Standards and Technology 2013).

If the BCA policy suspends import BCAs from countries that price their GHG emissions, the details of conditions for that suspension could matter a great deal, including for the potential revenue for import BCAs. If countries only have to price carbon in their export goods, we can plausibly expect most of them to do it. That way they can collect revenue that would otherwise go to the United States, and BCA revenue would be far lower than under an approach with no exemptions or more demanding criteria. In any case, the estimated budget implications for import BCAs will be particularly uncertain because of the difficulty in predicting how other countries will respond to U.S. policy.

TABLE 6

Use of Revenue from Import BCAs

Legislation	Revenue Use
Sanders (S. 2399)	Fees are deposited into a Carbon Equivalency Fee Fund. The fund expenditures are divided up in the following way: (1) The lesser of $150,000,000, or 5 percent of amounts in the Fund, shall be made available to the Secretary of Commerce for the Hollings Manufacturing Extension Partnership. (2) Twenty percent shall be made available to the Secretary of Energy, to be used, in consultation with the Secretary of Commerce, for activities of the Advanced Manufacturing Office of the Office of Energy Efficiency and Renewable Energy. (3) Thirty percent shall be made available to the Secretary of Energy for the State Energy Program, to be used exclusively by energy offices of States and territories to promote energy efficiency projects at industrial facilities within the jurisdiction of such States and territories. (4) The remaining shall be made available to the Secretary of Energy for industrial energy efficiency programs authorized under part E of the Energy Policy and Conservation Act (42 U.S.C. 6341 et seq.) or subtitle D of title IV of the Energy Independence and Security Act of 2007 (Public Law 110–140; 121 Stat. 1623).
McDermott (H.R. 972)	Proceeds (along with the revenue from the domestic permit sales) go towards the Energy and Economic Security Trust Fund, which pays monthly dividends to taxpayers.
CLC	Proceeds go towards larger carbon dividends

SUMMARY AND CONCLUSION

A few conclusions derive from this review of draft BCA proposals. The following summarizes the recommendations, with special attention to offering guidance to Congressional staff working on draft carbon tax legislation:

- The statutory language for BCA design requires careful thought. As reflected in the bibliography of this paper, a large literature has accrued on this topic, not all of it covered here. The Congressional Budget Office could update its 2013 report called "Border Adjustments for Economywide Policies that Impose a Price on Greenhouse Gas Emissions" focusing specifically on a carbon tax.[18]
- Expect BCAs to be the most time-consuming and complicated part of implementing a GHG tax. Relevant agencies will need sufficient resources to prevent undue bottlenecks. However, even with ample resources the process of promulgating the implementing regulations is likely to be protracted and subject to litigation. Once up and running, administering the program will be challenging but doable, provided the rules and processes are crafted carefully.
- Expect companies and foreign governments to try to exploit the BCA program in their self-interest. Plan to use oversight tools to ensure that executive branch agencies are faithfully carrying out the law's stated goals and are not captured by rent-seeking interests.
- Many factors will evolve after passage of a carbon tax bill. Consequently, BCAs will require regular updates as technologies change and national GHG policies and ambition evolve. Regular reports to Congress could update policymakers on how the BCA program and other aspects of the carbon tax are working and keeping up with changes.
- Harmonize the screening criteria for BCA-eligible products with the criteria that determine the magnitude of the adjustments. For example, screening in products whose costs of production have gone up significantly as a result of the GHG tax makes more sense than screening in products that are energy-intensive, but possibly not emissions-intensive.
- Electricity may not obviously fit in the definitions of BCA-eligible goods, but it can be GHG-intensive and traded internationally. It would make sense to border adjust electricity just like the more tangible GHG-intensive goods that appear in the legislation.
- McKibbin et al. (2018) suggest that border adjustments should apply to a sufficiently narrow set of products so as to prevent distortions in currency values that could undermine the trade goals.
- The net fiscal impacts of the BCA program are uncertain. They depend on the conditions under which BCAs are suspended, if any, and other countries' response to those conditions. For example, if the policy suspends BCAs for imports from countries that price the GHG emissions associated

with their exports, they are likely to do so in order to collect revenue that would otherwise go to the United States. If this response is widespread, little revenue would be raised from import BCAs. Likewise, if export rebates are also suspended, then expenditures fall along with revenues. The net budget impacts would depend on the BCAs associated with the remaining traded products to which adjustments apply.

    - Both revenues and expenditures would be larger in an approach like the RFF-Georgetown proposal in which no BCA suspensions apply. Flannery et al. (2018, p. 10) project the policy would generate billions of dollars in net revenues.

- Clarity about the use and source of BCA revenues and expenditures is important, particularly if the bill otherwise earmarks revenues for particular purposes. For example, do export rebates come out of gross carbon tax revenues or do they need separate appropriations?

- Even if the United States implements a BCA program, other countries' import BCAs might be higher than U.S. export rebates for the same products. This means some firms could be worse off on net despite their export rebate. This is not easily fixed. Raising a U.S. export BCA to match another country's higher import BCA could cause a WTO violation.

- As discussed around Table 5, carefully consider and articulate any conditions under which BCAs are suspended. This is one of the more complex dimensions of a policy that is already complicated. Recognizing the reality of global competition could significantly complicate the drafting of an export BCA suspension.

    - Most proposals would suspend the export BCA for shipments to countries with an equivalent carbon price. However, this ignores the fact that U.S. firms could still face export competition from firms in other countries that export to that same destination. Only if the recipient country adopts an import BCA that equivalently taxes the U.S. firm's competitors and exempts the U.S. firms would those competitive pressures be alleviated.

    - When other countries meet the conditions to suspend BCAs, U.S. firms can avoid losing their export rebates by sending their products to other countries first and trans-shipping them from there. Deterring this behavior would be difficult.

    - BCA suspensions or discounts should take careful account of the literature on WTO compatibility. Policymakers should consult trade law experts to avoid legal pitfalls and be clear about the criteria that govern BCA suspensions. For example, should BCAs be suspended on a product-by-product basis or only wholesale across all products from a given country? Do the comparable measures adopted by the exporting country have to apply

economy-wide to all emissions, to all emissions from production of a given good, or only to the emissions associated with goods exported to the United States?

    - Discounting BCAs by the amount of trading partners' carbon prices may create incentives on the margin for countries to raise their carbon price. However, discounting accurately may prove so complicated that in practice the incentives do not operate as hoped. The discounts also only matter once the U.S. carbon price is high. This may be one of those ideas that makes sense in theory but fails in practice.

    - In light of how difficult it is to craft BCA workable suspension conditions, consider the RFF-Georgetown framework that would apply BCAs consistently across all countries, regardless of their climate policies. Although it obviates using BCAs for diplomatic leverage, it offers the virtue of relative simplicity and a strategy for WTO compatibility.

- To avoid litigation, it could be advantageous to specifically allow certain kinds of discretion. For example, if you want to enable the Secretary of the Treasury to set adjustments that depend on how a good's emissions compare to current or historical industry average emissions or industry best practice, then consider including statutory language that allows such benchmarking.

- The BCA program should provide a way for other countries and individual firms to appeal or petition determinations made by the U.S. authorities.

    - Authorities should establish an administrative structure for such petitions, for example one that parallels a countervailing duty process, with phases for determinations, appeals, and adjudication.

    - Some kind of notification to trade partners and stakeholders about pending BCA policy changes, and an opportunity to comment would also be wise, if not compulsory under the WTO.

- These processes should be public, transparent, consistent, and predictable.

- It may only be feasible to rebate the direct and indirect carbon tax liabilities borne by U.S. EITE firms, but these are not the only impacts on these firms of a U.S. carbon tax.

Future work must address important considerations not addressed here. The most important of these is compliance with WTO rules (assuming the United States cannot change them). A large literature explores WTO constraints on BCA design, and it would be useful to analyze these legislative proposals through that lens.

Another important consideration is how to coordinate different federal agencies' expertise to best effect. Efficient BCA implementation in the United States would take into account the facts that: Treasury collects existing fuel excises and has deep expertise in managing billions of dollars in financial flows; the Department of

Commerce enforces rules on anti-dumping and countervailing duties; EPA collects GHG emissions data under its GHG reporting regulations; and U.S. Customs and Border Protection collects import tariffs. A useful complement to this review would compare how these proposals assign duties across agencies and suggest the best roles for each.

Implementing agencies will have to analyze the costs and benefits of the BCA program, including a range of regulatory alternatives, just as they must for other economically significant rules.[19] In addition, CBO and the Joint Committee on Taxation must estimate the program's uncertain fiscal impacts. Because the BCA policy poses novel questions about trade, emissions, industrial activity, incentives, and other outcomes, agencies may need modeling tools they do not normally require for their more typical duties. A thorough consideration of the appropriate tools is beyond my scope here, but it is an important priority to prepare for timely implementation of the program.

Finally, BCA determinations will require extensive data on domestic and foreign emissions and carbon fee liabilities. They will also require periodic updates as technologies and policies evolve. For careful thinking on the data demands of BCA determinations, see Flannery et al. (2018).

NOTES

[1] Gray and Metcalf (2017); Takeda et al. (2014)

[2] Flannery (2016); Wara, Michael (MichaelWWara). "Finally, I would just note that federal carbon pricing - if and when that ever happens - will require this. It is a must have for the unions. Without it, they will not support any form of national carbon pricing." June 11, 2018, 5:55 PM. Tweet.

[3] This view is echoed by Cosbey et al (2012); Aldy (2017) and Flannery (2016) note that while addressing some risks, BCAs can introduce new risks.

[4] Cosbey et al (2012, p. 4); Fischer and Fox (2012)

[5] Nordhaus, William, "Climate Clubs: Overcoming Free-Riding in International Climate Policy," American Economic Review, Vol. 105, No. 4, April 2015. (pp. 1339-70) https://pubs.aeaweb.org/doi/pdfplus/10.1257/aer.15000001

[6] Sakai and Barrett (2016) (p.106) assert that WTO rules would prevent taxing imports in excess of the domestic rates, even if their carbon content is greater. In contrast, Flannery et al. (2019) (p. 11) argue that the rules of the WTO permit internal taxes to be border adjusted.

[7] Kortum and Weisbach (2017) contemplate this approach.

[8] Condon and Ignaciuk (2013) also identified none as of their publication date.

[9] For example, Sweden has a carbon tax with discounts for certain industries. https://www.government.se/government-policy/taxes-and-tariffs/swedens-carbon-tax/

[10] See for example, the Economics Competitiveness Assurance Program, Section 5.5 in California's draft bill SB-775, California Global Warming Solutions Act of 2006: market-based compliance mechanisms. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB775. Existing cap-and-trade rules in California include free emissions allowances for certain trade-exposed industries.

[11] Morris et al. (2016) review the design issues of state-level carbon taxes.

[12] A compendium of U.S. carbon pricing legislation appears here: https://www.carbontax.org/bills/.

[13] Managed Carbon Price Act of 2015 (H.R. 972), introduced February 13, 2015, by Rep. McDermott (D-WA), cosponsored by Rep. Hastings (D-FL), Rep. Norton (D-DC), Rep. Velazquez (D-NY).

[14] Healthy Climate and 3 Family Security Act of 2018 (H.R. 4889), introduced January 29, 2018 by Rep. Beyer (D-VA), cosponsored by Rep.Norton (D-DC), Rep. Lowenthal (D-CA), Rep. Connolly (D-VA), Rep. Raskin (D-MD), Rep. Velazquez (D-NY), Rep. McGovern (D-MA), Rep. DeLauro (D-CT), Rep. Lee (D-CA), Rep. Schakowsky (D-IL), Rep. Huffman (D-CA), Rep. Hastings (D-FL), Rep. DeSaulnier (D-CA), Rep. Lofgren (D-CA), Rep. Cartwright (D-PA), Rep. Khanna (D-CA), Rep. McNerney (D-CA), Rep. Lieu (D-CA), Rep. Blumenauer (D-OR), Rep. Cohen (D-TN), Rep. Welch (D-VT), Rep. Napolitano (D-CA), Rep. Capuano (D-MA), Rep. McEachin (D-VA), Rep. Scott (D-VA), Rep. Pingree (D-ME), Rep. Nolan (D-MN), Rep. Espaillat (D-NY), Rep. Brown (D-MD), Rep. Watson Coleman (D-NJ), Rep. Carson (D-IN), Rep. Chu (D-CA), Rep. Pocan (D-WI), Rep. Grijalva (D-AZ), Rep. Lynch (D-MA), Rep. Bonamici (D-OR), Rep. Soto (D-FL).

[15] See James A. Baker III et al. (2017).

[16] U.S. Department of Energy (2016) describes patterns of trade in electricity across North America.

[17] Flannery et al. (2018, p. 7)

[18] Congressional Budget Office (2013).

[19] White House guidance on these analytical requirements appears in OMB circular A-4: https://reginfo.gov/public/jsp/Utilities/circular-a-4_regulatory-impact-analysis-a-primer.pdf

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