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The EU Carbon Border Adjustment Mechanism and how non-EU Countries May Adopt a Grandfathered Emissions Trading System

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ABSTRACT
The European Union's Carbon Border Adjustment Mechanism (CBAM) is a climate policy designed to impose carbon taxes on imports, aiming to mitigate the risk of carbon leakage and promote fair competition. However, many non-EU countries view the CBAM as an additional trade barrier. Here, the European External Action Service (EEAS) may offer a solution by assisting non-EU countries in designing domestic cost-effective grandfathered emissions trading systems (ETS) that would enable them to avoid the politically controversial CBAM payments. Policy lessons from the United States and the European Union offer valuable insights that can guide the EEAS in shaping such a global climate policy.

Keywords: Climate policy; Carbon Border Adjustment Mechanism; EEAS; Policy innovation; Carbon leakage; Trade barrier; EU Emission Trading System; US Acid Rain Program.

1. Introduction

The successful implementation of climate policies on a global scale is imperative. As countries endeavor to mitigate the impact of carbon emissions and combat climate change, the design of policies becomes crucial for attaining desired results. Climate policies often do not work as intended, and therefore it is crucial to identify those capable of achieving major emissions reductions in a cost-effective way (Stechemesser et al. 2024). This study investigates the European Union's (EU) new climate policy instrument, the so-called Carbon Border Adjustment Mechanism (CBAM), which constitutes the world's first tax on the carbon content of imported goods (Jørgensen et al. 2020). The CBAM is "the EU's tool to put a fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU, and to encourage cleaner industrial production in non-EU countries" (European Commission 2024).

The launch of the CBAM in July 2021 sparked numerous protests from the EU's trading partners, who saw it as another trade barrier under the guise of preventing global warming (Lim et al. 2021). Notably, China, along with Turkey, Ukraine, and regions of north and sub-Saharan Africa, will experience significant impacts from the CBAM. A considerable portion of domestic carbon emissions in these countries is related to exports to the EU and will be covered by the CBAM. Thus, political and academic critics of the CBAM have stressed that it violates the letter and spirit of the UN climate change framework: "An EU CBAM that would put high pressure on such countries would oppose the fundamental

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principle of ‘shared but differentiated responsibilities’ of the United NationsFramework Convention on Climate Change, which states that those countries should be supported in their transition to a low-carbon economy” (Beaufils et al. 2023, p. 5). In light of such critiques, it is essential to adopt a differentiated approach, particularly for the least developed countries, to ensure more equitable climate cooperation while maintaining the integrity and effectiveness of the CBAM. These fairness considerations are pivotal in gaining support from non-EU countries for a global climate coalition (Brandt and Svendsen 2022).

Furthermore, Chinese leader Xi Jinping stated in response to the CBAM that “[t]ackling climate change should … not become an excuse for geopolitics, attacking other countries or trade barriers” (Hayashi and Schlesinger 2021, cited from Shum 2023, p. 3). Addressing trade protection concerns, this paper fills a gap in the literature by examining the CBAM and its implications for non-EU countries. These have hitherto received limited attention, reflecting a Eurocentric bias (Magacho et al. 2023; Ahmed 2023). By discussing key design elements and implementation hurdles, the paper aims to formulate a rational response for non-European countries (e.g. China) seeking to avoid carbon taxes imposed by the EU. If addressed, the EU can answer accusations that the tax is both counterproductive to its stated climate objectives and an unfair trade barrier for those affected by it. The development of such policy recommendations constitutes a primary contribution of this study, facilitating a more comprehensive understanding of the CBAM’s global impact and guiding strategic responses from affected non-EU countries.

Beaufils et al. (2023, p. 4) have argued that the CBAM “could create an incentive for non-EU countries to implement their own carbon pricing scheme – at least on their exports – to get the fiscal revenue otherwise captured by the EU.” In the following, we will make a novel contribution to the existing literature by specifically focusing on the climate policy option of combining the CBAM with the potential response of grandfathering among non-EU countries, i.e. an emissions trading system (ETS) with free allowance allocations based on historical emissions levels. Such grandfathering can be used as an implicit side-payment mechanism to non-EU countries and actually bring about major emissions reductions via global climate policy (Brandt and Svendsen 2004).

Here, the European External Action Service (EEAS) arguably has the needed institutional leverage to help design policy innovations, as the body responsible for EU foreign interests including climate policy (Jørgensen et al. 2022). Thus, the overall research question is: How can the European External Action Service (EEAS) assist non-EU countries in designing a grandfathered emissions trading system (ETS)? The EEAS can not only ensure that EU internal efforts to protect the climate are successful but also motivate more climate-friendly carbon pricing schemes in non-EU countries, i.e. encourage the formation of a global climate club to solve collective action problems (Clausing and Wolfram 2023). The EU's ambition to lead globally in climate policy is also relevant to the ongoing debate about its strategic responses to the changing world order (Jørgensen et al., 2025).

The role of the EEAS in facilitating the design of a grandfathered ETS is well established (Jørgensen et al. 2022). However, its practical capacity and influence in non-EU policy contexts require further examination. A thorough analysis of the political and institutional constraints facing the EEAS could provide valuable insights into its potential as a global climate policy influencer, particularly in the least developed countries with weaker governance systems.

In the following, rational choice theory is first introduced (Section 2) before the main design features of the CBAM are delineated (Section 3). Next, a theoretical assessment of trade barriers, cost-effectiveness, and the choice between taxes and emissions trading is provided (Section 4), before policy perspectives are offered for the EEAS on a carbon ETS for non-EU countries in a rational choice setting (Section 5). Finally, Section 6 concludes.

2. Rational Choice Theory

This research employs a comparative analysis framework grounded in rational choice theory to analyze when climate policies vary (Clausing and Wolfram 2023). The basic behavioral assumption in rational choice theory is that individuals and organizations make decisions based on rational calculations to maximize their utility (Mueller 2003; Hillman 2019). When profit maximization in the marketplace is the primary focus, the application of rational choice theory facilitates an evaluation of the economic incentives and relevant design principles.

Understanding the European experiment with carbon taxation, as well as the US experience with emissions trading, provides important insights for the selection and implementation of economic instruments in climate policy. These experiences offer valuable lessons that can guide the development and refinement of strategies to address climate change effectively (Meckling and Jenner 2016). This comparative analysis provides an opportunity for policymakers, both in Europe and beyond, to gain insights into the cost-effective use of economic instruments when addressing climate challenges at a global scale. By learning climate policy lessons from experiences across countries, policymakers can more easily cooperate and solve collective action problems (cf. Immergut 1990).

A case study "investigates a contemporary phenomenon (the 'case') in depth and within its real-world context" when "the boundaries between phenomenon and context may not be clearly evident" (Yin 2018, p. 15). In the context of our setting, a single case can be considered an individual experiment with only one observation. If the case does not support the existing theory, it may strengthen a competing theory or prompt the consideration of new theoretical propositions. In contrast, the more confirming cases that are found, the stronger and more general a theory becomes (ibid., p. 40). Consequently, when multiple cases are empirically tested against the theory, a multiple-case study essentially involves conducting the experiment several times, with each case serving as an additional test of the theory's validity.

The introduction of emissions trading schemes with free initial allocation of emission rights to polluters (grandfathering) in both the EU and the US is analyzed using a multiple-case study research method with two observations. This dual-case comparison of the EU ETS and the US ARP offers valuable insights; however, a limitation of the study lies in its generalization based on two high-capacity governance contexts. While this narrow scope represents an initial step in generating new knowledge, it simultaneously restricts the global applicability of the proposed policy framework at this stage. Future research, incorporating a broader empirical range—particularly from developing countries—would provide a more comprehensive test of the claims presented here.

Mancur Olson's logic of the collective action problem is relevant in the context of this comparative analysis of the CBAM. Olson's behavioral assumption is grounded in the concept of *homo oeconomicus* and aligns with what Elinor Ostrom has termed "first-generation" rational choice theory (Ostrom and Ahn, 2009, p. 19). According to this view, rational, self-interested countries may fail to act in pursuit of their collective or group interests. Those countries that do not contribute to a collective good, such as combating climate change, cannot be excluded from benefiting from it (Olson, 1965). Even when there is consensus on the desire for a collective good and on the most cost-effective means to achieve it, the free-rider problem remains pervasive (Svendsen, 2020a, b). Carbon leakage serves as a clear example of such a collective action problem: "Carbon leakage occurs when companies based in the EU move carbon-intensive production abroad to countries where less stringent climate policies are in place than in the EU, or when EU products get replaced by more carbon-intensive imports" (European Commission 2022).

For instance, the United States has long expressed concerns about potential job losses if companies invest in unregulated regions (Brandt and Svendsen 2014; World Economic Forum 2024). However, politicians must make output decisions about target levels in climate policy, which then have to be implemented into policy outcomes. Overall, the cost-effectiveness of the EU CBAM and its implications for non-EU countries are extremely complex and hinge on addressing potential political, economic, and administrative distortions (Brandt and Svendsen 2022).

3. Main Design Features of the CBAM

To approach the main design features relevant for rational choice, the actual design of the CBAM is described by using a set of three main variables to simplify a complex reality. The first variable is the *target level* for emissions and the reduction goal, including the period in which the CBAM is applied. The second variable is the *target group*, describing which countries and sectors are included in the CBAM. The third variable is the actual *size of the CBAM tax* and how it is set.

3.1 Target Level

Valdis Dombrovskis, Executive Vice-President for an Economy that Works for People, said when introducing the CBAM: "Putting a price tag on products with a higher carbon footprint will help to prevent carbon leakage while respecting our international obligations in full. At the same time, the EU wants to promote cleaner industry in its partner countries and take a practical step towards a global system of carbon pricing" (European Commission 2022).

The CBAM is part of the so-called European Green Deal, with the ambitious target level of a 55 percent reduction in carbon emissions compared to 1990 levels by 2030. Furthermore, the EU aims to achieve climate neutrality by 2050 in accordance with the Paris Agreement (European Commission 2023). The European Green Deal is a package of policy initiatives to secure a green transition in the EU and was launched by the Commission in December 2019 (European Council 2024). Given the EU's status as the world's largest market for manufactured goods, encompassing both imports and exports, the implementation of the CBAM will undoubtedly exert considerable economic influence on its trading partners (Szulecki et al. 2022).

3.2 Target Group

CBAM's target group is non-EU countries, and CBAM is designed to impose a carbon tax on imported carbon-intensive goods in sectors where carbon leakage risk is highest. Thus, CBAM will initially apply to the following six sectors: cement, iron and steel, aluminum, fertilizers, electricity, and hydrogen. For this target group, CBAM began a gradual phase-in period on October 1, 2023, and will take full effect on January 1, 2026 (European Commission 2023).

During this transitional period from 2023 to 2026, importers of goods within the six regulated sectors are required only to report the *direct* emissions embedded in their imports (only linked to the production of the final product), and not yet make any financial payments. After the transitional period, *indirect* emissions are also planned to be reported (based on a forthcoming methodology to be defined in the meantime). The CBAM transitional phase will be reviewed before commencing the permanent system in 2026, including actual tax payments from importers. Additionally, whether to include goods from other sectors will be considered by 2030 (European Commission 2022). In other words, the CBAM transitional phase (2023-2026) is a learning period, from which experiences can be harvested before the permanent system is enacted.

3.3 Size of Carbon Tax

One notable strength of the CBAM is its taxation of the negative externalities imposed by carbon emissions on society. The size of the carbon tax is determined by the allowance market price within the EU ETS, which was established in 2005. Aligning the market-based economic instruments (CBAM with the ETS price signal) is done by calculating the weekly average auction price of EU ETS allowances (expressed in €/ton of CO_2 emitted).

Consequently, the CBAM allowance (or certificate) will mirror the ETS price. One allowance entitles a firm to emit one ton of carbon per year. This allowance price reflects how much EU importers have to pay per ton of carbon when declaring the emissions embedded in their imports. They must then "surrender the corresponding number of certificates each year," though "[i]f importers can prove that a carbon price has already been paid during the production of the imported goods, the corresponding amount can be deducted" (European Commission 2024).

ETS allowances were originally allocated for free in 2005; that is, grandfathered based on 1990 emissions levels (Markussen and Svendsen 2005). For example, if a firm emitted 1,000 tons of carbon in 1990 it would correspondingly receive 1,000 allowances for free in 2005, and these allowances would then be renewed on an annual basis (Brandt and Svendsen 2016). However, the plan is to gradually reduce the number of free allowances in the ETS until they are completely phased out in 2035 (European Commission 2023). The EU anticipates that ensuring equivalence between the carbon price applied to imports under the CBAM and the carbon price applied to EU production through the ETS align with regulations set forth by the World Trade Organization (WTO) (European Commission 2022).

Whether unilateral CBAM implementation is actually compatible with the GATT/WTO trade rules is disputed. Many non-EU countries, including China, have argued that the CBAM contravenes WTO free trade principles (Lim et al. 2023). This legal ambiguity surrounding the WTO compatibility of the CBAM remains insufficiently explored. Further investigation into potential legal disputes or rulings that could challenge or reshape the implementation of CBAM is warranted. A more systematic review of WTO jurisprudence could offer valuable future insights into detailed design adjustments and compliance strategies, particularly for vulnerable exporters. It is also important to highlight that the EU ETS was initially established through grandfathering, a mechanism that continues to be in use. Similarly, the emissions trading systems in the United States, including the Acid Rain Program (ARP), were also launched with a grandfathering approach.

Non-EU countries with fragile institutions and a lack of reliable data pose a difficult situation in terms of tax size, because a sectoral benchmark of the 10 percent least efficient European producers of equivalent goods then applies. Applying such a "one-size-fits-all" standard means that these vulnerable non-EU countries do not have any economic incentive to reduce carbon and invest further in green technology—they will have to pay the same carbon tax regardless (Magacho et al. 2023, p. 3). These implications are counterproductive for global climate policy, and the EU must take action to address and rectify these economic incentives.

4. Theoretical Assessment

4.1 CBAM Tax as a Trade Barrier

Theory provides insights into the ramifications of the introduction of a potential trade barrier such as the CBAM tax, as depicted hypothetically in Figure 1. Here, *SEU* represents domestic supply, while *DEU* denotes domestic demand within the EU. Initially, in the absence of international trade, the EU market self-adjusts to the domestic equilibrium price of *PEU*. However, with the introduction of global trade, the new market equilibrium now occurs at the global equilibrium price of *PW*.

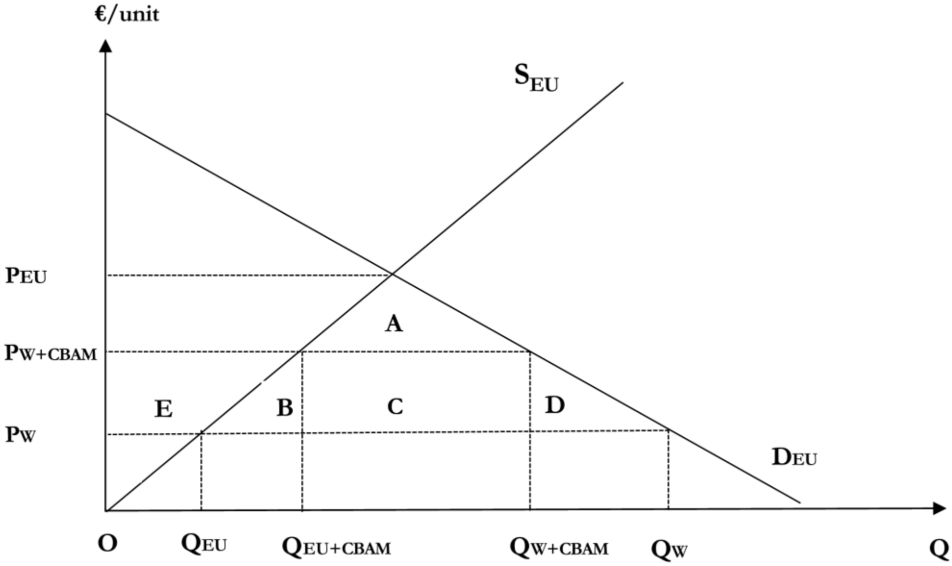

Figure 1: CBAM tax as a Trade Barrier
Source: Based on Meier and Rauch (2000), Svendsen (2003).

When the EU implements a carbon tax such as the CBAM on imports from non-EU countries, this leads to an increase in the world market price from P_W to P_{W+CBAM}. Consequently, the quantity of EU imports decreases from Q_W to Q_{W+CBAM}. Conversely, domestic EU supply increases from Q_{EU} to $Q_{EU+CBAM}$. As a result of the CBAM, the EU gain from global trade now decreases from areas $A + B + C + D$ to area A. Moreover, the net welfare loss (deadweight loss) incurred by the CBAM amounts to the combined areas of B and D, where area C represents the tax revenue collected by the EU, that is $C = CBAM \times (Q_{W+CBAM} - Q_{EU+CBAM})$.

Changing the status quo in climate policy and introducing a carbon tax on imports, such as the CBAM, highlights the implications of climate policy interventions. EU consumers experience a loss due to a reduction in consumer surplus as a result of the CBAM, while EU producers gain from an increase in producer surplus, represented by area E. This surge in producer surplus stems from the ability of producers to elevate their prices due to the trade barrier and reduced global competition. Domestic EU producers make a rational choice in favor of the CBAM in climate policy to maximize their profits at the expense of EU consumers compared to the scenario of unrestricted world trade (Svendsen, 2003). In this way, the CBAM can function as a trade barrier, but it can also simultaneously serve as a cost-effective tool in climate policy.

4.2 Cost Effectiveness

Cost-effectiveness means achieving a predefined reduction target at minimal cost. As illustrated in Figure 2 below, policymakers can effectively attain the target reduction level, denoted as Q^*, through the implementation of a CBAM tax per unit of emitted carbon. By aligning market prices with the negative externalities stemming from climate change, the CBAM endeavors to correct market failures as a "Pigou tax" (Pigou 1932 [1920]). The imposition of a carbon tax not only curtails emissions but also generates tax revenue, yielding a "double dividend" characterized by environmental and fiscal benefits (Brandt and Svendsen 2014). Under the CBAM regime, an equilibrium is established in which firms adjust their carbon emission levels to equate individual marginal costs of carbon reduction with the tax rate.

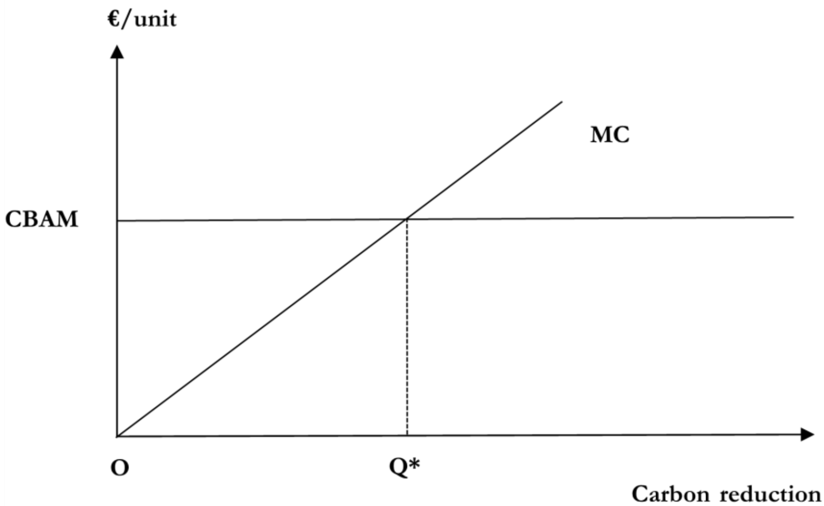

Figure 2: CBAM Tax and Cost-Effective Carbon Reduction

4.2 Tax and Emissions Trading

Both the CBAM tax and the emissions trading systems offer theoretically cost-effective means of achieving politically targeted emissions levels in climate policy. However, in practice, emissions trading may be preferred for five main reasons, as outlined by Baumol and Oates (1988, pp. 178-180). First, a tax may not guarantee that the desired pollution control level is reached. Second, tax systems may face challenges related to price inflation and economic growth, necessitating continuous adjustments, unlike emissions trading, which automatically adjusts allowance prices in response to demand changes. Third, emissions trading may offer more familiarity and ease of implementation. Fourth, emissions trading mechanisms have the capacity to better incorporate spatial considerations for pollutants where source location is significant. Fifth, taxes may encounter resistance because of the heightened costs for producers, particularly those stemming from non-EU countries exporting to the EU.

Moreover, persistent uncertainty surrounds the precise positioning of the marginal cost curve for non-EU countries as perceived by policymakers. Thus, the establishment of an appropriate CBAM tax becomes a trial-and-error endeavor, potentially leading to costly revisions and regulatory ambiguity. In contrast, emissions trading empowers administrators to regulate the quantity, and thus the magnitude, of carbon emissions from the outset, furnishing enhanced control and stability, as illustrated in Figure 3 below.

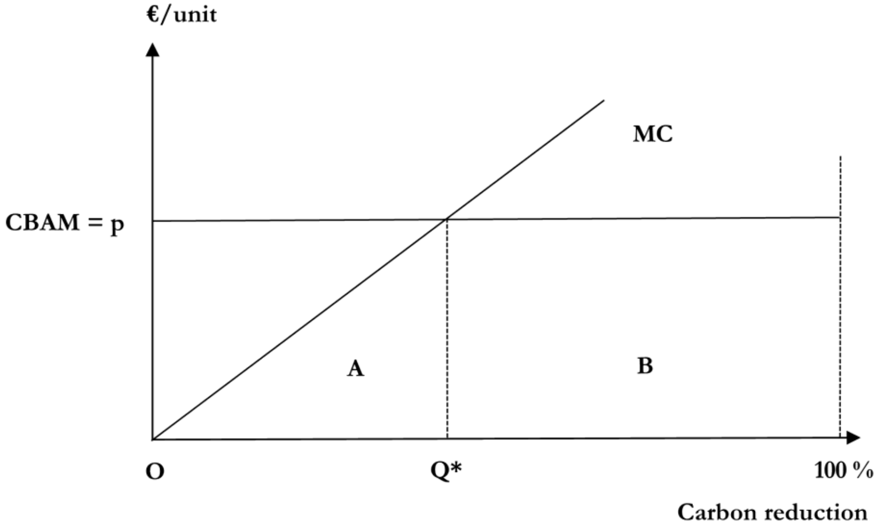

Figure 3: CBAM Tax and Emissions Trading

In pursuit of the political objective to reduce *Q** carbon units within the EU, the introduction of the CBAM tax can serve as a mechanism. In this scenario, producers would bear the cost represented by area *A* to reduce carbon emissions themselves. After *Q**, producers will now shift over and pay the CBAM tax for emitting the rest of their emissions up till 100 %. This is rational, because the marginal costs of reduction (*MC)* now exceeds the CBAM tax. Area *B* shows the size of the CBAM tax payments collected by the EU. Thus, the implementation of the CBAM tax means the transfer payment from non-EU countries of area *B* to the EU.

An alternative strategy to CBAM taxation of non-EU countries involves the adoption of a grandfathered ETS where the number of quotas could then be adjusted so that the price *p* equals the actual *CBAM* tax (Tietenberg and Lewis, 2020). Unlike CBAM, this system does not involve a direct financial transfer from polluters to the EU, as allowances are initially allocated for free to existing sources by an authority. In the context depicted in Figure 3 above, the allocation of allowances corresponding to *Q** emissions under a grandfathered ETS would result in original sources bearing only the reduction costs represented by area *A*. This stands in contrast to the CBAM tax, where the cost burden would encompass both areas *A* and *B*.

5. Policy Perspectives

In responding to the CBAM, the EEAS may guide non-EU countries to consider implementing a similar system to that of the EU ETS as a strategic approach to avoid paying the carbon tax. Hence, adopting a grandfathered ETS in non-EU countries emerges as a viable alternative and policy perspective. First, a grandfathered ETS has heightened political appeal for producers compared to a tax, as it circumvents direct financial contributions to state finances while minimizing carbon reduction expenses for producers. Economic interactions occur exclusively among polluters, with carbon reduction facilitated through emissions trading, allocated to producers best positioned to cost-effectively reduce emissions. In fact, producers with higher marginal reduction costs can compensate those with lower costs by purchasing allowances from them, fostering efficiency in carbon reduction efforts. Second, a barrier to market entry is created, as new producers must procure allowances from existing producers, who received their allowances at no cost (Svendsen 1998).

Addressing concerns regarding market accessibility for new entrants is crucial. A potential challenge arises if existing producers withhold carbon allowances from newcomers, potentially impeding competition in product markets. Drawing insights from the case of the US experience with emissions trading, particularly the ARP, provides valuable lessons. The ARP, aimed at achieving a 50 percent reduction in sulfur emissions from electric utilities over a decade (1990-2000), employed auctions as a mechanism to stimulate the ARP. Auctions ensured the availability of allowances, facilitating entry for new sources into the market. Moreover, auctions furnished clear price signals for sulfur allowances, enabling private trading among firms and potentially reducing transaction costs (ibid.).

Leveraging such auction mechanisms can promote market inclusivity and cost-effectiveness, ensuring that new producers can access markets while advancing climate and sustainability objectives. An auction therefore may be a useful tool for establishing a potential grandfathered carbon market in non-EU countries (Christensen and Svendsen 1999). When auctions are structured to be revenue neutral and non-discriminatory, where participants pay only the clearing price, total payments are refunded to producers, ensuring revenue neutrality (Hahn and Noll 1982). Under this framework, each polluter receives their historical emission rights at no cost and is obligated to offer these allowances for sale in auctions. Interested parties can participate in the auction by stating the desired number of allowances at different price points, thereby providing individual demand schedules for allowances. If authorities withdraw a portion of allowances (e.g., two percent) for auctioning, the original allowance holders should receive the revenue from the sale. For instance, if a source offers 100 allowances and the auction's clearing price is €100 per allowance, the existing producer will receive €10,000.

The auction-based model proposed for future ETS design requires further rigorous examination. Future research should therefore focus on modeling the economic impacts of such hybrid systems, particularly in low-income countries. An important topic for investigation is how auctioning might interact with existing informal markets or exacerbate corruption risks. Simulated scenarios could provide more accurate predictions and enhance the resilience of the design in politically unstable or data-scarce environments.

A grandfathered carbon market in non-EU countries can be structured into five key variables: target level, target group, allocation rule, trade rules, and control system (Svendsen, 1998). This analytical framework enables policymakers to systematically address essential components of the carbon market, ensuring clarity, transparency, and effectiveness in implementation. First, the target level has to be politically decided by the government in question and should be aligned with the CBAM, i.e. the Green Deal and a 55 percent carbon reduction by the year 2030 (compared to the 1990 level). Second, the target group must be defined. Similar to the EU ETS and the US ARP, the ETS could be implemented at the firm level in non-EU countries. An initial approach could then involve incorporating the same six sectors that are initially outlined in the CBAM.

Third, concerning allocation rule, each firm could be allocated emissions rights equivalent to its historical emissions without charge (grandfathering), which was also the case in both the original EU ETS and the early US emissions trading systems. Calculating the size of the free initial allocation to emitters could, e.g., be based on a three-year average period, such as 2023-2025. Fourth, trade regulations should stipulate that producers in non-EU countries be granted full property rights over their emissions allowances, including provisions for the banking of these allowances. To ensure the availability of allowances for new sources, it would be prudent to establish an annual reserve amounting to three percent of the total allowances. From this reserve, one percent could be earmarked for direct sale at a price reflective of the expected market value, with these allowances first offered to new entrants before being made available to existing producers. Additionally, to facilitate the entry of new producers and provide a clear price signal to the market, two percent of the allowances could be auctioned annually through a non-discriminatory and revenue-neutral process.

Fifth, and finally, the administration of the control system in non-EU countries must be centralized under a single authority to prevent local municipalities and regions from assuming control responsibilities, which could lead to potential biases in favor of protecting local firms. The implementation of an annual self-reporting mechanism regarding fuel inputs would allow this central authority to verify the accuracy of data submitted by both buyers and sellers, enabling a thorough examination of individual energy inputs across firms. In cases where a producer exceeds their allocated allowances, penalties should be imposed to deter fraudulent activities, ensuring that the penalty is greater than the economic benefit derived from non-compliance. Furthermore, excess emissions should be offset in subsequent years.

Ensuring the integrity of the central authority is paramount to prevent corruption among bureaucrats susceptible to inducements from producers. One approach to mitigate this risk involves establishing an independent supervisory body tasked with overseeing the central authority and acting as an anti-corruption agency (Brandt and Svendsen, 2013). Table 1 outlines a proposed cost-effective policy design tailored for a non-EU country's response to the CBAM.

Table 1: A Cost-effective Grandfathered Carbon ETS for non-EU countries

Key variables	Recommended policy design
1. Target level	The political target level in a given non-EU country should align with the EU's goal of achieving carbon reduction.
2. Target group	Initially, firms in the six sectors covered by the Carbon Border Adjustment Mechanism (CBAM)—cement, iron and steel, aluminum, fertilizers, electricity, and hydrogen—should be the primary focus.
3. Allocation rule	The initial allocation of allowances should be granted freely (grandfathered) to producers based on their average historical fossil fuel usage over a defined period.
4. Trade rules	Producers should be granted property rights over their emissions allowances, with the option to bank them for future use or trade. To ensure the availability of allowances for new entrants and to provide price signals to the market, a portion of the allowances could be withdrawn annually for direct sale and for a revenue-neutral auction.
5. Control system	A system should be established for annual reporting of fossil fuel inputs to a centralized authority, which will be responsible for verifying the accuracy of the data submitted by both sellers and buyers. In cases of non-compliance or violations, penalties should be imposed that exceed the price of allowances, and excess emissions should be offset in the following year. An independent anti-corruption agency, acting as a supervisor, should be tasked with overseeing the operations of the central authority to ensure transparency and accountability.

6. Conclusion

This paper's overall research question addressed how the EEAS could help design an emissions trading system (ETS) framework that would allow non-EU countries to avoid CBAM payments and join a global climate club. It was argued that the CBAM is a policy innovation that represents a significant step towards addressing carbon leakage and leveling the playing field for countries operating under different carbon pricing regimes. One of the key challenges associated with this policy innovation is the risk of carbon leakage, where carbon-intensive industries in the EU may relocate production to non-EU countries with less stringent climate policies to avoid carbon pricing. This not only undermines the effectiveness of carbon pricing measures but also leads to an international redistribution of emissions rather than a reduction in overall emissions. Furthermore, carbon leakage can result in negative economic impacts for countries implementing ambitious climate policies, as industries may face increased production costs and loss of competitiveness and jobs when domestic industries move their production to non-taxed countries.

While the CBAM holds promise as a policy innovation, it faces significant challenges. Implementing the CBAM to reduce the risk of carbon leakage has raised concerns among non-EU countries regarding its potential to act as a trade barrier and its impact on international trade dynamics. Additionally, the CBAM has sparked debates about its compatibility with existing WTO trade rules and its potential to exacerbate tensions between trading partners. Thus, in response to these challenges, the EEAS may advise non-EU countries such as China to consider the adoption of a national grandfathered carbon ETS as a viable and cost-effective way to avoid CBAM payments. This potential strategy can be guided by policy lessons from the cases of the EU ETS and the US ARP.

Through the implementation of a cap-and-trade system, both the EU ETS and the US ARP have effectively incentivized emissions reductions while providing flexibility for industry adaptation. Lessons gleaned from these experiences offer valuable policy perspectives for policymakers globally, showcasing the cost-effectiveness of market-based mechanisms, including a revenue-neutral auction, in achieving environmental objectives. In the context of the CBAM, non-EU countries could likewise be guided by the EEAS to implement a cost-effective grandfathered carbon ETS and thereby avoid paying carbon taxes to the EU while promoting emissions reductions domestically. This approach not only aligns with the principles of market-based environmental regulation but also provides a pathway for international cooperation and climate action. By harmonizing institutional frameworks and facilitating emissions trading across borders, countries can work together to achieve emissions reduction targets while promoting economic growth and sustainable development. However, the successful implementation of a grandfathered ETS requires careful consideration of the recommended design features. The combined CBAM/grandfathering model may ease global cooperation and encourage emissions reductions if non-EU countries adopt a grandfathered ETS to avoid CBAM-related payments with EU support.

A main future challenge involves the EEAS ensuring the application of the Polluter Pays Principle and incentivizing carbon emissions reduction consistently across countries. Here, the elasticity of demand for energy products can affect whether energy producers pass carbon tax costs to consumers, necessitating competitive markets with substitutes to mitigate this issue. Additionally, a supranational authority such as the WTO may be required to oversee a potential global climate club and prevent free riding by imposing sanctions to ensure compliance with climate policies in single countries. Such an authority must operate independently of narrow national and regional interests to earn trust (Bjørnskov and Svendsen 2007).

Moreover, as mentioned earlier, the CBAM exacerbates concerns regarding the treatment of producers in non-EU countries with fragile institutions, further underscoring the urgency of national solutions and getting the economic incentives right. As these countries face uniform treatment from the EU irrespective of their domestic efforts to curb emissions, investments in carbon-efficient technologies may be deterred within these countries, highlighting the critical need for even more policy innovation by the EEAS, including more CBAM flexibility regarding the poorest countries and global climate policy.

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