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Carbon Border Adjustment Mechanisms and Carbon Prices:

Taxing mining for the energy transition

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1.0 Introduction

The European Union (EU) is considering introducing a carbon border adjustment mechanism (CBAM). This mechanism is a tax on imports from outside the bloc on the estimated carbon dioxide emitted in their production that is equal to the price that EU-made products already pay for such emissions under the bloc's Emissions Trading Scheme (ETS). Manufacturers that have al ready paid a carbon price on their goods can deduct this from what they would be required to pay to the EU. Mining is responsible for a lot of carbon emissions, so the sector could be significantly affected by this scheme (and those being considered by other countries, including Canada, the United Kingdom, and the United States) in the future.[1]

The CBAM risks making mineral-rich countries that export these products (or raw materials on which they are based) to the EU worse off unless they introduce carbon prices equal to the EU's. In this context, we recommend that mineral-rich countries consider introducing carbon prices. In addition to the wider benefits that these prices carry, they would also reduce or eliminate payments to the EU under the CBAM. We also recommend that mineral-rich low- and middle-income countries lobby the EU to complement the CBAM with measures to make up for any negative effects on low- and middle-income countries. In this policy paper, we explore

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[1] Metal mining alone has been variously estimated to account for 10% of global energy-related GHG emissions (Ali, 2020); other estimates put mining's total share of global emissions at 10% (Delevingne et al., 2020, as cited in Ramdoo, 2022).

1. The details of the EU's proposed CBAM
2. The CBAM's potential impacts on mineral-rich low- and middle-income countries
3. Whether and how mineral-rich countries could introduce their own carbon prices
4. What kind of support they can lobby the EU for.

2.0 Objective

As the EU (and potentially other jurisdictions) implement CBAMs, companies in mineral-rich low- and middle-income countries potentially face a decrease in revenues from exporting to the EU. Our idea is designed to address the challenges facing these countries as a result.

3.0 The Challenge Posed by the EU's CBAM

3.1 The Reasoning Behind CBAMs

CBAMs are (or should be) designed to avoid "carbon leakage," which is where high-polluting industries shift to countries with lower carbon pricing. Carbon leakage can undermine efforts to discourage carbon emissions by putting a price on them.

Box 1. What is carbon pricing?

"Carbon pricing" refers to either

- A tax on emissions of carbon-based greenhouse gases (GHGs). This can either be levied on emissions themselves or on energy or fossil fuel use.
- Rules requiring companies that emit carbon-based GHGs to have a permit to do so. Where these permits are auctioned by the government or can be traded, this creates a price for the right to emit.

There are also subsidies that can introduce a positive financial incentive for carbon emissions and tradeable performance standards, but we do not cover those in this policy paper.

Source: Tatiana Falcao, personal communication, 2022.

In response, CBAMs are intended to ensure that individuals and companies only shift abroad when the private benefits outweigh the costs to everyone else. For example, if Country A applies this approach but its residents can still import from Country B where there is no carbon price, they may have an incentive to import high-carbon goods from Country B, even if the cost to wider society (i.e., the environmental damage caused by producing the goods) outweighs the benefits to the importer. Because there is no carbon price reflecting this "social cost" in Country B, companies based there could price their goods more cheaply and out-compete companies in Country A, even

if the product could be more efficiently produced in Country A when the "social cost" of carbon emissions is taken into account. To address this, a CBAM taxes imports from Country B at the same carbon price that Country A's companies have to pay. As a result, at least in theory, companies and consumers in Country A will only import products from Country B when it makes sense to do so, taking into consideration the "social cost" of carbon emissions in producing them. This is one important advantage of a CBAM.

In the early years of EU carbon pricing, there appeared to be little carbon leakage. But recent evidence suggests that it is indeed taking place. And as carbon prices rise (which they are doing rapidly), we can expect there to be further carbon leakage—unless there is action to stop it.[2] The European Commission estimates that a CBAM will reduce annual "CO_2 emissions in the sectors it covers by 1 percent in the EU and 0.4 percent in the rest of the world" and will "decrease carbon leakage in the five sectors by 29 percent" by 2030 (Pleeck, Denton, & Mitchell, 2022).

The CBAM could therefore be an important tool—not just for EU members but also for the wider world—in reducing carbon emissions worldwide.

3.2 The European Commission's Proposed Design

Under the European Commission's proposals for the CBAM, importers will have to pay a levy equal to what they would have paid under the EU's ETS if the goods had been produced in Europe. Manufacturers that have already paid a carbon price on their goods can deduct this from what they need to pay to the EU, and goods that are subject to the same carbon price as the EU will be exempt.

The scheme will be phased in gradually and is slated to initially apply to imports of iron and steel, cement, fertilizer, aluminum, and electricity generation, per the European Commission's proposal, but is likely to expand to other industries with time. Initially, the CBAM will cover "direct emissions" (i.e., those over which the producer has direct control). Emissions from some earlier stages of the value chain ("[I]nput materials (precursors) consumed in the production process") would be covered, but there is no precise definition of what this means (Marcu et al., 2021, p. 33).

Where there is insufficient data or estimates (from either companies or national sources) on the level of emissions involved in production, the EU will use its own default values.[3] While the scheme initially only covers imports of the goods mentioned above, it will be extended to cover other sectors over time. Marcu et al. (2021) offer a comprehensive analysis of the European Commission's proposal for the CBAM.

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[2] See a review of the literature in L'Heudé et al. (2021, pp. 6–7).

[3] How these are determined is still under discussion between different European institutions. See Marcu et al. (2021, p. 37) and the Draft Regulation of the European Parliament and of the Council Establishing a Carbon Border Adjustment Mechanism – General Approach, 2022.

According to the European Commission's current proposal, the CBAM will deduct carbon prices paid during production against the amount of the CBAM levy.

3.3 Impacts on Mineral-Rich Low- and Middle-Income Countries

3.3.1 The EU's CBAM Could Negatively Affect Mineral-Rich Countries

Aside from the impacts mentioned above (tackling carbon leakage and efficiency), the CBAM is also likely to have other effects—in particular, it could make some low- and middle-income countries (including mineral-rich ones) worse off by reducing their exports to the EU.[4] Even though raw commodities are not included in the EU's current proposals for the CBAM, they could still be affected—for example, in situations where mining countries add value in-country and/or by deterring the use of goods from the mining sector. The exact impact on mining in low- and middle-income countries is still unclear, and at the time of writing, there are few assessments that consider the details of the different proposals being put forward by the EU and measure the impact on countries' GDP or welfare. And details of what the scheme will look like are still unclear. However, the available evidence suggests a risk of negative impacts on a range of low- and middle-income countries, including mineral-rich ones.

For example, building on Pleeck et al. (2022), we can consider the scheme's impact on Mozambique's aluminum sector. In 2020, the country exported around 535,000 tonnes of aluminum to the EU (Chatham House, 2021). Assuming that around 3 tonnes of carbon dioxide (CO_2) is emitted for every tonne of aluminum (Clemence, 2019) since Mozambique's smelters are powered by hydroelectricity, associated emissions would total around 1.6 million tonnes of CO_2. With current EU carbon futures prices of USD 87 per tonne, this would add around USD 420 million to the price of Mozambique's exports to the EU. If Mozambique cut its prices by the amount of the CBAM levy to maintain export competitiveness, this would mean losing almost 1% of its GDP through this reduction in aluminum export revenues (GDP data is based on World Bank, n.d.).

Several other low- and middle-income countries depend significantly on exports to the EU of products covered under the CBAM; for example, according to the European Commission, Mauritania, Senegal, and Sierra Leone each have sectors that are exposed to the EU CBAM and contribute at least 2%—and up to 18% (depending on prices)—of the countries' GDP (European Commission, 2021). Although there are simulations on the potential impacts of the CBAM on trade, GDP and economic welfare, since the details of the scheme remain unclear, it is difficult to know what the impacts on the global economy (and on mineral-rich low- and middle-income countries) will be. But even conservative scenarios featuring the most limited version of the different

[4] The same thing may happen to their exports to non-EU countries that are processed there before being exported to the EU, since those countries further down the value chain will have to pay a CBAM levy; if this is passed on to customers in the EU, it may reduce overall demand for the processed products and raw materials from mineral-rich developing countries.

proposals currently put out by the EU (i.e., the European Commission's initial proposal) suggest that there would be small but significant impacts on some mineral-rich developing countries. In particular, He et al. (2022) find that total annual economic welfare in 11 individual low- and middle-income countries would decrease by USD 9.7 billion.[5] He and Li (2022) find similar results looking at China only. Both He et al. (2022) and He and Li (2022) find that these impacts could be much worse if more products (and/or emissions from either electricity used in production processes or from the use of produced products) are included in a future expansion of the CBAM. In an "extreme case" (not currently being proposed by the EU) where the scheme covers all sectors and all emissions associated with the product, He et al. (2022) find that the same 11 low and middle-income countries' annual economic welfare would decline by at least USD 106 billion; and the GDP of some of those countries could be hit significantly (the worst in percentage terms of the individual countries they highlight would be Mozambique, which would see its GDP decline by 2.5% compared to a no-CBAM scenario).

Other simulations suggest that exports would be hit for several low- and middle-income countries: Lim et al. (2021) estimate that aluminum and steel exports[6] for a range of low- and middle-income countries would fall by an average of 13%–17%. He et al. (2022) find that a similar group of countries would see their exports to the EU fall by a median average of 1.9%.

3.3.2 The CBAM Could Undermine International Climate Cooperation

Some low and middle-income countries have already expressed their strong objection to the EU's CBAM proposals. In particular, because the EU's GHG emissions per capita are higher than those of low- and middle-income countries, they may find that the EU is being hypocritical and "punishing" them for their emissions while emitting more itself. Moreover, the UN Framework Convention on Climate Change allows countries to set their own nationally determined contributions to climate change, stating that countries have "common but differentiated responsibilities according to their respective capabilities," which is to say that richer countries were supposed to take more action first (Pauw et al., 2019). The CBAM, however, will "force" the EU's partners to take action.[7] Given the link to climate policy, this may sow mistrust and bad feelings that could undermine international climate negotiations. Developing countries account for over 60% of GHG emissions (37%–40% if one excludes China), according to the latest available data, so

[5] The low- and middle-income countries for which He et al. (2022) show individual results are Brazil, China, Egypt, India, Kazakhstan, Mexico, Mozambique, Russia, South Africa, Turkey, and Ukraine.
[6] I.e., total exports, not just exports to the EU.
[7] The EU's GHG emissions per capita remained 50% higher than those of the Group of 77 (a grouping mostly composed of low- and middle-income countries) in 2018 (the latest year for which data was available) (author's analysis of Climate Watch, 2020).

cooperation between developed and developing countries is crucial for efforts to tackle climate change (author's analysis of Climate Watch, n.d.).[8]

How can we square the circle of reaping the climate (and efficiency) benefits of a CBAM while avoiding a worsening of the global income distribution in the short run and the risk of poisoning global cooperation on climate? One approach is for affected countries to introduce their own carbon pricing systems, which will reduce or eliminate their tax bill under the CBAM. Another is to lobby the EU to combine the CBAM with other policies that make up for negative impacts on low- and middle-income countries' economies. We discuss these options in the next two sections.

4.0 Should Mineral-Rich Countries Introduce Carbon Pricing—and How?

4.1 Pros and Cons of Carbon Pricing

If mineral-rich countries adopt their own carbon prices, they will potentially be able to capture some or all[9] of the revenues that the EU would otherwise get from their exports under the CBAM. Moreover, introducing carbon pricing may be in low- and middle-income mining countries' own interests, regardless of the need to avoid the CBAM, as discussed below.

Carbon prices are mainly important because of their role in tackling climate change, which is an urgent priority for countries across the world. Indeed, according to the *Report of the High-Level Commission on Carbon Prices*, carbon prices are an essential part of the energy transition (High Level Commission on Carbon Prices, 2017). Behavioural science shows that introducing carbon prices can put more pressure on others to take action, even in countries that are low emitters by themselves (Schein & Baynham-Herd, 2021). As noted in Section 3.1, carbon prices can also, in theory, increase overall prosperity if set at the right level because pollution within a country's borders harms its residents' quality of life, as well as its economy (see United Nations Committee of Experts on International Cooperation in Tax Matters, 2021, p. 1). The mining sector as a whole could also benefit from the adoption of a global carbon tax, as this would increase the demand for energy transition metals (Cox et al., 2022).

As outlined in Section **Error! Reference source not found.**, it is important to combine carbon prices with other policy measures to have a "managed" energy transition. One of the main difficulties in introducing carbon pricing can be the time and effort that it takes to introduce it,

[8] This statistic applies to two different definitions of "developing countries": the "non-Annex I" countries (roughly, developing countries for the purposes of international climate accords); and the "Group of 77" developing economies. Emissions figures are based on GHG emissions, including land-use changes and forestry in 2018.

[9] They can capture all of these revenues if their carbon prices are at least as high as the EU's and they pursue carbon pricing through either auctioning carbon permits and/or using carbon taxes.

given potential political resistance from the industries that will suffer as a result. For example, it took around 9 years to introduce carbon pricing in South Africa (from the initial discussion paper to a carbon tax coming into effect) (Machingambi, 2021). Another drawback is that, while carbon taxes are good at incentivizing companies to go green, they do not provide very reliable revenues, as companies can reduce their emissions over time, which will undercut revenues from a carbon tax; yet governments may need to reduce other taxes to make sure that, at least in the short term, carbon taxes do not weigh too heavily on the economy. Countries will need to weigh how much of a priority carbon pricing is compared to other policy initiatives and/or revenues that they might wish to prioritize.

As outlined in Section 0 below, carbon pricing used in isolation can have drawbacks, and it is important to consider this alongside other policy measures to have a "managed" energy transition. In Section 4.4, we briefly discuss how some of these policies might look for the mining sector.

4.2 Emissions Trading vs. Carbon Taxes

If they decide to pursue carbon pricing, countries will also face a choice between ETSs (i.e., where companies need to have permits to emit GHGs, the number of permits is limited, and they must trade these permits among them) and carbon taxes. There are also "implicit carbon prices" introduced through taxes or subsidies on investment, but we do not discuss those here.

The choice between emissions trading and carbon taxes will generally depend on a country's individual circumstances (Barragán-Beaud et al., 2018; Chiu et al., 2015). In many cases, carbon taxes and emissions trading are combined, which may be the best choice for some countries (see, e.g., Cao et al., 2019). Stavins (2019) reviews the costs and benefits of carbon taxes compared to emissions trading and provides advice on which one will be more suitable under what circumstances.

However, for most developing countries, including mineral-rich ones, carbon taxes are usually a better choice than emissions trading because they are easier to administer than ETSs, and developing countries often lack the administrative capacities to make them work well (Partnership for Market Readiness, 2017, p. 34). In fact, according to the United Nations, ETSs have only ever been successful in developed countries (United Nations Committee of Experts on International Cooperation in Tax Matters, 2021, p. 21). In the mining or mineral processing sectors, it can be particularly difficult to apply ETSs based on intensity measures (Partnership for Market Readiness & International Carbon Action Partnership, 2016, p. 51).[10]

[10] Some authors argue that ETSs can be politically easier to introduce than carbon taxes because with emissions trading, governments can use "free allowances" (i.e., permission for certain companies to emit GHGs without needing to purchase permits) to soften the blow to companies. But carbon taxes can also be made politically feasible in this way: governments can grant exemptions or allowances from the carbon tax—as is the case in South Africa—or they can use the revenues from carbon taxes to get citizens or businesses

4.3 Design and Implementation

Given our recommendation that carbon taxes may be more appropriate for most developing countries than ETSs, our focus will shift exclusively to such taxes. There are a number of considerations for designing carbon taxes in developing countries, as well as significant existing literature—for example, the UN recently published the 200-page *Handbook on Carbon Taxation for Developing Countries*. We will not repeat that analysis here outside of recapping a few key points.

A key choice in designing carbon taxes is at what point in the value chain to levy them. "Upstream" taxes on the purchase of fossil fuels are easier to administer than downstream taxes on emissions—they can just be levied when fuels are purchased, whereas downstream taxes have the challenges of monitoring, verification, and reporting (Partnership for Market Readiness, 2017). In general, the higher up the value chain taxes are levied, the easier it is to collect them (United Nations Committee of Experts on International Cooperation in Tax Matters, 2021).

"Downstream" taxes (i.e., on emissions themselves) can also have advantages in that they can cover a wider range of emissions (e.g., fugitive methane emissions, whose levels cannot be predicted from the level of fossil fuels used in production). "Downstream" taxes can be designed in a way that manages the administrative costs—for example, by focusing on large emitters, as in the case of Chile's carbon tax (United Nations Committee of Experts on International Cooperation in Tax Matters, 2021, p. 147).

In the mining sector, for all except coal mines, an "upstream" approach may be best. This is because the vast majority of emissions from most mines come from power consumption (author's analysis based on Delevingne et al., 2020). For coal mining, most GHG emissions come from fugitive methane, so direct measurement of these emissions appears to be needed alongside an upstream approach for fossil fuels used for power (author's analysis based on Delevingne et al., 2020).

It is important to allow time before entry into force to allow businesses to develop the procedures to assess how much tax will be paid and how to pass costs on to their customer. Businesses may also need time to undertake investments in greening their production procedures; without this, businesses that would be viable if they could undertake such investments may go bankrupt. For this reason, it may be advisable to signal that the government intends to adopt a carbon tax as early as possible and/or to use public investments to support companies in greening their production processes. Public consultation can also help to improve both the design of the tax (by receiving feedback from industry) and the level of compliance with it (see, e.g., South Africa's experience with revising its carbon tax).

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on side through tax cuts or spending programs. So it seems that carbon taxes can be just as easy to introduce as ETSs, if designed right.

4.4 Accompanying Policies

4.4.1 Adjusting Other Parts of the Tax Regime

When introducing new taxes, it is always important to check whether the overall tax burden remains manageable and whether the fiscal regime is striking the right balance between revenue-raising and supporting the economy. This is no different with carbon taxes (or emissions trading, where permits are auctioned). These elements are particularly important in the mining industry (and the rest of the extractives sector) because, in developing countries, high capital costs mean that they depend heavily on foreign investment (United Nations Economic Commission for Africa, 2019, ch. 6), and there may therefore be a higher risk of investors leaving due to increases in the overall tax burden. In fact, introducing a carbon price is likely to have strong impacts on the costs and competitiveness of a country's mining sector (Ulrich et al., 2022). Countries should therefore reassess the overall tax burden when introducing carbon prices/taxes and, if necessary, adjust other tax instruments to ensure that mining investment remains commercially viable.

In addition to the need to manage the overall tax burden, it is also important for mineral-rich countries to manage the balance between different tax types. Extractive-sector taxation generally requires a balance between (i) taxes that are more flexible and progressive (e.g., profit-based taxes) and that allow the government to capture a high share of rents without deterring investment in projects that are less profitable and (ii) taxes and royalties that are more dependable and easier to measure (since these can guarantee a minimum level of revenue and be less vulnerable to tax avoidance by extractive companies) (Natural Resource Governance Institute, 2014). Too much emphasis on taxes of type (i) can risk revenues being disappointing. Too much emphasis on type (ii) may deter investment in less profitable projects and make countries miss out on higher tax revenues when profits are very high—as in the case of Zambia's copper mining industry (Manley, 2017).

Although they have advantages from environmental and economic efficiency perspectives, carbon taxes, unfortunately, combine some of the worst aspects of both of these tax types: they are not flexible (they do not respond to changing economic conditions), but they also are not fully dependable since companies can green their technologies and reduce their carbon emissions over time, which will undermine government revenues. When introducing a carbon tax, mining countries could benefit from reassessing their tax regime to make sure that it maintains the right balance between flexibility and dependability once the carbon tax is reintroduced.

One way to achieve a good balance between flexibility and dependability is to use variable rate royalties, which can support a flexible tax system and make fiscal revenues less vulnerable to tax avoidance. This type of royalties is covered in the policy paper by David Manley and Thomas Lassourd in the present handbook.

To assess how a carbon tax affects the overall mining tax regime, it is important to model different approaches to mining-sector taxation to understand the effects on revenues and investment; as of

2022, the International Monetary Fund's latest version of its publicly available mining fiscal model includes the option to model carbon taxes. Modelling can also be useful to analyze other changes to the tax regime conducted in combination with a carbon tax and whether these manage to maintain the right overall burden of taxation and the right balance between flexibility and dependable revenues.

Even if the tax regime achieves the right level of tax burden when the carbon tax is introduced, it may become too generous as mining companies green their operations and, in so doing, reduce the amount of carbon tax that they pay (they are indeed likely to "green" their operations, as explained in Section 0 below). Once this happens, governments could be tempted to then change taxes to make up for lost revenues. But this would make the tax regime more unpredictable, which tends to discourage investment. It is better to have a tax regime that anticipates these changes from the start so that companies can predict their tax burden.

But how would this look in practice? Governments might be tempted to assume that all mines are using the greenest available technology from the start when reassessing the tax regime. But this is likely to hit existing mines too hard since they probably have invested in older, polluting technologies and will face a high carbon-tax bill. To address this, governments could provide a reduction in other (non-carbon) taxes for existing mines compared to the regime that new mines (i.e., those where construction/digging has not yet started) will face.[11] In this way, they can set a tax regime that avoids being overly generous to new mines (by setting the appropriate tax burden assuming that they invest in new, low-carbon technologies) while not taxing existing mines too heavily.

The approach outlined in the last paragraph addresses the difference between existing mines and new mines at the time when the carbon tax was introduced. However, it does not address the fact that low-carbon technologies could change over time in ways that governments cannot fully predict. Thankfully, there is a tried and tested approach to dealing with uncertainty over mine economics: using flexible tax instruments can increase the tax rate for mines that are highly profitable and decrease it for those that are only slightly profitable. These include resource-rent taxes and variable rate royalties. When introducing a carbon tax, therefore, it is important to ensure that the overall mining tax regime is sufficiently flexible so that if mines become very green and pay low carbon taxes or if the price of green technologies changes substantially, they will still pay a good level of total taxes.

4.4.2 Industrial Policies for Managing the Impacts of Carbon Pricing on the Mining Sector

To help companies and workers make the transition to a low-carbon economy, the High-Level Commission on Carbon Prices (2017) suggests combining carbon pricing with active industrial

[11] Some might argue that they could offer reduced carbon tax rates to existing mines. But if they do this, they will blunt the incentive for existing mines to switch to greener technologies. Therefore, it may be better to reduce other taxes to make sure that the overall tax burden is manageable.

policies. These policies include public investment, subsidies for green investments, etc. The literature underlines the advantages of these industrial policies—if they are correctly designed (Naudé, 2010).

This approach could:

- Mobilize investments by both the private and public sectors to green the economy faster.
- Help companies with the cost of adopting green technologies and, in so doing, speed up their adoption. If companies instead have to meet these costs themselves, it may slow down adoption where they have to borrow money to finance investments in green technologies.
- Help new green industries emerge by coordinating investments (it often helps productivity if multiple companies invest in similar industries at the same time, in the same place) and by helping to retrain workers laid off as a result of reductions in demand for highly polluting products or services.

How can governments do this? There is ample literature on how best to use such industrial policies to green the economy, which we do not have space to summarize in this policy paper. However, based on a recent review of the literature (Ferraz et al., 2021), some industrial policies that seem to be effective include subsidies for renewable energy, public investment in renewable power generation, support for skills necessary to expand renewable power generation and the uptake of green technologies, public awareness campaigns, efforts to create "green jobs" by incentivizing the use of labour over capital, the promotion of research into green technologies, etc., all linked by careful policy sequencing.

One particular concern for the mining sector is that many mines rely on fossil fuel-generated electricity. Introducing a carbon price could therefore be very expensive for such mines and threaten their commercial viability. In such cases, it may be important for governments to invest in (or, potentially, co-invest with mining companies) or otherwise support increased low-carbon electricity generation or provide reductions in other taxes so that the companies can viably invest in renewable energy technology. Some mines have already started to use renewable energy—for example, electric vehicles in Australia and Chile (Delevingne et al., 2020; Ramdoo, 2022), and several mining companies have committed to running their mines solely from renewable energy (e.g., in Brazil and Chile) (Ramdoo, 2022).

Mining countries will also need to be concerned about carbon leakage if they put in place a carbon tax and will potentially need to introduce their own policies to counteract it. Encouraging international carbon pricing could be a good option—it would avoid international disputes that trade taxes and carbon border adjustments can generate while being highly effective at cutting emissions (especially since it would cover non-traded sectors as well as traded ones). But it may be difficult to persuade all trading partners to pursue this approach. Therefore, countries could consider an alternative, like their own carbon border adjustment. This will help to prevent (i) a hit to countries' economies from high-polluting input industries shifting elsewhere and (ii) carbon emissions increasing as high-polluting industries shift location rather than cut emissions. A meta-

analysis from Branger and Quirion (2014) suggests that carbon leakage does occur and that such border adjustments can reduce its extent.

Another alternative would be to use tariffs on the import of high-carbon products or electricity, which would be easier to administer than a carbon border adjustment because there would be no need to assess the level of emissions from imported products. A further alternative could be to use consumption-based carbon taxation, which would apply to all products, regardless of whether they are imported or produced in-country, in proportion to the greenhouse gases emitted during their manufacture.

4.4.3 Seizing Opportunities Presented by the CBAM

Some mineral-rich developing countries may be able to leapfrog other producers as a result of the introduction of the CBAM and out-compete existing producers when exporting to the EU by installing the latest, lowest-emissions technology. To explain: existing producers may have an advantage from technology that is already installed (and not need to incur the costs of new investment), but the CBAM will raise costs for these producers and could therefore create an opportunity for new entrants. One example is steel production, where emissions depend heavily on the type of furnace used, which could, in theory, give iron ore producers more of an opportunity to move into steel production by eroding the advantage of existing high-emission producers (Bell & Benaim, 2020).

4.4.4 Managing Impacts on Incomes

It is also important to counteract the impacts of carbon prices (taxes or emissions trading) on the poor, as they could worsen poverty and/or income inequality (Malerba et al., 2021). For countries where high-emission products are used domestically for staple goods (e.g., where fossil fuels are a leading source of energy), carbon prices could hit the poor particularly hard. In such cases, the government may wish to pursue complementary policies such as using revenues from the carbon tax to provide income support for the poor and/or pursuing the development of alternative (cheaper) energy sources. In countries where mining is a major source of employment and carbon taxes will lead to a reduction in mining output, it may be advisable for governments to provide retraining programs and income support and to invest in local economic development projects for affected regions.

Protests against carbon taxes and other policies that raise fuel prices (e.g., in France and Nigeria) show the potential political risks of failing to address the impacts of carbon taxation on ordinary people. But the successful implementation of carbon taxation in other locations (e.g., British Columbia, Canada) that *did* take care of impacts on the cost of living shows that carbon taxation does not have to be politically unpopular.

5.0 How Should Mineral-Rich Developing Countries Lobby the EU Over the Proposed CBAM?

Mineral-rich low- and middle-income countries could lobby the EU to counteract potential negative impacts on developing countries. In particular, they could argue that the EU should counteract negative impacts on developing countries by providing increased financial and/or technical assistance to help them green their economies—especially the sectors covered by the CBAM.[12,13] Funds provided for this purpose should, of course, be in addition to existing climate finance and aid commitments, rather than simply "recycling" money that was already committed. We find this proposal to be a good idea because, in addition to helping to tackle climate change, these investments will also potentially cut the cost of energy in recipient countries (as, following the initial investment, renewable energy can be relatively cheap) and make their exports more competitive as more and more countries introduce similar border carbon adjustments (e.g., Canada, the United Kingdom, and the United States are all considering such adjustments). It would also potentially reduce the cost of living for European consumers (by making imports from countries receiving assistance cheaper). This result would reduce the EU's need to use revenues raised from the CBAM to help European consumers deal with a higher cost of living (which is how the EU currently plans to use those revenues), producing a win–win for the EU. Some members of the European Parliament have already proposed that the EU provide increased support to developing countries to help them green their manufacturing sectors (Cosbey, 2022). And as noted above, switching to greener metal processing could also be an opportunity to help developing countries leapfrog competitors that already have old, dirty plants installed.

There are, of course, other options for the EU to offset the impacts of the CBAM, but most of them would be inferior to the one described here. For example, countries might also be considering lobbying the EU for trade concessions to make up for the negative impacts of the CBAM. The problem with this is that increasing trade with one trading partner may reduce it with another, and reducing trade barriers with certain countries can erode the value of low-trade barriers with others (by reducing their advantage in exporting to the EU market). In particular, least developed countries already benefit from duty-free, quota-free market access to the EU market, so if the EU lowers trade barriers or boosts trade with other countries (e.g., by making its concessions through

[12] Delevingne et al. (2020) outline clear ways for the mining sector and downstream metal processing to cut emissions.

[13] We focus on low and middle-income countries because there is a stronger case that the EU should avoid the negative impacts of the CBAM on them (as opposed to high-income countries). In particular, high-income countries have a greater responsibility to take climate action in line with the EU; if they are not doing so, this may indicate a lack of commitment to tackling climate change, and the "incentive" to green their industries provided by the CBAM may be more justified.

the Generalized System of Preferences more generous), they may be left worse off.[14] Another approach could be to cut subsidies to domestic EU industries, but this can be politically complicated, and such subsidies can sometimes have beneficial effects for other countries (to the extent that the EU subsidizes their consumption of its goods). Greater cooperation in other areas might also be possible, but such cooperation might occur anyway if it is win–win, so developing countries may still find themselves worse off as a result of the CBAM (and there may still be negative political effects on climate cooperation)—hence the preferred solution of providing support to "green" affected industries in developing countries.

Some authors have emphasized that least developed countries should be exempt from the CBAM. Exemptions are not ideal because they would lessen the potential benefits of the CBAM for climate (and the global economy). And even though least developed countries now account for a small share of potential carbon leakage from the EU, this may change over time, especially as the EU carbon price rises (Pleeck, Denton, & Mitchell, 2022). It might therefore be better to include these countries' exports within the scope of the CBAM but provide "compensation" for negative impacts, as described above. However, if the EU is not able to provide adequate measures to counteract such negative effects, then an exemption could be considered.

6.0 Conclusion

The EU's proposed CBAM could have a significant impact on some developing countries, including mineral-rich ones, depending on how the design evolves.[15] To avoid worsening poverty in the short term, the bloc should consider measures to offset negative impacts. Supporting increased climate finance to help affected industries to go green appears to be a promising solution that could be a win–win for both the EU and the developing countries that export to it.

It could also be in developing countries' interests to introduce their own carbon prices, with the dual purpose of avoiding their exports to the EU being subject to them and tackling climate change. Carbon taxes, rather than ETSs, seem to be more appropriate for use in most developing countries.

Countries that do adopt carbon prices can manage negative side effects through active industrial policies to support industry and income support to individuals (and/or retraining for those who lose their jobs in sectors that re-size). In the mining sector, it is particularly important to review the tax system to ensure that it does not become uncompetitive and/or tip the balance too far in favour of non-profit-based tax instruments when a carbon tax is introduced. If this occurs, countries should consider adjusting other elements of the mining tax system. Countries should also consider

[14] Least developed countries are provided with duty-free, quota-free access to the EU market under the Everything But Arms scheme, detailed here: https://trade.ec.europa.eu/access-to-markets/en/content/everything-arms-eba.

[15] Further research that takes into account the latest details of the proposed design could be useful to quantify this impact.

supporting the development of green energy (e.g., through public investment) to help industry cut its emissions; this may be particularly important for the mining sector since it is often obliged to generate its own electricity separate from the grid.

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