ENTiCE

ENhancing our understanding of Trade Impacts on Climate, industries, and the Environment

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NAVIGATING THE NEXUS OF TRADE, CLIMATE, AND INDUSTRIAL POLICY

Policy Brief

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Trade and Climate in a New Era of Industrial Geopolitics

Global trade policy is undergoing a significant transformation, shifting away from long-standing liberalization towards strategic interventions and protectionism. The recent escalation of trade conflicts, further fuelled by President Trump's weaponization of tariffs is the pinnacle of this development. But already previous policy initiatives such as the US Inflation Reduction Act (IRA), the EU's Carbon Border Adjustment Mechanism (CBAM) have also been criticised for being protectionist and illegitimately interfering with global trade. Concurrently, the urgency of climate mitigation continues to grow, and the EU has acknowledged this with its commitments under the Paris Agreement and the European Green Deal. In this context, the European Commission has proposed the "Clean Industrial Deal" (CID) as its core industrial policy work programme. The CID emphasizes environmental competitiveness as a core strategy for Europe and effectively seeks to integrate the three policy domains of trade, climate and industrial policy into one holistic strategy. In order to assess the environmental and economic potential of the CID and to develop actionable policy recommendations it is necessary to systematically investigate and understand the interplay of the three domains.

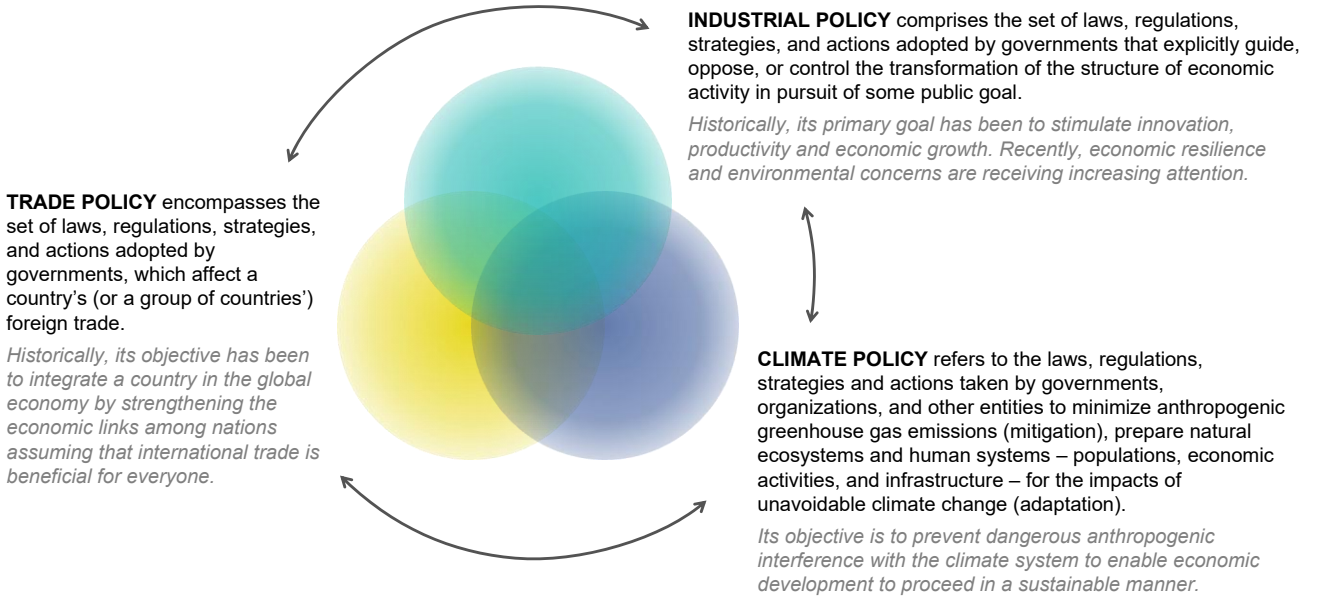

Figure 1. Definitions of and interactions between trade, climate and industrial policy. *Own illustration.*

Traditionally, trade, climate, and industrial policies operated in silos, a reality true for both scientific analysis and policy practice. Yet, recently their interdependencies are becoming increasingly salient, with policy instruments often impacting all three domains simultaneously (see Figure 1 for our working definitions of trade, climate and industrial policy). These three policy domains, while originating from distinct disciplinary traditions, are not mutually exclusive and often exhibit significant overlaps. Policy instruments can frequently serve multiple objectives across these fields. Perhaps the most apparent example is the EU's carbon border adjustment mechanism which is inherently a climate policy, but also functions as a trade policy by influencing import costs and can act as an industrial policy by incentivizing domestic green production. This inherent interconnectedness means that distinctions are not always clear-cut, necessitating a unified analytical framework to understand their complex interactions and avoid unintended consequences.

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This policy brief is designed to succinctly outline the complex and dynamic interplay at the nexus of trade, climate, and industrial policies. By providing a clear and structured understanding of these interconnected domains, the brief aims to lay a robust foundation for effective engagement with a diverse range of stakeholders, including scientific researchers, industrial representatives, and policymakers. This foundational understanding will facilitate more informed discussions, enable the elicitation of actual policy needs, and ultimately guide the underlying research project to address real-world challenges in a coherent and impactful manner.

Trade's Environmental Footprint Extends Beyond Direct Emissions

International trade has both direct and indirect environmental implications. Directly, international transport emissions from shipping, aviation, and land transport constitute a significant and growing source of greenhouse gases (GHGs). While protectionist measures or in fact any restriction to trade *could* theoretically reduce these by lowering overall trade volumes, they might also inadvertently induce inefficiencies in global supply chains.

Beyond direct emissions, trade's environmental impacts are multifaceted and can be understood through five key channels (see also Figure 2):

- The Scale Effect is enabled by increased market size, which in turn facilitates economies of scale and enhances overall productivity and economic performance. Economic growth resulting from trade can intensify environmental pressures if economic activities are not sufficiently decoupled from emissions.
- Specialization Effect: Trade enables countries to exploit comparative advantages which inevitably drive specialization and change the inter-industry composition of the economy. This can be beneficial or detrimental (pollution havens, carbon leakage) depending on how trade patterns are changing.
- Productivity Effect: Enhanced competition stemming from trade can drive efficiency gains and more resource-efficient production. International competition may reward firms adopting more productive technologies. This can change the intra-industry composition of firms, forcing the exit of the least productive firms. And because more productive firms are typically also cleaner, the productivity effect can lead to reduced environmental impacts.
- Technique Effect: Exposure to international competition as well as the promise of tapping into new markets are driving innovation. Moreover, trade and foreign direct investments facilitate the diffusion of cleaner technologies and environmental innovations, improving overall environmental performance and production techniques.
- Income Effect: Higher incomes typically correlate with higher overall consumption, which can initially lead to increased environmental pressures. However, the Environmental Kuznets Curve (EKC) hypothesis suggests that as incomes rise beyond a certain threshold, environmental concerns increasingly take priority, potentially leading to more stringent environmental regulations and, consequently, reduced environmental impacts.

It is crucial to emphasize that the environmental consequences of *decreasing* liberalization (i.e., increasing protectionism) are not necessarily symmetrical to those of increasing liberalization. This asymmetry creates new uncertainties and might play out, for example, in relation to the time in which these effects unfold, with some impacts being immediate and others emerging over longer periods. A systematic review of the existing economic and political science literature on the TCI nexus has demonstrated an almost complete lack of theoretical or empirical research studying the effects of decreasing trade.

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Trade, Climate and Industrial Policies: Shaping the Green Transition

Trade, climate and industrial policies, while distinct in their primary objectives, are increasingly intertwined in their efforts to shape economic structures and drive the green transition. Industrial policies play a strategic role by influencing the *specialization* and *productivity* effects of trade. Per definition, industrial policies are supposed to affect the structure of economic activity, which is synonymous with shaping the inter-industry composition (specialization) of the economy by steering investment and support towards specific sectors and thereby influencing a country's comparative advantages. Industrial policies are also frequently motivated by remedying unintended structural implications of trade. They can also affect the intra-industry composition (productivity) by fostering innovation, providing critical infrastructure, and supporting research and development, leading to the adoption of more efficient technologies and practices, for example, a policy which focuses on building "national champions" in selected industries. Industrial policies are increasingly viewed as critical tools for achieving "open strategic autonomy" and reindustrialization within Europe. In other words, industrial policies are deployed to remedy unintended structural implications of increasing trade.

Climate policies, on the other hand, primarily influence the *productivity*, *technique*, and *specialization* effects of trade. By internalizing externalities through mechanisms like carbon pricing, climate policies link profitability with environmental impacts. Doing so enhances the *productivity* effect, ensuring that the most productive firms are also actually the cleanest which is frequently but not necessarily the case without such policies. Climate policies also strongly drive the *technique* effect by stimulating innovation in low-carbon technologies and processes. However, stringent climate measures can also impact the inter-industry composition of the economy (the *specialization* effect), potentially leading to shifts in competitiveness and the relocation of production to regions with less stringent regulations, raising concerns about carbon leakage (as seen in the rationale behind CBAM). These potential trade-offs require careful consideration and integrated policy design to ensure that climate ambition is met without undermining European industry. The interconnections across these channels highlight that industrial and climate policies are not only complementary in their pursuit of a green transition but also necessitate careful coordination to manage potential trade-offs and maximize synergistic outcomes.

Drawing on the definition of trade policy introduced above, every policy measure that is affecting a country's foreign trade can be classified as trade policy. Related to the five trade effects, the interaction is therefore straight forward. Changes in trade/import tariffs will facilitate or constrain imports and exports and therefore sit at the beginning of the causal chains of each of the effects. Non-tariff measures (NTMs) have a similar effect, but may work through diverse channels. The scale effect should not be directly affected by import-related trade measures of a given country, but an exporting country will only be able to fully realize the scale and specialization effects if the importing country is not restricting trade. Both the productivity effect and the technique effect are driven by international competition. Measures limiting the extent to which domestic industries are exposed to international trade will therefore also limit these effects.

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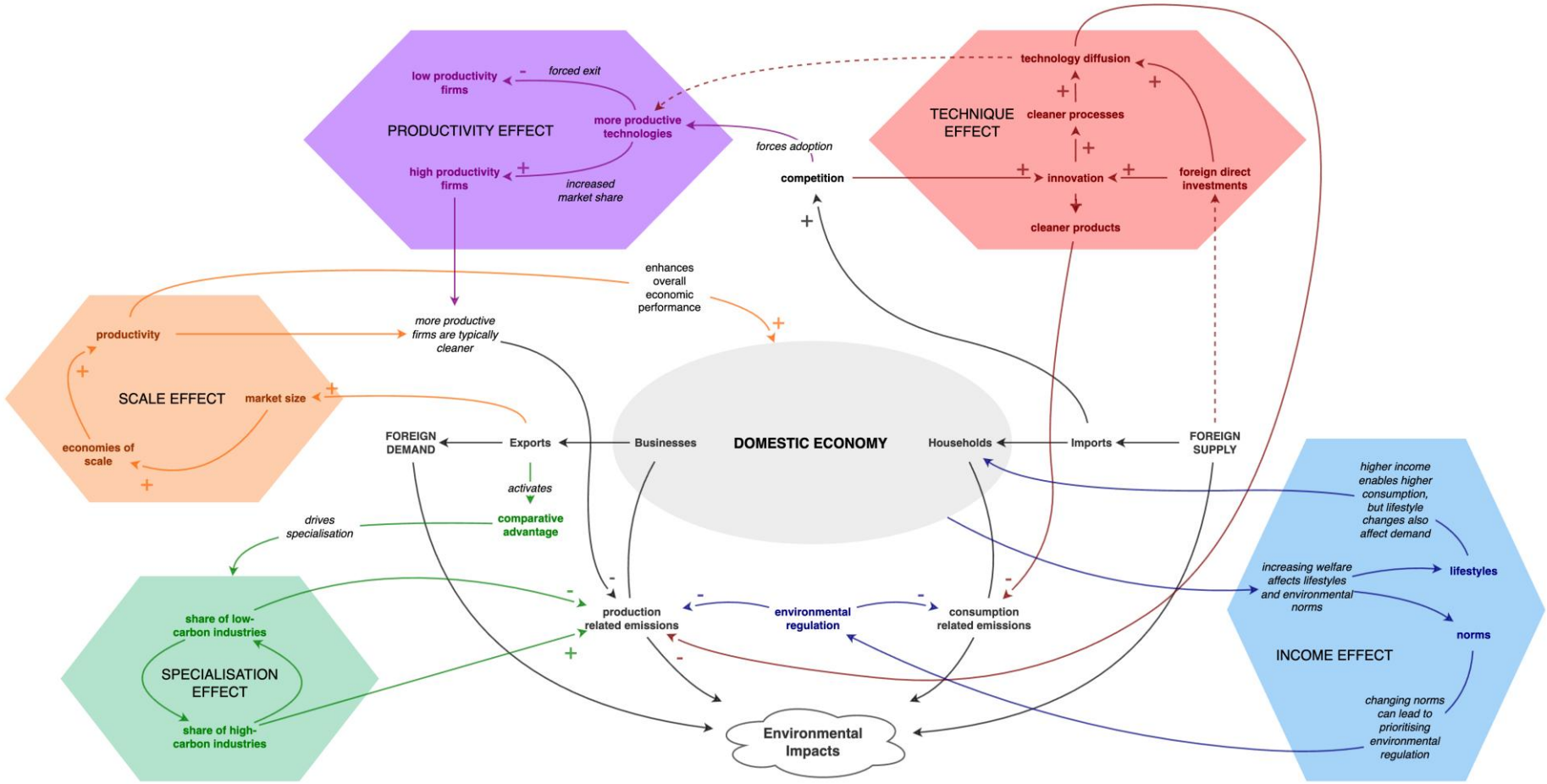

Figure 2. Schematic illustration of the scale, income productivity, specialisation and technique effects. *Source: own illustration.*

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We Need a Coherent Analytical Framework to Study Policy Interactions

The inherent overlaps and interdependencies among trade, climate, and industrial policies underscore the critical need for a holistic and integrated approach to policymaking in Europe. To facilitate this, the ENTICE project is developing a unified TCI policy taxonomy (see Table 1). It aims to provide a common language and analytical framework, which is essential for understanding the complex interactions between these policy domains.

Table 1. Overview of the unified TCI Policy Taxonomy.

CATEGORY	SUB-CATEGORY	POLICY INSTRUMENTS
OVERARCHING	framework legislation	*overarching goals & objectives; specific targets*
	strategic planning	*Roadmaps; multi-year plans*
ECONOMIC	carbon pricing	*emissions trading; carbon tax; crediting system*
	other market-based mechanisms	*tradable green certificates (e.g. for RE or EE)*
	subsidies (OPEX)	*feed-in tariffs or premiums; tax credits; price caps (e.g. electricity); CfDs; removal of inefficient subsidies; tariff/fee rebates (e.g. grid tariffs); other OPEX subsidies*
	subsidies (CAPEX)	*grants; low-interest loans; direct investment; tax credits; accelerated depreciation; removal of inefficient subsidies*
	direct investments	*public venture capital; public bail-out*
	procurement	*green public procurement; consumer subsidies*
	insurance	*disaster risk insurance*
REGULATORY	codes & standards	*product standards; pollution standards; quotas; local content requirements; licensing*
COMPETITION	competitive markets	*measures to remove market entry barriers; anti-trust measures; strategic merger control*
	monopolistic measures	*state trading; sole import agencies*
TRADE	import-related	*import tariffs, bans, quotas; other non-tariff barriers*
	export-related	*export tariffs, bans, quotas; export subsidies; export credit guaranties*
	foreign direct investments	*FDI entry and ownership rules; FDI incentives*
	trade defence	*remedies: safeguards, anti-dumping, countervailing measures; dispute settlement; trade agreements*
MONETARY	currency manipulation	*foreign exchange intervention; capital controls, exchange rate pegs*
	monetary adjustments	*interest rate adjustments; quantitative easing*
INNOVATION	research programmes	*research grants; research prizes; regulatory sandboxes*
	innovation systems	*stakeholder networks*
INFORMATION	company & product level	*mandatory reporting and auditing; mandatory transformation plans; labelling (e.g. energy efficiency labels)*
	consumer level	*information campaigns*
	societal level	*early warning systems for disaster risk; community and inter-organisation networks*
EDUCATION & CAPACITY	labour	*educational programmes*
	administration	*streamlined planning & permitting; reinforcing administrative capacity*
	individual	*special training / capacity building for adaptation*
INFRASTRUCTURE	physical (e.g. power, H2, adaptation)	*direct investment; coordination of emerging demand & supply*

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Existing policy taxonomies, developed within their specific disciplinary analyses (trade, climate, or industrial policy), often lack the comprehensive and unambiguous classification systems necessary for seamless integration into a holistic TCI framework. Despite their diversity and inherent complementarity, a unified TCI taxonomy is a necessary condition for systematically studying policy interactions at this nexus. Recognizing that a perfect, all-encompassing taxonomy is unattainable, the ENTICE project proposes a pragmatic classification system. This approach is designed to strike a balance between providing sufficient granularity for both quantitative and qualitative analyses, while remaining flexible and simple enough to enable effective collaboration across a diverse interdisciplinary consortium. To achieve this, the project initiated its taxonomy development by leveraging the detailed frameworks found in climate policy taxonomies, subsequently screening and integrating relevant elements from industrial and trade policy taxonomies.

The resulting unified framework categorizes policies into 10 main categories, including broad (overarching) policies, economic policies, regulatory policies, competition policies, trade policies, monetary policies, innovation policies, information policies, education and capacity building, and infrastructure. This structured approach facilitates a comprehensive analysis of how various policy levers can be combined to achieve integrated TCI objectives. For example, a carbon tax (climate policy) might simultaneously act as an incentive for green industrial innovation (industrial policy) and alter trade competitiveness (trade policy). By clearly categorizing these interlinkages, policymakers can design more coherent strategies that harness positive reinforcing effects and mitigate unintended consequences across these critical domains. The TCI framework will be operationalized and tested for applicability in the course of the ENTICE project. These practical experiences as well es input from stakeholders will be taken into account to eventually present a revised and consolidated version of TCI taxonomy towards the end of the project.

Starting a Conversation on Trade & Climate in a Changing World

Beyond developing a unified taxonomy, advancing analytical capacity is crucial for robust assessment of trade-climate linkages, particularly under evolving protectionist landscapes. This requires more granular and integrated data to capture the nuances of these interactions. Disaggregated trade data are necessary, for example, with respect to green versus conventional materials, in order to be able to assess how changes in trade regimes result in changes in emissions across supply chains. Furthermore, improved models are needed that can account for factors such as firm heterogeneity and regulatory asymmetry across different jurisdictions. Finally, the development of sophisticated scenario frameworks that reflect the current geopolitical and institutional fragmentation is essential for anticipating future challenges and opportunities. These frameworks must move beyond traditional assumptions of trade liberalization to explore diverse future trade regimes and their complex interactions with climate goals. Such an expanded scenario space (see Figure 3) will allow for a more robust assessment of how evolving trade patterns might impact emissions across global supply chains under various plausible future conditions.

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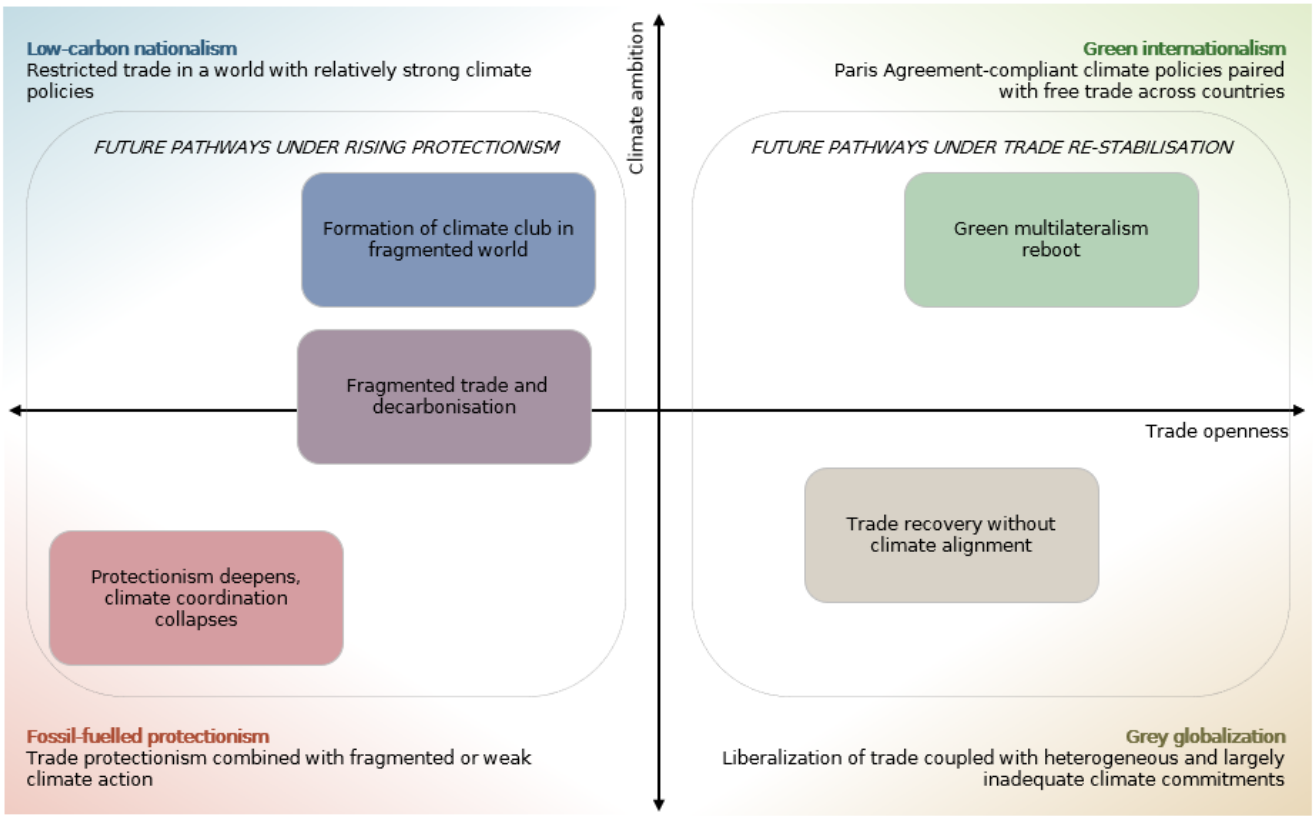

Figure 3. Illustrative scenario framework to examine climate action vis-à-vis trade openness and better capture the climate-trade interactions. *Source: own elaboration.*

This brief serves as a starting point for dialogue: the ENTICE project seeks to understand the *actual policy needs* of stakeholders to ensure its research directly addresses real-world challenges and contributes meaningfully to integrated policymaking. The future of Europe's green transition and economic competitiveness hinges on effectively managing the complex interplay of trade, climate, and industrial policies. Navigating this new landscape requires collaborative efforts between policymakers, industry, and researchers. The ENTICE project is committed to providing the necessary analytical foundations and tools to support informed and coherent policymaking. We invite stakeholders to actively participate in the ENTICE project's co-creation mechanisms to shape the research agenda and ensure its relevance to their policy needs.

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About the ENTICE Project

The ENTICE project aims to enhance understanding and develop tools for informed decision-making at the critical nexus of Trade, Climate, and Industrial (TCI) policy. Its core objectives include providing fact-based insights and developing analytical frameworks to navigate these complexities. Key elements of its work programme involve theoretical underpinnings, public perceptions, policy needs assessment, and the development of a unified TCI policy taxonomy.

For additional information, please refer to the project website: https://www.enticeproject.eu/

Policy Brief

NAVIGATING THE NEXUS OF TRADE, CLIMATE, AND INDUSTRIAL POLICY

In a nutshell

The global economic and political landscape is witnessing a profound shift where trade, climate, and industrial policies are no longer isolated but deeply interconnected, posing both challenges and opportunities for Europe's green transition and competitiveness. This brief highlights this critical interplay, intensified by recent geopolitical shifts and trade conflicts. International trade carries significant environmental implications, not only through direct transport emissions but also indirectly via "Scale," "Income," "Specialization," "Productivity," and "Technique" effects on economic activity and environmental performance. Existing research has focussed primarily on the environmental consequences of trade liberalization. Yet, recent political developments indicate a future of more constraint global trade. However, the environmental and economic effects of trade liberalization are not necessarily symmetrical to those of decreasing trade, creating new uncertainties. Industrial policies strategically influence economic structures and productivity, often aiming to remedy unintended implications of trade, foster green industries and safeguard economic resilience. Climate policies, through mechanisms like carbon pricing, may drive cleaner production and innovation, however they must carefully manage potential trade-offs such as carbon leakage. Given these complex interdependencies, a holistic and integrated policy approach is crucial. The ENTICE project is developing a unified Trade Climate Industry (TCI) policy taxonomy and advancing analytical capacities – more granular data, improved models, and robust scenario frameworks – to provide the evidence-based insights and tools necessary for coherent policymaking. We invite stakeholders to engage with the ENTICE project to shape research that directly addresses Europe's evolving policy needs at this critical nexus.

Corresponding Author(s)	Project Coordination
Dr. Lukas Hermwille, Wuppertal Institute for Climate, Environment and Energy Lukas.Hermwille@wupperinst.org	Panagiotis Fragkos, Maro Baka E3 Modelling Panagiotis.Fragkos@ricardo.com Maro.Baka@ricardo.com

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