CHAPTER 07

Trade, Treaties, and Aid: Insights into North-South Trade in Critical Raw Materials

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INTRODUCTION

As global competition for critical raw materials (CRMs) intensifies, the intersection of resource security, trade policy, and geopolitics has become a defining challenge of our time. Countries worldwide are striving to balance strategic autonomy with the need for resilient supply chains. Recent trade patterns illustrate this challenge. Global CRM flows have surged over the past twenty years, and the European Union (EU) has emerged as one of the world's largest importers, reflecting its own limited domestic resource base (Figure 1).

Within Europe, this has translated into concerted efforts to reduce dependence particularly on China—a vulnerability exposed during the COVID-19 pandemic and amplified by recent trade disruptions. Policymakers and industry stakeholders now widely recognize that ensuring resource security necessitates a more diversified and reliable network of international partnerships, capable of mitigating geopolitical and market risks.

This urgency is reinforced by the uneven geographical origin of CRMs (Figure 2). Large, often underdeveloped deposits are concentrated in low- and middle-income countries, while a small number of producers dominate the supply of several key materials. For example, over 70 percent of mined platinum comes from South Africa, around 70 percent of global cobalt from the Democratic Republic of Congo, and more than half of global nickel supply from Indonesia (IRENA, 2023).

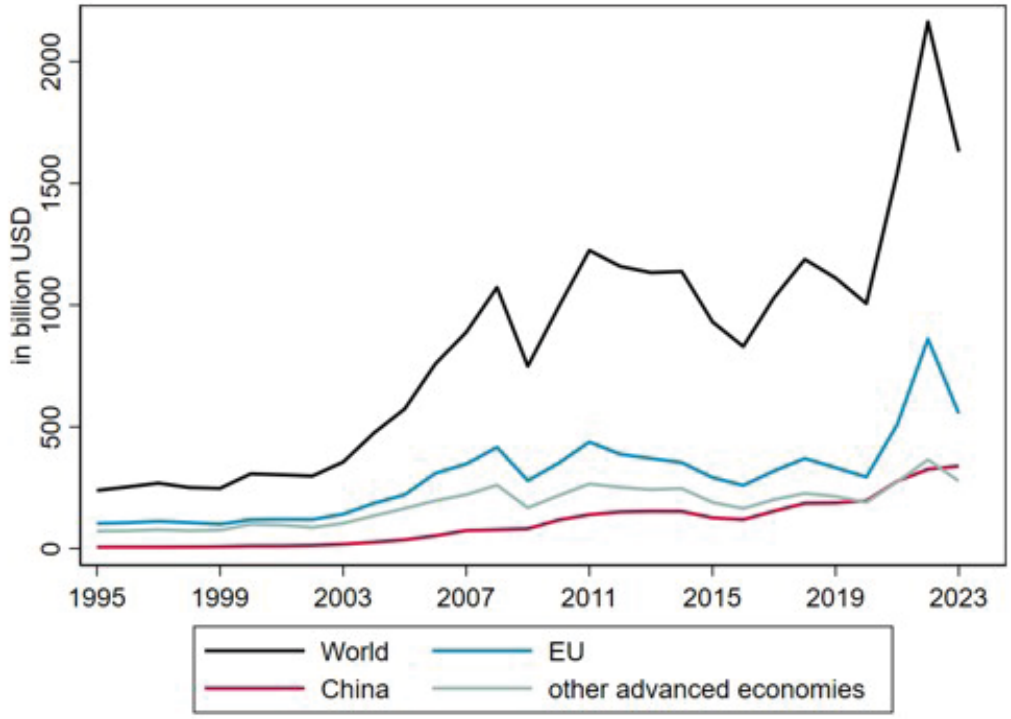
Access to these resources is increasingly shaped not only by technical and infrastructure factors, but also by shifting geopolitical dynamics. As strategic dependencies and competition deepen, major economies are deploying new policy tools to secure reliable access to the materials underpinning the green and digital transitions (UNCTAD, 2024; WEF, 2024).

While China continues to play a central role in CRM supply chains, others are adopting more proactive approaches, leveraging a mix of bilateral and multilateral measures designed to strengthen trade and investment links with resource-rich countries (see Section 2). Against this backdrop, this chapter sheds macro-level empirical light on the evolving policy landscape. Although many recent initiatives are still too new for full evaluation, past experience offers important insights into the underlying drivers that continue to shape current strategies.

We report on our analysis of three well-established bilateral policy instruments that reflect different dimensions of OECD (Organisation for Economic Co-operation and Development) coun-

1 This chapter is based on Stender and Vogel (2026), with select sections adapted and reformulated for this report. The research was conducted as part of a project supported by the German Federal Ministry for Economic Cooperation and Development (BMZ).

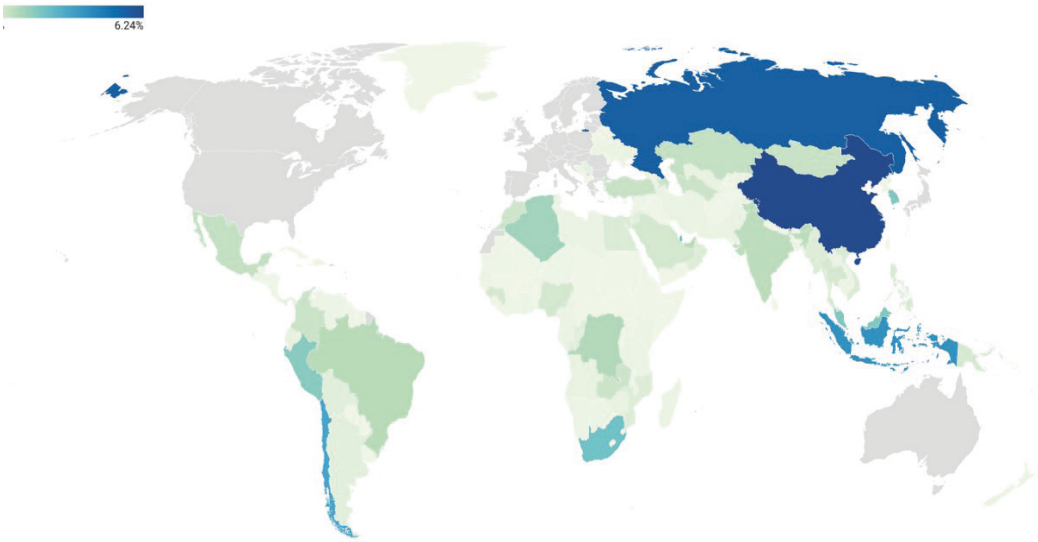
FIGURE 1: GLOBAL CRM IMPORTS (USD BILLION), 1995–2023



Notes: The grouping "other advanced economies" consists of Australia, Canada, Japan, Norway, Switzerland, United Kingdom, and the United States.

Source: Authors' own compilation based on the CEPII BACI dataset (Gaulier and Zignago, 2010) and the CRM classification by Georgitzikis (2023).

FIGURE 2: NON-OECD CONTRIBUTIONS TO GLOBAL CRM EXPORTS, 2023



Notes: The colour scheme reflects each country's export share of total CRM trade. Countries in grey are OECD DAC donors in 1995 or countries with missing data.

Source: Authors' own compilation based on the CEPII BACI dataset (Gaulier and Zignago, 2010) and the CRM classification by Georgitzikis (2023).

tries' engagement: Aid for Trade (AfT), Bilateral Investment Treaties (BITs), and reciprocal Preferential Trade Agreements (PTAs).

Each policy measure captures a distinct facet of how major economies seek to build more resilient and sustainable partnerships with developing countries. PTAs formalise trade relations and foster policy alignment; BITs encourage investment flows and signal regulatory stability; and AfT strengthens infrastructure and productive capacity. Taken together, these instruments represent a potential policy mix for deepening long-term cooperation in CRM supply.

Focusing on a sample of OECD importers and developing-country exporters, and using an augmented gravity model—the standard framework for ex-post trade policy analysis—our results show that PTAs play a particularly important role, improving OECD access to CRMs by both deepening existing trade relationships and fostering new supplier links. These findings challenge a narrow focus on finance and investment alone and underscore the strategic value of formal trade agreements. A balanced policy mix—combining trade diplomacy, investment protection, and targeted aid—appears key to building resilient and diversified CRM supplies.

To contextualize these findings, Section 2 provides a snapshot of recent policy initiatives by major economies with respect to CRM security, Section 3 presents empirical findings, and Section 4 concludes with policy implications and recommendations.

A SNAPSHOT OF RECENT POLICY DEVELOPMENTS

The strategic importance of CRMs is reshaping global trade and investment strategies. Major economies are increasingly integrating CRM considerations into their foreign economic policies to secure access and strengthen supply resilience.

The EU, for example, has been incorporating CRM-related provisions into new and revised trade agreements. The updated EU-Chile and EU-Mexico agreements were the first to include explicit CRM cooperation clauses, signalling a broader strategic shift. The recently concluded EU-Indonesia agreement continues this trajectory, with European Commission President Ursula von der Leyen describing it as a means to secure a "stable and predictable CRM supply" while fostering development-oriented partnerships (European Commission, 2025).

Comprehensive trade negotiations, however, are becoming more complex and time-consuming. The protracted EU-Mercosur talks highlight these challenges. To maintain momentum, the EU has therefore begun experimenting with more flexible and targeted instruments. These "slimmer" frameworks, agreed on more quickly, focus on specific sectors or shared strategic goals.

These efforts include the EU's expanding network of so-called Strategic Partnerships with key suppliers such as Canada, Namibia, and Kazakhstan. In 2025, the EU further concluded its first Clean Trade and Investment Partnership (CTIP) with South Africa. The CTIP model is designed to formalise bilateral cooperation, combining financial support and industrial collaboration in CRM value chains. It thereby reinforces the EU's broader Global Gateway initiative that links private investment with development finance to strengthen sustainable supply networks.

Other advanced economies are pursuing similar paths. Through

the Minerals Security Partnership (MSP), Japan, Norway, South Korea, the United Kingdom and the United States (U.S.) are promoting investment-driven strategies that mobilise public and private capital for CRM projects in developing countries. Recent U.S. agreements with the Democratic Republic of Congo and Ukraine exemplify this model by using government backing to attract private investment and secure long-term resource access.

Together, these initiatives signal a broader policy shift. Formal trade agreements remain important, but governments are increasingly relying on complementary tools—targeted partnerships, investment guarantees, and development-linked finance—to respond quickly to supply risks and geopolitical pressures.

This evolving landscape underlines the need for empirical evidence on how existing bilateral instruments such as trade agreements, investment treaties, and aid for trade, shape access to CRMs. Understanding these relationships can help design more balanced, resilient, and inclusive approaches to securing critical materials.

UNCOVERING THE BIG PICTURE: BROAD EMPIRICAL PATTERNS

Our analysis draws on annual CRM import data for 33 OECD countries from 172 developing countries over the period 1995–2023. Trade data are based on the January 2025 release of the *Base pour l'Analyse du Commerce International* (BACI) database (Gaulier and Zignago, 2010). Because CRM production and exports are highly concentrated, a sector-by-sector approach would produce uneven and non-comparable results. To ensure consistency, we therefore aggregate all CRM-related trade flows from Harmonised System (HS) 6-digit product-level data—aligned with the CRM classification developed by Georgitzikis (2023)—into a single annual observation for each country pair.[2] This approach captures the overall scale and evolution of trade rather than focusing on individual materials.

We explore the relationship between bilateral policies and access to CRMs using an augmented gravity model (Table 1). By focussing on a restricted sample of OECD importers and developing-country exporters, we identify conditional effects specific to this trading relationship.[3] Our analysis looks at two key dimensions of trade: The intensive margin, which captures how much countries trade within existing relationships (left column), and the extensive margin, which captures when trade occurs, i.e., the likelihood that a trade relationship exists at all (middle column).

In addition, we assess a combined margin that blends both effects, showing the *overall* impact of policies on both the formation of trade links and the value of trade once those

2 Unlike broader classifications that include non-critical inputs such as wood, this classification focuses specif-ically on CRMs essential to high-tech industries and the green energy transition. Specifically, the 53 base materials considered in our analysis can be grouped into key items such as rare earth elements (e.g., neo-dymium, dysprosium, terbium), platinum-group metals (e.g., platinum, palladium, rhodium), battery and magnet materials (e.g., lithium, cobalt, nickel, graphite), semiconductor and high-purity metals (e.g., gallium, germanium, silicon metal, hafnium), and key industrial minerals and metals (e.g., magnesium, manganese, copper, titanium metal).

3 For estimates derived from a fully global system that internalizes worldwide interdependencies, see the full paper version by Stender and Vogel (2026).

links are established (right column). This approach allows us to evaluate how different instruments contribute to deepening trade ties and expanding access to new suppliers.

Across these three dimensions, development finance, investment frameworks, and trade agreements play roles. However, PTAs show the strongest and most consistent effects. On average, PTAs increase trade values by about 20 percent and raise the likelihood of new trade links by nearly 3 percentage points, highlighting their contribution to diversification and access to strategically important CRMs.

These effects are in line with findings for total trade (Larch and Yotov, 2024) but are unlikely to result from tariff reductions alone, as Most Favoured Nation (MFN) tariffs on CRMs are already near zero in most advanced economies (own calculation based on data from World Bank, 2025). Instead, PTAs tend to lock in these low tariffs, thereby improving transparency, predictability, and trust. At the same time, PTAs frequently restrict or prohibit export controls (Korinek and Bartos, 2012), which in turn may strengthen the reliability of both existing and emerging trade relationships.

Compared with PTAs, BITs and AfT show weaker and more nuanced effects. BITs tend to support existing trade links but have limited influence on creating new ones, likely reflecting investors' preference for established partners. AfT, on the other hand, encourages the emergence of new trade links by improving infrastructure and production capacity, but it has little impact on expanding existing flows. This may be because earlier rounds of AfT already unlocked gains on the extensive margin, leaving fewer opportunities at the intensive margin.

TABLE 1: BILATERAL FOREIGN POLICY TOOLS AND CRM TRADE

	Trade performance in existing relationships	Potential for new relationships	Total trade engagement
Aid for Trade	-0.006	**0.001****	-0.005
	(-1.16)	**(2.02)**	(-0.97)
BIT	**0.109***	0.013	0.105
	(1.66)	(1.62)	(1.58)
PTA	**0.202***	**0.029***	**0.204***
	(2.92)	**(3.30)**	**(2.92)**
Observations	61,562	157,696	118,454

Notes: The left column reports Poison pseudo-maximum likelihood (PPML) estimates including using only positive trade flows; the middle column reports linear probability model estimates; the right column reports PPML estimates including zero-trade flows. Lagged annual bilateral AfT flows are transformed using the inverse hyperbolic sine. PTA (content) data are from the World Bank's Deep Trade Agreements database 2.0 (Mattoo et al., 2020), BIT data from the Electronic Database of Investment Treaties (EDIT) (Alschner et al., 2021), and AfT disbursements in constant million USD from the OECD Creditor Reporting System (2025). Robust, clustered (at the country-pair level) standard errors in parentheses. Asterisks denote the level of statistical significance with *** p<0.01, ** p<0.05, * p<0.1. Constant, country-pair and country-year fixed effects always included but not reported.

The analysis controls for broader country conditions and the stable characteristics of each trading pair through exploiting the panel structure of our data. However, a possible concern is that our findings on PTAs might simply reflect the impact of other policies alongside PTAs that benefit PTA partners but are not part of the agreements. For instance, the U.S. Inflation Reduction Act limits eligibility for certain tax credits to inputs sourced from the U.S. or from countries with a PTA (Bastida et al., 2023). Hence, it may have also influenced trade patterns.

To ensure such developments are not driving our results, we examine when the PTA effect materialises. We test whether introducing "placebo" treatment periods before an agreement enters into force already show structural differences between PTA and non-PTA, or whether effects only begin once the agreement is active or after an implementation phase. The accompanying event-study chart (Figure 3) for total trade engagement shows no meaningful impact on trade patterns prior to actual PTA entry into force and further illustrates that significant trade effects emerge only after a short implementation period following an agreement entering into force. Together, these results suggest that the above findings are not affected by unrelated policy shocks.

Both the scope of agreement coverage and the extent of interactions between policy instruments may also be relevant. Although CRM-specific provisions in PTAs are a relatively recent trend, the overall number of provisions included in agreements (PTA depth) could serve as a proxy for broader developments in agreement design. However, as shown in Table 2, there is no measurable relationship between PTA depth and CRM trade, suggesting that political signalling may matter more than the specific details of the agreement.

Turning to policy interactions, AfT and PTAs exhibit a negative interaction, indicating their positive effects diminish when implemented together. This may partly reflect overlapping objectives, such as improving customs procedures, which generate diminishing returns. It may also reflect rising compliance efforts associated with modern PTAs, which tend to absorb substantial shares of AfT resources, reducing the funds available for potentially more effective trade promotion projects (Stender and Vogel, 2025). By contrast, interactions between BITs and PTAs do not seem to be meaningful at all.

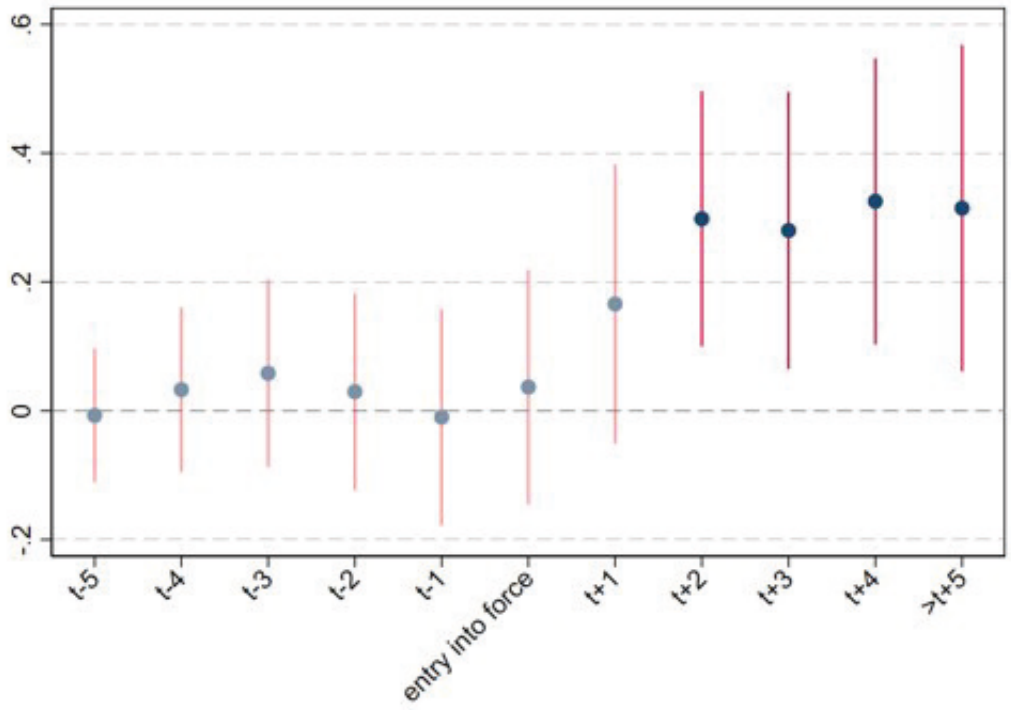
UNPACKING SUPPLY CHAIN STAGES

A central strength of using the Georgitzikis (2023) classification is its ability to distinguish between base CRMs and selected intermediate products across four stages of the CRM supply chain: extraction and mining, processing and refining, fabrication, and recycling. This level of detail supports more nuanced policy analysis, necessary especially because supply bottle-necks are often concentrated in processing and refining stages (Le Mouel and Poitiers, 2023).

Using this structure, we examine how the above general patterns vary across the CRM value chain (Figure 4). A notable pattern is that PTAs are most strongly associated with trade in downstream fabrication, while BITs are more closely linked to upstream activities such as mining and to circular-economy segments like recycling.

These patterns have distinct policy implications. PTAs seem to have limited influence on trade in raw,

FIGURE 3: PTA EFFECT OVER TIME (TOTAL TRADE ENGAGEMENT)



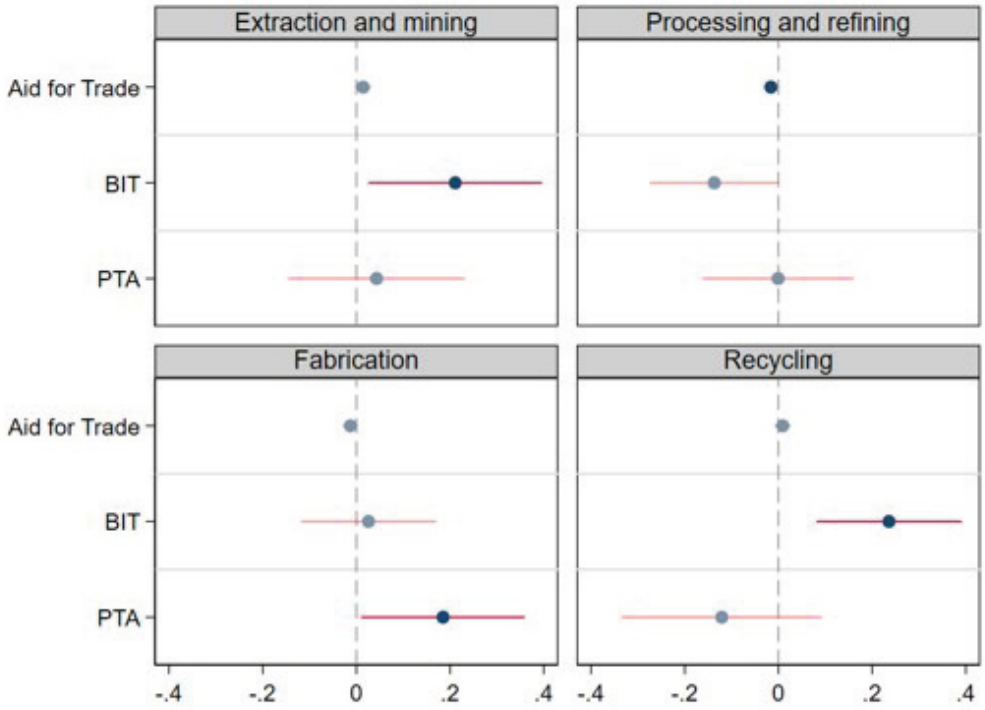
Notes: Dots denote coefficient estimates and spikes their 90 percent confidence intervals. Confidence inter-vals crossing zero (horizontal dashed line) indicate statistically insignificant effects. Statistically significant effects are shown in solid shades and insignificant effects in light shades. Estimation conducted using a PPML model that includes annual PTA dummies, AfT, BITs, a constant, country-pair- and country-year fixed effects.

TABLE 2: PTA DEPTH AND COMPLEMENTARITIES (TOTAL TRADE ENGAGEMENT)

	Depth	**Interaction with AfT**	**Interaction with BITs**
PTA	**0.1912***	**0.3881***	**0.2049****
	(1.78)	**(4.67)**	**(2.37)**
Depth	0.0699		
	(0.19)		
Aid for Trade ∗ PTA		**-0.0308***	
		(-3.88)	
BIT ∗ PTA			-0.0018
			(-0.02)
Observations	118,454	118,454	118,454

Notes: Columns report Poison pseudo-maximum likelihood (PPML) estimates including zero-trade flows. Lagged annual bilateral AfT flows are transformed using the inverse hyperbolic sine. PTA (content) data are from the World Bank's Deep Trade Agreements database 2.0 (Mattoo et al., 2020), BIT data from the Electronic Database of Investment Treaties (EDIT) (Alschner et al., 2021), and AfT disbursements in constant million USD from the OECD Creditor Reporting System (2025). Robust, clustered (at the country-pair level) standard errors in parentheses. Asterisks denote the level of statistical significance with *** p<0.01, ** p<0.05, * p<0.1. AfT and BITs are included as control variables to capture baseline effects, but their esti-mates are not reported. Constant, country-pair and country-year fixed effects always included but not reported.

FIGURE 4: BILATERAL FOREIGN POLICY TOOLS AND CRM SUPPLY CHAIN STAGES (TOTAL TRADE ENGAGEMENT)



Notes: Dots denote coefficient estimates and spikes their 90 percent confidence intervals. Confidence inter-vals crossing zero (horizontal dashed line) indicate statistically insignificant effects. Statistically significant effects are shown in solid shades and insignificant effects in light shades. Estimation conducted using a PPML model that includes annual PTA dummies, AfT, BITs, a constant, country-pair- and country-year fixed effects.

unprocessed materials immediately after extraction. However, they may support value addition in developing countries by encouraging some fabrication before export. This dynamic could reflect gaps in OECD manufacturing capacity (Kannan et al., 2025), but it also aligns with strategies used by resource-rich countries to deepen their participation in global supply chains. Many of these governments increasingly employ industrial policy tools to stimulate local processing (Farooki, 2025). While such measures stretch WTO rules, PTA partners may be willing to accept temporary arrangements that support these developmental objectives. When paired with broader cooperation efforts, PTAs may thus contribute to local content creation and industrial development.

BITs, by contrast, tend to support investment in capital-intensive sectors with long planning horizons. Their stabilising effects can help attract investment into mining and recycling, where financial and political risks might otherwise deter firms. Together, these findings highlight the complementary roles of PTAs and BITs in shaping different segments of CRM supply chains.

LOOKING AHEAD

Durable, rules-based trade frameworks can offer a mutually beneficial path toward resilient CRM supply for high-income countries seeking economic security and resource-rich devel-oping countries alike. These frameworks can in particular be anchored through PTAs and complemented

rather than substituted by targeted aid and investment agreements.

While at times more tedious to negotiate than narrower investment promotion or aid instruments, our analysis of OECD-developing country trade reveals that comprehensive trade agreements are effective in expanding CRM access from developing countries. In this setting, they deepen existing commercial ties while simultaneously opening pathways to untapped supplier markets. Furthermore, PTAs demonstrate a notable correlation with downstream pro-cessing activities, suggesting their capacity to stimulate industrial transformation and local value-addition in resource-rich countries rather than locking them into extractive roles.

Moving forward, understanding how foreign policy tools affect CRM trade remains vital for both high-income and developing countries. Further research should examine the specific channels through which PTAs influence CRM trade, particularly in downstream sectors. Equally important is gathering more comprehensive data on newer policy instruments and analysing how they differ from the more traditional tools investigated.

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