The International Political Economy of Border Adjustment Mechanisms: Diffusion, Institutional Capacity, and Cross-border Climate Transition Support

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Abstract

Recently enacted policy mechanisms to put tariffs on the carbon content of imports, such as the European Union's Carbon Border Adjustment Mechanism (CBAM), and recently proposed schemes like the Methane Border Adjustment Mechanism, have attractive characteristics for reducing international emissions. The CBAM, for example, levies charges if the exporting country does not have a carbon price mechanism and hence encourages other countries to adopt programs akin to the EU's own Emissions Trading System or other carbon pricing approaches. This paper contextualizes CBAM as a mechanism where climate policies in one country impact domestic policy in other countries. After situating this observation within the policy diffusion literature, we then argue that the external impact of CBAM will depend on the institutional capacity of countries. We focus on the expected experience of developing countries. We further consider how policies like CBAM can be augmented in a way to facilitate institutional changes and technological advances in developing countries. For example, revenue raised from CBAM, or through other EU budgetary mechanisms, can be targeted to developing countries and in ways that do not undermine the underlying carbon reducing incentives induced by these border adjustment mechanisms. In particular, we consider the role of technical assistance funding for countries with low institutional capacity to enact carbon pricing and a competitive grant fund that countries could apply to for things like technology transfer. We further discuss how this proposal can crowd in the political-economy interests of European firms and organizations. If other countries like the United States adopt Border Adjustment Mechanisms, similar arguments apply.

[1] Feedback welcome. Very much a first draft. Our thanks to Catherine Wolfram and Luis Garicano for early conversations. Send comments to Dustin Tingley, dtingley@g.harvard.edu

Introduction

In October 2023, the European Union formally adopted its Carbon Border Adjustment Mechanism (CBAM), which levies import taxes on carbon-intensive goods to account for emissions produced during manufacturing. In its transitional phase until the policy's complete rollout in 2026, the CBAM serves as a complement to the EU Emissions Trading System (ETS), a cap-and-trade framework that promotes domestic industrial decarbonization. Together, the CBAM and ETS encourage companies both within and outside Europe to reduce reliance on carbon-intensive processes. While ETS aims to create financial incentives for greener domestic production methods, the CBAM subjects foreign manufacturers to similar taxes, disincentivizing "carbon leakage," whereby companies transfer production overseas to avoid emissions regulations, and exerting similar pressures on foreign importers to curb emissions. The combined mechanism seeks to drive global progress towards carbon neutrality across industrial supply chains connecting Europe internationally (EP and Council 2023, CBAM Guidance 2023).

The CBAM will require companies importing from non-EU countries to purchase and surrender certificates for relevant imports, with obligations determined according to the EU ETS carbon price. Fees are intended to be equivalent under the CBAM and ETS. However, importers can deduct any carbon taxes already paid on the producing country of origin, providing an incentive for non-EU countries to adopt their own internal carbon pricing schemes to collect revenues that would otherwise be paid to EU states. Importers are responsible for collecting data on embedded emissions associated with the relevant production process from third-party manufacturers, including manufacturers of upstream precursor materials. As of now, the EU has defined a limited number of carbon-intensive products subject to the CBAM including cement, electricity, Weiron and steel, aluminum, hydrogen, and fertilizers. During the transitional phase, importers are required to report the quantity of CBAM goods imported each quarter, along with the total embedded emissions of their products, covering direct and indirect CO_2 emissions per ton of goods associated with the manufacturing process. Once the CBAM is fully implemented in 2026, countries will be required to obtain authorization to import CBAM goods (EP and Council 2023, CBAM Guidance 2023).

Initial projections suggest that by 2028, the CBAM will generate approximately €1.5 billion in annual revenues (EC 2023). This revenue is modest compared to the ETS, which generated €33 billion in revenues in 2022 alone (EC 2023).This difference is by design, as the policy allows importing companies to deduct carbon emissions contributions paid in the country of origin. As such, the policy also incentivizes non-EU states to adopt their own carbon pricing schemes to capture CBAM tax revenues. Importantly, the design of the CBAM specifically encourages non-EU countries to set their carbon emissions fee schedules equivalent to or higher than EU ETS prices. That is, companies importing from countries that do not collect carbon emissions fees will be subject to the full ETS carbon price, whereas companies with products originating in countries that levy a lower carbon fee schedule than the ETS encounter ETS charges minus their origin price. Companies importing from countries with an equivalent or higher carbon price compared to the ETS are exempt from additional fees. In effect, if all states

with importing firms carbon pricing schemes greater than or equal to ETS fee schedules, the CBAM instrument would raise no revenue for the EU.

Countries are preparing for the CBAM in a variety of ways that we discuss below. Because the CBAM allows for manufacturers to deduct fees collected in the country of origin to avoid double-taxation on the same product, the CBAM represents an initial step toward creating a global “climate club” by providing rewards for states that enact domestic carbon pricing schemes and levying a punishment, in the form of CBAM fees, for states that fail to take similar actions (Szulecki 2023).

Based on the volume of trade flows, the CBAM will initially have the largest impacts on larger developed economies including the UK, Russia, and China. However, the policy also places considerable constraints on developing countries, particularly those which lack sufficient capacity to respond to the legislative requirements in the near term. Debates during the policy development and amendment phases acknowledged the challenges that the CBAM might place on developing countries, and in particular least developed countries (LDCs). Earlier drafts of the policy text by the European Parliament included proposals to exempt LDCs from the tax or to use CBAM revenues to support external countries, and in particular LDCs, with decarbonization efforts. Unfortunately, explicit discussion of exemption or financing for LDCs was not included in the final legislative text.

The CBAM represents but one policy tool developed by the EU to achieve its ambitious climate neutrality goals. Not only has the CBAM stimulated discussions on carbon pricing in countries outside the EU, it has also inspired new policy proposals such as a Methane Border Adjustment Mechanism (MBAM). Such a policy would target harmful greenhouse gas emissions reduction from oil and gas sectors in particular, further incentivizing the adoption of low-cost or even negative-cost mitigation interventions (Clausing 2023).

Unsurprisingly policy tools like carbon border adjustment face a slew of complicated implementation questions, including the “scope of applicability (i.e., which policies, goods, sectors, countries), the methodology for assessing the carbon content of products, the type and price of the adjustment, scenarios requiring modification, and how the resulting revenues will be used” (Corvino 2023). This paper focuses on implications of CBAM for developing countries with a particular focus on how funds from CBAM–or funds made available alongside CBAM–can be used to support developing countries exporting to the European Union.

This paper has multiple goals. First, we develop a conceptual framework for how to think about what CBAM is and how it aims to work at the international level. In particular, we situate CBAM within a broader literature on policy diffusion, wherein other countries adopt carbon pricing as a result of the EU’s trade policy. Second, we focus on the context of developing economies and the challenges that they will face with CBAM. In particular, we embed CBAM within a discussion of institutional capacity. That is, the ability to comply with CBAM, or even adopt carbon pricing systems, is contingent on the institutional capacity of exporting countries. We argue that institutional capacity issues are crucial for understanding policy diffusion. We provide a series of

short country case studies to this effect. Third, drawing on the political economy of foreign aid and climate finance literature, we focus on how and why the EU could support developing countries as part of the CBAM policy in serious and politically viable ways. A final section concludes with some recent public opinion data that future drafts will build on.

Making BAM's go Bam: Policy Diffusion

Policy diffusion, or the process by which policies spread across various jurisdictions, has been studied across a wide range of policy contexts. Early studies analyzed the dissemination of policies across local and intrastate boundaries. Scholars have since applied these same insights internationally to understand how policies migrate across national borders. We draw from Marsh and Sharman's (2009) framework in differentiating policy diffusion, or the indirect proliferation of policies, from policy transfer, the active and deliberate exchange of policy knowledge and practices between entities. The breadth of international policy diffusion spans several domains, including democratization, trade policy, labor rights, and, most relevant to the current discussion, environmental regulation.

Several mechanisms have been proposed to explain how policy diffusion occurs. Simmons, Dobbin and Garett's (2006) analysis of the proliferation of economic liberalism during the late 20th century identifies four primary channels through which policies may become adopted across international contexts: coercion, competition, learning, and emulation. Coercion and competition focus on relations between actors to explain whether and when policy diffusion occurs. Coercion underscores the impact of power differentials, suggesting that weaker actors may adopt policies under pressure from more dominant entities. Competition assumes instead that actors willingly adopt policies to gain an equal or greater advantage vis-a-vis their rivals. Learning posits that actors independently assess the perceived successes and failures from peers before deciding whether to adopt the same policies on their own. Nicholson-Crotty and Carley (2016) extend this further by arguing that states evaluate their ability to implement policy innovations before deciding whether to adopt, incorporating state capacity as a necessary condition for policy diffusion to occur. As such, states may not only look to the success of external policy outcomes, but also whether the institutional conditions of the external state are similar enough to their own to suggest that the adopting state can reproduce the policy implementation. Finally, emulation describes the process by which identity and norms influence actors' decisions to enact policies in alignment with those they perceive as peers, driven by a desire for conformity or legitimacy.

These mechanisms map well onto extant studies of environmental policy diffusion. For example, David Vogel's (1995) early analysis of the gradual intensification of environmental regulations, both within US states and globally, identifies mechanisms that can be classified as competition and coercion to explain what he terms the "California effect." By enhancing environmental standards, domestic firms may gain a competitive advantage, especially if they adapt more effectively than their foreign counterparts. Moreover, powerful governments can extend their regulations to weaker states reliant on their markets. This dynamic was observed in the context

of strengthening vehicle emissions standards, which originated in California and subsequently became adopted across the US and in many other developed countries. Saikawa (2013) builds on this analysis with the inclusion of developing countries and finds evidence suggesting that competitive market forces indeed drive regulatory diffusion. Ovodenko and Keohane (2012) observe the diffusion of international environmental institutions such as emissions trading schemes, focusing primarily on the mechanism of learning. They argue that states are inclined to adopt external policies particularly when the nature of the problem that the originator and adopter faces is similar between contexts, and when the earlier institutional innovation has demonstrated effectiveness.

We expect that the diffusion of global carbon border pricing schemes will be heavily influenced by coercion and competition in particular. The enactment of CBAM by the EU imposes requirements on firms from non-EU countries to develop carbon emissions measurement systems. Without these systems, foreign firms could face restricted access to one of the largest global markets. Furthermore, the new fees should incentivize foreign firms to adapt manufacturing processes that limit carbon emissions to ensure that their products remain competitive in the EU, as well as any additional markets that choose to adopt their own carbon border pricing schemes. This, along with the stipulation that foreign firms may deduct carbon emissions prices paid in the originating country, should strengthen support in non-EU countries to adopt their own carbon pricing schemes to claim revenues.

Despite these pressures, some states are likely to wait and evaluate the effectiveness of the EU's implementation of CBAM prior to adopting analogous policies. The establishment of a CBAM requires significant investments by states to develop the necessary infrastructure to monitor carbon emissions and collect assessed emissions fees from domestic and international producers. Should the EU's implementation of CBAM prove effective, states with institutional capacities similar to EU countries will be more likely to adopt complementary policies on their own after observing the policy's success. For non-EU countries with more limited state capacity, policy learning will require collaboration and technical assistance for effective diffusion to take place. The EU's domestic ETS was developed, adjusted, and implemented over a 15 year period before reaching its current form in 2020. It is essential that institutional arrangements are created to facilitate information sharing between the EU and non-EU governments on lessons learned during the lengthy policy planning and revision processes.[2] Previous versions of the proposed legislative text for the CBAM explicitly acknowledged the challenges that the policy imposed on external countries, with a particular focus on least-developed countries. Proposals

[2] Previous scholars, such as Garett and Jansa (2015), have also noted the role of interest groups in policy diffusion through agenda-setting and lobbying efforts. In the context of carbon emissions pricing, interest groups may similarly play a pivotal role in facilitating technical assistance and information sharing to build state capacity for MRV systems in non-EU countries. Notably, several multinational professional services firms have initiated MRV training products targeted toward these countries. This development could lead to distributive implications, particularly if the privatization of technical assistance makes such services cost-prohibitive for states with limited capacity or resources, which are precisely those that stand to benefit the most from this assistance. Some publicly-funded NGOs, such as Changing Transport, have taken initiative to provide more accessible resources to facilitate capacity-building efforts.

to use funds to support green transition efforts in least-developed countries were ultimately not included in the final legislative text.

CBAM Impacts

Cross-national Aggregate CBAM Predicted Incidence

The implementation of CBAM will have a significant impact on EU trade partners throughout the world. In absolute terms, Russia, China, Turkey, Ukraine, South Korea, and India will pay the greatest costs of CBAM due to their high volume of trade with the EU (Magacho, Espagne, and Godin 2023, Brandi 2021). However, it is predicted that smaller, less-developed countries' with disproportionately large EU export markets for CBAM-regulated products will face the greatest consequences. A greater proportion of these countries' exports will be affected by CBAM compared to larger more diverse economies, and they will face greater difficulty with compliance and implementation. Countries in Africa and the Balkans are predicted to face the most significant incidence due to CBAM (Eicke et al. 2021). The extent to which CBAM impacts countries is driven by two factors: the significance of the EU export market for that country and the intensity of CO_2 emissions from these exports (UNCTAD 2021).

The severity of the impact of CBAM will vary significantly by country depending on their dependence on EU markets (Magacho, Espagne, and Godin 2023, Brandi 2021). While Balkan and African countries export a smaller dollar amount, they face severe consequences due to a significant proportion of their exports going to the EU market. Over 5% of CBAM-regulated exports from Bosnia Herzegovina, Ukraine, and Serbia are sent to the EU (Magacho, Espagne, and Godin 2023). The situation is similar for many African countries where the EU is the largest export destination for commodities, accounting for 26% of African exports of fertilizer, 16% of iron and steel, 12% of cement, and 12% of aluminum (Guepie et al. 2023). Because of the size of EU trade with these countries, both in dollar amount and proportionality, changes in tariffs on CBAM-regulated exports can have a significant negative impact on both the specific CBAM product sectors and the country's economic well-being.

The intensity of CO_2e emissions from a given country's production also plays an important role in the severity of the consequences of CBAM. Countries with a higher intensity of CO_2e emissions in the production of their exports will experience a more significant negative impact than countries with lower CO_2e emissions intensity. For example, under CBAM, Chinese and Russian steel will become less competitive due to their CO_2e-intensive production, while Turkish and Indian steel will become more attractive because their production is less carbon-intensive (UNCTAD 2021). In most cases, less developed countries will lose because middle and more developed countries have a greater capacity for less carbon-intensive production (Magacho, Espagne, and Godin 2023). Less-developed countries will be at a significant disadvantage and face greater consequences because they are not able to keep up with lowering emissions (Zimmer and Holzhausen 2020). Less developed countries will also face relatively greater costs associated with lower capacity in monitoring, tracking, and shift infrastructure (Eicke et al. 2021).

CBAM will likely cause both positive and negative shifts in trade and production across countries. Some analyses suggest that CBAM may cause a drop in the import and export of CBAM-regulated products by an average of 10% (Magacho, Espagne, and Godin 2023; and Kuusi et al. 2020). This will likely cause an inward shift towards domestic markets in both the EU and previously EU exporting countries. Larger and more advanced economies, such as China, will have a greater capacity to adjust to these shifts due to “stronger internal markets that decrease the importance of EU trade” compared to smaller, less developed countries (Eicke et al. 2021). However, it is possible that smaller economies, such as countries in Africa and The Balkans, will shift exports to markets such as China and India, which will then benefit from the increased competitiveness in imports. Less developed countries might also experience a positive shift in the allocation of factors of production from other countries looking for cheaper places to produce critical materials (Guepie et al. 2023). The constraints of CBAM may also create shifts towards greener production and exports. For example African agricultural and energy product imports to the EU are expected to increase due to the shift in comparative advantage (Guepie et al. 2023).

Use of CBAM Funds

During debates over the policy design of the CBAM, three main proposals emerged regarding how revenues raised by the policy should be used. The first proposal suggested channeling the funds collected back to the governments of countries with firms contributing into CBAM. In particular, the initial draft published by the Committee on Environment, Public Health, and Food Safety in the European Parliament initially recommended using CBAM revenues to assist external countries, particularly LDCs, in their efforts to enact their own policies to address climate change. Disagreement during the negotiation process primarily concerned administrative nuances regarding whether the present legislation could create financing schemes that impact the formal EU budget (EP, Committee on Budgets 2022). Although explicit language directing CBAM revenues to support climate mitigation efforts in LDCs was present in the European Parliament's adopted text, it was ultimately omitted during interinstitutional negotiations between the European Parliament and the Council of the EU (EP 2022, Council of the EU 2023). Approved legislation includes some mention of the importance of supporting LDCs, but refrains from specifying whether funds raised by CBAM will be allocated toward these efforts (EP and Council 2023).

The second proposal for the use of CBAM funds argued that the revenues could be used to help energy community transitions within the European Union through the Social Climate Fund (EC 2021). The third proposal advocated for using the funds to offset debt incurred from COVID-era EU budgetary support policies, namely the NextGenerationEU program.[3] A legislative proposal

[3]See Tax Foundation and from the EC Q&A.
"As part of the 2020 agreement on the long-term EU budget and NextGenerationEU, the European Parliament, EU Member States in the Council and the Commission agreed on a roadmap to introduce new own resources to the budget to support the reimbursement of the NextGeneration borrowing." "The Commission proposes a mechanism where CBAM revenue is collected by the competent authority of the Member State where the declarant is located.

formalizing a new own resource for revenues collected from the CBAM is currently under development (EP 2023). The latest draft as of May 2024 proposes for 25% of the revenues raised from CBAM certificates to be retained by the collecting member state, while the remaining 75% of revenues would be contributed to the EU-wide own resource (European Commission 2023). Precise allocations for the own resource disbursements have yet to be determined, although existing proposals focus primarily on financing support for internal programs such as the Innovation Fund, Social Climate Fund, and the NextGenerationEU recovery instrument, with no mention of targeted support for external countries or LDCs (EP and Council 2023, European Commission 2021).

Country Preparation

EU trading partners must build capacity for monitoring and reporting in order to comply with CBAM. Producers must be able to account for the amount of direct and indirect CO_2e emissions produced in the manufacturing of CBAM-regulated products. Many countries do not currently have this type of monitoring and reporting capacity. Due to this deficit, CBAM includes a transitional period to give producers time to design, implement, and test their ability to monitor and report CBAM data before the roll-out of the full mechanism in 2026 (EU 2023). While monitoring and reporting are firm-level processes, they are heavily influenced by the existing national infrastructure and capacity (Eicke et al. 2021). Unfortunately, building capacity for monitoring and reporting is complex and expensive. As a result, many countries, especially less developed ones, will struggle to build the needed infrastructure to prepare for and respond to CBAM (Baker et al. 2022).

Measuring and reporting CO_2e emissions begins with defining the parameters that must be reported. This is often more complex than it appears. Reports must include information on direct emissions from fuel and materials, direct emissions from heat flows, waste gasses (if relevant), electricity produced (if relevant), indirect emissions related to electricity consumption, and precursor consumption (if relevant) (EU 2023, 2). It can be difficult for a producer to know what information must be collected, let alone have the ability to gather that information. If producers cannot provide adequate emissions assessments, default values are used. The default value is based on the ten worst-performing producers in the EU (Gore, 2021). In sum, this means producers must prepare infrastructure such as creating adequate data systems, training personnel, and building data processing capacity if they hope to pay accurate costs.

Measuring direct CO_2e emissions from fuels and materials is an illustrative example of the complexities and costs of monitoring. Producers can choose one of three methods for monitoring: the standard method, mass balance, or establishing a continuous emissions monitoring system. The standard method and mass balance are calculation-based methods (EU 2023, 2). In the standard method, a producer calculates an emissions factor and multiplies that

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Member States retain 25% of the CBAM revenues. The remaining 75% are made available to the EU budget by Member States once per year (in February) following the Commission's call for funds."

by the quantity of inputs in production. For mass balance, a producer determines the carbon content of the input and output materials, determines the difference between the two, and sums these values across production (EU 2023, 2). These methods require complex data systems, high data processing capacity, and well-trained personnel. In the continuous emissions monitoring approach, greenhouse gas emissions are measured directly from the production stacks or through an extractive process (EU 2023, 2). While less data-intensive, this method requires expensive equipment for measurement, data processing and management systems, and highly trained personnel to maintain the equipment and interpret and report the collected data. Reports with this information will be required quarterly. Establishing and maintaining the infrastructure needed for monitoring and reporting will be a manageable problem in higher capacity states but could be prohibitively expensive and out of reach in many less developed countries (Ülgen 2023).

While firms are ultimately responsible for complying with CBAM, the county they reside in plays a vital role in determining its success. Governments can establish laws and policies to encourage and incentivize compliance. For example, China is preparing by implementing policies such as more targeted carbon emission verification guidelines (Yan and Yuan 2023).

Many countries have already implemented a carbon tax or emissions trading system (ETS) or have one under consideration. For example, Ukraine implemented an ETS in 2021, and Turkey currently has one under consideration (World Bank 2023). In 2017, China implemented an ETS for electricity production and will likely explore similar options for other CBAM-regulated products (IEA 2020). Other large emitters, such as the US, Japan, and the UK, have announced they are researching CBAM mechanisms (Yan and Yuan 2023). Unfortunately, there is a large discrepancy between more developed and less developed countries regarding establishing carbon taxes. Almost all current carbon pricing mechanisms are in high-income countries. While CBAM will have a sizable negative impact on African countries, only South Africa has implemented a carbon tax, and Morocco, Senegal, Nigeria, Gabon, and Botswana are the only ones with an ETS or carbon tax under consideration (World Bank 2023). In addition, even when a low or middle-income country such as South Africa implements a carbon tax, the carbon price is low compared to the prices set by the EU, which means producers will still pay a high import tax to make up the difference (Pleeck and Mitchell, 2023).

Countries can also prepare for CBAM by considering and implementing policies to encourage greener production of CBAM-regulated products. As emissions decrease, so will the CBAM costs. Thus, it is advantageous for governments to encourage their industries to become greener. This approach is especially relevant if more countries implement CBAM policies, as there will be fewer alternative exportation locations without a carbon tax. Coupling carbon trading and tax systems with regulation and subsidies could significantly benefit countries responding to CBAM. Because the CBAM transition period has just begun, we have yet to see countries implement climate policies in response, but these will likely arise with more time.

Institutional Capacity

Carbon pricing policies will require resources and political will. Establishing these policies in high-capacity states will be much easier than in many less developed countries that may be left behind. As such, state institutional capacity is a significant determinant in a country's ability to effectively respond to the new European Union carbon border adjustment mechanism. Prior research suggests that a country's level of institutional capacity plays a central role in determining the success of environmental and climate change-related policies (Laird and Stefes 2009; Lipp 2007). State capacity constraints the available policy options and the ability to execute policy decisions (Hughes and Urpelainen 2015). As countries work to implement the needed institutions to comply with CBAM and explore domestic policies to avoid CBAM fees, they will be limited by their existing institutional capacity. While institutional capacity may feel inevitable in many countries, the ability of the central and local government to identify and implement its objectives is lacking in many others (Acemoglu et al 2015). It is likely that cleavages in the negative impacts of CBAM will arise along the lines of state institutional capacity.

We broadly define state institutional capacity as the state's ability to implement and execute its goals and policies. In this broad definition, institutional capacity focuses on the ability of the state to identify objectives and adequately address them (Cingolani 2013). This encompasses many other definitions such as the presence of state functionaries and agencies (Mann 1986; Soifer 2008), the ability to deliver benefits and services to households and firms (Besley and Persson, 2011), the ability to work through local state apparatus (Henn 2023), capability for coercive and extractive activities (North 1990; Tilly 1990) and many others. While there are many ways to measure and analyze state institutional capacity (Hanson and Sigman 2021), we consider institutional capacity to address climate change and environmental issues in a framework of five governance levels: 1) the individual, 2) organizational capability, 3) national systems, 4) public governance, and 5) broader society (OECD 2003).

Many attributes contribute to institutional capacity at each of these five levels. On the individual level, capacity includes issues such as sufficiently trained personnel, adequate resources provided for individuals, and individual-level commitment to the organization's success (OECD 2003). Organizational capacity focuses on organizations having sufficient management capacity and resources to achieve objectives. National system capacity goes hand in hand with this as it is concerned with coordinating and managing programs and systems across institutions. Public governance establishes the environment in which individuals and organizations function. This can include establishing laws and regulations, ensuring the rule of law, and managing international coordination. Finally, institutional capacity at the societal level is concerned with social norms, values, and practices around a given issue (OECD 2003).

At the individual level the role of government capacity is in creating an environment that supports the needed personnel for CBAM compliance. Countries must have an education system and labor market that create opportunities for individuals to gain the technical expertise needed for compliance with CBAM such as collecting, verifying, and maintaining emissions

data. This leads to the need for organizational and system level capacity. While the government itself is not responsible for CBAM compliance, it is responsible for creating a broader environment that supports the firms in complying. For example, if a country has low education capacity, it will struggle to comply with CBAM because firms lack the needed personnel. Firms need access to technically trained individuals who are created through high-capacity organizations and systems put in place by the government. This is only one example of the organizational and system capacity requirements. Other examples include reliable public services, transportation infrastructure, and supply chain networks.

Firms' actions to comply with CBAM heavily depend on the legal and economic context created by public governance. Governments are responsible for establishing laws and policies that support firm compliance with CBAM, if not pro-environmental actions by firms. For example, governments can incentivize firms to become "greener" and decrease carbon emissions, which will decrease the cost of CBAM. Governments must also create institutions such as environmental protection agencies to support their laws and policies. These institutions perform critical functions such as providing technical and bureaucratic support and maintaining the rule of law to enforce the laws and policies. Creating these complex laws and institutions is very difficult in cases of low capacity (Gazmararian and Tingley 2024). CBAM also requires that countries have the capacity for high-level interaction and cooperation with the EU. Without public governance capacity, it will be very difficult for firms to comply with CBAM.

At the highest level, governments play a role in shaping the broader societal environment around climate change. Government policy both informs and is informed by societal knowledge about climate change. This is particularly relevant in regions with low levels of public climate-change knowledge. It is difficult to develop climate governance capacity without public support. If there is little knowledge about climate change, there will be little support for pro-environment laws and policies. For example, many sub-Saharan African countries have low-levels of public awareness around climate-change which leads to low levels of demand for climate action (Torsu and Krönke 2023; Simpson et al 2021). Without such laws CBAM compliance will be more difficult and expensive because firms will have less government support.

The European Union Emission Trading System (EU ETS) offers an illustrative example of the high institutional capacity needs of a carbon trading system. This is helpful both as a general illustration of institutional capacity and as a literal example of the type of policies many governments may consider implementing in response to CBAM. The EU ETS functions as a 'cap and trade' system. Every year, a cap is set for the total amount of allowed greenhouse gas emissions. Producers are then given an amount of free emission allowance, and all are permitted to buy more on the EU carbon market. In addition, if a producer has too much or too little carbon allowance, they can trade with other producers to obtain the needed amount (European Commission 2023). Some of the most important requirements for the system to function are the ability to accurately monitor emissions, the administrative ability to assign and track carbon credits, a reliable market to buy and trade carbon credits, and the capacity to enforce consequences for non-compliance.

The EU ETS requires high institutional capacity at all five levels discussed above. At the individual level, the EU has a labor market to support the system. The EU can access individuals with skills ranging from emission monitoring and engineering to financial management and law (Partnership for Market Readiness 2022). Organizationally and systemically, the EU has the management capabilities to administer a highly complex trading system efficiently and accurately and to adapt when needed (De Perthuis and Trotignon 2014). For example, during the Phase III reform of the ETS, the system shifted from an aggregated national-level system to a centralized EU system (Verde et al. 2021).

With regard to public governance, the EU is highly receptive to the policy needs of the ETS and has the ability and latitude to respond when adjustments are needed. The EU was able to respond to the long-term fallout from the 2008 financial crisis with a series of legislation, including establishing the Market Stability Reserve in response to surplus allowance build-up (European Commission; Verde et al. 2021). Finally, while it is nuanced, there are high levels of knowledge and concern about climate change and awareness of the ETS among EU citizens which provides societal support (McCright, Dunlap, and Marquart-Pyatt 2015; Wei et al. 2021). Institutional capacity at each level is incredibly expensive, both monetarily and politically. This is in large part why, as noted earlier, most carbon tax systems are in high-income/high-capacity states.

Countries face many challenges in building and maintaining institutional capacity for a greener economy. Many obstacles are particularly pivotal for effective climate action, such as establishing credibility, securing access to resources, and enhancing knowledge and technology transfer capabilities. Gazmararian and Tingley (2023; 2024) underscore the critical role of credibility in green transitions, highlighting that a credibility deficit can significantly impair institutional capacity. Similarly, the availability of resources emerges as a crucial determinant, with studies indicating that countries with greater economic development or access to green financing exhibit an enhanced capacity for implementing green initiatives (Gaikwad, Genovese, & Tingley, 2023; Haque Rashid, 2022; Shahbaz & Sarıgül, 2021). Transferring knowledge and technology is another critical element of building sustainable institutional capacity, yet many countries struggle with this (Ockwell et al. 2010; Popp 2012). These difficulties are often compounded by broader issues inherent to institution building in many developing regions, such as corruption, unresponsive governance, poverty, illegitimacy, instability, violence, and more (De Vaal & Ebben, 2011; Ebohon, Field, & Ford, 1997; Hutchison & Johnson, 2011; Wubneh, 2003).

Country Case Studies

The implementation of CBAM will have varying effects across countries. The severity of the negative impacts will depend on factors such as economic development, institutional capacity, and reliance on EU markets. We intend to explore this by analyzing three short case studies: Mozambique, Morocco, and Turkey. These countries were chosen due to their high exposure to CBAM and their varying levels of economic development and institutional capacity (Magacho et

al., 2023; Ülgen, 2023). Each of these countries faces unique challenges as they aim to comply with and adapt to CBAM. For example, Mozambique has low institutional capacity and will likely struggle to comply with CBAM. This contrasts with Morocco, which will likely transition towards a greener economy, or Turkey, which intends to implement its own emissions trading system in response to CBAM. In these short case studies, we hope to demonstrate both the potential absolute impact of CBAM and the distribution effects across countries.

Mozambique

Mozambique and the EU have deep political and economic ties. The two cooperate on various issues, ranging from initiatives to support democracy to military training programs (UNDP 2024; EEAS 2022). In recent years, climate change and environmental sustainability have become significant priorities in their interactions (Pichon 2023). The foundation for Mozambique-EU relations is the Samoa Agreement. This agreement outlines the goals of EU relations with Organization of African, Caribbean, and Pacific States (OACPS) members including Mozambique (Pichon 2023). Two of the six goals outlined in this agreement are sustainable economic growth and development and environmental sustainability and climate change (European Union and Organisation of African, Caribbean and Pacific States 2021). In line with working towards these goals, the 2021-2027 EU-Mozambique strategic plan outlines "Green Growth" as one of three main priorities. The plan designates €150 million between 2021 and 2024 towards green growth initiatives such as enhancing access to renewable energy and protecting biodiversity (European Commission's Directorate-General for International Partnerships 2021).

In terms of economic relations the EU is Mozambique's second-largest trading partner and the second-largest export market for Mozambique goods. The EU accounts for approximately 14% of all Mozambique trade, and in 2021, total trade with the EU amounted to €2,385 million (GSP Hub). EU imports into Mozambique constitute a tiny percent of this trade (EU 2019). The high Mozambique to EU export level is largely due to multilateral Economic Partnership Agreements (EPAs). The EU and Southern Africa Development Community (SADC) signed an EPA known as the "Everything but Arms" agreement (EBA), which allows Mozambique to export all goods but arms and ammunition into the EU without tariffs (EEAS 2024). The benefits of EBA will decrease immediately with the implementation of CBAM, as about 20 percent of Mozambique's exports are covered by CBAM (Baker et al. 2021).

The EU's CBAM is poised to have significant effects on Mozambique’s economy, particularly in its aluminum industry. Mozambique hosts one of the world's largest smelters and exports 97% of its aluminum to the EU making up almost all CBAM-covered exports from Mozambique (Machado 2023, World Bank Group 2024; Baker et al. 2021). Given the industry's size and heavy reliance on the EU market, estimates suggest that the impact of CBAM on Mozambique’s GDP could range from 0.17 percent (Guepie et al. 2023) to 2.5 percent (Xiaobei, Fan, & Jun 2022). This only accounts for CBAM in its current state. If CBAM is expanded to cover more products, Mozambique will encounter increasingly severe repercussions.

One way countries can adapt to CBAM is to become more reliant on greener exports to the EU. This likely means a turn towards natural gas and mineral reserves for Mozambique. In 2010, Mozambique discovered massive natural gas reserves. This discovery led to a US$20 billion investment in liquid natural gas (LNG) production, and investment is only expected to increase (Mozambique LNG 2024; World Bank 2022). While natural gas produces GHG emissions, its emissions are lower than alternatives such as coal and oil (IEA 2024). This is particularly appealing to the EU in the face of energy security crises like the one triggered by the Russian invasion of Ukraine (European Commission 2022).

Mozambique also has vast mineral reserves critical for the transition to clean energy. It is the third largest producer of natural graphite and has rich stores of ilmenite, iron ore, vanadium, titanium, copper, gold, tantalum, and bauxite (World Bank 2022, Pg. 14). As the world seeks cleaner energy solutions, the demand for these resources will continue to rise. While mineral reserves may offer fewer economic opportunities in absolute terms, their diversity and resilience in the face of the green transition make them a vital alternative source for Mozambique's exports (World Bank 2022).

Mozambique faces significant challenges in adapting to CBAM due to its limited institutional capacity. The country suffers from issues of corruption and insecurity, which have weakened the government's institutional capacity at all levels (United States Department of State and Bureau of Democracy, 2023). It also has a weak civil society and poor public support for and trust in government institutions (U.S. Mission Maputo 2023). These and other factors make it difficult for the government to adapt to CBAM. The recently passed LNG Sovereign Wealth Fund provides one example of the capacity needed for adaptation (Cornelius 2023). For this fund to be successful, Mozambique needs access to individuals with adequate management skills, organizational capacity to coordinate and cooperate across institutions and firms, government responsiveness to issues such as transparency and corruption, and public confidence in the system (Sarmento 2024). Given the current state of institutional capacity, it seems unlikely that Mozambique will be able to achieve these goals (U.S. Mission Maputo 2023).

Mozambique also faces significant challenges in complying with CBAM requirements. A major dimension of Mozambique's vulnerability to CBAM is its lack of institutional capacity to monitor, report, and verify the emissions of its products (Eicke et al 2021). Compliance with CBAM requires technical expertise in reporting, organizational capacity for coordination and management, and supportive institutional systems. Unfortunately, given Mozambique's history, it seems unlikely that it will be able to meet these requirements. For instance, the country has missed several deadlines for reporting to the United Nations Framework Convention on Climate Change (UNFCCC) and has expressed the need for capacity-building. The lack of institutional capacity leaves the least developed countries such as Mozambique disproportionately exposed to CBAM (Baufils et al. 2023; Lowe 2021).

Morocco

Morocco serves as a key political and economic ally of the EU. This relationship is underscored by Morocco’s designation as a partner country with “advanced status,” a recognition granted first

in 2008 and reinforced in 2019 with the adoption of a joint political declaration detailing plans for their continued partnership (Council of EU 2019). Cooperation over environmental policy and combating climate change have been cited as key priorities in the partnership, emphasized in the joint political declaration and EU-Morocco Green Partnership announced in 2022. This partnership marked EU's first joint initiative with a partner country as part of the Green New Deal, which pledges €150 million investment from the EU to support green transition of Morocco's agriculture/forestry industries (EC 2023-2).

Morocco's role as the EU's primary trading partner in the Southern Neighborhood highlights the deep economic interdependence between the two regions.[4] In 2022, the EU comprised nearly half (49%) of Morocco's total merchandise trade and 56% of the country's total exports (EC 2023). As a global leader in phosphate production, holding over 70% of the world's reserves and supplying about half of the EU's phosphate needs (U.S. Geological Survey, 2022; European Parliament, 2023), Morocco's chemical derivatives sector is expected to be particularly vulnerable to the CBAM. Despite this, Morocco's sustained economic and institutional development, particularly in climate policy, in recent years suggest that the country may be well-positioned to adapt to the EU's carbon pricing regime.

Indeed, Morocco has already begun developing climate policies to encourage green transition, particularly for its phosphates industry. In 2023, the state-owned firm that supervises phosphate production in Morocco, Office Cherifien des Phosphates (OCP), committed to achieving carbon neutrality by 2040, with an interim goal of reducing carbon emissions by 50% by 2025 (OCP 2023). The Moroccan parliament has also introduced legislation proposing the introduction of its own domestic carbon tax, which could reduce firm exposure to CBAM if successfully implemented (Eljechtimi 2021).

Morocco's efforts to support the United Nations Framework Convention on Climate Change (UNFCCC) also indicate efforts to reduce the environmental impact of its carbon-intensive industries. The country's National Determined Contributions (NDC) report in 2021 included modest objectives to reduce fossil fuel use in cement production and limiting carbon emissions associated with phosphate mining (NDC 2021). An online monitoring, reporting, and verification (MRV) platform is currently under development with technical consultation support from the UNFCCC and other international NGOs. The MRV intends to track industrial greenhouse gas emissions as well as monitoring for its mitigation efforts, although specific methodology for estimating emissions and progress indicators have not been defined. Morocco has identified areas in need of assistance from international partners, including support for human resources, data collection, and regulatory framework development (UNFCCC 2022-2).

Despite the challenges posed by path dependence in Morocco's carbon-intensive industries, the country is also well-positioned to become a leader in renewable energy production, and green hydrogen production in particular. OCP has announced a significant investment of $13 billion to

[4] The EU also has geopolitical interests in maintaining economic stability in Morocco, as the country's geographic proximity to the EU and its role as a buffer state from security threats in the Sahel underscore Morocco's significance as a key security interest (Council of the EU 2019)

transition to 100% renewable energy usage in its facilities by 2027 (OCP 2022). The European Bank for Reconstruction and Development (EBRD) recently announced an investment strategy for Moroccan hydrogen development (EBRD 2024), complementing the country's pledge to increase green hydrogen production through its National Roadmap for Hydrogen Energy (MEM 2019). Morocco has also negotiated bilateral agreements with Germany, Portugal, and the Netherlands stating intent to collaborate on research and investment relating to green hydrogen production (Government of Morocco 2020, 2021, Government of Netherlands 2023).

Türkiye

The EU and Türkiye have a complex history of political and economic interactions. Central to modern EU-Türkiye relations is the EU's coercive capacity driven by Türkiye's desire to join the union, a process which was initiated in 1987 but was halted in 2018 due to EU concerns over issues such as democracy, human rights, and corruption in the country's judicial system (EEAS 2021b, Toygür 2022; Ahmad Madatali 2021). Although the halted negotiations have strained bilateral relations, Türkiye still works to align itself with the EU on key issues, such as climate change (European Parliament 2021; EU Directorate-General for Climate Action 2021). This alignment was demonstrated in 2021 when Türkiye signed the Paris Climate Agreement and committed to carbon neutrality by 2053 in line with the EU's Fit for 55 package (EU Directorate-General for Climate Action 2021).

Economically, the EU is the largest export market for Türkiye and accounted for 41 percent of all Turkish exports in 2022 (European Commission 2024a). Türkiye is also the EU's seventh largest trade partner, making up 3.6 percent of total EU trade in 2022, with total volumes estimated at €198.1 billion that year (European Commission 2024a). The largest sectors of Turkish imports are textiles, transportation equipment, base metals and articles, and machinery and appliances. The EU-Türkiye customs union agreement largely enables this level of economic integration. This agreement allows for the free trade of all industrial goods and preferential agreements for agriculture, coal, and steel, which Türkiye greatly benefits from (European Commission 2024b). CBAM is expected to constrain many of the benefits previously ascribed by the customs union agreement.

Türkiye is one of the most CBAM-exposed countries (Magacho et al., 2023; Acar, Aşıcı, and Yeldan, 2021; Long et al., 2023). Unlike Mozambique and Morocco, which primarily face a threat to one industry (aluminum and fertilizer, respectively), Türkiye will experience sizable impacts on all five CBAM-regulated industries (Magacho et al. 2023). Türkiye is the second largest supplier of steel to the EU, a top ten cement producer, and a key player in aluminum production (ING 2023; van de Ven 2021). Estimates suggest that CBAM could cost Türkiye between EUR 399 million and EUR 771 million in 2026 and lead to a 2.7-3.6 percent loss in GDP (Maratou 2021; Acar, Aşıcı, and Yeldan 2021). Despite this high level of exposure, Türkiye is also relatively well positioned to adapt and respond to CBAM to limit the negative impacts (Acar, Aşıcı, and Yeldan 2021; Maratou 2021; van de Ven 2021).

Türkiye's incentives to adapt and respond to CBAM are twofold. Domestically, the country's high trade exposure necessitates proactive preparation to blunt the policy's impacts on a relatively fragile economy. The country has adopted strong measures in recent years to stabilize its economy in the face of extraordinarily high inflation rates and a devastating earthquake in the country's southern region in 2023 (Acar, Aşıcı, and Yeldan 2021; Maratou 2021; van de Ven 2021). To the extent that Türkiye continues to seek accession to the union, the country also faces external motivation to adopt institutional measures that demonstrate the country's ability to integrate its market with the EU. Indeed, national budget strategy proposals have identified aligning legal infrastructure with the EU's ETS and CBAM as core components of the country's green transition objectives (Republic of Türkiye 2023).

One result of this push to align with the EU was the 2021 "Green Deal Action Plan" announcement. This legislation lays out many programs to address goals such as green finance, sustainable agriculture, and emissions reductions (Güçlü 2021). As part of this move towards a green transition, Türkiye is working on a variety of projects such as the Hydrogen Technologies Strategy and Roadmap to produce green hydrogen, the Türkiye Green Industry Project with the World Bank to decrease emissions, and major investments into the energy sector (IEA 2023; World Bank Group 2023; Republic of Türkiye n.d.). Türkiye is also aided in its transition by the fact that it is already more in line with EU levels of emissions than many other countries. For example, Türkiye's aluminum production emissions are not much higher than the EU and steel production emissions are much lower than the global average (ING 2023). This means that the volume of CBAM fees is high, but the intensity is lower than in many other countries.

Arguably the most influential piece of the "Green Deal Action Plan" was the announcement that Türkiye intends to implement an emissions trading system (ETS). This is a clear illustration of the policy diffusion of CBAM as the announcement of a Turkish ETS is a direct response to CBAM and Türkiye's desire to become an EU member (Long et al. 2023; Tastan 2022; Directorate of Climate Change, Türkiye n.d.). Türkiye intends to transplant the EU ETS framework to establish the legislative framework for its system in a bid to align itself with the EU (ICAP 2023; Pauw, van Schaik, and Cretti 2022). The government is expected to finalize the legislation in 2024 and begin system operation in 2025 (ICAP 2023). Should Türkiye successfully operationalize its ETS prior to the start of CBAM fees in 2026, it will avoid many of the negative impacts of CBAM and will likely benefit from increased tax revenue and green investment (Directorate of Climate Change, Türkiye n.d.).

Türkiye should be able to respond and adapt to CBAM due to its institutional capacity across many levels. At the individual level, Türkiye has a skilled workforce that can support a transition towards green energy. It has created and filled thousands of jobs in the green transition thus far, and is expected to generate over 300,000 more by 2030 (Uyanık and Orhun 2022; IEA 2022). Türkiye has educational and labor market systems in place to produce individuals with the necessary skills and is supported by outside institutions such as the UNDP in providing training for renewable energy employment (OECD n.d.; Örtücü 2023). Unlike countries such as Mozambique, Türkiye has the human capital to adapt and comply with CBAM.

For years, Türkiye has been building organizational and system-level intuitional capacity in green spaces. The country established the monitoring, reporting, and verification system (MRV) in 2012 and began monitoring in 2015 (Republic of Türkiye n.d.). The MRV system oversees the emissions of over 700 facilities, covering about 50 percent of Türkiye's total GHG emissions (ICAP 2022; Republic of Türkiye n.d.). This figure implies that companies in Türkiye are already capable of measuring and reporting their emissions, and that the government has already established the necessary systems for coordination, management, and evaluation. Unlike other countries that must establish this capacity in response to CBAM, Türkiye will only need to make some adjustments and pay the fee. This also means it has the foundational data, systems, and personnel to establish its own ETS.

For the ETS to succeed and minimize the impacts of CBAM, Türkiye needs supportive governance and societal institutional capacity. Not only does Türkiye need to establish the ETS legislative framework, but it also needs supportive policies such as removing fossil fuel subsidies and developing green infrastructure (Republic of Türkiye n.d.). It must also build public support for its green initiatives (Republic of Türkiye n.d.). Unfortunately, this will be a challenge for Türkiye as it is hampered by weak and highly politicized government institutions (Tastan 2022). In recent years power has become increasingly centralized, often leading to highly political and inefficient politics (Arıkan and Ecevit, 2023). Regarding public support for climate actions, research shows that Türkiye is on the lower end of support for middle-income countries (Dechezleprêtre et al. 2022). For Türkiye to succeed in its green transition, it will need to find a way to address these weaknesses.

Developing Country Support Mechanisms

As discussed above the EU currently plans to direct funds from CBAM to be spent within the EU as part of the general EU budget. While this outcome is the result of the process to put CBAM in place and keep the program in line with EU budgetary guidelines, it does not mean that this will be the final and sole outcome as the CBAM begins to kick in in the coming years. Even if other funding sources are used, there are multiple ways the EU could magnify the decarbonization effects of CBAM. We, of course, are not the only scholars to raise questions about how revenues or other funds might be used in order to reduce negative effects on economies that did not meaningfully contribute to climate change to date (e.g., Magacho, Espagne, and Godin 2023; UNCTAD 2021; Åhman, Nilsson, Johansson 2017; Cosbey, Droege, Fischer, and Munnings 2019; Böhringer, Balistreri, Rutherford 2012; Corvino 2023; Gore 2021; Sartor et al. 2022; Overland and Sabyrbekov 2022).

These considerations are also important on the heels of unmet climate finance promises more generally (e.g., Gordon 2023; Gaikwad, Genovese, and Tingley 2024). Furthermore, uncertainty in trade policy (in the present context the implications of CBAM) has been shown to have very large impacts (Handley and Limão 2022).

Technical Assistance and Technical Cooperation

Data collection and verification will be easier for some countries compared to others. As discussed above, there is great variation in institutional capacity generally, let alone for the highly technocratic exercises that go into a carbon pricing scheme. One way to help this discrepancy is to provide technical assistance to countries (Wilson 2007). This could come in a variety of forms, each tethered to the different dimensions of capacity building required (individual, organizational national systems, public governance, and broader society).

Knowing these challenges, the European Union considered linking technical assistance to CBAM (EC 2021). While not formally included in the final policy, getting in place accurate, verifiable systems to make estimates is crucial because foreign countries and firms will have incentives to underreport carbon emissions. Indeed, these incentives and the sheer complexity of the required calculations has led some to criticize CBAM and offer alternatives (Campolmi et al. 2022).[5] This is compounded by the fact that European importers might not have legal means of redress if exporting firms provide inaccurate information, given that exporters exist outside of the EU (Kardish and Wildgrube 2022). Furthermore, implementing pricing schemes that are transparent and comparable will be key for countries if they want to take advantage of CBAM deductions that this can bring (Baker et al. 2022).

Linking funds raised from CBAM directly to technical assistance commitments will help improve the credibility of any commitments and ensure that these activities actually happen. Even if technical assistance comes from other funding mechanisms outside of those raised by CBAM, this will help deliver on the hope that CBAM can help drive carbon pricing in other countries.

Technology Transfer

Decarbonization of sectors like aluminum, fertilizer, and steel will be challenging. With current technologies, putting an ETS equivalent carbon price on would have grave consequences for the export industry in a number of developing countries. Further, even in cases where a producer claims a low carbon footprint, such claims can turn on a variety of assumptions that will be contested.[6] As such, mechanisms like technical assistance to help stand up a comprehensive pricing program will be insufficient to prevent broad disruption of developing country economies.

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[5] "In its current design, CBAM faces a number of important problems. First, it necessitates the computation of detailed carbon contents of foreign imports at the producer level. Put differently, it requires knowing the exact carbon content of the foreign production process, including all intermediate inputs. This data requirement strikes us as far too ambitious to be realistic. Moreover, it implicitly creates a distortive non-tariff barrier to trade by shifting the burden of collecting data on carbon content to foreign firms. Crucially, foreign firms have obvious incentives to under-report the true carbon content of their production, necessitating expensive monitoring and a horrendous amount of bureaucracy. (Campolmi et al. 2024).

[6] For example, Mozambique, the main exporter of aluminum to the EU, claims a very low carbon profile due to power provided from hydroelectric sources. However, such claims are questioned given integration with a carbon intensive South African grid (https://www.climatechangenews.com/2023/07/03/mozambique-aluminium-cbam-carbon-border-tax/).

Technology transfer is thus an additional option (Martinot et al. 1997). Indeed, these same technologies are what producers in the European Union have to adopt in order to reduce the carbon intensity of their own manufacturing. Technologies can range from storage technologies to remove intermittency problems of renewable energy sources as part of manufacturing processes. They can also involve more advanced industrial processes, such as new reaction processes in the production of chemicals and fertilizers or electric arc furnaces for steel production that leverages renewable energy sources. These transfers could be pursued under existing institutional arrangements such as the WTO TRIPS Agreement,[7] especially given that many of these technologies have patents highly concentrated in OECD countries (Guepie et al. 2023).[8]

Technology transfer can also include monitoring technologies that help to keep track of carbon emissions. This could be an important part of covering other greenhouse gasses such as methane that future border adjustment mechanisms might cover. Methane tracking systems are quickly being developed and deployed in the developed world, but they are less present in developing economies.

Technology transfer is no panacea of course. First, the institutional context of recipient countries will be incredibly important to effectively deploy technologies and scale their use (Pigato et al. 2020, pg. 119). Absent political and economic institutions, technology transfers will have minimal impact and could even be detrimental. Further, the history of development aid over the decades is riddled with stories of technologies that get transferred, such as tractors and other agricultural processes, that are ill supported and quickly fall into disrepair. Recent commentary on these practices suggest that rather than conceiving of things in terms of transfers, “innovation cooperation” perhaps best reflects the required two-sided incentives (Pandey, de Coninck, and Sagar 2021).

Competitive Grants Funds

The European Union could also consider setting up a fund that developing countries could apply to for particular projects. For example, such a competitive fund could be a mechanism to implement technology transfers (or “cooperative innovation”). An application could identify projects, perhaps ones that would be extremely hard to abate, but where European firms had developed proven technologies that could be used. Having developing countries apply for these funds with specific projects in mind would help to ensure that the proposed solutions are in the interest of the country, rather than European firms seeking only to export their wares. This enables developing countries to “adopt a proactive stance and identify the types of technologies

[7] TRIPS stands for the Trade-Related Aspects of Intellectual Property Rights and is a WTO agreement.
[8] More generally, Ma and Yomogida (2021) suggests that foreign direct investment mechanisms can endogenously reduce carbon leakage with green technology investments in developing countries by developed country firms.

that would be critical to enable a green transition, with a focus on technologies relevant to greening products covered by the CBAM" (Guepie et al. 2023, xii).

Similarly, a competitive grant fund could be used to gain access to technical assistance for setting up ETS or related carbon price systems. Countries, perhaps with some nominal support, could identify what areas will be the most challenging for them in terms of adopting carbon pricing and what types of support would help them reduce those barriers. Part of the application would have to justify why the country could not do this work on its own. By making the process competitive, it could reduce incentives that could crowd out other efforts.

Of course, institutional capacity would still be a constraint. Even in developed countries there is a broad distribution of capacity to apply for grants. For example, in the United States there are many localities and even states that struggle to apply for competitive Federal grants that seek to decarbonize local economic activity.

CBAM and the Political Economy of Overseas Development Assistance

All of these mechanisms for supporting developing countries take the form of using EU resources to help developing countries. As discussed, while the EU considered building in this type of support directly into CBAM this was ultimately scrapped. In light of this, how might support be designed in order to garner political support within the EU but also be helpful and compatible with the needs of recipient countries? Answering these questions is important. To date, for example, climate finance funding has been riddled with failed and incomplete commitments.

One starting point is the political economy literature on foreign aid which highlights the domestic politics around aid in donor countries (e.g., Milner and Tingley 2015). Historically one way to increase support for foreign aid in donor countries has been to have aid, in part at least, sourced and provided through firms and organizations in donor countries. Such "tied aid" has historically had many problems, including a mismatch of incentives between profit maximizing firms in developed countries and developing country needs. As a result, members of the OECD adopted the so-called Helsinki Package which sought to reduce the amount of tied aid being distributed.

However, there are reasons to believe that involving firms from donor countries, here the EU, would be a smart decision. First, there are expertise gaps in how to implement things necessary for carbon pricing. Second, technologies are rapidly being developed and scaled that would be well suited to many developing country contexts. Third, the EU could institute competitive internal processes that span the EU rather than being captured by firms in specific countries which could lead to rent seeking.

Further, developing countries have an incentive to make their exports more attractive and competitive. With CBAM, if information is not available or collected on carbon content of exports then a default is used based on the worst performing actors within the sector of the export. This is broadly understood to disadvantage many developing country exporters. Furthermore, this could even lead firms to move supply chains and other operations away from some developing countries, leading to broader knock-on effects that would be quite detrimental (Baker et al. 2022).

Finally, some evidence suggests that publics within recipient countries would welcome partnership models between developed country firms and recipient country firms when it comes to climate finance projects. Gaikwad, Genovese, and Tingley (2024) show that such partnerships increase support for climate finance in a sample of the Indian public. They also show it increases support for climate finance in the United States.

None of this of course suggests that funding arrangements should be captured by narrow business interests in the EU. Instead, new partnership models can be explored that align incentives and leverage funding sources efficiently. Such partnerships could be overseen by third party actors, including existing multilateral organizations.

Public Opinion

In this section we briefly discuss early public opinion research on CBAM that we are conducting. This work is in progress. We first describe existing and new data, and then discuss new samples we are in the process of procuring.

Previous public opinion work on CBAM

Existing survey work on CBAM is quite limited. Kuehner, Jakob, and Flachsland (2022) conducted a survey of a small number (81) of German respondents from industry (companies and associations), civil society (NGOs and unions), and researchers (academic and think tanks). Most of the survey focused on internal implementation questions. The majority of respondents (59%) supported the CBAM. Civil society respondents and researchers largely supported offering exemptions to the CBAM for least developed countries and low-income countries. In terms of allocation of CBAM revenues, industry representatives showed the highest support for recycling raised revenues to invest in green technologies within the EU. About a third of civil society respondents and researchers supported funds directed to transferring green technologies to low-income countries. Support for recycling revenues into the general EU budget or compensating EU citizens most affected by climate policies was low across all respondents.

Buylova et al. (2022) also surveyed members of industry and civil society organizations. They find general support for CBAM, but divergent viewpoints between groups. Civil society

organizations are more likely to cite the need for protecting low-income countries while industry groups are more focused on protecting the competitiveness of EU industries.

Sagetalova, Milko, and Fitzpatrick (2023) surveyed 1,003 registered voters in four US states, again finding broad support generally (74%) for the implementation of a CBAM in the US. Over 80% of respondents reported that benefits for domestic manufacturers producing low-carbon goods and holding disproportionately large polluters like China and Russia accountable were convincing reasons to support the CBAM.

New public opinion evidence

We introduce results from a quota-sampled nationally representative survey fielded in the United States with 1,692 respondents. This was an opportunity to pilot some questions.

We began by providing respondents with an introduction to CBAM, aiming for an intuitive introduction of a somewhat complicated policy instrument.[9] Of the total survey respondents, 1,503 (88.8%) correctly answered the comprehension question and proceeded with the section.[10] The majority of respondents (63.1%) favored the US adopting a carbon border adjustment.[11] Support was highest among respondents identifying as Democrats (76.4%),

[9]The European Union (EU) is a group of European countries that work together to make laws and trade with each other.

The EU has a new policy called a Carbon Border Adjustment Mechanism. This policy affects companies in countries outside the EU that want to sell their products inside the EU.

When a company makes a product, it requires energy which often creates carbon emissions that warm the planet. Since 2005, companies that make products in the EU have had to pay a fee to the EU when they create emissions. Until now, companies making products outside the EU did not have to pay that carbon fee.

The Carbon Border Adjustment Mechanism tries to level the playing field by charging a similar fee on products imported into the EU from non-EU countries. Products made outside of the EU and exported into the EU will now be charged a fee based on the carbon emissions of the product. This fee is paid once products cross the border into the EU. That's why it's called a carbon border adjustment.

This carbon fee can be avoided if the product is made in a country that has its own carbon fee. If the carbon fee is lower than the EU's, the charge would be the difference between the two. If the fee is higher than the EU's, there would be no fees paid to the EU.

The policy means that if countries outside the EU do not adopt their own carbon fee system, their exports will cost more. This means businesses outside the EU may be less competitive in the EU market.

The next questions are about this Carbon Border Adjustment policy.

[10] How can companies avoid paying the EU carbon border fee?
- The country where the exporting company is located can apply for an exemption.
- The country where the exporting company is located can sign a treaty with the EU.
- The country where the exporting company is located can charge its own carbon fee equivalent to the EU amount.
- The country where the exporting company is located can provide “green aid” to poorer developing countries.

[11] Given that the European Union adopted a fee on internal carbon emissions and a fee on products imported from countries without a carbon fee, should the United States adopt a similar carbon border adjustment policy?

If the US adopts the EU policy, it will mean that:

- US Manufacturers will pay carbon emissions fees to the US government based on how much carbon dioxide is released during the manufacturing of many products

followed by respondents who did not identify with either party (57.4%) and respondents identifying as Republicans (50.7%).

Rationales for supporting or opposing CBAM[12] were roughly consistent across party affiliations. Promoting global environmental sustainability was the most popular justification among supporters, followed by safeguarding US economic interests among Democrats and Republicans. The third most popular reason for support among Democrats was the potential to generate funds to support climate efforts in developing countries. Conversely, Republicans valued the benefit of additional tax revenue raised for US government programs.

Among respondents who thought the US should not adopt CBAM, respondents most commonly cited increasing costs to consumers as the top reasons for their opposition, followed by the belief that the US already imposes taxes on too many products. Approximately one-fifth (19.6%) of Republican opponents reported that there is insufficient evidence to justify climate change as a basis for trade policies.

Next we explored how individuals would use funds raised by a CBAM by asking respondents to allocate revenues across four categories with two experimental treatments.[13] In the first treatment, we randomized whether the question asked about how the EU should spend revenues from an EU CBAM or how the US should spend revenues from a US CBAM. This was to evaluate whether our US-based respondents exhibited a "local bias" consistent with previous climate finance work (Gaikwad, Genovese, and Tingley 2024). The second treatment included a

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- When US companies export many products to the European Union, carbon emission fees will not be paid to the European Union.
- When foreign countries that do not themselves charge for carbon emissions import many products into the United States, fees will be charged on these products based on the amount of carbon released during manufacturing.
- Goods that are charged carbon emissions fees may become more expensive to consumers.

The US should adopt a carbon border adjustment.
The US should NOT adopt a carbon border adjustment.

[12] Supporters were asked to choose the best reason why they supported CBAM among the following:

- The policy would safeguard U.S. economic interests and ensure fair trade practices.
- The policy would generate additional tax revenue for U.S. government programs.
- The policy would generate funds for assisting developing countries in combating climate change.
- The policy would enhance U.S. leadership in global climate change efforts.

Opposers were asked to choose the best reason why they opposed CBAM among the following:

- The policy would increase costs for consumers due to higher prices on imported goods.
- The US already levies taxes on too many products.
- The policy would negatively impact developing countries' economies and trade.
- Environmental regulation should not interfere with free market dynamics and international trade.
- There is insufficient evidence to justify climate change as a basis for trade policies.

[13] Products imported from countries without carbon fees will lead to charges being paid to the country that has the carbon border adjustment policy. There are debates about what countries should do with the money. [Some argue that developing countries will be the hardest hit by these policies and are the least able to adapt. / no text]

Where should funds raised by the [European Union / United States] from a carbon border adjustment policy be spent? Please allocate percentages to each option so that the total sums to 100%. Enter positive integers only. X% of the funds should be used to help: poorer developing countries implement their own carbon pricing systems, poorer developing countries invest in technologies that help them reduce their emissions, companies in the [European Union / United States] develop technologies to reduce carbon emissions, other [European Union / United States] government initiatives.

prime informing respondents that developing countries may be particularly disadvantaged by such a policy. We did this to see if support for sending funds to developing countries could be increased with a relatively small amount of information.

The first two categories directed funds to help poorer developing countries implement their own carbon pricing systems or invest in green technologies, respectively. The latter two categories allotted EU (US) funding to help EU (US) companies develop green technologies or to general EU (US) government initiatives. We plot the pilot results in Figure 1.

Respondents were categorized based on their assignment across both experiments, resulting in four subgroups. We further differentiate results by the individual's partisan orientation. First, we observe that on average there is support for all of the different funding categories. By and large, the median levels are similar across the different categories. Reinvesting funds into domestic green technology was the top category that respondents allocated funds to, regardless of party identification. There was a small depressing effect of the informational prime on keeping resources within the implementing country. This tended to be offset by greater support for technology transfers to developing countries.

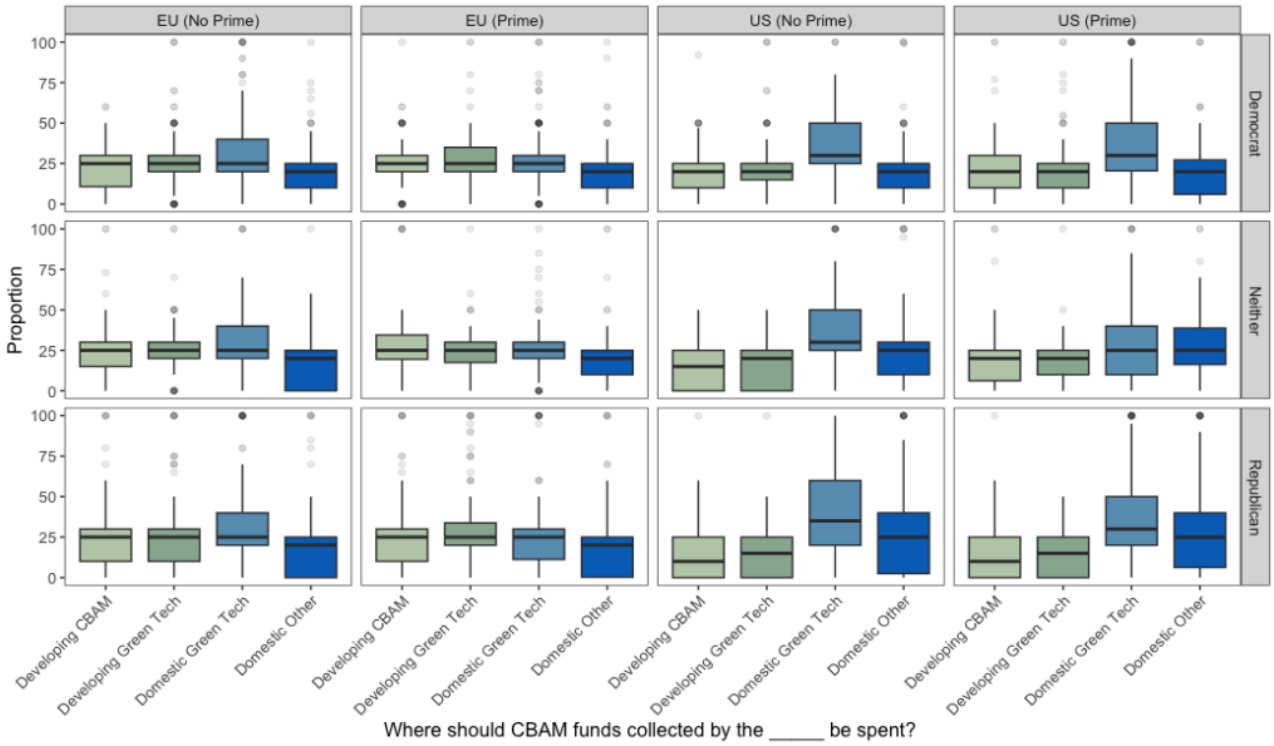

Figure 1. Preferred Allocation of CBAM Revenues

Finally we examined expectations around whether or not carbon tax policies and border adjustment policies would spread to other countries as a result of CBAM. To do this we randomly assigned respondents to consider *either* countries in Asia, countries in Africa, or

simply “other countries”.[14] While this question does not let us get at particular perceptions of why these regions may or may not be likely to adopt such policies, it provides a starting baseline for future investigation. Figure 2 presents the results, again broken out by the respondent’s party affiliation. Overall, respondents who identified as Democrats were more inclined to expect broader adoption of CBAM by various countries, regardless of whether they were asked about a specific continent. Republicans and respondents with neither affiliation tended to predict that Asian countries or other countries, generally, were likely to establish their own CBAM. A greater number of Republicans and respondents with neither affiliation reported that countries in Africa were unlikely to adopt similar policies.

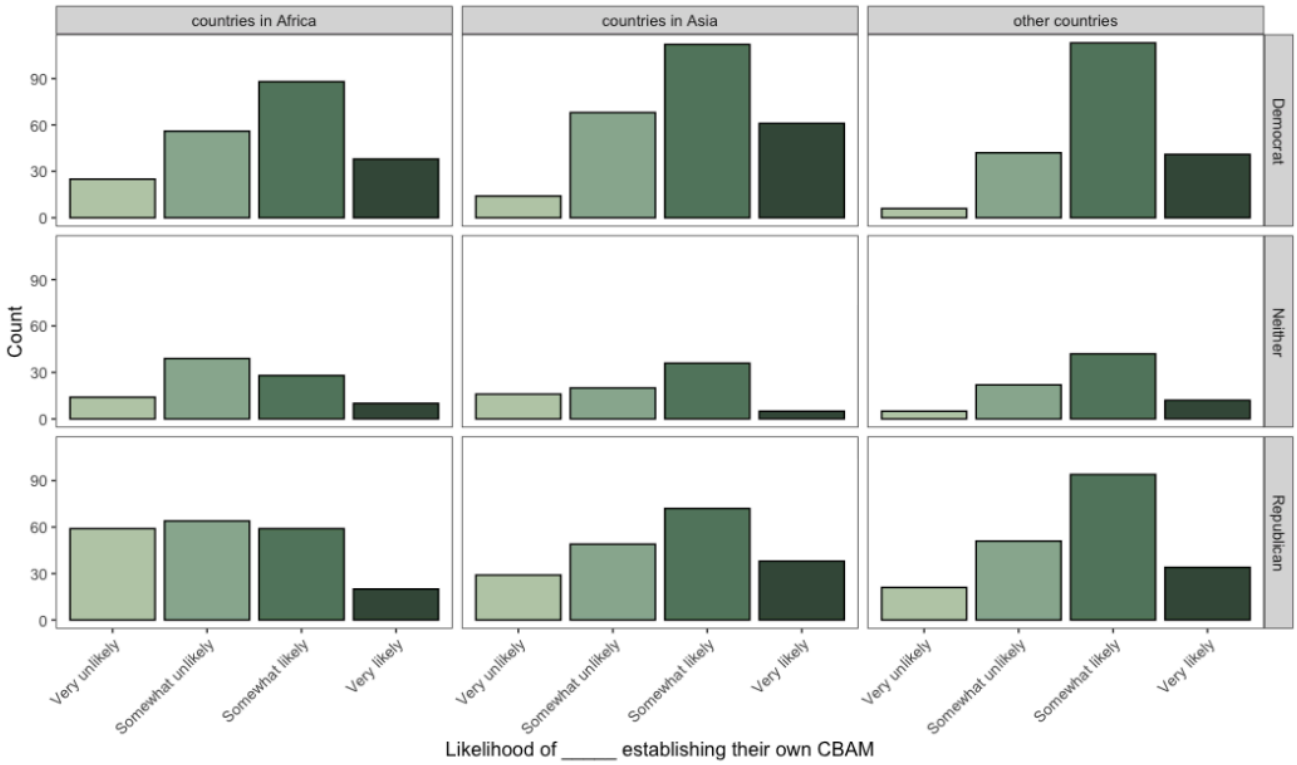

Figure 2. Likelihood of CBAM Diffusion

New Samples

We are working towards a survey instrument that we will field in the US, EU, and developing countries. For our developing country samples we plan to exploit Facebook sampling strategies. We are also planning to conduct interviews with a range of business, government, and civil society leaders in multiple countries.

[14] How likely do you believe it is that [countries in Africa/countries in Asiaother countries] will establish their own carbon pricing and carbon border adjustment policies? Very likely, Somewhat likely, Somewhat unlikely, Very unlikely

Conclusion

States have long used trade policy as a tool to advance a range of foreign policy objectives (Cooper 1973, Hafner-Burton 2005, Lechner 2016). The EU's ratification of the CBAM represents a significant development in leveraging trade policies to advance both domestic and international climate objectives. Domestically, the CBAM addresses concerns of carbon leakage resulting from their adoption of the ETS by ensuring that foreign manufacturers are subject to the same carbon pricing standards as those within the EU. In addition, the CBAM furthers international climate policy goals by encouraging carbon pricing policy diffusion among its global trade partners. Specifically, the CBAM exerts considerable coercive and competitive pressures on non-EU countries to adopt similar policies to remain competitive in the EU market and capture carbon pricing revenues that would otherwise be paid to the EU.

We anticipate that countries will closely monitor the phased implementation of CBAM over the next few years and learn from the EU's execution. However, despite the strong economic incentives that CBAM imposes for non-EU states to adopt their own BAMs, the likelihood of policy diffusion will hinge on whether states have the institutional capacity to adapt. To meet requirements of the EU CBAM alone, firms in non-EU countries first need to develop robust monitoring and reporting processes and technologies capable of accurately measuring CO_2e emissions across the manufacturing supply chain of carbon-intensive goods. These processes and technologies then need to be institutionalized nationally for non-EU governments to administer their own domestic carbon pricing schemes. Furthermore, firms in low and middle-income countries face stronger path dependency challenges in adopting greener manufacturing processes, as novel technologies that can support emissions reductions can be too costly or complex to adopt without external support. As such, dedicated channels for technical assistance and technology transfer will be essential to limiting negative externalities for countries with low institutional capacity.

Our analysis herein focuses on the distributional effects of the policy in the global south, where countries are likely to experience disproportionate adverse effects due to their high trade volume exposure and limited state capacity. Our case studies in Mozambique, Morocco, and Turkiye illustrate that variation in existing state capacity has already impacted the ability for countries to adapt to the changing climate policy environment.

However, cross-border initiatives to offer technical support for governments seeking to build domestic MRV systems suggest a promising example of how NGOs and firms from the global north can help governments in the global south meet shared climate goals. Indeed, private sector support may be particularly valuable given the highly specialized knowledge and rapid development associated with carbon emissions monitoring and green manufacturing technologies. To this end, it will be important to establish institutional checks to ensure that such public-private partnerships remain incentive-compatible for all parties while avoiding aid capture or exploitation.

We also present new evidence of public opinion in the US regarding CBAMs. We find that the majority of respondents support adopting a US CBAM and cite promoting global environmental sustainability as the most popular reason for supporting the policy followed by safeguarding US economic interests. Respondents opposed to the US adopting a CBAM reported increasing consumer costs and resistance to new taxes as primary reasons for opposition, a pattern consistent with opposition to other climate policies (Ansolabehere and Konisky 2016). When asked about how revenues raised by CBAM should be allocated, respondents were most likely to support reinvesting funds into domestic green technology development. Whether and how this support could be directed to developing countries remains an open question. Finally, we found that the majority of respondents expected that other countries were likely to adopt their own CBAMs in response to the EU's implementation, although we noted differences in perceived likelihood of geographic spread by partisanship. We plan to measure similar attitudes in the EU and developing countries through future survey studies and interviews. Of course, the internal politics within the EU around the ETS will continue to evolve (Kruse-Andersen and Sørensen 2024). While CBAM may lead to policy diffusion, backsliding within the EU could undermine or even reverse this effect as it introduces uncertainty and concerns about policy credibility within the EU and in other countries (Baudry and Dumont 2024, Gazmararian and Tingley 2023).

Ultimately, the EU's CBAM holds considerable potential in promoting carbon emissions reductions globally by encouraging green technology transition and diffusion of climate policies in non-EU states. While the policy mechanism effectively aligns economic incentives with environmental objectives, the capacity for firms and governments in non-EU countries to respond will be constrained by their existing institutional capacity. As such, dedicated channels to provide firms and government actors in low-capacity countries with access to in-kind and financial assistance will be critical to mitigate adverse effects and optimize the policy's impact on downstream climate effects.

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