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The EU's CBAM: implications for member states and trading partners

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ABSTRACT

The EU Carbon Border Adjustment Mechanism (CBAM) came into force on 1 October 2023, introducing reporting requirements for importers of covered products and, from 2026, an obligation to pay a fee on the carbon content of imported goods. This paper uses indices of ad valorem tariffs to assess the incidence of the EU CBAM on both EU member states and the EU's trading partners. Overall, the direct impact on EU countries' trade is estimated to be small, adding 0.1 percent to the value of EU imports when averaged across all imports, and 0.04 percent to the average cost of non-EU countries' exports to the EU—with a maximum of 1.2 percent. However, effects could be sizeable for specific products such as iron, steel and aluminium, which can help explain CBAM's political salience. Moreover, an expanded CBAM featuring full coverage of ETS sectors, and a significantly higher carbon price could entail larger costs in the more distant future.

Keywords: Carbon Leakage; Emissions Trading; Carbon Taxation; Trade Policy

JEL Classification Numbers: F13; F64; Q54; Q56

NON-TECHNICAL SUMMARY

On 1 October 2023, the EU introduced its Carbon Border Adjustment Mechanism (CBAM), a key component of the EU's Fit for 55 policy package. The CBAM is designed to address the risk of carbon leakage, which arises from differences in carbon pricing between the EU and its trading partners. It achieves this by imposing a levy on imports of selected products based on their carbon content and the carbon price differential between the EU and the exporting country. The primary goal of CBAM is to create a level playing field for EU producers competing with foreign counterparts in the EU market. However, the current regulation does not include a mechanism (e.g., export rebates) to offset the carbon allowance costs for products exported by EU-based producers, which would level the playing field for EU producers in non-EU markets.

The EU CBAM is poised to affect producers and consumers within the EU as well as a range of economic actors along international supply chains. Therefore, understanding its direct and indirect effects on both EU economies and those outside the EU—including through supply chain linkages—is essential to foster a sound, evidence-based policy debate and, ultimately, gain broader acceptance among EU industries and EU trading partners.

This paper contributes to this understanding by examining the direct impact of CBAM on both EU member states and their trading partners, using indices of ad valorem tariffs. We develop a simple analytical framework that enables us to carry out numerical simulations. Taking product-level bilateral trade data between the EU and its trading partners for the year 2021, along with detailed input-output tables to derive the carbon content of EU imports, we calculate the implied carbon fee that would be levied on the products of individual trade partners. Similarly, we calculate the implied carbon fee that would be added to imports of covered products by EU countries.

The CBAM currently covers six categories of energy- and emissions-intensive products: aluminium, cement, electricity, iron & steel, and fertilizers. Our analysis focuses on these product categories. A key finding is that the overall direct impact of the current CBAM on EU countries' trade is relatively contained, adding 0.1 percent to the value of EU imports when averaged across all imports, and 0.04 percent to the average cost of a country's exports to the EU (with a maximum impact of 1.2 percent across countries). However, the analysis also shows that the CBAM cost will be sizeable for specific products such as iron and steel, and aluminum. These higher costs, together with other concerns, explain why CBAM has triggered opposition from some of the EU's trading partners. Moreover, an expanded CBAM featuring coverage of additional products and a significantly higher carbon price could entail larger costs in the more distant future.

1. Introduction

The 2015 Paris Agreement requires countries to define their own contributions, known as Nationally Determined Contributions (NDCs), towards the shared objective of global decarbonization, along with the policies they will implement to achieve these contributions. Countries are free to set the level of effort and ambition of their NDCs and are only required to ‘ratchet up’ their commitments, meaning they must increase their efforts every five years. While this flexibility allows countries to tailor their commitments to local contexts, it can lead to significant disparities in the stringency of climate policies across nations. As a result, the more ambitious parties to the Paris Agreement face the dilemma of tightening their climate policy without putting their domestic producers at a competitive disadvantage in international markets and inducing so-called carbon leakage.

Tighter mitigation policy may adversely affect the international competitiveness of domestic industries (Carbone and Rivers, 2017) since it tends to increase production costs for regulated emitters, particularly in the short term (McGuire, 1982; Pasurka, 2008; Dechezleprêtre and Sato, 2017). This is because measures to cut emissions typically require affected firms to invest in clean technologies, pay a carbon tax, surrender emission allowances, and/or comply with stricter environmental regulations, all of which lead to higher production costs.[1] Tighter mitigation policy may also lead to carbon leakage, i.e., a migration of CO_2-intensive economic activities and associated emissions from countries with stringent regulations to those with more lenient ones (Aichele and Felbermayr, 2012; Fontagné and Schubert, 2023).[2] These issues, in turn, risk undermining the global benefits of enacted policies (Fontagné and Schubert, 2023) and may even deter ambitious unilateral action in the first place (Barrett, 2003). The risk of carbon leakage is especially pronounced in high-emitting sectors producing internationally traded goods (Nielsen et al., 2021).

Consequently, jurisdictions that have been implementing or contemplating stringent domestic emission reduction policies have also been seeking ways to shelter their most exposed sectors from adverse competitive impacts and minimize the risk of carbon leakage. In theory, a comprehensive approach that combines full pricing of domestic emissions with a border carbon adjustment mechanism can help address these concerns. However, the implementation of border carbon adjustment mechanisms raises practical difficulties—most notably in accurately determining the carbon content of imported products, political opposition from affected countries, and potential legal challenges including with respect to their consistency with WTO rules (Keen et al., 2021; Parry et al., 2021). Consequently, governments have until recently relied on simpler strategies, such as exemptions, free allocation of emission allowances, and output-based rebates for industries at risk of carbon leakage (Quirion, 2022; Bohringer et al., 2023). This has been the case in the European Union (EU), where emissions-intensive and trade-exposed (EITE) sectors covered by the EU emissions trading system (ETS) have been supported by the free allocation of emission allowances.[3] However, partly because this allocation method has been criticized on multiple—climate, economic, fiscal—

1 Since the enactment of the first major environmental regulations in the 1970s, the impact on the competitiveness of affected firms has attracted significant attention in the literature, with two main perspectives being debated: the ‘pollution haven’ hypothesis and the Porter hypothesis. The pollution haven hypothesis maintains that stringent environmental policies raise compliance costs, leading to a shift of pollution-intensive production to regions with lower abatement costs, thereby creating pollution havens and resulting in emissions leakage. Conversely, the Porter hypothesis posits that stricter environmental regulations can enhance the competitiveness of regulated firms by driving efficiency improvements and fostering innovation, potentially leading to international technological leadership. While the jury is still out on which effects prevail in the long term, it is generally agreed that the pollution haven hypothesis dominates in the short run—see Dechezleprêtre and Sato (2017) for a comprehensive review of this literature.

2 The literature distinguishes two main channels of carbon leakage (Bohringer et al., 2018; Fowlie and Reguant, 2018). The *operations* channel, whereby domestic climate policies induce a relocation of production to countries with less stringent policies, and the *resources* channel, whereby domestic climate policies lower the demand for carbon-intensive inputs (e.g., fossil fuels), thereby lowering their price and inducing higher consumption abroad. The larger the coalition of acting countries, the more pronounced the resources channel, and the less effective the carbon-based border tax adjustments are in dampening carbon leakage (Burniaux et al., 2013).

3 Emitters covered by the EU ETS either acquire EU emission allowances (EUAs) at auction or are allocated a set volume of emission allowances for free based on EU-wide harmonized rules set out in European Commission (2019).

grounds, free allowances will be replaced gradually by a Carbon Border Adjustment Mechanism (CBAM) as part of the 'Fit for 55' regulatory reforms.[4]

The EU CBAM, introduced in October 2023, will impose a charge on imports of selected products based on their carbon content starting from 2026, unless a comparable carbon price is already implemented in the exporting country.[5] The objective is to create a level playing field by requiring foreign producers of carbon-intensive goods to pay for the emissions embedded in their products when these goods are imported into the EU. However, the current design of CBAM lacks a mechanism, such as export rebates, to level the playing field in EU producers' export markets. EU producers exporting to countries without a carbon pricing mechanism must bear the carbon costs associated with their production, while their foreign competitors face no equivalent charges, leaving EU exporters at a competitive disadvantage in global markets. Since CBAM will be introduced progressively over a 10-year period, the absence of export rebates is not an immediate concern. However, as the carbon price differential between the EU and non-EU countries widens over time, EU exporters may face growing competitive challenges (Beaufils et al., 2023; Ambec et al., 2024). At the same time, implementing export rebates could raise questions about their consistency with WTO rules and might risk undermining one of CBAM's core objectives: encouraging the adoption of carbon pricing systems in other countries.

The EU CBAM has already faced significant resistance and criticism, particularly from developing countries exporting to the EU, on the grounds that it acts as a *de facto* trade barrier that raises costs for exporters to the EU and distorts international trade. Additionally, critics have argued that the mechanism undermines the principle of common but differentiated responsibilities, as it effectively imposes a similar carbon cost on developing economies as it does on advanced ones, despite the former historically contributing less to global emissions and climate change. Beyond concerns about trade distortions and fairness in responsibility sharing, there are also potential risks of retaliatory measures and escalating trade tensions. The CBAM opposition index developed by Overland and Sabyrbekov (2022) emphasizes this friction, indicating that countries with a high share of CBAM-exposed exports to the EU, along with high carbon intensity and low levels of technological innovation, are more likely to oppose its implementation.

Understanding how the EU CBAM affects economies outside the EU, both directly and indirectly through supply chain linkages, is thus essential to foster a sound, evidence-based policy debate and, ultimately, facilitate its acceptance among EU trade partners (Beaufils et al., 2023). This paper contributes to this assessment by examining the direct impact of the EU CBAM on both EU member states and their trading partners. To this end, we develop a simple analytical framework that enables us to carry out numerical simulations. Taking product-level bilateral trade data between the EU and its trading partners for the year 2021, along with detailed input-output tables to derive the carbon content of EU imports, we calculate the implied carbon fee that would be levied on the products of individual trade partners.

Due to the significant delay in the availability of detailed input-output tables and bilateral trade data used in our simulations, this paper does not capture substantial structural changes in CBAM exposure that may have occurred since 2021. Additionally, we do not model potential supply chain impacts, trade effects, or the negative consequences that the CBAM could have on downstream EU industries that rely on CBAM-protected goods as inputs—effects that could be significant (see Dechezleprêtre et al., 2025 for further

[4] Recent literature has explored alternative institutional mechanisms to address the carbon leakage problem associated with asymmetric carbon pricing. For example, Farouki and Lishahskaripour (2025) compare the CBAM mechanism with climate club frameworks, where border taxes are used as contingent penalties. Their analysis finds that climate clubs are generally more effective, achieving universal compliance while preserving free trade. Campolmi et al. (2023) propose the Leakage Border Adjustment Mechanism (LBAM), which targets carbon leakage directly without requiring detailed information on foreign carbon intensities. Using a quantitative trade model, they show that LBAM tariffs significantly outperform the CBAM in terms of reducing global emissions and improving welfare.

[5] See European Commission, 'Proposal for a Regulation of the European Parliament and of the Council Establishing a Carbon Border Adjustment Mechanism', COM(2021) 564 final, 14 July 2021.

discussion). Furthermore, we do not account for the potential impact of the CBAM on carbon prices in the EU ETS, which could arise from the interdependence between the ETS allowance market and CBAM certificates, as discussed by Bellora and Fontagné (2023).

Our approach focuses on estimating the pressures exerted by the EU CBAM on affected countries through direct trade dependencies, without incorporating endogenous adjustment in trade flows—in other words, we do not undertake a general equilibrium assessment of the CBAM's broader impacts. Given that the introduction of the CBAM and the associated phasing out of free allowances for domestic producers will occur gradually over ten years, and considering that our analysis takes existing trade patterns as given—while in practice some behavioral responses, such as the reallocation of exports, are expected to occur to mitigate the CBAM's impact—our estimates should be interpreted as the upper-bound effect of the full levy on individual trade partners in the near term, if this full levy were introduced today.[6]

Using detailed data on carbon intensities across sectors and considering various scenarios, we find the expected direct impact of the EU CBAM on EU countries' trade to be small—on average, about 0.1 percent of the value of EU countries' imports and 0.04 percent (ranging from 0 to 1.2 percent) of non-EU countries' exports to the EU. These findings are consistent with those of Clausing et al. (2025), who, using a quantitative equilibrium model of global trade, also conclude that the CBAM does not impose significant pressure on lower-income countries. However, our study highlights that the effects could be sizeable for specific products, such as iron, steel and aluminum, particularly in certain countries, which can help explain the CBAM's political salience. Furthermore, in the longer term—after the EU reviews the CBAM and possibly expands it to most or all sectors covered by the EU ETS starting from the early 2030s, and the EU carbon price rises significantly—an expanded EU CBAM could entail larger impacts.

This paper adds to a nascent but fast-developing literature examining the impact of the EU CBAM on its main trading partners. Two main strands of literature can be identified. The first employs partial-equilibrium models, which are relatively straightforward to implement and provide detailed insights into the impacts of specific groups of CBAM-targeted products, taking into account detailed input-output relationships. However, a limitation of these models is their inability to capture changes in trade patterns resulting from behavioral responses and general equilibrium effects. Much of this body of work adopts the EU's perspective, ranking countries based on the absolute value of their CBAM exports to the EU (Cornago and Berg, 2024; Tamba et al., 2024). As a result, major exporters to the EU are often identified as the most exposed to the CBAM. However, countries with the highest absolute value of CBAM exports to the EU may not necessarily be the most affected by its introduction in terms of the implied tax rate on exports or GDP impact. To better assess a country's vulnerability to the CBAM levy, a measure of relative incidence is more appropriate. This metric takes into account the share of a country's export revenue that could be impacted by potential CBAM costs, as well as the carbon intensity of the goods exported to the EU. In a related study, Magacho et al. (2024) analyze the trade implications of the CBAM for developing countries. They find that, in relative terms, Eastern European economies, particularly those in the Balkans, along with some African economies, are the most exposed in terms of the external dimension.

The second strand of literature uses general equilibrium models, which analyze the economy-wide effects of trade policy changes by considering interactions across sectors and countries. These models can capture long-term behavioral adjustments to the CBAM. However, they are significantly more complex, rely on a number of assumptions and typically have to use less granular trade and carbon intensity data. For these reasons, these models can be less effective than their partial-equilibrium counterparts in providing detailed

[6] The long-run effects of CBAM will depend on behavioral responses, which in turn are influenced by a country's or sector's relative emission intensity and its competitiveness in EU markets. For example, a sector with lower emission intensity may increase its exports to the EU, becoming more competitive as its rivals face higher CBAM levies, which would lead to a greater incidence of CBAM. While behavioral responses may alter the order of incidence in the long term, the short-term results are likely to provide a clear picture of the pressures that countries may face.

modeling of sectoral impacts and cannot account for complex input-output dynamics, resulting in reduced regional resolution and diminished tractability. At the same time, these models can provide insights into the general equilibrium effects of policy shocks related to the CBAM which, while likely small for now, could become larger in the future as CBAM's scope expands and the EU ETS carbon price increases. Notable studies based on Computable General Equilibrium (CGE) models include Burniaux et al., (2013); Bohringer et al., (2018); Maliszewska et al., (2023); Mendoza et al. (2024). Moreover, Fontagné and Schubert (2023) survey the literature on carbon leakage and border carbon adjustment mechanisms, highlighting the prominence of CGE studies in this field.

In this paper, we pursue the first approach, namely a partial equilibrium analysis. By using detailed trade and carbon intensity data and employing straightforward assumptions within a partial equilibrium framework, our study transparently estimates the underlying drivers of CBAM's effects. Additionally, we provide a detailed assessment of the exposure of middle- and low-income countries to the EU CBAM, which had received less attention in the literature so far. Research at the sub-regional level suggests that the distributional impacts of the EU CBAM could vary significantly based on local conditions (Beaufils et al., 2023).

Our study contributes to the existing literature in several important ways. Our simulations focus on the macro-relevant effects of the CBAM on all trade flows with the EU. In particular, we examine the effects on trade flows from the perspective of the exporting country—rather than the EU perspective dominating in existing studies—and compute and compare measures of relative exposure. Furthermore, we extend the existing literature by incorporating a broader range of countries and policy scenarios and using more detailed data on the carbon intensities of various sectors.

The rest of this paper is organized as follows. Section 2 reviews the main design features of border carbon adjustments and discusses their operationalization in the EU CBAM. Section 3 describes our methodology and data. Section 4 presents the main results. Section 5 discusses the impact of some possible CBAM extensions under consideration in the EU. Section 6 concludes.

2. Design Features of the EU CBAM

Discussions about a border carbon adjustment mechanism in the EU emerged in connection with carbon pricing and how to address associated carbon leakage concerns. In the initial phase of the EU ETS (2005 to 2007), the focus was primarily on establishing the trading framework and nearly all emission allowances were distributed for free. Together with low allowance prices, this implied that carbon leakage was not seen as a pressing concern during this pilot phase (Figure 1, left panel). Beginning in phase two of the EU ETS (2008-2012), the EU started shifting from free allocation to auctioning of emission allowances, bringing the issue of levelling the playing field between domestic and foreign energy-intensive industries to the fore. Consequently, in the 2008 revision of the EU ETS Directive, a carbon border adjustment mechanism emerged as an option. Before formal proposals were released, the EU Commission circulated an informal concept for a 'Future Allowance Import Requirement'. This proposal aimed to include importers of products from sectors covered by the EU ETS, contingent on trading partners taking comparable action. The measure also offered rebates in the form of free allowances to exporters. However, due to anticipated administrative complexities, this adjustment mechanism was not included in the formal legislative proposal, and the Commission opted instead for extending free allowances to at-risk (i.e., EITE) industries.[7]

Subsequent discussions on border adjustments resurfaced intermittently in EU policy circles, but tangible progress was only achieved in 2019. The driving force behind this shift was the rising carbon price during phase three of the ETS (2013-2020), which intensified concerns about the competitiveness of domestic producers. At the same time, criticism of the free allocation of emission allowances to industries continued,

7 Espa et al. (2022) provide a detailed overview of the historical evolution of the EU CBAM.

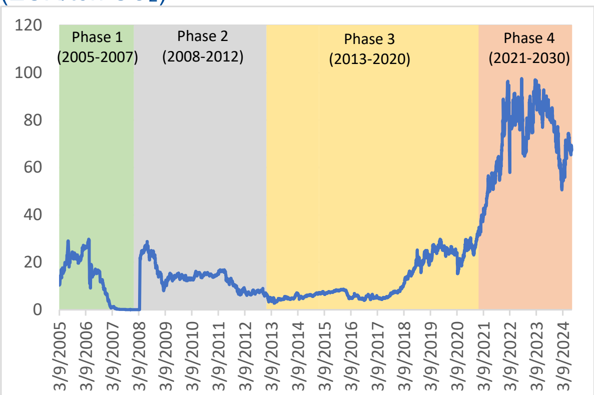
making a continuation of free allocation difficult. The CBAM was ultimately integrated into the 2019 EU Green Deal, culminating in draft regulations published in July 2021.

The EU CBAM aims at gradually replacing—between 2026 and 2035—the free allocation of emission allowances to industries at risk of carbon leakage (see Box 1).[8] The phasing-out of free allocation under the EU ETS will take place in parallel to the phasing-in of CBAM in the period 2026-2034. This means that the share of the total CBAM charge applicable to CBAM products will increase as the share of emission allowances freely allocated to EU producers of these products decreases, according to the schedule depicted in Figure 1, right panel.

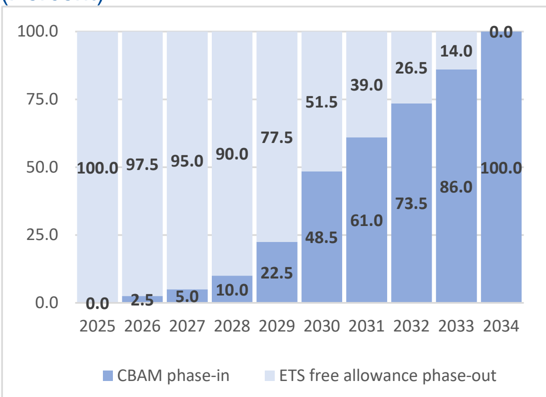
Several design features of the CBAM are relevant in assessing its effects on third parties, particularly in terms of environmental effectiveness and administrative feasibility.

Figure 1. EU ETS Prices and Free Allocation

Carbon price under EU ETS
(EUR/ton CO_2)



Timeline for phasing out of free allocation
(Percent)



Sources: International Carbon Action Partnership (ICAP) and European Commission.

Scope of Products: the effectiveness of the CBAM in preventing carbon leakage depends on its product scope. A broader scope would reduce leakage risk in a broader set of product categories. However, CBAM entails substantial administrative cost and technical complexity which, in the case of complex goods, would need to be weighed against the environmental benefits (i.e., the reduction in carbon leakage risk). Focusing on upstream energy-intensive and trade-exposed (EITE) sectors allows to secure significant leakage mitigation benefits while reducing the administrative and technical burden of a border carbon adjustment (ERCST, 2023). Accordingly, the EU has so far adopted a narrow scope, initially targeting carbon-intensive goods at high risk of carbon leakage. The sectors currently included are cement, iron and steel, aluminum, fertilizers, electricity, hydrogen, and certain intermediate products. Presently, the CBAM covers approximately 50 percent of the emissions covered by the EU ETS, with future revisions anticipated to extend coverage to all sectors and emissions currently included in the ETS.

System Boundaries for Greenhouse Gas Emissions: any border carbon adjustment mechanism, including the EU CBAM, is centered around the emission intensity of imported products. Therefore, its operationalization requires defining the scope of emissions to be included in the calculation of the emission intensity, i.e., the system boundary. This boundary is determined by (i) the number of upstream production stage(s) considered, and (ii) the type of greenhouse gas included at each stage. In the case of the EU CBAM, the system boundary varies across *in-scope* products; while direct CO_2 emissions are included for all in-

[8] See European Commission, 'Carbon Border Adjustment Mechanism', 17 January 2025, available online here. See also Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism.

scope products, indirect emissions from electricity consumption are only included for specific products, such as cement and fertilizers.

Reporting Obligations and Covered Entities: The CBAM regulation currently provides for a 'de minimis' exemption for shipments below EUR 150 in value.[9]

Calculation of Carbon Content of Imports: the implementing regulation of the CBAM outlines the methods for monitoring and calculating the embedded emissions of imported products. These calculations are complex and depend on the specific production processes used. Until the end of 2024, producers and importers can choose one of three reporting options: (a) full reporting according to the new methodology (EU method); (b) reporting based on an equivalent method (three options available); or (c) reporting using default reference values (available only until July 2024). The "EU Method" consists of two approaches:

- calculation-based approach, which determines greenhouse gas (GHG) emissions from source streams using activity data obtained through measurement systems and additional parameters from laboratory analyses or standard values; and
- measurement-based approach, which involves continuous monitoring of the concentration of relevant greenhouse gases in exhaust gas from production and the associated flow.

Recognizing that importers and producers in third countries have limited time to adapt to the CBAM's requirements, the regulation allows for additional flexibility in monitoring methodologies until 2025. Specifically, alternative GHG emissions monitoring systems ("Other Methods") are permitted. These may include a carbon pricing scheme applicable to the production site, a compulsory GHG emissions monitoring scheme for the site, or an emissions monitoring scheme at the installation. Default values published by the Commission may also be used during the transitional period for imports where the reporting declarant lacks the information needed to utilize either the EU Methods or Other Methods. In such cases, the reporting declarant must indicate the methodology used in their CBAM reports, ensuring that any alternative methods provide similar coverage and accuracy as the EU Methods.

Under the EU CBAM, default values for embedded emissions can be used during the transitional period, particularly for the first three quarterly reports until 31 July 2024, when an importer does not have access to actual emissions data for a specific imported good. After this period, reported values must be based on actual emissions data, with limited estimations allowed for complex goods only, and with a limit of 20 percent of the total embedded emissions. Using default values would qualify as 'estimation'. These values can be certified through a combination of supplier declarations, verification schemes, and potential audits, depending on the complexity of the good and the reporting requirements set by the EU Commission.

The carbon content of imports under the CBAM is calculated by multiplying the weight of the imported good by an emission factor specific to its production process. This calculation determines the total amount of carbon dioxide emitted during the manufacturing of the product, allowing for a comparison to the carbon cost of domestically produced goods in the EU. Importers must declare these embedded emissions and purchase CBAM certificates to offset them based on the calculated carbon content.

9 The European Commission is reportedly considering amending the administrative exemption threshold from the current 'de minimis' level of EUR 150 to 100 tons of CO_2e annually (see, Rebecca Gualandi, 2025, 'The EU plans to exempt more than 80% of companies from CBAM compliance', *Carbon Pulse*, 6 February). This change aims to exclude many small reporting entities for whom compliance would impose a substantial burden. While the simplified regime is expected to exempt around 80 percent of reporting entities, approximately 95 percent of the annual imported emissions currently within the scope of the CBAM would still be covered under the simplified regime. Thus, even with this adjustment, the overall incidence of the CBAM by country should not change materially.

Box 1. Timeline of the EU CBAM

The EU CBAM came into force on 1 October 2023 and it will be phased-in gradually. During the transition, lasting until 1 January 2026, importers of goods that fall within the scope of the CBAM regulation must report GHG emissions embedded in their imports, without making payments. Fines are envisaged for non-compliance with the reporting requirement. This phasing-in period allows importers to adapt to the new system, ensuring a smooth transition towards the entry into force of the final system. The transition period will also enable the EU to gather information on CBAM declarants' reporting processes and emission intensities underlying CBAM charge calculations.

Starting from 1 January 2026, importers will be required to declare each year the quantity of goods imported into the EU in the previous year, along with their embedded GHG emissions. They will then need to surrender the corresponding number of CBAM certificates. As a result, the CBAM incidence will be deferred by one year, meaning that the charges will not be applied to the products when they enter the EU, but rather one year later. The price of the CBAM certificates will be calculated based on the weekly average auction price of EU ETS allowances expressed in EUR/ton of CO_2e emitted. A deduction will be made for any carbon price that has been paid in the country of origin of the good, but no adjustment will be made for non-price policies.

A review of the CBAM's functioning during its transitional phase will be concluded before the entry into force of the definitive system in 2026. This will involve a review of the product scope, to assess the feasibility of including other goods produced in sectors covered by the EU ETS in the scope of the CBAM, such as certain downstream products and those identified as suitable candidates during negotiations. The report will include a timetable for their inclusion by 2030.

By the end of this period a new system of reporting emissions and acquiring allowances that is uniform for both domestic producers and importers will be adopted. By 2035, importers and domestic producers will have to acquire emission allowances through auctions done in the same marketplace, marking complete adoption of CBAM.

3. Methodology and Data

3.1. CBAM Cost and Its Components

We measure a country's CBAM cost as the static incidence; that is, the additional cost arising from CBAM, measured as a share of the value of the corresponding trade flow. Our focus—and main results—is on a country's CBAM incidence across all CBAM-covered products. This incidence depends on (i) the CBAM cost associated with each CBAM product, and (ii) the relative share of each product in total imports for EU countries, and in total exports for the EU's trading partners. The CBAM cost for each product, in turn, is determined by (i) the CBAM charge, i.e. the difference between the domestic (i.e., EU) carbon price and the carbon price in the country of origin—if any—and (ii) the carbon intensity of the product.

The CBAM cost for country i is found by summing over all products p the multiplication of the product-specific CBAM cost and the trade share. This results in a trade-weighted average of the carbon cost associated with each CBAM product, where the weights are the share of product-specific trade in total trade. Formally:

$$t_i \equiv \sum_{p,j} \underbrace{\overbrace{\left(c_i^{EU} - \tau_{p,j}\right)}^{CBAM\ charge} \times e_{p,j}}_{CBAM\ cost} \times s_{p,j,i} \quad (1)$$

where c_i^{EU} is the level of the *CBAM obligation* (USD/tCO_2e), which accounts for the carbon price and the volume of emissions covered by free allowances in the country/area of destination; $\tau_{p,j}$ is the level of the *CBAM adjustment* (USD/tCO_2e), which accounts for the carbon price and the share of product emissions covered by carbon pricing in the country of origin j; $e_{p,j}$ is the CO_2 emissions intensity (ton/USD) of product p in country j; and $s_{p,j,i}$ is the share of trade in product p from country j to country i in total trade (exports or imports).

A more general version of equation (1) can be written as:

$$D_i \equiv \frac{\overbrace{\sum_{pj}\left(c_i^{EU} - \tau_{p,j}\right) \times e_{p,j} \times X_{p,j}}^{CBAM\ expenditure}}{A_i} \quad (2)$$

where D_i denotes the generalized carbon cost index, $X_{p,j}$ represents the value (in USD) of imports from non-EU countries (or exports to EU countries) of product p from country j, and A_i is the relevant economic measure used for the normalization of the total CBAM expenditure, which in this paper is GDP or total trade. Setting $A_i = X_i$, where X_i represents total trade of country i, allows to define $s_{p,j,i} \equiv X_{p,j}/X_i$. Equation (1) ensues immediately.

Unlike Maliszewska et al. (2023), who use total imports (or exports) of CBAM products as denominator A_i, we use total imports and total exports (of both CBAM and non-CBAM products) as denominator in our main index. This choice stems from our interest in understanding the impact of the EU CBAM on total trade of individual countries, a perspective better captured when total imports and exports are employed as denominators in the indices. Our estimates are therefore lower by construction than those in Maliszewska et al. (2023), given that CBAM exports are only a subset of overall exports.

Equation (2) indicates that the overall CBAM cost depends on a country' *exposure* to it, i.e. on the share of CBAM-covered products in EU countries' total imports or in the EU's trading partners' total exports. Specifically, for EU countries, exposure is the share of CBAM products imported from non-EU partners; for the EU's trading partners, it is the share of CBAM products destined to EU countries. Formally:

$$s_i \equiv \sum\nolimits_{p,j} s_{p,j,i}, \quad \text{where: } s_{p,j,i} = X_{p,j}/X_i.$$

This definition of s_i, which follows Magacho et al. (2024), has a straightforward interpretation: a higher value indicates that a larger share of country's trade is subject to the CBAM and hence denotes a higher exposure.[10]

In this paper, for simplicity we abstract from free allowances and other rebate mechanisms in both the CBAM area and the country of origin. As a result, c_i^{EU} and $\tau_{p,j}$ simplify to the carbon price applicable in the CBAM area and the country of origin, respectively. In addition, our results are best interpreted as the impact of CBAM under its current scope once free allowances have been fully phased out in 2035.

[10] This definition of exposure differs from the "CBAM exposure index" introduced in Maliszewska et al. (2023). The index accounts for the emission intensity of products and the cost of emissions; it is equivalent to t_i in equation (1).

3.2. Data

We draw on two data sources for our analysis. First, we use data on bilateral trade in goods from the UN COMTRADE database (United Nations, 2023) to measure countries' exposure to the EU CBAM. We identify trade in CBAM products using the products' list published in European Union (2023) and the corresponding Common Nomenclature (CN) and Harmonized System (HS) codes.

Second, our incidence calculations draw on the Global Resource Input-Output Assessment model (GLORIA) v.57, a comprehensive economic accounts framework covering 164 countries from 1990 to 2021 (Lenzen et al., 2017, 2021). The classification of economic activities used in GLORIA (Industrial Ecology Lab, 2023) is based on ISIC rev.4, and provided at 120 sector resolution for each year and country. In addition, the GLORIA database provides greenhouse gas emissions 'satellite' data for each sector. Emissions data are consistent with, and mapped from, the EU Emissions Database for Global Atmospheric Research (EDGAR) (European Commission, 2023). The disaggregation of EDGAR data follows the IPCC 2006 classification and is mapped onto the GLORIA sectoral classification using a concordance algorithm.[11]

We perform our analysis of the static incidence of CBAM on data for the year 2021, the latest available (historical) year in GLORIAv57. The calculation of the static incidence involves three steps. First, we calculate the product-specific trade shares, $s_{p,j,i}$, by retrieving bilateral trade flows from GLORIA. Next, we combine sector-level data on total output (in USD) and the 'satellite' CO_2 emissions to calculate the emissions intensity of production (in kg/USD) for each economic activity in each country, $e_{p,j}$. Finally, we determine the CBAM charge for each bilateral country-product pair, $c_i^{EU} - \tau_{p,j}$. Combining these factors allows for the calculation of the CBAM cost.

Our analysis accounts for direct (scope 1) CO_2 emissions and therefore constitutes a departure from the system boundary of the EU CBAM, which, as mentioned above, encompasses emissions associated with electricity production for some products (scope 2) and, for some products, includes non-CO_2 GHG such as perfluorocarbons and nitrous oxide. For iron and steel, and aluminum, which together represent 82 percent of EU CBAM imports, this departure is not an issue, as Scope 2 emissions are also excluded from the CBAM regulation. It could lead to an underestimation of the CBAM cost in the case of fertilizers and cement, which however are only 4.5 percent of EU CBAM imports. Processing of the UN COMTRADE and GLORIA data is executed in Python 3.

4. Results

CBAM Exposure

A first assessment of the potential impact of CBAM on trade flows can be made by looking at CBAM exposure, defined as the share of CBAM products' value within total trade flows. For EU countries, the overall exposure to CBAM is relatively limited (Figure 2, left panel), with CBAM products imported from non-EU partners accounting for only 4.5 percent of their total imports. In 2021, this represented approximately USD 110 billion worth of goods (UN COMTRADE, 2024). However, exposure is greater in some EU countries, such as the Baltics and some Eastern European economies, where CBAM imports from non-EU countries account for up to 6 percent of total imports. Similarly, the exposure of non-EU countries—measured by the value of their

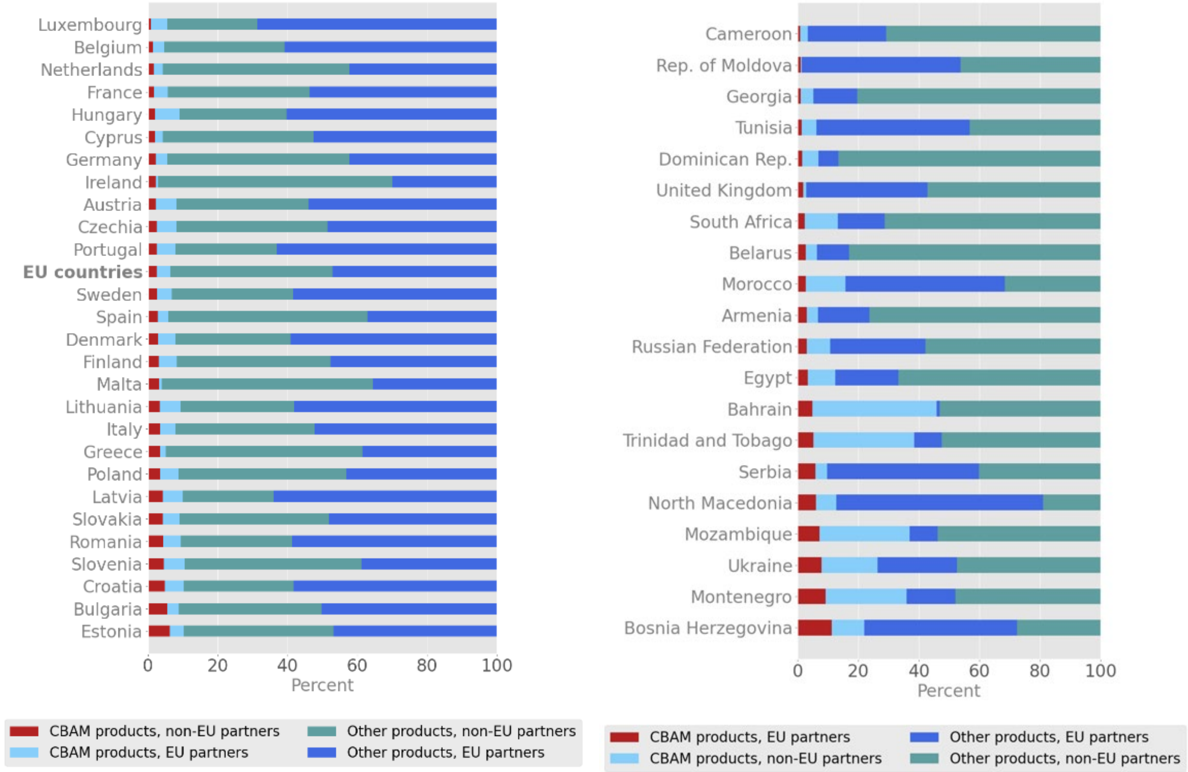
[11] Trade shares can be calculated using either aggregate trade flows from COMTRADE or by aggregating inter-industry flows from GLORIA. However, these two datasets produce different trade share values, resulting in a statistical discrepancy. This discrepancy occurs because GLORIA inter-industry flows undergo a data reconciliation and adjustment process to meet input-output balancing constraints. Consequently, trade share values derived from COMTRADE may more accurately reflect bilateral trade flows at the aggregate level. In this paper, we utilize COMTRADE data for trade shares and GLORIA for inter-industry trade flows. It is also important to note that the statistical discrepancy between the two datasets is relatively minor, especially for large countries.

exports of CBAM products to the EU—is also limited, though slightly higher than for EU countries. The share of CBAM products in EU trading partners' total exports is 6 percent on average across the 20 exporters with the largest share of CBAM products in total imports, and does not exceed 11 percent (Bosnia and Herzegovina).

Figure 2. CBAM Products as a Share of Total Trade

Imports (EU countries)
(Percent of total imports, 2021)

Exports
(Percent of total exports, 2021)



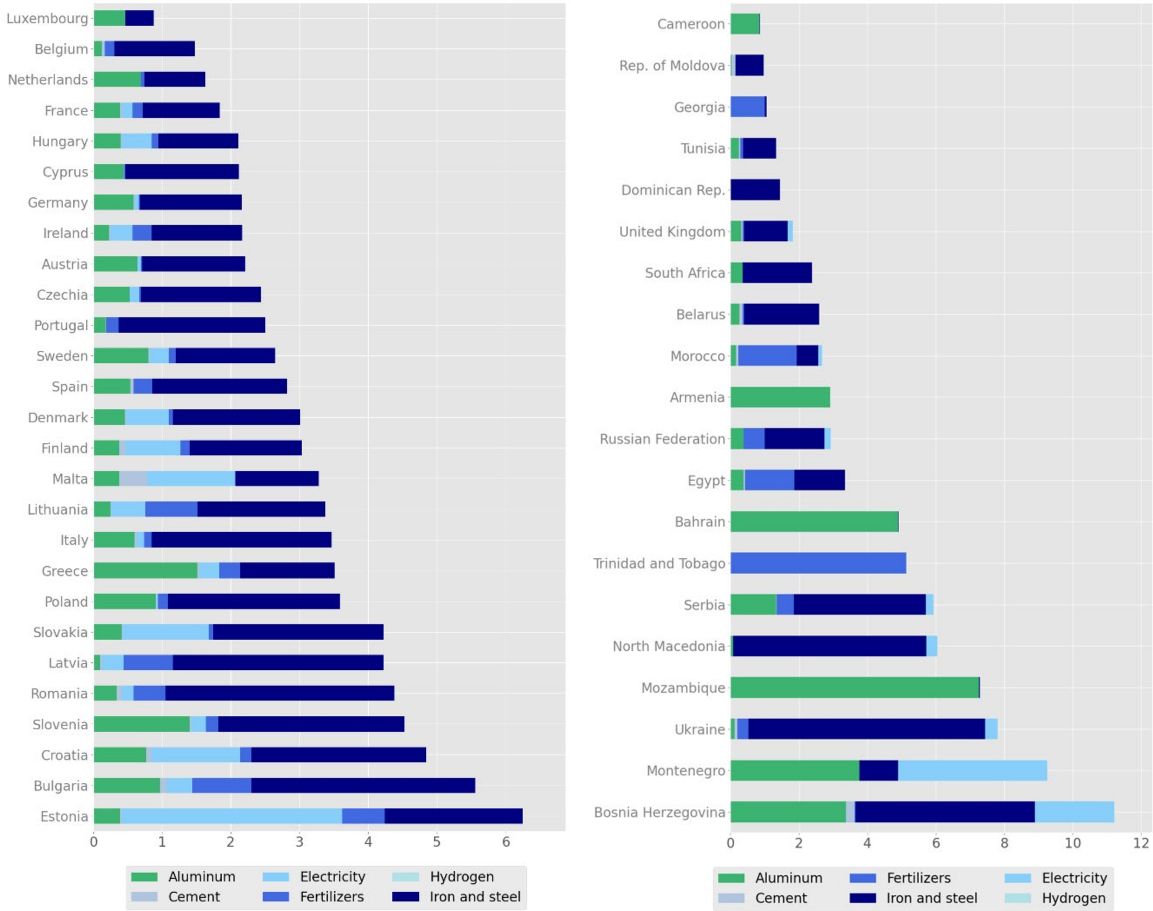
Sources: UN COMTRADE and authors' calculation.
Notes: Left panel, countries ranked according to the value of CBAM products from non-EU partners (as a share of total imports). Right panel, exporters ranked by largest value of CBAM exports to the EU (as a share of total exports). Top twenty exporters. Iceland, Norway, Switzerland and Liechtenstein are excluded from the sample as CBAM does not apply to them since their carbon price is aligned with the EU ETS.

In the longer run, the impact of CBAM on EU countries and exporters to the EU will depend in part on their ability to source imports from within the EU and redirect exports to non-EU countries, respectively—in addition to how ambitious carbon pricing policies will get outside of the EU. To shed light on this aspect, the relative exposure can be compared to the share of a country's trade in CBAM products that is not subject to CBAM; that is, for EU countries, products imported from within the EU and, for non-EU countries, products destined to all partners other than the EU. This gives a rough indication as to how easily a country could redirect its trade. The EU—and most EU countries except for Greece and Ireland—currently source a larger share of CBAM products from within the EU (sky blue) than from non-EU (red) countries, suggesting that EU countries might be able to reorient some of their imports to EU-based producers. Exporters to the EU export less CBAM products to the EU than they do to other non-EU partners, suggesting that they might also be able to redirect supply to other countries. However, for some countries, exports to the EU represent a large share of industry-specific exports. For instance, Ukraine and Serbia export large quantities of iron and steel to the EU, representing 28 and 61 percent of that industry's exports, respectively, even though total CBAM exports to the EU represent a relatively small share of their total exports—7.8 and 4.6 percent respectively.

Zooming onto individual sectors, countries' exposures to CBAM are mainly driven by a subset of CBAM product categories. Under CBAM's current product scope, two product categories are the largest contributors to exposure: aluminum and iron and steel (Figure 3). Taken together, they represent between 38 (Estonia) and 100 (Luxembourg) percent of total trade in CBAM products. Moreover, for some EU countries, a significant share of these imports originates in non-EU countries, indicating a high product-specific exposure. For instance, 89 percent of Greece's aluminum and 75 percent of Ireland's iron and steel are imported from outside the EU. Some opportunities to redirect demand to EU-based producers may exist, which would mitigate the incidence of CBAM; however, not all types of iron or aluminum products are alike, which may limit the potential for mitigation from import substitution.

Figure 3. Trade in CBAM products

Imports from non-EU countries (Percent of total imports) — **Exports to EU countries** (Percent of total exports)



Sources: UN COMTRADE and IMF Staff calculations.

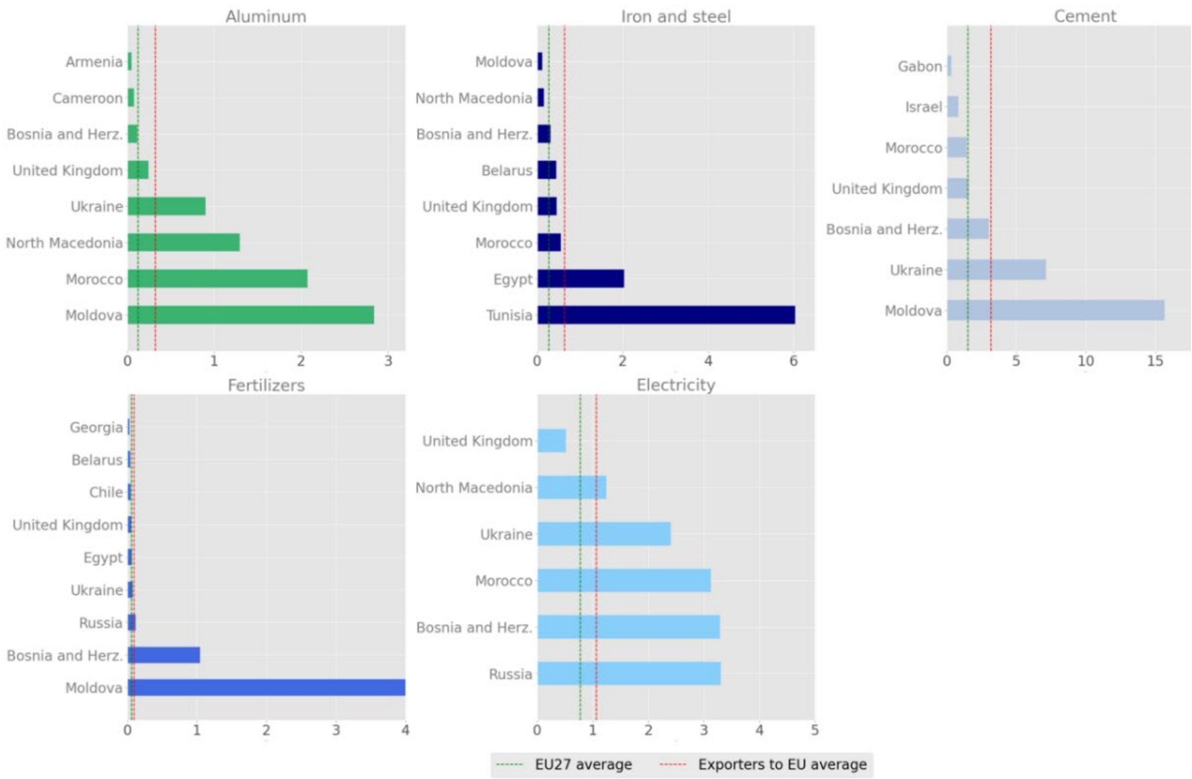
Notes: Left panel, countries ranked according to the total value of CBAM products from non-EU partners (as a share of total imports). Right panel, exporters ranked according to the total value of CBAM exports to the EU (as a share of total exports). Top twenty exporters. Iceland, Norway, Switzerland and Liechtenstein are excluded from the sample as CBAM does not apply to them since their carbon price is aligned with the EU ETS.

Emission Intensity

The emission intensity of in-scope products in exporting countries plays a prominent role in the determination of CBAM costs. For an EU member state, the total CBAM cost depends on the emission intensity of its suppliers across all imported products, weighted by the share of each supplier-product pair in the country's total imports. In contrast, the CBAM cost for exporters to the EU is only determined by their *own* product-specific emission intensity and the share of each CBAM good's exports to the EU.

Looking at the emission intensity of products in exporting countries (Figure 4) yields two observations. First, there is substantial variation in CO_2 intensity across countries for each product, driven by differences in production processes and technologies—for instance, iron and steel can be produced using electric arc or blast furnaces. Second, the long-run impacts will depend on exporters' emission intensity relative to other producers—both within and outside the EU. Specifically, exporters with CO_2 intensities significantly above EU or third-country averages may find themselves at a competitive disadvantage, potentially losing market share to less emission-intensive producers. Figure 4 displays the average emissions intensity of EU27 countries as well as that of non-EU exporters to the EU. For all product categories except iron and steel and fertilizers, the emission intensity of production of non-EU countries is significantly above the EU27 average. Those non-EU countries whose emission intensity exceeds the non-EU exporters' average—such as Moldova for aluminum and cement, for example—can be expected to be most affected by the introduction of the EU CBAM, all else equal.

Figure 4. CO_2 Intensity of CBAM Products in Exporting Countries
(kg per USD)



Sources: UN COMTRADE and authors' calculation.
Notes: Emission intensities are calculated using output values, assuming the price of a commodity is uniform across countries. Embedded emissions are also calculated using trade values, assuming that export prices are the same across all export markets.

CBAM Cost

Total CBAM Cost

To calculate the total CBAM cost, we combine the trade flows and emission intensity data with assumptions about the price paid on embedded emissions. As indicated in equation (1), the price of embedded emissions is the difference between the EU carbon price (c_i^{EU}) and the carbon price applied by the country of origin

($\tau_{p,j}$). We assume $c_i^{EU} = USD90/tCO_2$ and $\tau_{p,j} = 0 \; \forall \; p, j$; that is, we do not account for the presence of carbon pricing mechanisms in the country of origin.[12]

The direct impact of the EU CBAM on EU countries is small albeit heterogeneous (Figure 5). It ranges from 0.025 percent of the value of total imports in Austria to 0.3 percent in Croatia. The weighted average for the EU is 0.1 percent. In most countries, iron and steel, aluminum and electricity are the largest contributors to the average CBAM impact, reflecting the exposure discussed above.

The composition of the total CBAM cost, as shown in Figure 5, depends on the trade mix of the country and the emissions intensity of the in-scope products in exporting countries. In Portugal, for example, 'iron and steel' is the main contributor, reflecting the fact that (i) imports of iron and steel represent a large share of Portugal's imports and/or (ii) Portugal is importing from relatively emissions-intensive producers. In Croatia, the average CBAM cost is primarily driven by imports of electricity from Bosnia and Herzegovina, in line with the fact that electricity represents 26 percent of Croatia's imports of CBAM products, and that the electricity mix in Bosnia and Herzegovina is relatively carbon intensive.

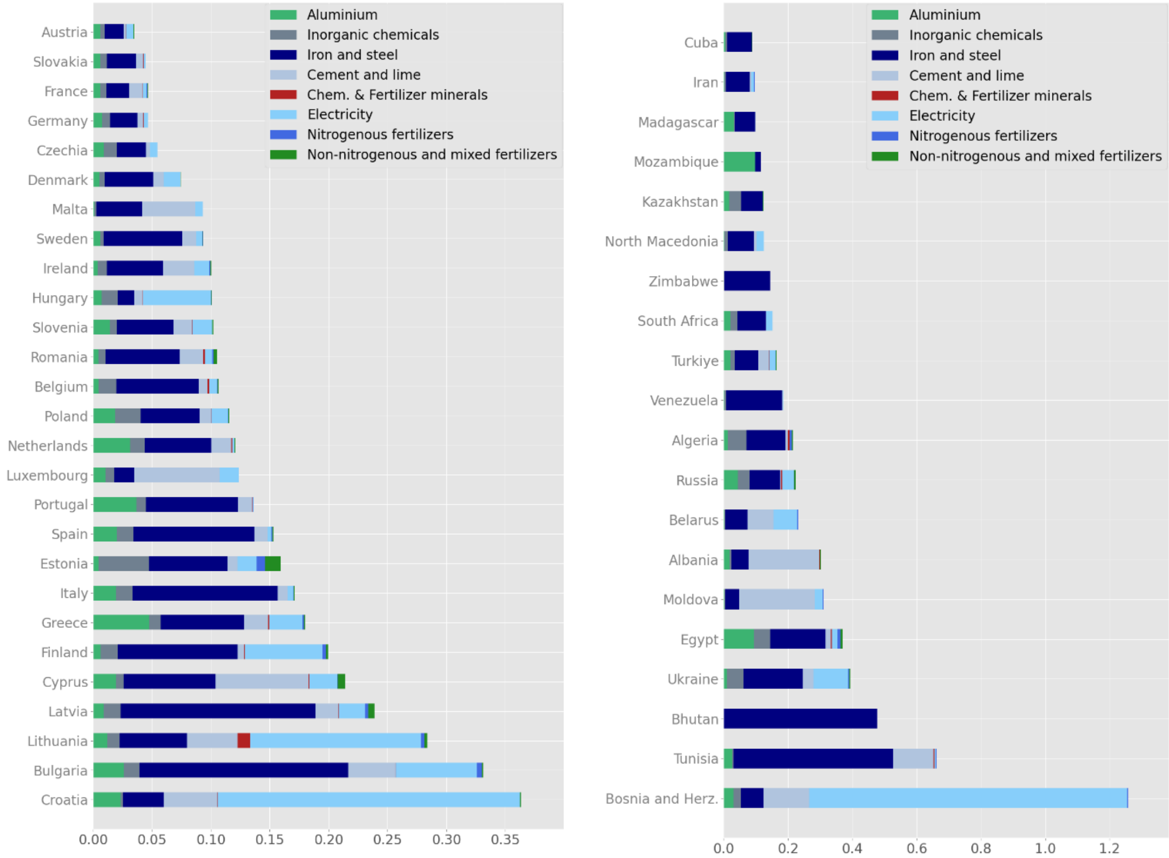
Turning to exporters, the overall implicit cost that CBAM imposes is also small, although impacts can be large for some products (see next section). Figure 5 (right panel) shows that, among the 20 countries where costs are largest, the ad valorem equivalent CBAM cost varies between 0.1 percent in Iran to 1.2 percent in Bosnia and Herzegovina. The figure for Bosnia and Herzegovina is the mirror image of that for Croatia as electricity exports are the largest contributor to Bosnia and Herzegovina's CBAM cost.

[12] While this is a simplification, among the EU's trading partners most affected by the CBAM, only Ukraine and the UK have a carbon price mechanism, with the price being significant only in the UK (USD 60/tCO_2e, versus USD 0.8/tCO_2e in Ukraine). CBAM does not apply to Iceland, Liechtenstein, Norway and Switzerland, as their carbon price aligns with the EU ETS.

Figure 5. The Trade-Weighted CBAM Cost

Average CBAM Cost on Imports
(Percent of total imports)

Average CBAM Cost on Exports
(Percent of total exports)



Sources: Global Resource Input-Output Assessment (GLORIA) and authors' calculation.
Notes: Right panel, exporters ranked by largest value of CBAM cost. First twenty exporters. Iceland, Liechtenstein, Norway and Switzerland not reported in the chart as they are exempted from CBAM. Data for Montenegro, which would likely appear in this chart, is unavailable.

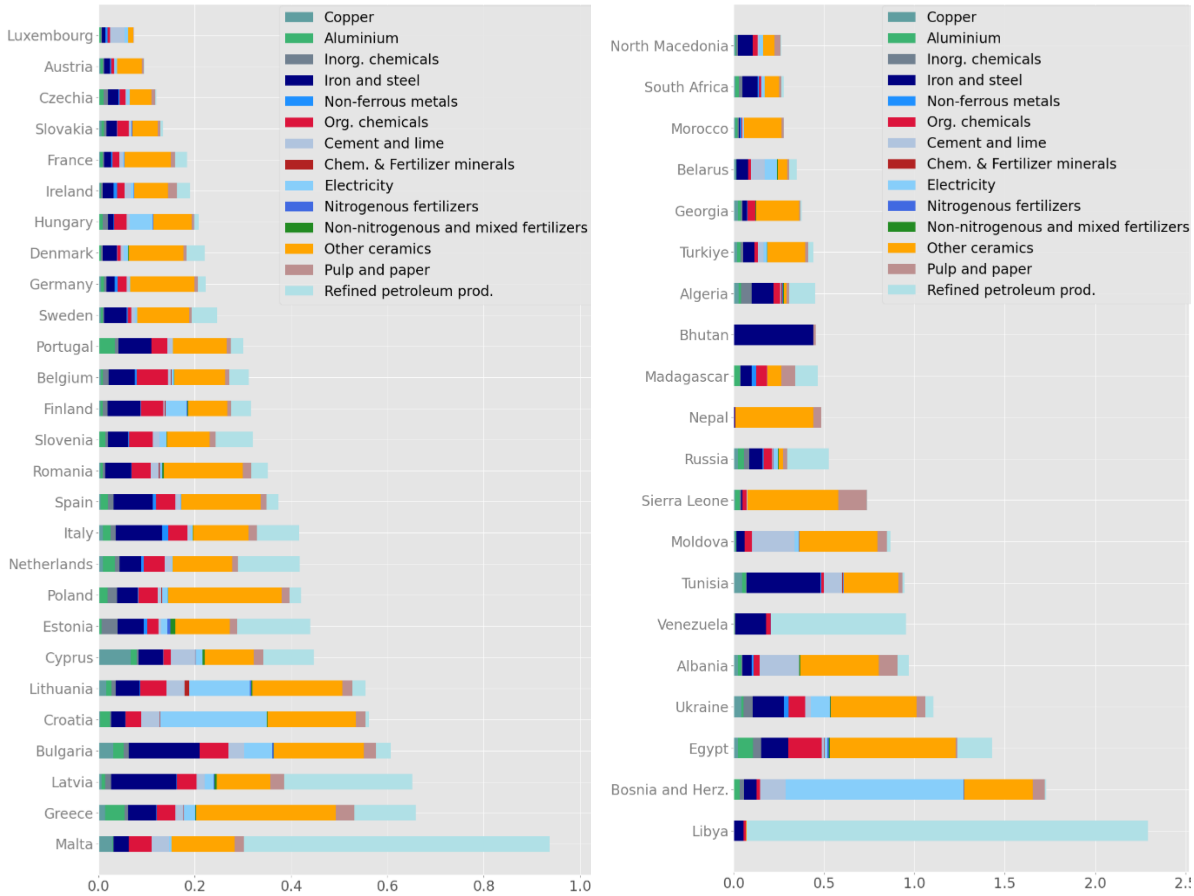
Similar conclusions are drawn when measuring the impact relative to GDP (see Annex). The CBAM cost represents at most 0.1 percent of annual GDP for EU countries and 0.3 percent of GDP for exporters to the EU. Furthermore, when expressed as a fraction of GDP, CBAM costs are comparatively smaller for the larger, more closed economies.

Extending the scope of CBAM beyond its 2026 perimeter to all products currently subjected to the EU ETS would primarily increase the incidence of the CBAM costs on EU countries, not much that of exporters to the EU (Figure 6). For EU countries, the incidence of an extended EU CBAM scope would be 4-8 times larger than under the current implementation scope. While this would represent a substantial increase, costs would remain modest given the low incidence under the current scope. Overall, the ranking of countries would also be preserved, with some exceptions. For instance, Malta, which in 2021 imported approximately two-thirds of refined petroleum products from Russia, would be the most impacted. For exporters, interestingly, the extension of the CBAM would not necessarily imply substantial increases in incidence in any given country, but instead would primarily broaden the set of exporting countries affected by the CBAM. This reflects the fact that countries are generally specialized in the production and export of a narrow set of goods. This is evidenced in Figure 6, which shows new countries entering the 'top 20', but relatively modest increases in country-specific total incidence among those already affected by the current CBAM.

The extension of the EU CBAM to all products covered by the EU ETS is likely to occur in the early to mid-2030s, when carbon prices are expected to be much higher than today, reflecting the expected scarcity of pollution permits. The linear nature of our elasticities implies that the CBAM cost would rise proportionally to the carbon price, and the relative ranking of the country incidence would remain unaffected. For instance, if the carbon price reaches USD 140/tCO_2 in 2030, as forecasted by various EU ETS models (PIK, 2023), and is 55 percent higher than our baseline assumption of USD 90/tCO_2, the CBAM cost would also increase by 55 percent for all countries. The overall impacts on individual countries can thus still be expected to remain small.

Figure 6. CBAM Cost Under Extended Scope

EU Countries (Percent of total imports) | **Exporters to the EU** (Percent of total exports)



Sources: Global Resource Input-Output Assessment (GLORIA) and authors' calculation.
Notes: EU countries and exporters to the EU are ranked by largest value of CBAM cost. For exporters, the top twenty are shown. The assumed carbon price in the charts above is USD 90/tCO_2.

Product-Level CBAM Cost

While the macroeconomic impact of the EU CBAM, whether measured relative to total trade or GDP, is modest, it is more material for some specific country-product pairs. For instance, imports of cement in the EU are particularly exposed to the CBAM, especially in some countries. Ukraine's exports of cement to the EU would be made 30 percent more expensive, whereas Bosnia and Herzegovina's electricity exports to the EU would face a 20 percent CBAM charge (see Table A in Annex B).

The EU CBAM currently applies primarily to upstream products (e.g., iron and steel, cement); that is, products used by firms located upstream and midstream in the supply chain. As such, it partly corrects for the environmental bias of trade policy (Shapiro, 2021), i.e., the fact that upstream products are more carbon intensive than downstream products and that average costs on upstream products are lower than those on downstream products.

5. Discussion and Limitations

Adjustments to the EU CBAM

The effects discussed in this paper are based on a partial-equilibrium approach and represent first-order, static impacts. They do not account for dynamic adjustments to trade patterns or the broader general equilibrium effects of CBAM that are likely to unfold over time. However, the introduction of CBAM is expected to drive various adjustments that could reshape trade patterns between the EU and its trading partners. These adjustments are driven by incentives to reduce the CBAM-related cost, which can be achieved by either decreasing reliance on CBAM-covered products or lowering their emission intensity. Specifically, EU-based importers may (i) shift toward EU-based suppliers, or (ii) opt for suppliers with lower emission intensity, whether located within or outside the EU. Similarly, exporters to the EU may respond by investing in technologies to reduce their emission intensity or by redirecting part of their CBAM-covered exports to non-EU markets.

The extent and nature of these adjustments will depend on the structure of the international market for the considered product. Under perfect competition, the CBAM charge would be fully passed through to EU-based consumers. Under imperfect (often oligopolistic) competition, the extent to which foreign exporters to the EU absorb the extra cost of CBAM through margin compression—or pass it on to EU consumers—will depend on the EU's share of demand for that product in international markets: if that share is large, the introduction of the CBAM charge may lead to a decrease in prices in international markets, dampening the domestic impact.

Countries with significant exports to the EU might also introduce carbon pricing mechanisms to match the EU ETS as a way to collect fiscal revenues that would otherwise accrue to the EU. The implications of higher carbon prices in exporting countries (e.g., on the price of CBAM products in international markets) are not assessed here but could be material. For example, a carbon price in exporting countries would lower the CBAM charge (potentially to zero) and could change the price of products in international markets and the incidence of CBAM between exporters and importers, depending on the market structure.

The EU CBAM may also raise production costs of EU-based up- and mid-stream industries using in-scope products. The extent of this effect will depend on the emission intensity of those non-EU imports, the substitutability between intra and extra-EU imports, and the extent to which the marginal product costs of EU producers of CBAM-covered products would rise to serve the additional demand.

Modeling these adjustments requires a general equilibrium analysis. Given the scope of this paper, a comprehensive general equilibrium analysis is not pursued here but is left for a future extension of this work.

Introduction of Border Carbon Adjustment by Other Countries

Several jurisdictions outside the EU are considering border carbon adjustment mechanisms, raising concerns about potential disruptions to shared trade patterns from overlapping measures. Using Australia as a case study—given its review of carbon leakage policies[13]—we simulate the effects of a hypothetical Australian CBAM, applying the same product scope and price assumption (USD 90/tCO_2e) as the EU CBAM.

[13] See Australia's Carbon Leakage Review, available at: https://www.dcceew.gov.au/climate-change/emissions-reduction/review-carbon-leakage.

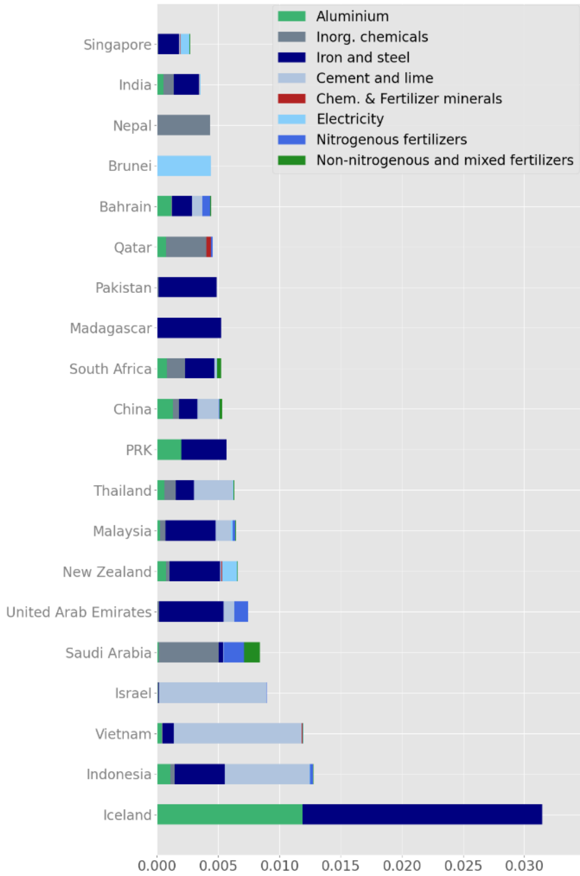
The analysis yields three key insights (Figure 7). First, an Australian CBAM would primarily impact East and Southeast Asian countries due to existing trade flows and geographical proximity. Second, its impact on trading partners would be much smaller than the EU CBAM, reflecting Australia's smaller footprint on global trade. Third, there is minimal overlap between countries affected by the EU CBAM and an Australian CBAM, though some countries located at the intersection of trading networks could face substantial impacts from both mechanisms (e.g., South Africa).

6. Conclusions

Under the framework of the 2015 Paris Agreement, the global climate change mitigation effort is expected to be the sum of countries' nationally determined contributions to global emissions reductions. Differing levels of ambition are bound to result in different levels of climate policy stringency, including different carbon prices, across jurisdictions. This, in turn, may place emission-intensive producers in the most ambitious countries at a competitive disadvantage and lead to carbon leakage, whereby GHG-emitting activities relocate from the regulating jurisdiction to that with less stringent (or no) regulation.

Border carbon adjustment, as an instrument to level the playing field across jurisdictions and reduce carbon leakage, has gained significant policy momentum over the last few years. The most notable instance of this instrument is the EU's CBAM, which entered into force in October 2023. Given the importance of the EU in international trade, the impact of the CBAM on EU countries and the EU's trading partners is worth analyzing.

Figure 7. Average CBAM Cost on Exports
(Percent of total import values in 2021)

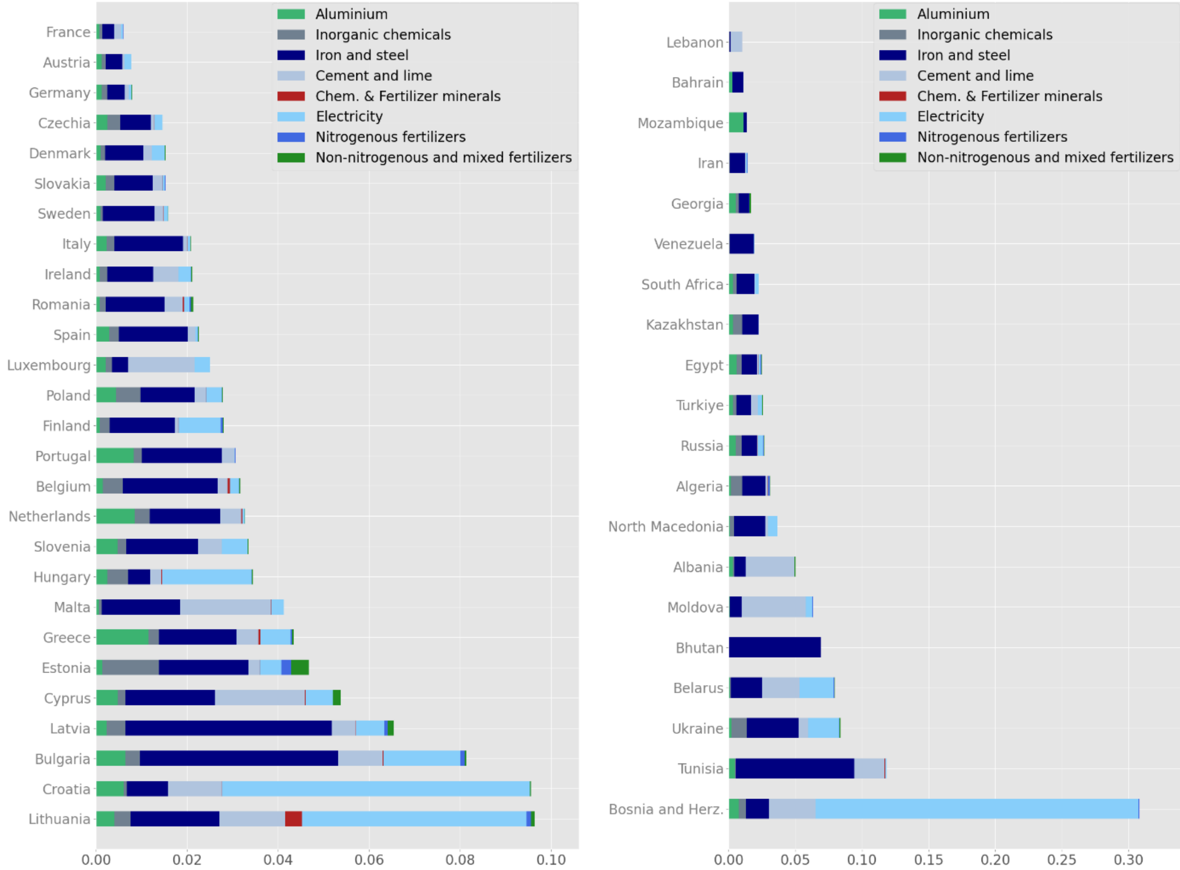


This paper used indices of ad valorem tariffs to assess the short-run, static, partial equilibrium incidence of the EU CBAM on both EU importers and the EU's trading partners. A key finding of this paper is that the overall direct impact of the current EU CBAM on EU countries' trade is estimated to be small, adding 0.1 percent to the value of EU imports when averaged across all imports, and 0.04 percent to the average cost (and 1.2 percent at most) of a country's exports to the EU. However, the analysis also shows that the CBAM cost will be sizeable for specific products such as iron and steel, and aluminum which, together with other concerns, helps explain why CBAM has triggered opposition from some of the EU's trading partners. Moreover, an expanded CBAM featuring full coverage and a significantly higher carbon price could entail larger costs in the more distant future.

Annex A. CBAM Cost as a Share of GDP

Figure A. CBAM Cost as a Share of GDP

EU Countries (Percent of GDP) | **Exporters to the EU** (Percent of GDP)



Sources: Global Resource Input-Output Assessment (GLORIA) and authors' calculation.

Notes: EU countries and exporters to the EU are ranked by largest value of CBAM cost. For exporters, the first twenty are shown.

Annex B. Product-Level CBAM Cost

Table A. Product-Level CBAM Cost
EU Countries' Imports
(Percent of value of imports)

	Basic Aluminum	Basic Inorganic chemicals	Iron and steel	Cement, lime, and plaster products	Electric power	Nitrogenous fertilizers	Non-nitrogenous and mixed fertilizers
Austria	0.4	0.9	0.6	1.0	0.7	0.1	0.1
Belgium	1.0	1.9	2.8	4.9	1.5	0.3	0.3
Bulgaria	2.7	4.1	3.5	21.3	7.3	0.7	0.2
Cyprus	2.5	2.6	2.6	20.0	4.7	0.4	1.2
Czechia	0.8	2.3	0.7	2.9	1.0	0.0	0.1
Germany	0.8	1.2	0.9	5.1	0.7	0.1	0.2
Denmark	0.7	0.9	1.8	2.6	1.4	0.1	0.2
Spain	2.1	2.1	3.2	10.9	1.2	0.5	0.2
Estonia	1.0	6.7	1.9	3.1	1.8	0.9	0.9
Finland	1.0	1.5	3.0	2.7	6.3	0.9	0.6
France	0.8	0.9	0.8	4.7	0.9	0.3	0.1
Greece	3.9	2.7	2.9	19.7	4.5	0.5	0.4
Croatia	1.5	0.9	1.2	12.5	8.8	0.1	0.3
Hungary	0.5	2.4	0.5	4.7	6.2	0.2	0.3
Ireland	1.0	1.6	3.1	11.6	3.0	0.3	0.2
Italy	1.9	2.6	3.0	10.8	0.6	0.5	0.5
Lithuania	2.0	3.5	2.0	13.8	11.7	0.5	0.4
Luxembourg	1.5	1.0	0.6	15.4	0.9	0.0	0.0
Latvia	1.8	5.1	4.6	7.3	2.9	0.5	0.7
Malta	0.8	1.6	3.1	17.2	1.8	0.3	0.0
Netherlands	2.3	1.9	2.8	8.2	0.8	0.2	0.2
Poland	1.4	2.5	1.3	7.7	2.6	0.2	0.2
Portugal	2.6	1.7	2.4	5.4	0.1	0.2	0.0
Romania	0.7	1.9	1.6	14.3	2.2	0.5	0.6
Slovakia	0.6	1.5	0.7	2.8	0.1	0.1	0.2
Slovenia	0.8	1.1	1.2	10.5	1.3	0.1	0.5
Sweden	0.7	0.4	2.1	3.7	1.5	0.2	0.1

Table A (*continued*)

Exports to EU Countries

(Percent of value of exports)

	Basic aluminum	Basic inorganic chemicals	Iron and steel	Cement, lime, and plaster products	Electric power	Nitrogenous fertilizers	Non-nitrogenous and mixed fertilizers
Albania	1.3	6.2	0.7	14.6	0.0	0.0	9.7
Bosnia and Herzegovina	0.8	0.6	0.6	20.9	19.4	7.5	0.7
Belarus	0.7	1.0	1.3	12.7	24.7	0.1	0.0
Bhutan	37.0	0.0	1.8	0.0	0.0	0.6	0.0
Cuba	9.9	2.1	2.1	0.0	0.0	0.1	3.9
Algeria	144.8	31.5	17.3	12.4	0.5	0.5	27.1
Egypt	5.7	5.1	3.3	3.3	6.5	0.2	0.6
Kazakhstan	1.4	4.5	0.8	0.1	0.0	1.7	0.3
Liberia	3.0	1.6	17.3	NA	0.0	0.7	0.1
Moldova	5.3	4.5	0.2	78.0	44.2	21.8	5.0
Madagascar	NA	11.6	153.6	51.7	0.0	0.0	0.2
North Macedonia	8.1	3.8	0.4	5.5	9.8	0.4	1.6
Mozambique	0.4	0.0	1.6	0.0	0.0	0.0	0.0
Russia	3.0	5.9	1.9	3.0	9.9	0.2	0.2
Tunisia	9.5	0.1	25.4	13.4	22.8	0.9	0.0
Türkiye	1.8	1.7	1.1	4.1	14.2	0.5	1.4
Ukraine	1.0	11.1	0.8	30.1	17.4	0.1	0.5
Venezuela	0.1	1.6	3.6	0.5	1.6	0.0	0.0
South Africa	1.6	1.8	1.2	0.7	2.6	0.0	0.1
Zimbabwe	0.6	0.6	1.9	0.1	0.0	0.0	0.0

Sources: Global Resource Input-Output Assessment (GLORIA) and authors' calculation.

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