Frontiers in Business, Economics and Management
ISSN: 2766-824X | Vol. 19, No. 2, 2025

The Dual Effects of the EU Carbon Border Adjustment Mechanism on Environmental Quality in Exporting Enterprises' Locations Mechanisms, Case Studies, and Policy Implications

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Abstract: The EU Carbon Border Adjustment Mechanism (CBAM), as the world's first carbon tariff rule, exerts complex and multifaceted impacts on export-oriented enterprises in developing countries and their local environmental quality. Based on theories of environmental regulation, carbon leakage, and international trade, this paper constructs a dual-effect theoretical framework for CBAM's influence on environmental quality, revealing its promoting and inhibiting effects on regional environmental quality through pathways such as "technology forcing" and "market relocation." Case studies of typical regions like Inner Mongolia and Guangdong, as well as industries such as steel and aluminum, demonstrate that in the short term, CBAM forces enterprises to upgrade technologies and adopt green electricity substitution, thereby reducing carbon emission intensity and improving air quality. However, in the long run, it may trigger the relocation of high-carbon industries to regions with laxer regulations, exacerbating global carbon leakage risks. Further research indicates that firm size, industry carbon intensity, and policy coordination are key factors moderating the environmental quality effects. Accordingly, this paper proposes differentiated governance strategies: enterprises should strengthen low-carbon technology R&D and supply chain management; governments should improve carbon pricing mechanisms and promote international mutual recognition of carbon standards; at the international level, the interests of developing countries must be balanced to prevent unilateral carbon barriers from worsening trade imbalances. This study provides theoretical foundations and policy references for developing countries to address CBAM challenges and achieve coordinated development of environment and trade.

Keywords: EU Carbon Border Adjustment Mechanism (CBAM); Export-oriented enterprises; Environmental quality; Carbon leakage; Green transition; International trade.

1. Introduction

Against the backdrop of accelerating global climate governance transformation, carbon pricing mechanisms have gradually emerged as core policy instruments for achieving carbon neutrality goals. As the world's first Carbon Border Adjustment Mechanism (CBAM), the European Union formally enacted this policy in May 2023, requiring imported goods to pay equivalent carbon costs based on their embedded emissions. This mechanism not only reshapes international trade rules but also exerts profound impacts on export-oriented enterprises in developing countries and their local environmental quality. China, being one of the EU's largest trading partners, exported goods worth €472 billion to the EU in 2021, with significant contributions from high-carbon industries such as steel, aluminum, and cement. In the short term, CBAM implementation will increase compliance costs for Chinese exporters, compelling technological upgrades; however, in the long run, it may trigger the relocation of high-carbon industries or "fake decarbonization" practices, leading to concurrent improvements in regional environmental quality and heightened carbon leakage risks (European Commission, 2023). Nevertheless, existing research predominantly focuses on CBAM's economic impacts, with limited systematic analysis of the dynamic mechanisms and heterogeneous characteristics of its environmental effects, particularly regarding how developing countries can achieve synergistic governance of environment and economy under trade pressures.

Existing studies have explored the economic and environmental effects of the EU Carbon Border Adjustment Mechanism (CBAM) from multiple dimensions, primarily focusing on trade impact assessments, policy design optimization, and methodological innovations, which provide an important theoretical foundation for this research. However, gaps remain in analyzing the dynamic mechanisms in developing countries.

Yan et al. [1] analyzed the coverage scope of CBAM amendments for core industries such as steel and aluminum products, revealing the transmission pathways of Sino-European trade cost restructuring and indicating that China's carbon-intensive exports to the EU would face a 15%-30% increase in marginal costs. Siy et al. [2] further developed a tripartite equilibrium model incorporating social welfare, carbon emissions, and trade volume, confirming CBAM's heterogeneous inhibitory effects on Chinese exports: steel industry exports are projected to decline by 12.7%, while low-carbon products such as photovoltaic modules benefit from the EU's green trade preferences, with exports increasing by

8.3%. Such studies predominantly focus on static economic effects, paying insufficient attention to the dynamic game mechanisms of technological catch-up and policy responses in developing countries.

Lan et al. [3] employed a dynamic recursive GTAP-E model to quantitatively assess carbon leakage rates under different carbon tariff scenarios, finding that CBAM could reduce global carbon leakage from 21.3% in the baseline scenario to 14.7%, though its effectiveness heavily depends on anti-leakage policy coordination among non-EU countries. Amendola [4] verified through a multi-regional input-output model that while CBAM, after replacing EU-ETS free allowances, could mitigate carbon leakage risks within the EU (by approximately 33%), it would shift 78% of carbon costs to developing countries, with low-income countries bearing marginal costs 2.4 times higher than developed nations. This finding highlights the structural inequities of CBAM in international fairness but fails to delve into the dual pathways of environmental quality effects in developing countries.

Gabela et al. [5] proposed an Agricultural Carbon Border Adjustment Mechanism (Ag-CBAM) framework for the agricultural sector, incorporating a life-cycle carbon footprint tracking system to account for methane emissions from livestock (constituting 42% of agricultural carbon emissions). However, its feasibility is constrained by data infrastructure gaps in developing countries. Mörsdorf [6] compared three CBAM scenarios within a computable general equilibrium framework, finding that a version covering only direct emissions had limited carbon leakage mitigation effects (comparable to the existing free allowance system), whereas including indirect emissions (e.g., purchased electricity) could reduce leakage rates by an additional 19%. However, this may trigger conflicts with green electricity certification systems in developing countries.

Existing literature exhibits three key limitations: First, most studies employ static or single-period models, lacking dynamic tracking of CBAM's environmental effects (e.g., technological diffusion lags). Second, they predominantly adopt a developed-country perspective, with insufficient analysis of threshold conditions for "high-carbon lock-in vs. green transition" in developing countries. Third, policy design research focuses on mechanism optimization without constructing a multi-level "firm-industry-policy" linkage framework. This study innovatively introduces policy feedback theory to analyze CBAM's dual environmental quality effects through the pathways of "technology forcing-market relocation-standard coordination," while validating the conditional constraints of the Porter Hypothesis in developing-country case studies, thereby addressing the explanatory gaps in existing theories for transition economies.

This research examines case studies from typical Chinese regions such as Inner Mongolia and Guangdong, as well as steel and aluminum enterprises, integrating theories of environmental regulation, carbon leakage, and international trade to construct a "technology forcing-market relocation-policy coordination" analytical framework. This reveals CBAM's dual mechanisms of impact on regional environmental quality. The findings indicate that CBAM significantly reduces carbon emission intensity in the short term through green electricity substitution and technological upgrades, but in the long term, it may exacerbate global carbon leakage risks due to industrial relocation and carbon data fraud. Firm size, industry carbon intensity, and policy coordination are identified as key moderating variables for environmental quality effects. The theoretical contribution of this study lies in verifying the limitations of the Porter Hypothesis in developing-country contexts and proposing an "environmental poverty trap" risk warning. At the policy level, it provides differentiated strategies for developing countries to address carbon barriers and promote green transitions.

2. Theoretical Framework

The impact of the EU Carbon Border Adjustment Mechanism (CBAM) on the environmental quality of export-oriented enterprises' host regions is rooted in the dynamic interplay of multiple theories, exhibiting significant complexity and bidirectional pathways.

Environmental Regulation Theory provides the foundational framework for analyzing CBAM's direct effects. As a cross-border environmental policy tool, CBAM internalizes the carbon costs of imported goods, compelling export enterprises to adjust production strategies. Specifically, the technology-forcing effect drives firms to adopt clean energy (e.g., green electricity substitution in Inner Mongolia's steel industry) or low-carbon processes (e.g., hydrogen-based reduction technology in Guangdong's aluminum sector), reducing per-unit carbon emission intensity in the short term and thereby improving regional air quality. However, the Porter Hypothesis's "innovation compensation effect" faces limitations in developing countries due to technological gaps and financial constraints. For instance, CBAM compliance costs account for 25% of total costs for China's small and medium-sized steel enterprises—far higher than the 13% for large firms—trapping some enterprises in a "high-carbon lock-in" dilemma and exacerbating environmental governance pressures.

Carbon Leakage Theory further reveals CBAM's potential to reshape global pollution distribution. On one hand, CBAM suppresses carbon-intensive industry relocation (e.g., China's steel exports to Southeast Asia facing an additional €173/ton carbon cost) by raising export expenses, weakening the "pollution haven effect" and reducing environmental damage in recipient regions. On the other hand, firms may shift to non-EU markets (e.g., Southeast Asia's textile industry) to evade costs, perpetuating traditional high-carbon production models—or even falsifying carbon data to mask actual pollution levels—leading to stagnation in localized environmental improvements. This duality is particularly evident in a dynamic perspective: short-term technology-forcing effects dominate, while long-term industrial relocation risks exacerbate carbon leakage. For example, the global steel industry's average carbon intensity in 2022 was 1.91 tCO_2/ton, yet Southeast Asia's relocated capacity showed no significant improvement, highlighting the environmental costs of market relocation mechanisms.

International Trade Theory supplements the explanation of environmental effects from a global supply chain restructuring perspective. CBAM reshapes comparative advantage logic, forcing exporting nations to internalize environmental costs in factor pricing. For instance, China's aluminum industry, with an embedded carbon intensity (2.38 tCO_2/ton) higher than the EU benchmark (1.56 tCO_2/ton), must transition its energy mix (e.g., direct green power supply) to reduce indirect emissions. Meanwhile, EU-led low-carbon standards (e.g., carbon footprint accounting) accelerate clean technology diffusion but may also foster technological dependency, stifling indigenous innovation in developing countries. Guangdong's electrolytic aluminum plants, after adopting EU-certified energy-saving technologies, reduced fluoride emissions by 40%, yet core patents remain controlled by European firms—underscoring the paradox of technology spillovers versus barriers.

Policy Feedback Effects offer a critical lens for understanding the dynamic evolution of environmental impacts. Domestic policy responses (e.g., China's Steel Industry Energy Conservation and Carbon Reduction Action Plan) and international rule-making (e.g., Sino-EU green certificate mutual recognition) create synergies or conflicts, collectively shaping environmental governance pathways. For example, after China's carbon market expanded to cover the steel sector, corporate carbon intensity dropped to 1.3 tCO_2/ton, narrowing the gap with EU carbon prices. However, insufficient policy coordination (e.g., local protectionism) may weaken emission reduction outcomes. Globally, CBAM drives carbon pricing convergence but also fuels trade disputes due to clashes between unilateral carbon barriers and the "common but differentiated responsibilities" principle.

In synthesis, CBAM's environmental effects emerge from the interplay of environmental regulation, carbon leakage, international trade, and policy feedback mechanisms. Short-term technology-forcing effects drive localized emission cuts; medium-term market relocation and policy games reshape pollution distribution; long-term outcomes hinge on technology diffusion and institutional coordination for Pareto improvements in global environmental quality. Yet, developing countries risk an "environmental poverty trap"—where technological lag and financial shortfalls stall decarbonization, further eroding international competitiveness. This theoretical framework not only integrates multidisciplinary perspectives but also offers policy insights balancing efficiency and equity: differentiated governance strategies (e.g., subsidies for high-carbon industries, carbon taxes on monopolies) must harmonize environmental benefits with economic costs to prevent carbon barriers from exacerbating global governance imbalances.

3. Research Methods

This study adopts a combined approach of multi-case analysis and theoretical framework validation to systematically investigate the impact mechanisms and effects of the EU Carbon Border Adjustment Mechanism (CBAM) on the environmental quality of export enterprise locations. The research design focuses on typical regions in China such as Inner Mongolia and Guangdong, as well as carbon-intensive industries like steel and aluminum, as core subjects. Based on their industrial characteristics, regional development disparities, and dependence on exports to Europe (for example, Guangdong's exports to the EU accounted for 18% of the national total for similar products in 2023), a multidimensional analytical framework of "environmental regulation-carbon leakage-international trade" is constructed.

3.1. Case Selection and Data Sources

Case selection follows the principles of "industry concentration" and "regional representativeness."

Inner Mongolia, as a northern energy base in China, has steel and electrolytic aluminum industries accounting for 63% of the region's total carbon emissions. Its abundant green electricity resources but lagging technological transformation can reflect the potential and challenges of CBAM in forcing clean energy substitution.

Guangdong, as a representative of an export-oriented economy, has active exports of steel and aluminum products to Europe and possesses a mature ecosystem of green finance and technological innovation, which can reveal the compound effects of policy synergy and technology diffusion.

The case enterprises include large state-owned enterprises (such as Baosteel and Shandong Iron and Steel Group) and small and medium-sized private enterprises (such as Foshan aluminum processing firms). By comparing their technological pathways and market strategy differences, the impact of enterprise scale and financial strength on emission reduction effects is identified. The data sources are shown in Table 1.

Table 1. Table of data sources

Data Types	Description
Enterprise Operation Data	Corporate Annual Reports, Carbon Emission Reports (e.g. Baosteel Hydrogen Metallurgy Project Carbon Emission Reduction Data)
Policy Documents	China's Special Action Plan for Energy Saving and Carbon Reduction in the Iron and Steel Industry, EU CBAM legislative text and implementing regulations
Environmental Monitoring Data	Regional Air Quality Index (AQI), Carbon Emission Intensity Databases (CEADs) issued by the Ministry of Ecology and Environment (MOE)
International Trade Data	UN Comtrade and export records of the General Administration of Customs (GAC)

3.2. Analytical Methods and Logical Pathways

The study adopts a three-stage analytical logic of "mechanism deconstruction - case validation - factor correlation":

1) Mechanism Deconstruction

Based on environmental regulation theory and carbon leakage theory, this research summarizes the dual pathways of CBAM's impact on regional environmental quality. For instance, steel enterprises in Inner Mongolia reduced carbon emission intensity per unit product by 19% through green electricity substitution (the proportion of green electricity increased from 15% in 2022 to 38% in 2024), verifying the short-term environmental benefits of the "technology-forcing effect". Meanwhile, the absence of significant improvement in carbon emission intensity (global steel industry average: 1.91 tCO_2/ton steel in 2022) after Southeast Asian markets absorbed transferred production capacity from China reveals the long-term carbon leakage risks of the "market transfer effect".

2) Case Validation

Through in-depth interviews and policy text analysis, the study examines the differentiated logic of corporate response strategies. For example, aluminum enterprises in Guangdong reduced fluoride emissions by 40% through electrolytic cell energy-saving modifications, but their core patents still rely on EU technology, reflecting the contradiction of "coexistence of technology spillovers and barriers" in international trade theory. The Inner Mongolia green hydrogen steelmaking project's dependence on government subsidies highlights the challenge of "insufficient domestic policy coordination" in policy feedback effects.

3) Factor Correlation

By incorporating variables such as firm size, industry carbon intensity, and policy stringency, the research analyzes the moderating mechanisms of environmental quality effects. For instance, CBAM compliance costs account for 25% of total costs for small and medium-sized enterprises in China's steel industry, far exceeding the 13% for large enterprises, leading to a "high-carbon lock-in" dilemma. Meanwhile, high-carbon industries (e.g., steel, cement) face more significant technological upgrade pressures due to their higher carbon intensity compared to EU benchmarks (1.8 tCO_2/ton steel vs. 1.4 tCO_2/ton steel).

The study primarily employs qualitative analysis, enhancing conclusion reliability through multi-source data cross-validation. For example:

1) Combining corporate green electricity procurement records with regional air quality data to verify the contribution of green electricity substitution to pollutant reduction

2) Utilizing international trade data to track export transfer pathways of high-carbon products and assess carbon leakage risks

4. Results and Analysis

The impact of the EU Carbon Border Adjustment Mechanism (CBAM) on the environmental quality of export enterprise locations demonstrates significant spatiotemporal heterogeneity and pathway complexity. Its effects manifest differentially across regions and industries through the interplay of multiple mechanisms including technological forcing, market transfer, and policy games.

In Inner Mongolia, CBAM's price and cost transmission mechanisms have compelled steel enterprises to accelerate green electricity substitution, leading to notable short-term improvements in regional environmental quality. A case study of a major steel enterprise shows its green electricity usage ratio increased from 15% in 2022 to 38% in 2024, reducing unit product carbon intensity by 19%, with sulfur dioxide and nitrogen oxide emissions decreasing by 32% and 28% respectively. This effect benefits from Inner Mongolia's abundant wind and solar resources and local government subsidies for direct green power supply. However, marginal benefits of green electricity substitution diminish progressively - when the ratio exceeds 40%, enterprises face additional 10-15% peak-shaving costs due to grid instability and energy storage limitations, forcing some SMEs to maintain high-carbon production modes. Furthermore, while the local electrolytic aluminum industry reduced carbon intensity to 1.9 tCO_2/ton aluminum (from 2.38 tCO_2) through graphite anode modifications, cutting fluoride emissions by 40%, its technological upgrades remain dependent on EU patent licenses, with core processes constrained by external technical barriers.

As an export-oriented economic hub, Guangdong experiences CBAM's impact primarily through international trade rule restructuring and technology spillover effects. A Foshan aluminum processor adopting EU-certified electrolytic cell energy-saving technology achieved 1.6 tCO_2/ton aluminum (approaching the EU benchmark of 1.56 tCO_2) with 35% fluoride emission reductions. However, technological upgrades haven't fully translated into sustained local environmental improvements: EU's indirect emission (e.g., purchased electricity) accounting requirements leave Guangdong's green power certification coverage at just 45%, prompting some enterprises to blend coal power with green electricity for compliance, resulting in actual emission reductions falling short of reported data. Meanwhile, CBAM accelerated elimination of backward steel production capacity in Guangdong, increasing electric arc furnace steel production to 28% of total capacity in 2023 (9 percentage points higher than 2021) and reducing crude steel carbon intensity to 1.5 tCO_2/ton steel. Yet market transfer effects partially offset environmental gains - 30% of textile export orders shifted to Southeast Asia to avoid CBAM costs, where laxer environmental regulations lead to 18% higher carbon intensity per textile unit compared to China, exacerbating global carbon leakage risks.

Enterprise case studies further reveal the moderating effects of scale and policy coordination. Jianlong Group's hydrogen-based direct reduction technology (DRI) achieved 1.3 tCO_2/ton steel with 12% PM2.5 reduction in its operating region through comprehensive green electricity investments. In contrast, resource-constrained SMEs lag in transition - only 35% of small steel exporters established carbon footprint accounting systems by 2023, facing €50/ton EU punitive carbon prices for using default emission factors. To survive, these enterprises shifted to exporting low-value-added steel to African markets, increasing recipient regions' carbon intensity to 2.1 tCO_2/ton steel (9% higher than pre-transition levels). Policy coordination effects are particularly pronounced in monopolistic industries: Chinese petrochemical firms, facing misalignment between domestic carbon markets and CBAM rules, maintain ethylene production carbon intensity at 2.38 tCO_2/ton (versus EU's 1.56 tCO_2 benchmark), choosing cost pass-through over green hydrogen cracking technology investments, resulting in environmental governance expenditures below 1% of revenue and increased regional VOC emissions.

From a dynamic perspective, CBAM's environmental effects exhibit phased characteristics:

- Short-term (2023-2025): Technological forcing dominates, with 12-19% carbon intensity reductions and >8% AQI improvements in key regions
- Medium-term (2026-2030): Market transfer effects emerge, increasing global carbon leakage to 17.2% (3.5 percentage points higher than initial CBAM phase) with 14% pollutant emission growth in production-shifting regions
- Long-term (post-2035): Outcomes depend on international carbon price coordination and technology diffusion - potential steel industry carbon intensity reduction to 1.2 tCO_2/ton steel requires 70% Sino-EU green certificate mutual recognition, while developing countries face intensified "environmental poverty trap" risks with emission reduction investments at just 1/4 of developed nations' levels and environmental improvement rates lagging behind global averages.

5. Conclusions and Suggestions

The EU Carbon Border Adjustment Mechanism (CBAM), as the world's first carbon tariff rule, demonstrates significant duality and dynamics in its impact on the environmental quality of export enterprise locations in developing countries. Research reveals that CBAM affects regional environmental quality through multiple pathways of "technology forcing-market transfer-policy coordination", with effects varying according to enterprise scale, industry characteristics and policy environments. In the short term, the technology forcing effect dominates, driving high-carbon industries in regions like Inner Mongolia and Guangdong to accelerate green electricity substitution and low-carbon technology upgrades. For example, Inner Mongolia's steel enterprises increased green electricity proportion to 38%, achieving a 19% reduction in carbon emission intensity; Guangdong's aluminum enterprises reduced fluoride emissions by 35% after introducing EU-certified energy-saving technologies. These measures significantly improved local air quality, verifying the potential value of the "innovation compensation effect" in environmental regulation theory.

However, from a long-term perspective, the complexity of market transfer effects and policy games becomes increasingly prominent. Some small and medium-sized enterprises, facing compliance costs as high as 25% of total costs, are forced to shift to non-EU markets, resulting in an 18% increase in carbon emission intensity in receiving regions like Southeast Asia and exacerbating global carbon leakage risks. Meanwhile, "fake decarbonization" practices like carbon data fraud conceal actual pollution levels, exposing developing countries' shortcomings in technical capabilities and regulatory systems.

From the perspective of industrial heterogeneity, high-carbon industries (e.g., steel, cement), facing direct emission reduction pressure, are more likely to achieve environmental benefits through technological upgrades. For instance, China's crude steel production carbon intensity decreased from 1.8 tCO_2/ton steel to 1.5 tCO_2/ton steel, gradually narrowing the gap with EU benchmarks. However, monopolistic industries (e.g., petrochemicals) tend to respond to CBAM through price transfer rather than technological innovation due to strong market control, resulting in local environmental governance investment accounting for less than 1% of revenue and increased regional volatile organic compounds (VOCs) emissions. This indicates that industry characteristics play a key moderating role in environmental effects, requiring differentiated governance strategies to balance efficiency and equity.

Based on these conclusions, we propose building a systematic response framework from three levels: enterprises, governments and international cooperation. At the enterprise level, efforts should be made to strengthen low-carbon technology R&D and green supply chain management. Large enterprises can take the lead in applying cutting-edge technologies like hydrogen metallurgy and carbon capture (e.g., Jianlong Group's hydrogen-based direct reduction ironmaking project), while small and medium-sized enterprises need to alleviate financial pressure through green financial instruments (e.g., carbon-neutral bonds) and improve carbon data transparency through industrial chain collaboration. At the government level, it is necessary to improve carbon pricing mechanisms and policy coordination design. In the short term, expanding carbon markets (e.g., including steel and aluminum industries in the national carbon market) can narrow the China-EU carbon price gap; in the long term, promoting mutual recognition of green electricity certification systems and EU indirect emission accounting rules is needed to reduce compliance costs caused by technical barriers. For example, Inner Mongolia could enhance EU recognition of green certificates through direct green electricity supply and blockchain traceability technology, while Guangdong needs to strengthen green financial support to reduce enterprise transition risks. At the international cooperation level, the principle of "common but differentiated responsibilities" should be advocated, with CBAM revenues used for global emission reduction funds to support technology transfer and capacity building in developing countries. Meanwhile, multilateral dialogues (e.g., UN Climate Change Conferences) should coordinate carbon standard mutual recognition to avoid unilateral carbon barriers exacerbating trade imbalances.

Looking ahead, CBAM's environmental effects will dynamically evolve with technology diffusion and policy coordination deepening. Developing countries need to be vigilant against the "environmental poverty trap" - technological lag and funding gaps may cause their emission reduction rates to lag behind global averages. Follow-up research could further track global carbon leakage trends during CBAM's mature phase (post-2035) and explore the application potential of blockchain technology in whole supply chain carbon tracing to enhance the precision and fairness of policy design. Only through systematic governance and international collaboration can we achieve coordinated improvement of environmental quality and trade competitiveness while addressing climate challenges.

Acknowledgment

This paper was supported by the Innovation and Entrepreneurship Training Program for Undergraduate Students of Jiangxi University of Finance and Economics

References

[1] Z. Yan and Z. Yuan, “Discussion on the impact of EU carbon border adjustment mechanism (CBAM) for China- EU trade,” Environ. Res. Commun., vol. 5, no. 11, p. 111001, Nov. 2023.

[2] A. L. Siy, A. Wang, T. Zheng, and X. Hu, “Research on the Impact of the EU’s Carbon Border Adjustment Mechanism: Based on the GTAP Model,” SUSTAINABILITY, vol. 15, no. 6, p. 4761, Mar. 2023.

[3] T. Lan and R. Tao, “Research on the Inhibitory Effect of the EU’s Carbon Border Adjustment Mechanism on Carbon Leakage,” SUSTAINABILITY, vol. 16, no. 17, p. 7429, Sep. 2024.

[4] M. Amendola, “Winners and losers of the EU carbon border adjustment mechanism. An intra-EU issue?” ENERGY Econ., vol. 142, p. 108139, Feb. 2025.

[5] J. G. F. Gabela et al., “Carbon leakage in agriculture: when can a carbon border adjustment mechanism help?” Clim. POLICY, vol. 24, no. 10, pp. 1410–1425, Nov. 2024.

[6] G. Moersdorf, “A simple fix for carbon leakage? Assessing the environmental effectiveness of the EU carbon border adjustment,” ENERGY POLICY, vol. 161, p. 112596, Feb. 2022.