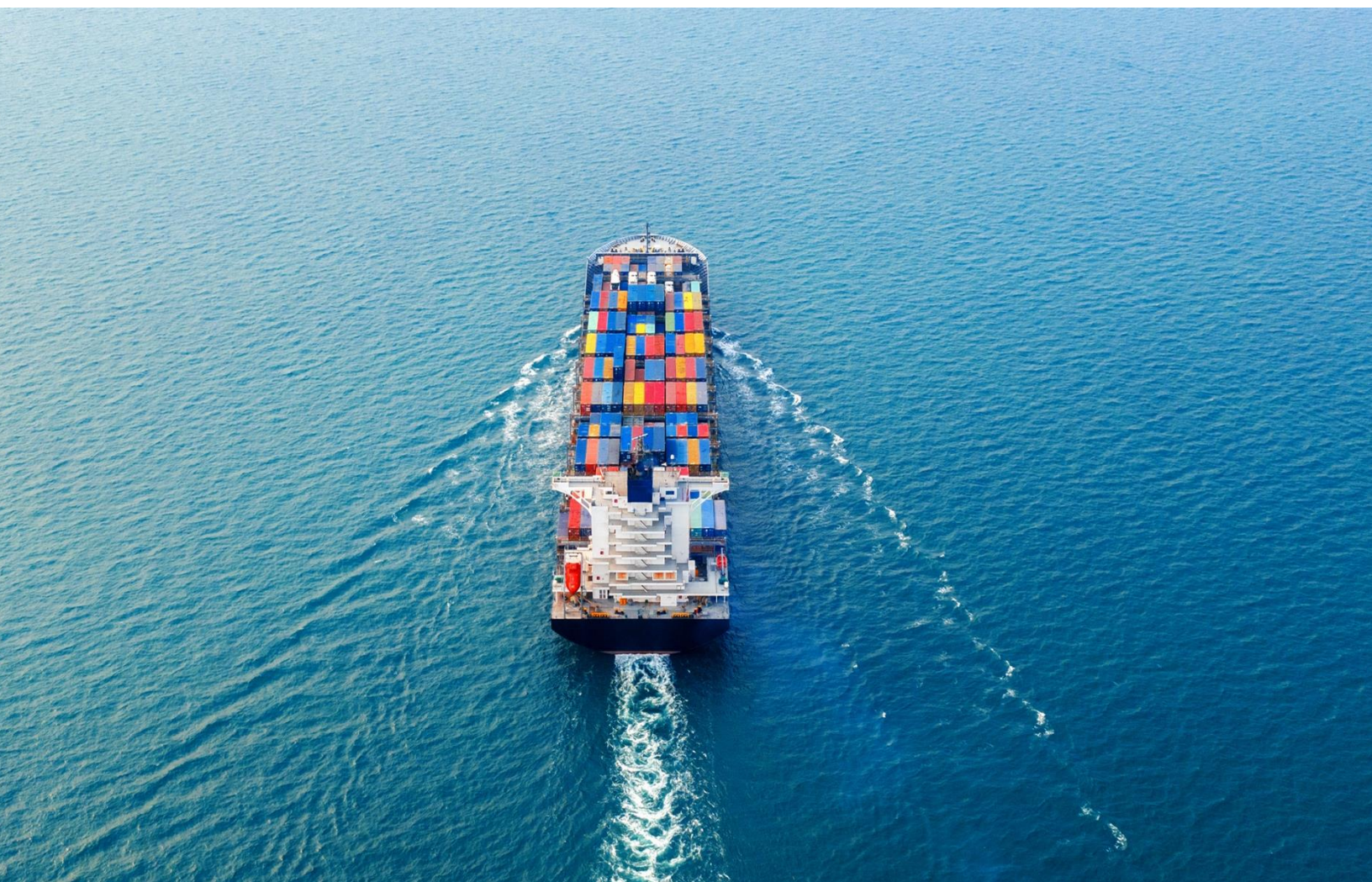


The EU CBAM in Practice: The Challenge of Resource Shuffling



SUMMARY

- *Resource shuffling is a carbon leakage avoidance strategy where foreign producers or traders manipulate accounting and trade flows by exporting their cleanest, low-carbon goods to the EU (to minimize the Carbon Border Adjustment Mechanism (CBAM) cost) while diverting their dirtier, high-emission production to unregulated markets.*
- *None of the assessed options (including doing nothing, targeted stopping of certain shuffling types, or stopping all shuffling via default values, and solutions external to the CBAM or pausing CBAM) are a perfect solution, and each involves significant trade-offs.*
- *The most pragmatic path forward is a strategy that accelerates EU industrial decarbonization while also backloading the phase-out of free allowances under the EU ETS to provide critical transitional support.*

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1. Introduction

The European Roundtable on Climate Change and Sustainable Transition (ERCST) is an independent think-tank dedicated to facilitating informed debate and providing insight into European Union (EU) and global climate policy, including among others the EU Emissions Trading System (ETS) and the EU Carbon Border Adjustment Mechanism (CBAM). Previous work has explored various aspects of carbon leakage, competitiveness, and the design features necessary for effective policies.

Following the earlier phases of the project “Border Carbon Adjustments in the EU”—Phase I (2019–2020), Phase II (2020–2021), Phase III (2021–2022), Phase IV (2023), and Phase V (2024)—this paper marks the third publication under Phase VI (2025).

Building on the 2021 ERCST report “Addressing Carbon Leakage in the EU: Making CBAM Work in a Portfolio of Measures,”¹ which only briefly touched upon the issues of circumvention and resource shuffling, this paper provides a more detailed and focused analysis of these challenges, with particular emphasis on resource shuffling.

The report is particularly topical given the immediate regulatory schedule facing the CBAM. As the transitional phase nears its conclusion, scrutiny remains high on its final design parameters, with critical Implementing Acts and Delegated Acts still pending. Additionally, a legislative proposal is expected in the fourth quarter of 2025, covering an export solution, downstream scope extension, and a dedicated Anti-Circumvention Strategy. This follows the public consultation on scope extension, anti-circumvention measures, and rules for the electricity sector which concluded on 26 August 2025.

The necessity of addressing integrity risks is explicitly embedded in the Regulation’s legal framework. Article 27 of the Regulation explicitly tasks the Commission with the responsibility for detecting and addressing circumvention, requiring the monitoring of trade patterns, the investigation of notifications from Member States, affected parties, or NGOs, and the ability to amend Annex I to include modified products and close loopholes if systematic circumvention is confirmed. This mandate for vigilance is reinforced by the requirement under Article 30 of the Regulation to present a report on the CBAM’s application and functioning, including an assessment of circumvention practices, to the European Parliament and Council before the end of the transitional period and then every two years thereafter.

Beyond EU boundaries, the EU’s leadership in deploying its CBAM has also prompted other major jurisdictions—e.g. the UK, Australia and Canada—to develop or actively consider similar measures, making the EU’s experience a crucial global case study.

Following this introduction, Section 2 provides a critical analysis of the CBAM’s underlying objectives, defining three distinct interpretations of the core goal—the prevention of carbon leakage—to establish the necessary analytical framework for policy evaluation. Section 3 then outlines the spectrum of implementation challenges, distinguishing between circumvention risks

¹ Andrei Marcu et al., Addressing Carbon Leakage in the EU: Making CBAM Work in a Portfolio of Measures (Brussels: ERCST, 2021), <https://ercst.org/addressing-carbon-leakage-in-the-eu-making-cbam-work-in-a-portfolio-of-measures/>.

(i.e., deliberate cheating) and avoidance strategies (i.e., exploiting legal rules). Section 4 moves to the paper’s primary focus: a detailed examination of resource shuffling, exploring its mechanics and implications. Finally, Section 5 addresses potential policy responses, offering recommendations for what should be done to effectively mitigate the risk of resource shuffling.

2. The CBAM’s Objectives

The implementation of the EU’s CBAM faces numerous challenges that could frustrate its core objectives. This report first unpacks what those objectives are, as the appropriate policy approach for addressing the challenges—particularly resource shuffling—differs substantially depending on which interpretation of the CBAM’s purpose is pursued.

As per Article 1, para. 1, of the CBAM Regulation², “this Regulation establishes a carbon border adjustment mechanism (the ‘CBAM’) to address greenhouse gas emissions embedded in the goods listed in Annex I on their importation into the customs territory of the Union in order to prevent the risk of carbon leakage, thereby reducing global carbon emissions and supporting the goals of the Paris Agreement, also by creating incentives for the reduction of emissions by operators in third countries.”

The term ‘carbon leakage’ refers to the transfer of CO₂ emissions from one country to another when, due to strict climate policies, companies relocate their production to countries with weaker emission constraints which may or may not contribute to an increase in global greenhouse gas emissions. The formula for calculating it is the emissions increase in other countries divided by the emissions reduction in the implementing country, expressed as a percentage. Leakage of 50% would mean that half of the emissions reduction achieved domestically was cancelled out by foreign emission increases. A figure greater than 100% would mean that carbon leakage actually caused global emissions to increase. For perspective, the Commission’s impact assessment of the CBAM modelled a complete removal of free allocation without a protective CBAM and predicted leakage in the CBAM sectors of 42%.³

Preventing carbon leakage is the key explicitly stated objective in the CBAM Regulation, but we believe there are also other objectives connected with a “thereby”/“and” that in our view can lead to an increasingly broader interpretation: the narrow product-level focus, the broader producer/sector-level focus on competitiveness, and the overarching global-level objective concerning environmental outcomes:

- **Address carbon leakage by ensuring that we mirror the EU domestic carbon price on the carbon intensity at product level.** This understanding would only require that goods actually entering the EU face a symmetrical carbon cost but would not affect the remaining

² Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism, Article 1, para. 1. <https://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:32023R0956>.

³ European Commission. (2021). Impact Assessment Report accompanying the document Proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism. SWD(2021) 643 final. Part 1, Table 4. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021SC0643>.

share of foreign producers' output. In other words, this approach would allow foreign producers in countries with lower or no carbon pricing to enjoy a lower average firm-level carbon cost than that faced by EU producers. This interpretation of the objective of CBAM does not address competitive pressures resulting from carbon pricing which applies in the EU to the whole production.

- **Address carbon leakage and competitiveness by ensuring that the effective carbon price in an exporting country is mirroring the EU domestic carbon price on carbon intensity at the sector level.** This interpretation goes beyond the first by providing a more comprehensive approach to safeguard the competitiveness of EU producers. In this case, the whole production in a sector in the exporting country would have to be charged the same carbon price, whether it is exported to the EU or not.
- **Preventing an overall increase in global GHG emissions:** Under a global-level interpretation, the CBAM's purpose would go beyond ensuring competitive parity or carbon cost symmetry between EU and foreign producers. Instead, the central objective would be to prevent an overall rise in global GHG emissions. In this view, carbon leakage is understood as a situation where the EU carbon pricing leads to an increase in emissions outside the EU that offsets the reductions achieved within the EU. The emphasis shifts from levelling the playing field and cost parity to environmental effectiveness at the global level.

The first interpretation of the CBAM objective is not relevant to the discussion on addressing resource shuffling, as CBAM focuses solely on the carbon content of goods entering the EU. Consequently, trade flows and the allocation of cleaner versus dirtier production abroad fall outside its scope. In contrast, the second and third CBAM objectives, if pursued, would imply different policy approaches to tackling resource shuffling. These implications are explored further in Section 5.

3. An Overview of Challenges

The practical implementation of the CBAM is subject to various challenges that can be broadly categorized into circumvention and avoidance risks. The key distinction we apply in this report is that circumvention involves deliberate non-compliance or falsifying information, whereas avoidance involves legally leveraging the rules of the mechanism, without technically breaking the letter of the law.

3.1. Circumvention-Related Challenges

Circumvention challenges arise from deliberate attempts to mislead authorities. Approaches to addressing these challenges do not vary significantly depending on the choice of policy objectives. Three major challenges can be identified:

3.1.1. Mis-labelling shipments

Importers may attempt to mis-label shipments by declaring goods under incorrect Harmonised System (HS) codes to evade or reduce their CBAM liability. For example, a product subject to CBAM could be reported under a similar but exempt category, making detection challenging for customs authorities. Such practices undermine the environmental integrity of the CBAM and create unfair competition, highlighting the need for stronger customs oversight and risk-based verification mechanisms.

3.1.2. Data falsification

Some types of data are inherently difficult to verify, increasing the risk of misdeclaration of emission intensities. For example, distinguishing whether goods are produced from primary aluminium or from recycled scrap is often highly challenging, even though the two production routes have significantly different carbon footprints. Moreover, not all accredited verifiers can necessarily be relied upon, as some may even be complicit in manipulating or misreporting figures to conceal true emission levels. This risk has fuelled arguments in favour of restricting accreditation to verifiers based in Member States, though such a measure would increase compliance costs for foreign producers.

3.1.3. Undeclared transshipment to exploit Article 9

That is, falsely declaring a good was produced (or substantially transformed or processed) in a country when it was not, in order to benefit from a reduction of the CBAM obligation based on the carbon price imposed in that country.

3.2. Avoidance-Related Challenges

These challenges operate within the legal boundaries of the regulation, exploiting its rules without formally violating them. In such cases, the most appropriate policy response may depend on which CBAM objective is prioritized. The key challenges identified are:

3.2.1. Processing out of scope

This challenge involves processing goods just enough, so they fall outside the scope of the CBAM. While this provides a justification for extending the scope downstream, the risk of carbon leakage typically decreases, and administrative difficulty rises, the further downstream we go.^{4,5} There is a point, or “cliff,” beyond which coverage should not extend; however, just past that cliff, there will inevitably be some impacts, leading to some processing out of scope.

⁴ Andrei Marcu et al., Including products further down the value chain in the EU CBAM (Brussels: ERCST, 2024), <https://ercst.org/including-products-further-down-the-value-chain-in-the-eu-cbam/>.

⁵ Andrei Marcu et al., Extension of the CBAM scope (Brussels: ERCST, 2025), <https://ercst.org/extension-of-the-cbam-scope/>.

The ways this challenge might be approached do not differ significantly based on the chosen CBAM objectives.

3.2.2. Splitting shipments across different legal entities

Under the previous value-based de minimis threshold of €150 per shipment, some importers sought to split consignments into multiple smaller shipments to keep each one below the reporting threshold and thus circumvent CBAM obligations.

The transition to a mass-based de minimis threshold of 50 tons of imported goods per importer per year effectively addressed this specific loophole. However, this change has created a new form of avoidance: instead of dividing shipments, importers may now seek to establish multiple legal entities or registered declarants to distribute their import volumes across several reporting entities. By doing so, each declarant's total imported mass can remain below the 50-tonne limit, effectively avoiding CBAM reporting obligations while still maintaining the same overall import volume at the group level.

3.2.3. Foreign carbon pricing on exports alone

If the CBAM recognizes carbon pricing applied only to goods destined for export as a credit, it may advantage foreign firms because their goods face a much lower average cost of carbon than EU-produced goods. Furthermore, recognizing just an export carbon price removes the incentive for foreign governments to adopt comprehensive domestic carbon pricing and for foreign firms to genuinely reduce their overall emissions.

Note that whether this challenge constitutes avoidance, circumvention, or neither will ultimately depend on what the forthcoming Implementing Act on carbon price paid in third countries⁶ will specify.

3.2.4. Foreign subsidies to mitigate the impact of carbon pricing

Foreign governments may institute strong carbon pricing measures to take advantage of Article 9 crediting but simultaneously implement technically unrelated subsidies that, in effect, negate the financial impacts of the carbon pricing on their producers.

The approach to this issue depends on how the subsidies are defined, i.e. a dilution of the carbon price vs. unrelated policy measure or measures to reduce emissions (e.g. as in the case of the EU Innovation Fund).

3.2.5. Resource shuffling

This avoidance challenge involves rearranging trade flows such that the cleanest, less carbon-intensive goods are specifically exported to the EU, while the dirtiest goods are sold elsewhere.

⁶ https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14830-Carbon-border-adjustment-mechanism-CBAM-carbon-price-paid-in-a-third-country_en

Resource shuffling can lead to changes in global emissions by shifting market share from EU producers to foreign competitors whose production processes may be either cleaner or dirtier. Moreover, the indirect effects, such as the closure of EU facilities and the ramp-up of new capacity abroad, can further increase or decrease overall emissions depending on the relative carbon intensity of the new producers.

4. Deep Dive: Resource Shuffling

Among the several manifestations of carbon leakage identified in the economic literature, *resource shuffling* – sometimes referred to as “reshuffling” or “contract shuffling” – occupies a distinctive position. While there is no universally accepted definition, the term broadly denotes a reallocation of production or trading relationships that alters the *attributed* carbon intensity of traded goods or energy without changing actual physical emissions. In its simplest form, a regulated entity substitutes low-carbon output for delivery into the jurisdiction subject to carbon constraints, while redirecting higher-emission output to unregulated markets. The net effect is a statistical reduction in measured emissions, even though global atmospheric concentrations remain unchanged.

Early discussions emerged in the context of sub-national carbon markets, notably California’s cap-and-trade program, where regulators faced the challenge of incorporating imported electricity. The California Air Resources Board (CARB) initially defined resource shuffling in 2011 as “any plan, scheme, or artifice to receive credit based on emissions reductions that have not occurred, involving the delivery of electricity to the California grid”.⁷ Subsequent commentary, however, recognized that the concept extends beyond the power sector, applying to any market where regulatory asymmetries and contractual flexibility permit a re-labelling of carbon-intensive production. Economists often describe it as a *form of leakage*, or – as Borenstein et al. (2019) put it – an “*extreme form*” thereof,⁸ because it can fully decouple apparent emissions reductions from real abatement outcomes. Unlike conventional leakage, where production physically migrates to jurisdictions with laxer constraints, resource shuffling operates through accounting and trade flows, effectively “off-shoring” emissions on paper while underlying technologies remain unchanged.

The difficulty of crafting a precise definition stems from the inherent complexity of attributing emissions to traded goods. In electricity markets, where physical electrons are indistinguishable once dispatched to the grid, contractual assignments of carbon intensity inevitably rely on conventions rather than direct measurement. Legal and economic analyses have accordingly framed resource shuffling as a behavioural response to carbon price differentials, enabled by informational asymmetries and the fungibility of market instruments.⁹ The challenge for policy

⁷ Cal. Code Regs. tit. 17, §95802(a)(250).

⁸ Borenstein, Severin, James Bushnell, Frank A. Wolak, and Matthew Zaragoza-Watkins. ‘Expecting the Unexpected: Emissions Uncertainty and Environmental Market Design’. *American Economic Review* 109, no. 11 (2019): 3953–77. <https://doi.org/10.1257/aer.20161218>.

⁹ Bushnell, James, Yihsu Chen, and Matthew Zaragoza-Watkins. ‘Downstream Regulation of CO₂ Emissions in California’s Electricity Sector’. *Energy Policy* 64 (January 2014): 313–23. <https://doi.org/10.1016/j.enpol.2013.08.065>; Caron, Justin, Sebastian Rausch, and Niven Winchester. ‘Leakage from

makers seeking to prevent resource shuffling is, therefore, to distinguish legitimate shifts in procurement or investment from purely notional re-allocations that erode environmental integrity.

4.1. The Californian Experience

California's approach to imported electricity offers the most extensively documented case study of resource shuffling in practice. When Assembly Bill 32 established California's economy-wide emissions cap, electricity imports were explicitly included to avoid competitive distortions between in-state generators and out-of-state suppliers.¹⁰ Under this "first jurisdictional deliverer" model, importers were required to surrender allowances for the emissions associated with delivered electricity, using facility-specific data where available and a default emissions factor for unspecified imports. The original regulation included a categorical prohibition on resource shuffling and mandated sworn attestations of compliance.

Political and practical constraints soon intervened. Utilities importing large volumes of power from coal-based contracts – such as the Los Angeles Department of Water and Power and Southern California Edison – warned that the prohibition was overly broad and could expose staff to liability under ambiguous circumstances. In 2012, following pressure from industry and the Federal Energy Regulatory Commission (FERC), CARB suspended the attestation requirement and later introduced thirteen "safe harbour" provisions that redefined a range of transactions as lawful, including divestment from legacy coal contracts and changes consistent with the State's Renewables Portfolio Standard.¹¹

Academic and advisory assessments were divided on the consequences. An influential early working paper out of Stanford University argued that the safe harbours effectively "swallowed the rule," estimating potential leakage from coal divestments equivalent to as much as 47–197 percent of the cumulative mitigation expected under AB 32 through 2020.¹² The authors likened resource shuffling to a "near-zero-price offset" lacking additionality, warning that it could undermine both market credibility and statutory obligations to minimize leakage. Subsequent analyses by the Independent Emissions Market Advisory Committee (IEMAC) acknowledged evidence of some reshuffling behaviour but found it difficult to quantify *ex post*, given simultaneous structural changes in Western electricity markets and falling natural-gas prices.¹³

Sub-National Climate Policy: The Case of California's Cap-and-Trade Program'. *The Energy Journal* 36, no. 2 (2015): 167–90. <https://doi.org/10.5547/01956574.36>.

¹⁰ Pauer, Stefan U. 'Including Electricity Imports in California's Cap-and-Trade Program: A Case Study of a Border Carbon Adjustment in Practice'. *The Electricity Journal* 31, no. 10 (2018): 39–45. <https://doi.org/10.1016/j.tej.2018.11.005>.

¹¹ Ibid.

¹² Cullenward, Danny, and David Weiskopf. 2013. *Resource Shuffling and the California Carbon Market*. Stanford Law School, Environmental and Natural Resources Law & Policy Program Working Paper, 18 July 2013. <https://law.stanford.edu/index.php?webauth-document=publication/440262/doc/slspublic/Resource%20Shuffling%20-%20Cullenward%20and%20Weiskopf.pdf>.

¹³ Fowlie, Meredith, Danny Cullenward. 2018. *Report on Emissions Leakage and Resource Shuffling*. Sacramento, CA: California Environmental Protection Agency; Burtraw, Dallas, Danny Cullenward, Meredith Fowlie, Katelyn Roedner Sutter, and Ross Brown. 2021. <https://calepa.ca.gov/wp-content/uploads/2018/09/6e.-IEMAC-Meeting-Materials-9-21-18-Fowlie-and-Cullenward-Report-on-Emissions-Leakage.pdf>. *Annual*

Later reviews suggest that any large-scale evasion through contract reshuffling was short-lived. A literature review by the International Carbon Action Partnership (ICAP) noted in 2021 that CARB's monitoring and reporting regime, coupled with parallel policies – especially the Emissions Performance Standard and the Renewable Portfolio Standard – contributed to a steady decline in coal-based imports and a convergence in emissions intensity between California's imports and the rest of the Western Electricity Coordinating Council.¹⁴ By 2018, two-thirds of coal capacity previously exporting to California had been retired or converted to natural gas. Still, observers agree that the controversy exposed fundamental tensions between environmental integrity, legal certainty, and political feasibility. As Pauer (2018) emphasizes, the weakening of the original prohibition represented a political compromise to ensure program stability, even at the cost of diminished stringency.¹⁵

As for whether resource shuffling undermined the Californian cap-and-trade system and thus its decarbonization efforts, the literature offers a nuanced view. While early critics underscored its potential to erode genuine abatement, later empirical studies found limited measurable leakage once broader market trends were accounted for.¹⁶ Some economists interpret the resulting reallocations as an efficient, if imperfect, market response to differentiated carbon prices – an illustration of how trade and contractual flexibility can minimize compliance costs when emissions accounting remains incomplete.¹⁷ Still, the avid discussion and initially dire predictions regarding resource shuffling in California have left a perception that it was, and is, an intractable challenge that has undermined the normative credibility of California's pioneering carbon market. What it certainly has, is underscore the difficulty of regulating emissions embodied in traded commodities under asymmetrical jurisdictional coverage.

4.2. Implications for the EU CBAM

California's experience offers both cautionary and instructive lessons for the EU as it progresses to operationalize its own CBAM. The parallels are not exact, yet similarities exist: a major preoccupation for California has been to ensure that buyers of electricity do not strategically switch from high-carbon specified sources to unspecified mixed sources of imports, benefiting from the default values assigned to unspecified sources. Depending on the as-yet unfinished operational rules regarding use of default values rather than actual reported and verified emissions under the CBAM, a similar dynamic could manifest in Europe if third-country producers strategically refuse

Report of the Independent Emissions Market Advisory Committee. Sacramento, CA: California Environmental Protection Agency. <https://www.calepa.ca.gov/wp-content/uploads/2022/02/2021-IEMAC-Annual-Report.pdf>.

¹⁴ Kardish, Christopher, Jana Elbrecht, and William Acworth. 2021. *Carbon Leakage and Competitiveness: California's Treatment of Imported Electricity and New Zealand's Synthetic Greenhouse Gas Levy*. Berlin: International Carbon Action Partnership (ICAP). https://icapcarbonaction.com/system/files/document/canz-paper_v06_final.pdf.

¹⁵ Pauer, *supra*, n. 10.

¹⁶ Xu, Qingyu, and Benjamin F. Hobbs. 'Economic Efficiency of Alternative Border Carbon Adjustment Schemes: A Case Study of California Carbon Pricing and the Western North American Power Market'. *Energy Policy* 156 (September 2021): 112463. <https://doi.org/10.1016/j.enpol.2021.112463>.

¹⁷ Fowlie, Meredith L., and Mar Reguant. 'Mitigating Emissions Leakage in Incomplete Carbon Markets'. *Journal of the Association of Environmental and Resource Economists* 9, no. 2 (2022): 307–43. <https://doi.org/10.1086/716765>.

to furnish actual emissions data, prompting reliance on default values instead. Another way resource shuffling could occur is if importers cancel or fail to renew contracts with high-carbon producers in third countries and instead buy from lower-carbon producers.

But it is worth noting that important differences remain. California's electricity imports come from a limited number of nearby sources – a pool that is relatively stable in terms of new producer entrants or low-carbon retrofits. The EU's imports of CBAM-covered goods come from many thousands of far-flung producers – a pool that is comparatively dynamic in terms of new entrants and low-carbon investments. Resource shuffling in the CBAM context is therefore more likely to constitute dynamically rewarding and incentivizing low-carbon investment and may reward clean foreign producers in ways that may reduce the competitiveness of some EU producers. Competitiveness was not a major concern for California electricity producers. Certain features of the European context may also render the CBAM more resilient to resource shuffling. Physical goods covered by the CBAM are easier to trace than the intangible flows of electricity on a shared grid, and customs procedures already provide a framework for product-specific reporting.

What is more, the potential for resource shuffling tends to be largest when emissions intensities vary significantly across producers and their installations, as is the case in the power sector between different electricity generation technologies. When it comes to industrial process emissions, the variability in carbon intensities of production tends to be more limited, at least across comparable production routes. Indirect emissions from electricity consumption are an area where variability can be large, increasing the likelihood of resource shuffling, but only two product categories – cement and fertilizers – that consume limited amounts of electricity have to currently account for indirect emissions under the CBAM; that would change, of course, if indirect emissions coverage expands in future revisions to the scope of the CBAM Regulation. Another area of concern is the possibility to use scrap as raw material inputs in metals production to reduce the direct emissions reported under the CBAM.

Another insight from California's experience concerns the political economy of enforcement. In California, opposition from utilities threatened program viability, leading to the dilution of regulatory safeguards. The EU will face analogous pressures from both domestic constituencies as well as trading partners seeking integrity at the same time as administrative simplicity. Conversely, the international scope of the CBAM introduces constraints absent in California: exposure to international free trade disciplines and World Trade Organization (WTO) scrutiny, the need to reconcile embedded-emission methodologies with foreign data quality, and the potential for retaliatory trade measures.

In spite of these differences between the Californian BCA, which covers domestic cross-border electricity trade, and the European CBAM, with its coverage of very different types of produces and a truly international scope, both settings share the core problem of asymmetric climate ambition and the incentive to manipulate attribution of emissions to dampen the financial implications of a border adjustment measure. The Californian case demonstrates that even within a relatively coherent regulatory space, resource shuffling proved difficult to define, detect, and deter. The establishment of “safe harbours” was intended to provide legal certainty but at the same time created broad avenues for strategic reallocation. Comparable dynamics can emerge under the European CBAM to the extent that importers are allowed to select individual facility-based emissions data and can substitute low-carbon products for products with large, embedded

emissions. As the IEMAC and its members have observed, reliance on standardized or default emission factors can limit such opportunities for resource shuffling.¹⁸ Perhaps unsurprisingly, therefore, virtually all U.S. proposals for a federal border carbon adjustment or fee have relied on default emission values rather than individually reported emissions.¹⁹ As we discuss in the next sections, however, this seemingly simple solution comes with significant trade-offs.

Text box 1: Emerging findings from Fastmarkets' trade flow modelling²⁰

Fastmarkets has undertaken quantitative modelling to assess the implications of the EU Carbon Border Adjustment Mechanism (CBAM) for trade flows and price formation within EU markets. The analysis compares three policy scenarios that are directly relevant to the challenge of resource shuffling:

- A baseline scenario without CBAM;
- CBAM implementation using facility-level emissions intensity factors; and
- CBAM implementation using national average emissions intensity factors.

This modelling is currently being finalized, but preliminary results already provide insights on the potential direction and magnitude of impacts. The modelling directly estimates potential impacts of resource shuffling but does not reflect other forms of avoidance or circumvention.

Overview of preliminary results

CBAM is projected to have an overall positive effect on EU production of covered goods. Even accounting for potential shifts in trade flows toward lower-emission producers and countries, thereby reducing the CBAM cost burden on imports, EU producers are likely to increase their market share. This outcome reflects two main dynamics:

- a) Comparative emissions performance: On average, EU firms exhibit lower emissions intensities than competing imports.
- b) Existing carbon cost exposure: EU producers already bear carbon costs under the EU ETS (albeit partially offset by free allocation), while importers will face a new and

¹⁸ Burtraw et al., *supra*, n. 13; Fowlie et al., *supra*, n. 17.

¹⁹ See, for instance, the designs of the: Fair, Affordable, Innovative, and Resilient Transition and Competition (FAIR) Act, S. 2378, Senate 117th Congress (2021-2022) 1st Session (2021). <https://www.congress.gov/bill/117th-congress/senate-bill/2378/text>; Clean Competition Act, S. 3422, Senate 118th Congress (2023-2025) 1st Session (2023). <https://www.congress.gov/bill/118th-congress/senate-bill/3422/text>; Foreign Pollution Fee Act of 2025, S.1325, Senate 119th Congress (2025-2026) 1st Session (2025). <https://www.congress.gov/bill/119th-congress/senate-bill/1325/text>.

²⁰ Fastmarkets, 2025, Trade flow modelling of CBAM impacts, forthcoming.

immediate cost on emissions exceeding the relevant benchmark once CBAM takes effect.

Changing from facility-specific to national average emissions factors, however, has a more ambiguous effect. It would provide greater protection to upstream producers (e.g. producers of iron ore and hot rolled coil) but could lead to lower market shares for downstream producers (e.g., fabricators) as their input costs rise.

Detailed impacts of CBAM

- CBAM could lead to significant cost increases for EU importers, exceeding 100% of current prices for some producers.
- However, firms can respond by shifting their sourcing to lower emissions intensity producers, reducing the extent to which these costs are passed on in prices. This effect is especially strong for products with wide variation in emissions intensities.
- These market share changes are often to the benefit of EU producers which already face carbon prices and often have lower emissions intensities than imported products.
 - Upstream EU producers (with high emissions intensity and lower prices than downstream products) gain the most, with increases in market share of over 10 percentage points for some products in some scenarios.
 - Downstream EU producers do not gain as much as higher prices for their inputs have a countervailing impact on competitiveness.

Impact of using national average emissions intensity factors

- Shifting from facility-specific to national average emission factors removes a key channel for importers to minimise CBAM exposure – namely, switching to less carbon-intensive facilities within a given country.
- This adjustment amplifies CBAM-related cost pressures, particularly in sectors with high intra-country variation in emissions. In iron and steel, for instance, model results show price increases up to 50% higher under national averages compared to facility-level reporting.
- While the aggregate effect on EU market share is limited, the distributional impacts along the value chain are pronounced: upstream producers (e.g. sintered iron ore, hot-rolled coil) gain competitiveness, whereas downstream manufacturers (e.g. coated flats, fabricated components) lose share due to higher input costs. Sectors downstream of CBAM products, e.g., the automotive sector, lose out from greater costs of materials without gaining competitive protection from CBAM.

Overall, once demand destruction is considered, switching to national average factors may decrease total value added in CBAM-covered sectors in the EU and increase overall emissions, compared to using facility-level factors.

Ultimately, the case of California shows that resource shuffling is difficult to define and even more difficult to eliminate. It also suggests that no silver bullet solutions exist, and that the problem has to be managed through pragmatic design and careful balancing of objectives and trade-offs. Options for doing so – including the attendant trade-offs – are discussed in the next section. What the Californian debate on resource shuffling did reveal, however, is that even this “extreme form of leakage” may be politically tolerable if its magnitude remains limited and the broader policy architecture continues to drive structural decarbonization. For the EU, the challenge will therefore be to balance the same triad of objectives: ensuring environmental effectiveness, preserving legal defensibility, and maintaining political durability in a dynamically changing domestic and international context.

5. Policy Options

The preceding sections have set out the challenge of resource shuffling under the EU CBAM. This section assesses six options—not all mutually exclusive—for dealing with that challenge. None constitutes a perfect solution, and in each case the analysis sets out the strengths and weaknesses involved.

5.1. Do Nothing

The policy: This option involves doing nothing to prevent resource shuffling.

The argument: This policy option assumes that resource shuffling is to be expected and should not be prevented. The leakage that takes place as a result of resource shuffling is not a result of uneven conditions of competition, since both foreign and domestic products are assessed the same carbon price in the EU. It is rather a result of a shift in competitiveness as a result of that carbon price, with the cleanest producers winning. It amounts to foreign producers responding to the incentives offered by carbon pricing, and the market rewarding them for doing so.

There is an intuitive argument that resource shuffling is undesirable because it does not involve any change in the GHG intensity of foreign production, but rather just a reshuffling of existing production.²¹ That argument is misguided in two ways. First, it is only valid in a very static context. To understand, take the hypothetical case of two foreign producers. One invested in reducing GHG emissions-intensity one day *before* the advent of the CBAM. If the CBAM causes that producer to shift its existing exports toward the EU, it is considered resource shuffling since foreign GHG intensity of production has not changed from the baseline date, which presumably is the CBAM’s

²¹ This argument has a basis in California’s definition of resource shuffling in the electricity market, where the primary concern was a shift in the designation of grid-based electricity supply without any actual change in suppliers – for example, changing the designation of a supplier from one that specified the exact mixture of sources to an unspecified designation to benefit from more favorable defaults. As noted above, the context of electricity supply, with very few foreign producers that do not often change their emissions intensity, is different in important ways from the context of industrial goods.

entry into force. Now take the example of a producer that invested in reducing GHG emissions-intensity one day *after* the advent of the CBAM. If that producer shifts its existing exports to the EU, it is considered an appropriate response to the CBAM, which has as a secondary objective incentivizing foreign producers to decarbonize. This contrast highlights the impropriety of punishing or failing to reward the first producer for costly investment in decarbonization, which may have been undertaken with a view to gaining a premium in the carbon-conscious markets of the future.

Second, the argument is an incomplete picture of resource shuffling. The initial shuffle may be nothing more than a rearrangement, with no changes in productive activities or GHG emissions. But the *result* of the shuffle may be that EU producers lose market share to foreign producers. Those foreign producers will be either more or less GHG intense than the EU producers they replaced. There may also be indirect effects - if EU producers go out of business, new capacity will ramp up elsewhere, either more or less GHG-intense than the bankrupt EU capacity. So, resource shuffling can involve significant changes to patterns of production and overall GHG emissions.

The challenges: Carbon pricing, and resource shuffling as a response to it, re-order the basis for competitive advantage in favour of cleaner producers. There are currently enough clean producers globally that if the EU unilaterally prices carbon on imports of CBAM-covered goods, those clean producers have the capacity to shuffle trade such that the EU's imports will be for the most part low-carbon.²² Such a dynamic would disadvantage EU producers with higher GHG-intensity, many of whom are already on the verge of economic viability.

In particular, given the relatively high costs of electricity in the EU, if the EU moves to increase the sectors for which indirect emissions are covered under CBAM, removing at the same time existing EU producer compensation for indirect costs, the resulting resource shuffling would lead to a crisis of competitiveness for those with significant electricity-related emissions. Marginal-cost pricing for electricity in the EU means that EU producers would be subject to electricity prices that include high carbon costs (even if electricity production is relatively low-carbon), but foreign producers with electricity supply of similar GHG intensity would face lower carbon costs under the CBAM.

It is important to note, however, that the negative competitiveness impacts of doing nothing will be most heavily concentrated in the upstream of CBAM-covered sectors. By the same dynamic that would see upstream producers suffer from competition with low-carbon foreign producers, downstream producers who need to buy CBAM commodities as inputs would probably benefit from being able to source those goods from foreign producers with lower GHG-intensity of production and therefore lower carbon costs.

As well, doing nothing might result in resource shuffling that increases overall global emissions of GHGs. The conditions under which that might come to pass are explored in Section 5.3 below, but if the doing nothing scenario allows this to take place, then the benefits of rewarding clean

²² For example, China has over 6 million tons of low-carbon scrap-based aluminum production per year, and current exports to the EU of aluminum total just over 600,000 tones. (Assous et al. (2024). A Scrap Game: Impacts of the EU Carbon Border Adjustment Mechanism. Sandbag).

producers must be balanced off against the environmental costs of increasing overall global emissions.

All these realities would put significant pressure on lawmakers to scale back environmental ambition under a “do nothing” policy option, undercutting the viability of the phase out of free allowances and the CBAM, both of which are key planks in the EU Green Deal and the mitigation targets it aims to achieve.

So doing nothing likely involves either sacrificing climate ambition or sacrificing the viability of some EU industrial production.

The objectives: Doing nothing is in line with a CBAM objective that focuses only on the carbon intensity of goods as they show up at the border, but not with one that focuses on the competitive impacts of producer behaviour at a sectoral level in the country of export. It may or may not be in line with the objective of decreasing overall global emissions; as discussed in 5.3, resource shuffling could have positive or negative global emission impacts.

5.2. Stop Indirect-Emission-Based Resource Shuffling

The policy: Stop resource shuffling that originates from the CBAM’s coverage of indirect emissions.²³

The argument: There are two ways in which the CBAM’s coverage of indirect emissions might lead to resource shuffling. The first starts from the fact that indirect emissions are much more varied across different producers in a given sector than are direct emissions, because there tends to be a much wider range of emissions intensity for electricity production than for the production of goods. As such, much of the potential “shuffling” of low-carbon goods for high-carbon goods would take place because the CBAM was pricing indirect emissions in sectors that are electricity-intensive, such as aluminium.²⁴ Such coverage would produce a significant spread in the costs of the goods, depending on the source of the producers’ electricity, creating incentives for resource shuffling.

The competitiveness effects on European producers would be particularly poignant, because the carbon costs associated with their indirect emissions are higher than those that an identical foreign producer would face. The price of electricity in the EU, unlike in other parts of the world, is set by the last (most costly) producer in the merit order, typically a GHG-intense fossil-based producer, so that producer’s carbon cost becomes the carbon cost paid by those that purchase electricity. Foreign producers, by contrast, pay a CBAM charge that is more directly tied to the actual carbon intensity of their purchased electricity. Those extra costs for EU producers greatly expand the possibility for profitable resource shuffling based on indirect emissions.

This form of resource shuffling could be stopped by simply not covering indirect emissions under the CBAM, relying instead on the existing facility for protecting competitiveness in the face of

²³ The CBAM defines indirect emissions slightly differently than other regimes. In the CBAM, indirect emissions are all emissions associated with the generation of purchased electricity.

²⁴ The current CBAM design covers indirect emissions only for fertilizers and cement but has a mandate to consider expanding that coverage to other sectors.

carbon costs based on indirect emissions: indirect cost compensation. The mechanism might need some reform to make it optimal as a solution to resource shuffling, including ensuring EU-wide coverage at adequate levels, and ensuring that the formula applied does not lead to over-compensation

A second form of resource shuffling based on indirect emissions arises because there is incentive for foreign producers to strategically rebrand their existing electricity supply as low carbon, with no actual change in the GHG intensity of their supplier(s). A producer that buys electricity from a grid with mixed sources might contract with the grid to purchase only the electricity from the lowest-carbon grid sources, despite the fact that once they are sold to the grid there is no way to distinguish electrons from the various sources. Or a producer might contract directly with a low-carbon supplier to the grid from which it currently purchases, arranging for that supplier to sell directly (via new physical connection) to the producer instead of to the grid.

Such strategies are classic resource shuffling, of the type that California has historically tried to avoid in its electricity market. It is different from resource shuffling in the goods market, which is simply a redirection of goods from one market or export destination to another. As argued above the latter results in changes in patterns of production and overall GHG emissions, while the former is a re-labelling or re-direction of existing electricity production to dedicate it to a particular producer.

The challenges: Policing the second type of behaviour would be difficult; it would involve detailed knowledge of the contractual arrangements between foreign producers and their suppliers of electricity. Systematic or even random checking might be out of the question.

It might be an adequate deterrent, however, to mandate stiff penalties for the behaviour, including perhaps mandatory use of default values, and then rely on reports of circumvention to initiate investigations. Another possibility would be to flag producers that suddenly changed their reported GHG emissions intensity, selecting them for further investigation.

The downsides of using indirect cost compensation as a deterrent for resource shuffling include the high fiscal costs of such a strategy at the EU level, the blunting of incentives for industrial energy efficiency, and the risk that trading partners might complain to the WTO that such payments amount to actionable subsidies.

The objectives: Stopping both types of resource shuffling is in line with the CBAM objective that focuses on exporter behaviour at the sectoral level in the country of export

Stopping both types of indirect-emissions-related resource shuffling is in line with a CBAM objective that focuses on exporter behaviour at the sectoral level in the country of export. Stopping the second type goes beyond what would be required by an objective that simply focused on the GHG intensity of goods when they arrive at the border, and stopping the first type is not strictly related to that objective. Because the second type of indirect emissions-related resource shuffling is neutral for GHG emissions, stopping it is not a priority from the global environmental perspective. Stopping the first type might be in line with the objective of lowering overall global GHG emissions if resource shuffling were destined to increase global emissions, but by the same token that objective would be violated if resource shuffling were destined to lower overall global emissions.

5.3. Stop “Environmentally Harmful” Resource Shuffling

The proposal: Define certain varieties of resource shuffling as environmentally harmful and implement policies to prevent only those varieties.

The argument: From an environmental perspective, there are two fundamentally different outcomes from resource shuffling: that which sees overall global emissions increase, and that which sees them decrease. Both would see EU producers lose global market share, but in the first case they would be replaced by producers that are more GHG intensive, and in the second case they would be replaced by producers that are less GHG intensive. Both cases involve some carbon leakage, which is simply the increase in foreign emissions as a response to domestic climate policy. But only the first case is directly harmful from an environmental perspective.

A specific set of conditions would need to exist to lead to that sort of harmful outcome. The first-order impacts of resource shuffling are that low-emission producers would re-direct to compete in the EU market, and if they were successful in replacing higher intensity—and therefore costlier—EU production, then global emissions would fall. But if that resulted in a reduction of EU production via closure of facilities, and global demand remained the same, then other producers would increase production, whether by increasing utilization at existing facilities or by building new capacity. If that increased production were at a higher intensity than the shut-down EU capacity, then the final result would be an increase in overall global emissions. This dynamic is analogous to the increased emissions that e.g. result from indirect land use change in the context of biofuels trade.

If EU producers simply lost domestic market share but did not close, then the unfulfilled demand created globally by the re-direction of foreign production to the EU could in theory be met by exports from those same EU producers: a simple reshuffle.²⁵ However, this would depend on there being some sort of export solution in the CBAM that rebated carbon costs to exporters; absent that, the dynamic described above would most likely play out: foreign production would increase to compensate for the increased market share foreign producers gained in the EU.

The challenges: In principle it may make sense to distinguish between environmentally harmful and non-harmful resource shuffling. But in practice the hurdles to distinguishing between the two are formidable.

The first challenge would be to identify which shipments to assess. The analysis would have to focus on individual shipments. The focus should be on imports with low GHG intensity, for example lower than that of the average EU producer (though that is a simplifying assumption). And presumably the focus should be on altered trade patterns that may have responded to the CBAM price signal. But, altered from what baseline? Would the analysis focus on shipments from producers that never formerly exported to the EU, and if so, would that baseline ever be updated, and how? Would it also cover increased shipments from existing exporters to the EU?

²⁵ In reality, no shuffle is simple or costless. Theoretical discussions of resource shuffling in the context of goods tend to ignore the practical difficulties involved with switching buyers and suppliers in international markets. Even upstream commodities face some transaction costs in doing so, but the further downstream from those basic commodities into more processed and specialized derivatives, the higher those costs will tend to be.

The more fundamental challenge would be in assessing the shipments once the focus had been decided. For each assessed shipment, the analysis would first require proof of causation – that the shipment to the EU was the cause of some corresponding increase in production in some other country. Simply assuming that there was increased production elsewhere would not work, since the next step in the analysis would require knowledge of the GHG intensity of that increased production – information that may not even be measured, and even if known would be difficult for the EU to determine. The sheer number of shipments involved means that an accurate or fair regime for discriminating would be impossible; simplifying assumptions would be needed that would be unfair to some individual producers.

The objectives: Stopping environmentally harmful resource shuffling goes beyond what would be required by an objective that simply focused on the GHG intensity of goods as they arrived at the border and would be inadequate from the perspective of a sectoral focus, since it would allow some types of resource shuffling (that which lowered overall global emissions). For that same reason, this option is solidly in line with the objective of reducing overall global emissions.

5.4. Stop All Resource Shuffling

The proposal: Define any resource shuffling as harmful and implement policies to stop it.

The argument: Resource shuffling presents a significant problem for the CBAM: it threatens to undermine the competitiveness and viability of significant elements of EU industry. As noted above, adhering to a strictly environmental objective and stopping only environmentally harmful forms of resource shuffling is challenging.

A much simpler option is to stop all resource shuffling. This could be done by removing the ability for importers to declare the emissions intensity of individual shipments based on producer data, and instead to mandate default values for the emissions intensity of all imported goods covered by the CBAM. That is, for instance, the solution proposed by the Independent Emissions Market Advisory Committee in California (see above, Section 4.1). Such default values could be either elaborated at a global level, for example, set at some benchmark of EU performance, or at a more disaggregated level, for example set at national sectoral values for the EU's major trading partners.

Global values would eliminate the possibility of resource shuffling completely. National sectoral values would still allow for limited resource shuffling, with goods from jurisdictions with relatively low default values directed toward EU exports, replacing goods from jurisdictions with relatively high default values.

The challenges: Setting default values removes incentives at the firm level to improve carbon-intensive production. It punishes producers that are relatively low-carbon, and rewards those that are more carbon-intensive than the default level. A default that could be challenged by individual producers would restore the rewards for cleaner production, but at the cost of also restoring the ability to engage in resource shuffling. Moreover, it would still reward relatively high-carbon producers.

Because this policy would trade off accuracy for administrative ease and effectiveness, it would engender a great deal of political heat from trading partners, likely adding considerably to the

existing pushback in venues such as the WTO and the UNFCCC. By the same token, the use of such default values would likely run afoul of WTO law. They might undermine an environmental GATT Article XX defence in any of several ways, for example by their arbitrary character, or by severing the direct link between the environmental characteristics of goods and their treatment under CBAM, being seen as measures to protect competitiveness rather than to protect the environment.²⁶

It would also have uneven effects on the competitiveness of EU industry. Upstream producers would be protected from competition with low-GHG-intensity foreign firms, but downstream producers would be deprived of the ability to import input goods with a lower carbon cost. Even the lowest-carbon foreign producers would be charged the default rate at the border.

The objectives: Stopping all resource shuffling goes beyond what would be required by a CBAM objective that focused only on the GHG intensity of goods at the border but is solidly in line with an objective that focuses on the sectoral behaviour of foreign producers. It might be in line with the objective of lowering overall global GHG emissions if resource shuffling were destined to increase global emissions, but by the same token that objective would be violated if resource shuffling were destined to lower overall global emissions.

5.5. Solutions Outside the CBAM

The proposal: In light of the fact that there is no perfect solution to the challenge of resource shuffling in CBAM, policymakers might pursue avenues outside of the CBAM for protecting the competitiveness of EU industry in the face of potential resource shuffling.

Given the root cause of the problem—that EU industry might be out-competed by cleaner production in a market with carbon prices—anything that might lower costs of production would help. The obvious focus would be lowering GHG-intensity of production, and in that context the measures envisioned under the Clean Industrial Deal and the Innovation Fund could be helpful.

An avenue for lowering costs for all CBAM-covered producers would be addressing Europe's relatively high costs of electricity. There are existing subsidies with this objective, including indirect cost compensation under the ETS, but that mechanism is not available in all producing countries, does not apply equally to all, and does not address the non-carbon-related drivers that lead to high prices, including the EU's marginal cost pricing regime for electricity.

Creating lead markets for EU-based green production would also be helpful in preserving European industrial competitiveness, for example through government procurement directives to buy low-carbon European products.

Anything that raises the bar for GHG emissions in foreign production will reduce the risk of environmentally harmful resource shuffling. In that context initiatives such as the G7-spawned Climate Club²⁷ have the potential to be helpful, particularly if they can evolve to foster

²⁶ Mehling, Michael A, and Robert A Ritz. 'From Theory to Practice: Determining Emissions in Traded Goods under a Border Carbon Adjustment'. *Oxford Review of Economic Policy* 39, no. 1 (2023): 123–33. <https://doi.org/10.1093/oxrep/grac043>.

²⁷ <https://climate-club.org/>

international agreements that raise sectoral performance standards on GHG emissions.²⁸ Clubs that encourage CBAM-like instruments are also helpful;²⁹ the more countries incentivize low-carbon production at the border, the less “excess” clean production will be available to shuffle, and eventually new clean production will be incentivized.

The argument: Policies outside the CBAM can of course be adopted whatever course of action is taken in the face of potential resource shuffling, and all are helpful in their own right. But if they were on the whole successful, they would lend force to the argument that nothing should be done within the CBAM to address resource shuffling.

The challenges: The challenges of improving the competitiveness of EU industry are well known.³⁰ If a silver bullet solution existed, it would be in place. Even the best policy solutions would take time to effectively increase the competitiveness of EU industry vis a vis its global competitors. And many of the solutions for direct support—for example, to retrofit the European steel fleet of mills—are unrealistically costly in the current context.

Moreover, green industrial policy subsidies risk being ineffective without flanking policy support that addresses key obstacles to low-carbon investment. For example, doubts about the availability of green hydrogen at scale recently caused ArcelorMittal to return €1.3 billion in subsidies slated for converting its two German steel mills to green-hydrogen-based direct reduced iron production.³¹

International “club”-type cooperation to raise the bar on industrial production would need agreement among a wide variety of national interests and starting points, and even in the best-case scenarios would take years.

None of these challenges argue against pursuing the policies needed to improve European competitiveness, but the costs and timelines involved argue that such actions cannot be the only strategy employed to address the risks posed by resource shuffling under CBAM.

The objectives: Increasing the competitiveness of EU producers, if it were done in a way that lowered their GHG intensity, would be in line with all three of the possible CBAM objectives considered here. Done in other ways, it would not be relevant to the objectives focused on the GHG intensity of imported goods, or on foreign producer sectoral behaviour. But if it prevented clean EU producers from losing market share to resource shuffling by lowering their costs, it would be in line with the objective of reducing overall GHG emissions.

²⁸ See Agora Industry. (2024). A vision for international trade in CO₂-intensive materials. The role of carbon product requirements. https://www.agora-industry.org/fileadmin/Projects/2022/2022-12_IND_Product_Requirements/A-IN_342_Product_Requirements.pdf

²⁹ See Global Climate Policy Project Working Group on Climate Coalitions. (2025). *Building a Climate Coalition: Aligning Carbon Pricing, Trade, and Development*. Cambridge, MA: Global Climate Policy Project at Harvard and MIT. <https://salatainstitute.harvard.edu/building-a-climate-coalition-gcpp-flagship-report/>.

³⁰ Draghi, Mario. (2025) The Future of European Competitiveness. Luxembourg: Publications Office of the European Union. https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en; European Commission. (2025) A Competitiveness Compass for the EU. Communication From the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. https://commission.europa.eu/topics/eu-competitiveness/competitiveness-compass_en

³¹ <https://www.dw.com/en/arcelormittals-pullout-plunges-german-green-steel-in-doubt/a-73303680>

5.6. Pause the CBAM

The proposal: Pause the phase out of free allocation under the ETS, which would simultaneously pause the phase in of CBAM charges, avoiding any incentives for resource shuffling.

The argument: Given that there is no perfect solution to the challenge of resources shuffling under CBAM, and the significance of the potential impacts described above, the phase out of free allowances which gives rise to the need for CBAM should be delayed until such time as an effective solution is elaborated, or resource shuffling no longer poses such a significant risk (for example, because of success in increasing EU competitiveness).

Given the relatively greater threat of resource shuffling in the context of indirect emissions,³² a less drastic policy would pause expansion of indirect emissions coverage under CBAM until such time as an effective solution is elaborated, or resource shuffling no longer poses such a significant risk.

Or, as suggested in Section 5.2, the CBAM could abandon all coverage of indirect emissions and instead utilize indirect cost compensation to protect against indirect-emissions-related resource shuffling. As argued in that section, most of the potential for resource shuffling arises from the spread of costs that results from very different emissions intensities of electricity production.

The challenges: It may ultimately be a long time before a fully effective solution can be elaborated, or before EU and global production of CBAM-covered goods is such that resource shuffling no longer poses such a significant risk. Ergo, pausing the CBAM would in effect stop the reform of the EU ETS.

The downsides of such a policy include the fact that the post-2023 trajectory of cap tightening sees the ETS running out of allowances to freely allocate by roughly 2040, and with available free allocation becoming a problem earlier.³³ As such, changing the trajectory of the phase out of free allowances would also require triggering the cross-sectoral correction factor. As well, postponing the phase out of free allowances would remove a significant budgeted source of revenue for decarbonization. And retaining free allocation continues a muting of the carbon price throughout the value chain of the covered sectors, muting incentives for circular economy and materials switching.

Politically, while such a pause would likely be welcomed by the EU's trading partners, it would amount to a significant and very public backtracking, running against the EU's pledges to maintain and increase ambition in addressing climate change.

³² Resource shuffling is, in special cases, also a serious scope 1 problem. The CBAM assigns zero carbon emissions to scrap in aluminum and steel, which may create a significant risk of resource shuffling by the use, or falsely declared use, of scrap in foreign production. The latter is a circumvention problem that should be addressed separately from solutions to resource shuffling. In the case of steel, resource shuffling may arise also from the use of other low carbon input materials, such as directly reduced iron (DRI) and/or hot briquetted iron (HBI).

³³ Pahle, Michael et al. (2025). "The Emerging Endgame: The EU ETS on the road towards climate neutrality." *Resource and Energy Economics* Vol. 81(101476). <https://doi.org/10.1016/j.reseneeco.2024.101476>

The challenges with eliminating coverage of indirect emissions under the CBAM were discussed above: high fiscal cost, muted incentives for industrial energy efficiency, and potential breach of the WTO's subsidy rules.

The objectives: Pausing the CBAM would do nothing to further the objectives of a focus on GHG intensity of products at the border, or a focus on exporter behaviour at the sectoral level. If it delayed the decarbonization of EU industry, or delayed incentivizing foreign producers to decarbonize, pausing the CBAM would be at odds with the objective of lowering overall GHG emissions.

6. Concluding Recommendations

The prospect of circumvention and avoidance – most notably the potential for widespread resource shuffling – poses a real, and arguably underappreciated, threat to the effectiveness of the CBAM. Early quantitative assessments suggest that, if left unaddressed, resource shuffling could fundamentally undermine the stated CBAM goal of averting carbon leakage and its associated economic and environmental harm. As European producers face rising carbon costs under the CBAM and its gradual replacement of free allocation, nothing would potentially change for foreign producers capable of reallocating trade flows to mitigate a carbon cost under the CBAM. The result would be a further loss of competitiveness for European industry, greater risks of deindustrialization, and, ultimately, a shift in emissions to third countries. The success of the CBAM, and with it the credibility of the European Green Deal and the EU's industrial decarbonization strategy, will therefore depend on how this challenge is met.

6.1. Addressing the Challenge: Risks and Tradeoffs

Based on the preceding analysis, several approaches could in principle help mitigate the risks of resource shuffling. None, however, offer a straightforward solution.

6.1.1. Monitoring and quantification of trade and production patterns

The EU could seek to develop a comprehensive monitoring system to detect shifts in trade flows and production patterns across partner countries and individual foreign producers, quantifying the environmental effect of such shifts. In theory, this would represent the most direct and rigorous way to ensure the CBAM fulfils its objectives: preventing “the risk of carbon leakage” and thereby “reducing global carbon emissions and supporting the goals of the Paris Agreement, also by creating incentives for the reduction of emissions by operators in third countries,” as articulated in Article 1 of the CBAM Regulation.³⁴

³⁴ Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism, Article 1, para. 1. <https://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:32023R0956>.

Yet in practice, this path borders on impossibility. It would require technical capacity, information access, and administrative coordination on a scale far exceeding even the EU's most ambitious regulatory endeavours to date. The compliance and verification burdens would be immense, and the need to track complex supply-chain adjustments in real time would test both feasibility and legitimacy.

Moreover, such an expansion would run counter to the prevailing political momentum within the EU. After several years of regulatory proliferation under the European Green Deal and the “Fit for 55” package, policymakers now face mounting pressure to simplify, streamline, and reduce the administrative load on European companies. Growing concerns about competitiveness and innovation, combined with objections to over-complexity, have already triggered a slowdown in several legislative initiatives with an extraterritorial dimension – including the Corporate Sustainability Due Diligence Directive (CSDDD), the Corporate Sustainability Reporting Directive (CSRD), and the European Union Deforestation Regulation (EUDR) – whose reach had raised both domestic and diplomatic resistance. Against this backdrop, any further extension of Brussels' regulatory perimeter, particularly one that introduces another layer of complexity and perceived extraterritorial reach, would risk ignoring hard-won lessons from these experiences and could provoke renewed political backlash.

6.1.2. Reliance on default values

At the opposite end of the spectrum lies a relatively simple – indeed, a deceptively elegant – option: relying exclusively on default values, rather than individual operator data, to determine the embedded emissions of imported goods. It is worth noting that all major U.S. border carbon adjustment proposals, from the Coons-Peters FAIR Act to the Whitehouse Clean Competition Act and the Cassidy Foreign Pollution Fee Act, envisage precisely this approach as a safeguard against resource shuffling and other avoidance strategies. Undoubtedly, the dismal U.S. track record with measures targeted against specific countries, such as country-specific tariffs, import and export restrictions, and sanctions, and the observed prevalence of sophisticated avoidance strategies³⁵ have contributed to this design choice.

However, simplicity and effectiveness come at a price. A system based solely on default values would nullify one of the CBAM's core incentives: encouraging emissions reductions by producers in third countries.³⁶ Under a uniform default value, cleaner facilities abroad would see no reward for decarbonizing, as their efforts would only marginally affect the national or sectoral average. The result would be a classic prisoner's-dilemma dynamic, where collective progress stagnates even as individual actors act rationally in their own interest.

Such a solution would not even protect competitiveness across the board. It would be effective at protecting upstream producers, but the other side of that coin is that downstream producers would see costs increase; they would be deprived of the ability to import input goods that were assessed a low CBAM charge because of their low GHG-intensity.

³⁵ Demarais, Agathe. *Backfire: How Sanctions Reshape the World Against U.S. Interests*. Center on Global Energy Policy Series. Columbia University Press, 2022.

³⁶ Mehling et al., *supra*, n. 26.

Beyond this environmental trade-off, exclusive reliance on default values would raise serious legal concerns. Two seminal WTO disputes – US-Superfund (1987) and US-Reformulated Gasoline (1996) – established that border measures based on generalized or default factors may constitute de facto discrimination if domestic producers are assessed on actual performance. Applying uniform EU-set defaults to imports while allowing EU producers to rely on verified installation-specific emissions under the EU ETS would therefore be difficult, if not impossible, to defend under the principle of national treatment. Politically, such an approach would invite accusations of disguised protectionism: a unilateral imposition of EU methodologies on foreign producers, insensitive to individual progress with decarbonization. At a time of heightened geopolitical tension and economic insecurity, the adoption of punitive default values could easily be interpreted as a protectionist turn, damaging the EU’s diplomatic credibility and risking retaliatory measures.

6.1.3. A hybrid “middle path”?

Elements of both approaches described above could be combined in a more nuanced hybrid solution. For instance, the EU could engage in some level of trade monitoring and surveillance to detect suspicious patterns and temporarily suspend individual emissions reporting for imports from jurisdictions demonstrably engaged in resource shuffling. Such measures would then have to be accompanied by clear criteria and procedures for reinstatement once credible corrective actions are taken. This hybrid approach would maintain the deterrent effect of scrutiny while avoiding across-the-board defaults and thus appear a pragmatic compromise between both extremes. Nevertheless, even such a hybrid mechanism would still face the unavoidable difficulty – both analytical and normative – of defining what constitutes harmful as opposed to tolerable resource shuffling. We therefore advise against relying on it as a putative solution to resource shuffling: not only would it risk incurring the same challenges each of the solutions faces on its own, but it might provide false assurance that a weak link of the CBAM has been effectively corrected – when that is unlikely to be the case.

6.1.4. Accelerate industrial decarbonization and backload CBAM

Between the foregoing options entailing unworkable oversight and legally risky default values lies a pragmatic, though politically demanding, path. This option would not lend itself to striking slogans, but it represents a realistic course that balances environmental integrity with political and legal feasibility. It would involve refocusing European political capital on domestic industrial decarbonization rather than attempting to perfect the CBAM’s external reach.

But such a strategy would bear fruit on longer timelines than those dictated by the challenge of resource shuffling under the CBAM. As such, a first necessary element of such a strategy would be to reconsider the pace of the free-allocation phase-out under the EU ETS with three provisions:

- “Backloading” the timeline over which free allocation is gradually phased out,
- Potentially with an extension of the overall timeline, to afford transitional support while parallel decarbonization measures take hold.

- Pause any plans to expand CBAM coverage of indirect emissions—which are at the root of most potential resource shuffling—instead relying on an optimized version of indirect cost compensation.

This breathing space should not be mistaken for complacency; rather, it would be a critical window to accelerate investment and technological transformation within Europe’s energy-intensive industries at a time in which other priorities – such as security and defence – have captured much of the political attention span.

Second, the EU must restore industrial decarbonization to the centre of its policy agenda, aligning the CBAM with a reinvigorated Clean Industrial Deal. This implies:

- rapid implementation of previously announced measures to strengthen low-carbon manufacturing,
- active creation of markets for low carbon goods through public procurement and product-carbon requirements, and
- expanded fiscal and financial support via instruments such as the Innovation Fund and, at the national level, targeted investment tax credits modelled on the U.S. Inflation Reduction Act.

Third, the competitiveness of European industry ultimately depends on energy costs. Persistently high energy prices remain a structural handicap, eroding the very foundation of Europe’s industrial base. A credible CBAM strategy must therefore be accompanied by a durable reform of the EU energy market.

6.2. The Road Ahead

The EU now stands at a critical juncture. The CBAM was conceived as the keystone of Europe’s effort to reconcile ambitious climate policy with industrial competitiveness. But we need to be realistic. To address the risk of carbon leakage, there is no perfect solution – free allocations and CBAM will provide protection to a certain degree but will never be 100% foolproof.

The solution lies in accelerating decarbonization, and CBAM backloading is a necessary condition in our view, but not a sufficient one.

The credibility of CBAM – and indeed its political survival – depends on addressing some of its current blind spots, including the risk that circumvention could hollow out its purpose. Policymakers must therefore act swiftly and decisively, not by layering additional complexity onto an already intricate mechanism, but by sending a clear signal that Europe remains committed to decarbonizing its industry at home while engaging partners abroad in good faith.

If industrial decarbonization is to succeed, European industry must be given not only regulatory certainty but also the means to adapt: affordable energy, predictable market demand for low-carbon products, and targeted investment support. In a rapidly changing world in which security concerns and geopolitical rivalries have displaced decarbonization from the list of top priorities, the EU has to credibly reassure stakeholders both within the EU and around the world that its commitment to climate ambition and industrial transformation continue to enjoy support at the

highest level. The CBAM can play a vital role in this transformation, but only if its implementation avoids the perils of excessive complexity, ineffectual oversight and protectionist reflexes. The coming years will determine whether the CBAM becomes a cornerstone of sustainable competitiveness or a cautionary tale of good intentions undone by practical realities.

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