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Tariff Policies and International Trade Flows: Impacts on Developed and Developing Economies

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Abstract

This paper continues our earlier work on tariff policies and international trade but introduces new theoretical and empirical concepts into the analysis. This version 2.0 is a continuation of the development in the first paper (covering 2018–2024) and concentrates particularly on the three forces that are changing global trade today: geopolitical fragmentation, the development of climate-driven trade instruments, and the increasing push toward digital sovereignty. Increases in tariffs have detrimental effects on exports and imports, and developing economies are especially impacted, which suffer most due to structural weaknesses that hinder their ability to absorb shocks. More importantly, competitiveness and resilience are no longer dependent on tariffs alone. Climate regulations and digital restrictions are becoming significant impediments to trade and are already beginning to determine which nations and firms remain competitive and can best weather disruptions. Resilience against disruptions can be achieved by strengthening regional trade relationships and investing in robust digital infrastructure, although, as crises are converging and escalating and not occurring in isolation, governments are actively restructuring global supply chains to seek friend-shoring and strategic independence.

Keywords: Geopolitical Fragmentation, Green Trade Policy, Digital Trade Barriers, Trade Trilemma, Supply Chain Resilience, Friend-shoring, Carbon Border Adjustment (CBAM), Developing Economies, Strategic Autonomy, Non-Tariff Barriers, Trade Diversion.

INTRODUCTION

The Global Trade Policy Architecture Is Changing

Trade policy has been forced to work in extremely difficult conditions between 2018 and 2025, including trade tensions, the COVID-19 shock, supply chain collapses, and other frequent disruptions that few could predict, all of which have challenged traditional policy responses. We have carefully quantified these effects in our previous study (Olawore *et al*., 2025; Krugman *et al*., 2018; Baldwin & Freeman, 2022). Among the key discoveries is that, though they have their purposes, tariffs have unequal welfare and trade effects, and the adjustment costs are not distributed equally among countries and industries. The burden on developing economies is far heavier, since their exports usually depend on basic commodities, and they possess less advanced technology and weaker institutions to help them adapt.

The international trading environment has changed significantly since the first study analysis, and this Version 2.0 reflects the understanding that the traditional rules of international trade are being revised in real time, with the focus now shifting away from old-fashioned tariff barriers.

The Depoliticization of Trade:

Increasing strategic competition is causing economic fragmentation and the weaponization of interdependence to rise. Countries are now seeking so-called friend-shoring and strategic independence, rather than focusing on pure economic efficiency (IMF, 2024).

A good illustration of a trade policy having a direct impact on climate action is the Carbon Border Adjustment Mechanism (CBAM) of the EU, which levies a fee on the carbon emissions enclosed in imports to Europe (OECD, 2024).

Digital Regulatory Frontier:

Digitization of the economy has also resulted in the creation of a new border of control, including laws on data localization, taxation of online services, platform regulation, and cybersecurity, which today are viewed as natural non-tariff trade barriers (UNCTAD, 2023).

In our previous study (Olawore *et al*., 2025), it was found that traditional buffers alleviate tariff shocks; it is not known whether the mechanisms are adequate or relevant in a world.

Contributions and Novelty of Version 2.0

The paper does not only update our previous paper but also recalibrates the research agenda and expands the analytical focus to incorporate the multidimensional drivers that dictate the outcome of trade in the current day. Although we continue to hold a firm comparative framework between developed and developing economies, we do so by considerably expanding the analytical scope. Specifically, Version 2.0 makes three distinct and substantive contributions:

Synthesis and Extension of the Theory:

Protectionism is not just one trade concern, but it is one aspect of a larger agenda that encompasses the realization of strategic supply chains, augmentation of technological control, and attainment of climate-related goals (IMF, 2024). Therefore, the issue of protectionism is not entirely a trade issue but a bigger agenda of realizing strategic supply chains, greater technological superiority, and climate-related goals.

Empirical Innovation and Measurement:

We are also able to introduce and empirically measure two newly created indices: a Digital Trade Restrictiveness Index and a Green Trade Pressure Index, so that we can do a more thorough study of their joint impacts.

Evidence-Based Policy Relevance:

We offer an in depth, evidence based understanding of the practical means of governments navigating this pragmatic policy trilemma of attaining economic security, global competitiveness, and fulfilling pressing climate commitments in an ever more disordered world economy.

Research Objectives and Questions

1. First, it examines the impact of both the traditional tariffs and more modern green and digital barriers on bilateral trade between 2018 and 2025 and whether their effects are additive and possibly non-linear.
2. Second, it contrasts the way developed and developing economies are adapting to these changes, paying specific attention to the disparities in the adoption of green technology and the development of digital infrastructure.
3. Third, it considers how institutional shock absorbers, especially regional trade agreements and national digital preparedness, can reduce the effects of trade disruption in an environment that is defined by the establishment of geopolitical blocs and strategic decoupling.

Research Questions:

1. What is the response of international trade to the joint shock of increased tariffs, geopolitical changes, and environmental and digital technology regulations?
2. Is there an increase or decrease in the gap in historical trade resilience, given the various capabilities to embrace green technology and digital transformation?
3. How strongly are trade flows supported and enhanced by regional economic integration and national digital preparedness in an environment that increasingly is being organized around competing strategies and values-based blocs?

The History of Trade Theory Comparative Advantage to Strategic Autonomy

The classical and neoclassical trade theory is the basis of the traditional tariff research, and David Ricardo is the one who introduced the principle of comparative advantage as the beneficial specialization of countries in producing goods that they can produce most effectively. This idea was later extended by the Heckscher-Ohlin model and the Stolper-Samuelson theory, which showed how factor endowment could affect trade and how tariffs could affect income distribution in an economy (Heckscher & Ohlin, 1991; Stolper & Samuelson, 1941).

With these standard models, there are a few important assumptions that are made: countries primarily trade in final goods in a cooperative international system, and trade policy is primarily about efficiency or a temporary barrier to new industries.

Towards the end of the 20th century, trade theory began to consider learning over time, imperfect competition, and scale economies; research on endogenous growth models (Grossman & Helpman, 1991) and strategic trade theory (Krugman, 1987) was established. However, these models typically made the assumption that the world economy was stable and governed by well-defined laws.

Today's trading world calls for another shift in thinking. Production is now taking place across global value chains, not within the various countries that trade in finished goods, but in various connected stages across borders. Such complex supply chains mean that any change in tariffs can be felt throughout the entire chain, and these firms will purchase inputs differently and re-architect competitiveness in subsequent years (Antras, 2020; Baldwin, 2022; Baldwin & Freeman, 2022; World Bank, 2023).

What this means is that tariffs are no longer just a choice between "free trade" and "protectionism." They have turned into a tactical instrument of larger ambitions. Trade actions are becoming more and more utilized to promote:

Economic Security: Making sure countries can reliably access key inputs without depending too much on rivals (IMF, 2024);

Technological leadership remaining on top in high-value and low-carbon industries such as semiconductors, advanced manufacturing, and clean tech (OECD, 2023; WIPO, 2024);

Trade policy is used by climate action to hasten the process of shifting to low-carbon production (Nordhaus, 2015; OECD, 2024).

In this regard, this paper fills the gap between the old theory of tariff and modern discourses of geopolitical fragmentation, digital trade regulations, and green industrial policy. Figure 1 describes our framework; it provides how regional trade agreements and digital preparedness determine how policies and structural conditions are converted into trade outcomes, competitiveness, and supply-chain resilience. This framework then grounds the empirical research in Section 3.

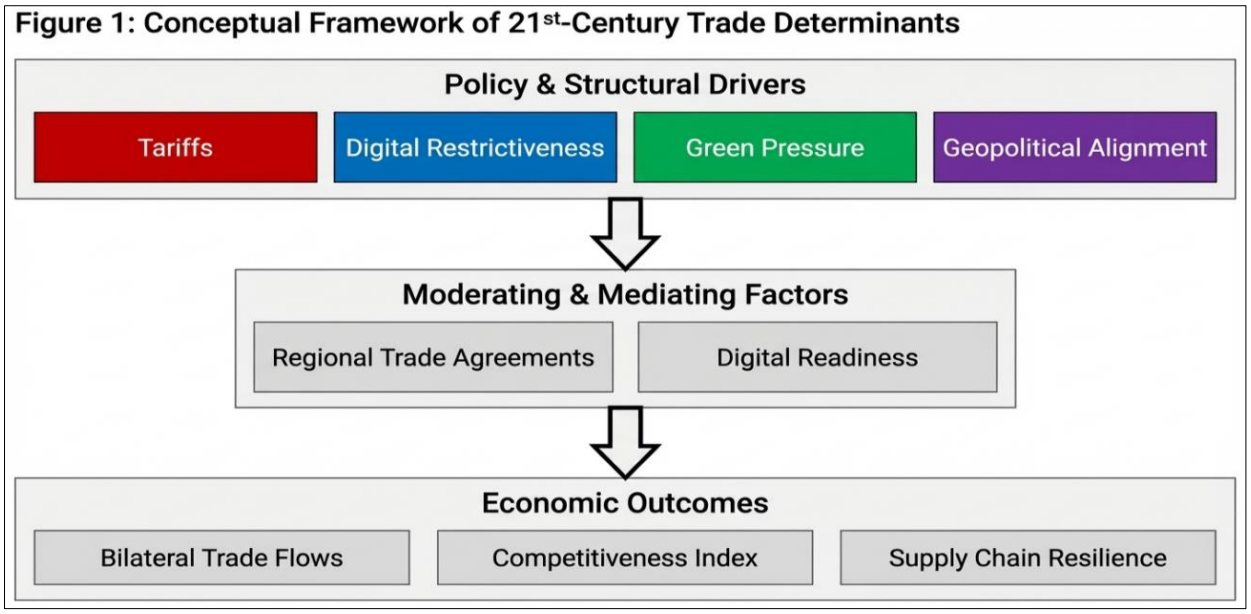

Figure 1: Illustrates the theoretical approach of this study, which asserts that the impacts of tariffs are never solitary; rather, the impacts of such tariffs are influenced by neo-trade elements, digital regulation, climate action, and geopolitical restructuring and mediated by regional trade agreements and national digital preparedness (Baldwin & Freeman, 2022; OECD, 2023; UNCTAD, 2023). These factors yield three important outcomes, namely, bilateral trade flows, national competitiveness, and supply chain resilience

Empirical Tips of the Recent Turbulence a Natural Experiment:

The 2018-2025 stress test on trade theory presents a combination of overlapping shocks, which we can use to understand how trade systems react to a collision between tariffs, supply disruptions, and policy changes (Handley et al., 2024; Freund & Pierola, 2022). There are three developments of particular importance.

The U.S.-China trade war (2018-present). This episode demonstrated that tariffs between leading powers quickly spread. They create spillovers throughout value chains around the world and compel companies to reconsider their sourcing and production locations. It has been demonstrated that tariff increases shattered established East Asian production networks and sped up the process of diversification, with changes to Southeast Asia, Mexico, and other substitute bases (Bown, 2023). Practically, such change has been in the form of trade diversion and supply-chain restructuring on a scale never experienced before (Baldwin, 2022; Freund *et al*., 2022).

The COVID-19 pandemic occurred between 2020 and 2022. It turned out that even the supply chains optimized exclusively on efficiency were incredibly weak during the pandemic. Lockdowns, shipping delays, and component shortages compelled governments, as well as companies, to make a painful decision: could companies afford to focus on low costs instead of security and reliability (Ivanov & Dolgui, 2020)? It further moved the supply chain security to the center of the trade and industrial policy, reinforcing the dynamics of nearshoring, regionalization, and strategic buffering (Christopher & Peck, 2004; Tang & Veelenturf, 2019).

Green and digital changes are occurring simultaneously. There are two other long-term transitions that have shifted to the forefront of trade policy. Climatically, policies like the Carbon Border Adjustment Mechanism by the EU have introduced a new set of trade costs associated with embedded emissions, and the implications of this policy are more complicated than ever in developing economies (OECD, 2024). At the same time, the growth of digital trade has resulted in the emergence of more and more regulatory restrictions, data localization regulations, taxes on digital services, cyber security regulations, and platform regulations

that become non-tariff restrictions (UNCTAD, 2023; OECD, 2023).

Synthesis. These disruptions combined together lead to one straightforward fact that the success of modern trade is not determined by tariffs, but rather by the adaptability of a country. The main aspects of such adaptive capacity are digital infrastructure, substantial regionalization, innovation potential, and the possibility to address or respond to climate-related standards (World Bank, 2023; OECD, 2024).

RESEARCH DESIGN AND METHODOLOGY

This section outlines the information and sample construction to be applied in the augmented gravity model analysis. To be comparable to our previous piece and at the same time capture the newer dynamics that have been introduced in Version 2.0, we consider a balanced panel of 20 major economies: 10 developed and 10 developing, followed up every year between 2018 and 2025 (including projections of 2024-2025).

The sample was constructed using stratified purposive sampling to achieve coverage within three dimensions:

1. **Economic Size and Systemic Relevance**: We consider the five largest economies in the world in terms of GDP: the United States, China, Germany, Japan, and India, to ensure that the sample is representative of countries that have a significant influence on the direction of trade flows and the global policy (World Bank, 2024; IMF, 2024).
2. **Development and Region Coverage:** The sample of the developing economies covers large areas and the various levels of industrialization and encompasses nations like Brazil, Nigeria, Vietnam, and Indonesia (UNCTAD, 2024; World Bank, 2024).
3. **Strategic and Institutional Reliability:** The sample of countries is undergoing major regional free trade agreements (e.g., USMCA, EU Single Market, and AfCFTA) and larger geopolitical groupings and realignments (G7 and BRICS+) (OECD, 2024; WTO, 2024).

Overall, this design offers a reasonable size of the sample, broad representativeness, and tackles the dynamics of an increasingly fragmented trade system (Baldwin and Freeman, 2022; Freund and Pierola, 2022).

This Version 2.0 Will Add to the Common Trade and Macroeconomic Sectors to Include Green, Digital, and Geopolitical Variables in the Dataset:

We take into account the bilateral tariff rates of the World Trade Organization (2024), the values and volumes of trade of the United Nations (2024), and the main macroeconomic variables of the World Bank (2024) and the International Monetary Fund (IMF) (2024): GDP, inflation, and real effective exchange rates.

Green transition indicators: The Green Trade Readiness Index is developed with the help of three weighted variables, such as the carbon intensity of exports, the rate of renewable energy, and adherence to climate-linked trade standards (including CBAM-type measures). The index has been calculated using the statistics of the OECD (2024), the World Bank (2024), and the UNFCCC.

Digital economy indicators: Digital constraints and capacity are the measures used to assess the regulation and infrastructure, measuring them with the index of OECD Digital Services Trade Restrictiveness and complemented by the e-commerce index and ITU broadband indicators (OECD, 2023; UNCTAD, 2023; ITU, 2022).

Geopolitical alignment: The result is the annual coding based on the shared membership of the key strategic groups and institutional constructs (such as G7, BRICS+, AUKUS, and the U.S.-EU TTC). This coded hypothesis is a test of the geopolitical gravity hypothesis (IMF, 2024; Baldwin, 2022). The final dataset, harmonized and missing data imputed with standard procedures (Roodman, 2009; Blundell & Bond, 1998), has about 3,200 observations of exporter-importer-year, the data of which are based on manufacturing and intermediate goods. All the monetary values are adjusted to constant 2015 U.S. dollars (World Bank, 2024).

Table 1: Countries in our 2025 dataset: digital, green, and geopolitical factors

Country	Development Status	Digital Restrictiveness Index	Green Trade Pressure Index	Primary Geopolitical Bloc
United States	Developed	0.25	35	G7 / TTC
Germany	Developed	0.30	40	EU / G7
Japan	Developed	0.35	42	G7 / CPTPP
South Korea	Developed	0.28	38	OECD / IPEF
United Kingdom	Developed	0.32	36	G7 / AUKUS
France	Developed	0.33	45	EU / G7
Canada	Developed	0.27	32	G7 / USMCA
Australia	Developed	0.29	39	AUKUS / CPTPP
Italy	Developed	0.38	43	EU / G7
Netherlands	Developed	0.26	37	EU / OECD
China	Developing	0.65	75	BRICS+
India	Developing	0.60	68	BRICS+ / IPEF
Brazil	Developing	0.58	72	BRICS+ / MERCOSUR
Mexico	Developing	0.50	50	USMCA
Vietnam	Developing	0.52	60	ASEAN / CPTPP
Indonesia	Developing	0.55	65	ASEAN / G20
Nigeria	Developing	0.70	80	AfCFTA
South Africa	Developing	0.62	70	BRICS+ / AfCFTA
Turkey	Developing	0.59	63	OECD / MIKTA
Argentina	Developing	0.63	74	MERCOSUR

Table 1, the Digital Restrictiveness Index (DRI) has a range of 0 (least restrictive) to 1 (most restrictive). The Green Trade Pressure Index (GTPI) has a range of 0 (low pressure) to 100 (high pressure). Some of the geopolitical and regional formations are abbreviated as TTC (EU-US Trade and Technology Council), IPEF (Indo-Pacific Economic Framework), and AfCFTA (African Continental Free Trade Area).

Dependent Variable: The Bilateral Export Value, which is the Natural Logarithm of Exports (LOGEXPORTS)

The most important variable is a natural logarithm of actual annual exports of a country of origin to an importing country, UN Comtrade data (UN Comtrade, 2024). It is the standard measure of trade flow applied in gravity-model studies (Anderson & van Wincoop, 2003; Head & Mayer, 2014).

Composite Competitiveness Index

To gain competitiveness, not only through trade volumes, we form a composite index of three components:

Export sophistication is a measure of the income content of exports and is calculated by weighting products by the income levels of countries that also typically export the products (Hausmann *et al*., 2007).

Logistics performance relies on the World Bank Logistics Performance Index, which is the measure of customs performance, the quality of infrastructure, and the reliability of tracking (World Bank, 2024).

Two constituents that are used to measure innovation and green capability include patenting intensity (PCT patent applications per capita) and the proportion of clean-technology exports a country makes (WIPO, 2024; World Bank, 2024).

Trade Diversion

We measure trade diversion by measuring the change in yearly market share of an exporter in a destination of tariff-affected goods, relative to its market share in similar destinations where the same goods are not subject to tariffs (Bown, 2023; Baier & Bergstrand, 2019).

Price (Unit) and Quality (Unit) Changes

We proxy cost pass-through and quality improvement by the annual change in the unit values, export value/quantity, at the HS-6 level (Hallak & Schott, 2011; Amiti *et al*., 2019).

Core Explanatory Variables:

Tariff Rate

We use the simple average of ad valorem tariffs that are actually levied at the HS-4 level, which can be found in the WTO Integrated Database (WTO, 2024).

Digital Restrictiveness

This is an exporter-level time-varying index, which is computed based on the OECD Digital Services Trade Restrictiveness Index and is scaled between 0 (least restrictive) and 1 (most restrictive) (OECD, 2023; UNCTAD, 2023).

Green Trade Pressure

The exporter exposure measure is a measure of the extent to which the exports of any country are influenced by the carbon-related costs of the border trade, and it also modifies this exposure in accordance with the intensity of the export-related industries (OECD, 2024; World Bank, 2024).

The Measure also Takes into Account the Membership in Regional Trade Agreements

We include an indicator of 1 in the case of both countries belonging to the same deep regional trade agreement in a particular year (OECD RTA database, 2024; Baier & Bergstrand, 2019).

Geopolitical Alignment

We add an indicator equal to 1 when the two countries belong to the same major strategic bloc in a given year (IMF, 2024; Baldwin, 2022).

Control Variables

Other standard gravity models are the size of the exporting and importing economies (log real GDP), the distance between them (log), and the existence of a border, a common language, or a colonial relationship (World Bank, 2024; IMF, 2024; CEPII, 2023; Head & Mayer, 2014).

Empirical Strategy

We use an approximation of a long-run version of the gravity model that incorporates general equilibrium effects and allows for country-specific and time-varying trade responses (Anderson & van Wincoop, 2003; Head & Mayer, 2014).

In simpler terms, export performance is modeled using five key drivers of tariffs, including digital restrictiveness, the green trade pressure, and two terms of interaction, which test the hypothesis that tariffs bite more strongly in case digital restrictions are harsher or the carbon-border exposure is more pronounced. We also include shared geopolitical alignment, shared regional trade agreements, standard gravity controls, and exporter, importer, and year fixed effects.

Tariff Endogeneity

To overcome the possibility of reverse causality, we use an instrumental-variable design that uses partner-import-weighted tariff shocks (Baier & Bergstrand, 2019; Handley *et al*., 2024).

Tariff Endogeneity:

To treat the reverse causality, we use an instrumental-variable design based on the use of the import-partner-weighted tariff shocks (Baier & Bergstrand 2019; Handley *et al*., 2024).

Dynamic Panel Bias: We use System GMM to eliminate bias that arises when past trade outcomes influence current ones (Blundell & Bond 1998).

Standard Errors: To measure the serial correlation between trading relationships over time, we pool them at the country-pair level (Yotov *et al*., 2016).

Sensitivity Tests:

We approximate PPML, divide the sample by the development group and sector, do placebo tests, and experiment with other index-weighting schemes (Silva & Tenreyro 2006).

Key Findings

Tariffs continue to decrease trade, but the effects are not equally distributed among nations and industries.

Our new results validate our previous observation that an increase in tariffs reduces bilateral trade. An increase in the average tariff by 1 percentage point reduces real exports by 0.6 to 0.8 percent and has long-term impacts (Handley *et al*., 2024).

The impact is uneven. The drop in exports in the developing economies is 30 to 40 times as large as the drop in exports in the developed economies after similar increases in tariffs (World Bank 2023; UNCTAD 2024).

This Disparity is an Indicator of Structural Factors That Render Adaptation More Difficult in Developing Economies, Which Consist of:

1. The developing economies typically have smaller, commodity-intensive export baskets (Hausmann *et al*., 2007).
2. When the demand changes, few realistic alternative markets are available (Bown 2023).
3. There is a small fiscal capacity to absorb companies and industries during times of disturbances (IMF 2024).
4. The institutional performance in managing disputes and enhancing the productivity of industrial policy has been reduced (Chang 2002; Rodrik 2018).

Table 2: Regression Results of the Impact of Tariffs, Digital, and Green Policies on Bilateral Exports (2018–2025)

Variable	Full Sample	Developed Economies	Developing Economies
Tariff Rate (ad valorem)	−0.75	−0.60	−0.95
Digital Restrictiveness	−0.42	−0.30	−0.58
Green Trade Pressure	−0.35	−0.25	−0.50
Tariff × Digital Interaction	−0.18	−0.10	−0.28
Tariff × Green Interaction	−0.22	−0.15	−0.32
RTA Membership (dummy)	0.35	0.28	0.40
Geopolitical Alignment	0.20	0.25	0.15
Controls Included	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes
Observations	3,200	1,600	1,600
R-squared	0.72	0.68	0.65

Table 2. The result in Table 2 is the log of bilateral export value. The standard errors are concentrated at the country-pair level. Unless mentioned otherwise, coefficients are statistically significant at the 5% level.

New Gaps in Trade Resilience: The Green Gap and the Digital Divide

Version 2.0 emphasizes that the former North-South divide is no longer the only one. Two other more recent gaps affect the trade performance: the green gap, or how ready the nations are to switch to the low-carbon economy, and the digital divide, or the level of digital trade potential that the nations possess (World Bank 2023; OECD 2024).

Green Gap:

Countries that have already made progress in the clean-energy transition, as indicated by a low carbon intensity of exports and a greater role of renewable energy, were more likely to be able to cope once climate-related trade measures become stricter (OECD 2024; Nordhaus 2015). Practically, exporters with lower levels of decarbonization have fewer frictions with the expansion of CBAM-type policies.

Other developing economies may reduce the exposure by moving to cleaner parts of global value chains. An example of a more integrated country is Vietnam, which does not seem to be as susceptible to the pressure of CBAM as the countries that remain primarily controlled by carbon-intensive goods like steel, cement, or aluminum (World Bank 2024; UNCTAD 2024). Altogether, decarbonization is important in terms of compliance and competitiveness.

Digital Divide:

Digital capability is also more influential than traditional trade models would indicate. The nations with improved digital foundations, including efficient broadband, the absence of paper in their customs and trade operations, a wider use of e-commerce, and clear data management, would be more likely to be able to sustain trade in disruptions (OECD, 2023; UNCTAD, 2023).

The presence of advanced digital systems in such countries as South Korea and Estonia can change suppliers quickly, trade with fewer physical bottlenecks, and preserve business relationships even in case of transport disruption (ITU 2022; Tang & Veelenturf 2019). Conversely, less powerful digital capacity countries have to apply expensive short-term solutions such as manual workarounds, emergency stockpiling, or slow supplier searches that increase costs and loss of competitiveness (World Bank 2023; Freund & Pierola 2022).

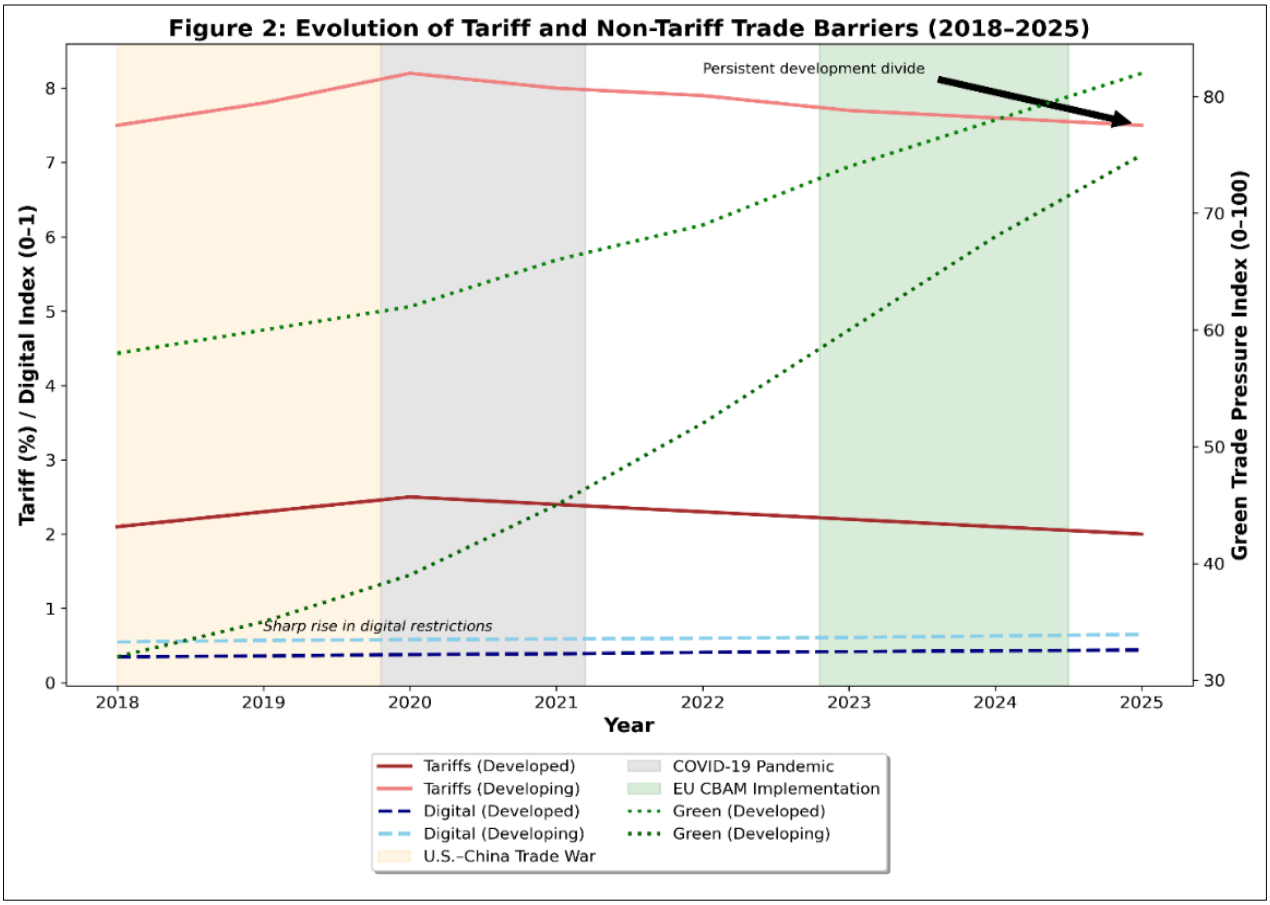

Figure 2: Presents the trend of three indicators tariff rates, digital restrictiveness, and green trade pressure between 2018 and 2025 between developed and developing economies. Tariffs are adjusted in a minor way, and non-tariff barriers, especially environmental policy ones, are shifted more. In all indicators, the difference remains evident: the developing countries have more barriers in general, and green and digital constraints increase more rapidly following significant global shocks.

Regionalism Remains Important to Trade Resilience, But Geopolitics is More Important than Ever

Deep regional trade agreements protect trade flows from shocks from outside the region, as shown in earlier studies (Baier & Bergstrand, 2019; Freund & Pierola, 2022). Intra-agreement trade is 25 to 35 percent more resilient, with a smaller decrease in response to an increase in external tariffs. The current deals and agreements, such as the European Single Market, USMCA, and the African Continental Free Trade Area, lower the transaction cost, enhance coordination, and increase predictability (OECD, 2024; World Bank, 2023).

Meanwhile, geopolitics has a greater impact. Since we have already controlled the effects of gravity and the countries belonging to the same major strategic blocs (e.g., G7 or BRICS+), we observe higher trade flows within countries belonging to the same major strategic blocs. This suggests that the establishment and maintenance of trade relations are changing. Political trust, security relations, and adherence to rules and standards have a direct effect on trade and investment decisions in a new environment of strategic competition (IMF 2024; Baldwin 2022; Baldwin & Freeman 2022). One of the possible outcomes is a more fragmented trading system with cross-border flows becoming more and more geopolitical instead of strictly economic (IMF 2024; World Bank 2023).

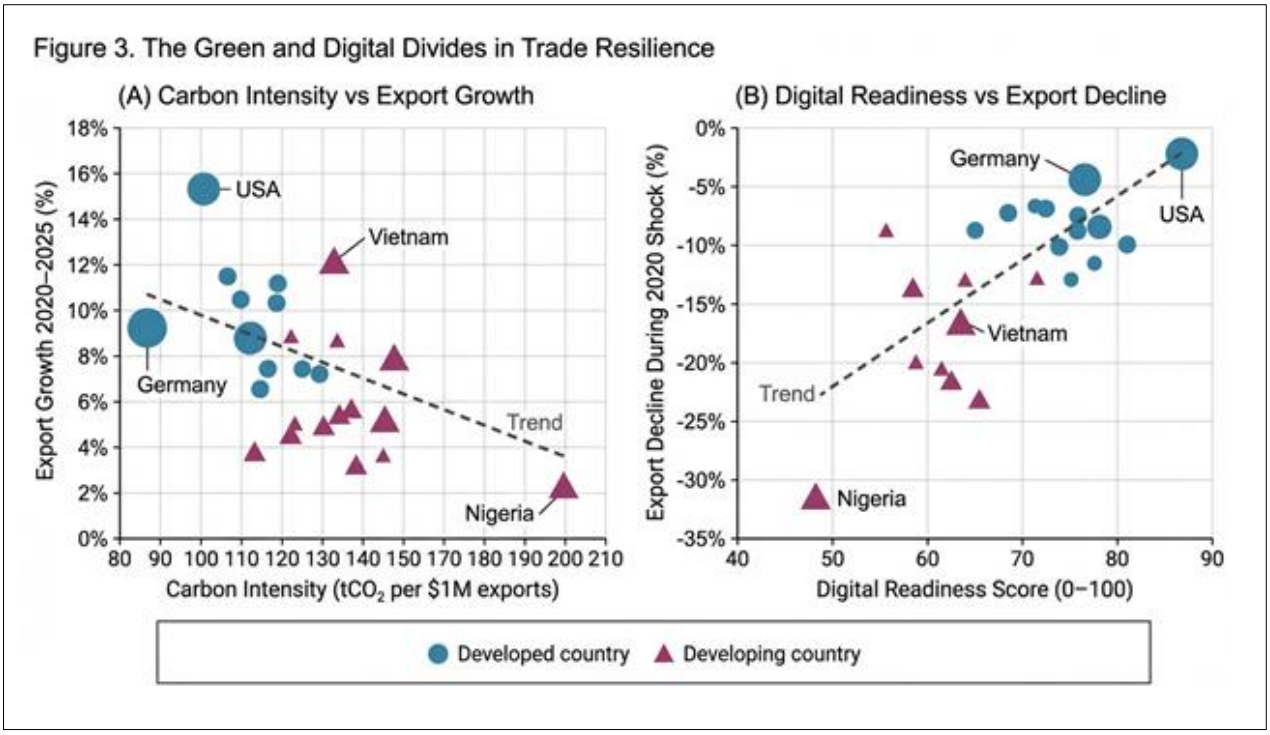

Figure 3: Shows these dynamics. Panel A describes how export carbon intensity is related to export growth, and Panel B describes how digital readiness is related to trade performance in the 2020 shock. In both scenarios, it is evident that the less carbon-dependent and more digitally prepared nations are performing better. The combination of the figures highlights that the concept of trade resilience is centered on green and digital capability, rather than background aspects of the economy (OECD 2024; UNCTAD 2023).

Sectoral Vulnerabilities and Weak Value Chains Are Prevalent in the Industry

Fragmented global-production theories are confirmed by sector results. The trade losses have not been the longest recorded in the finished consumer goods but in the intermediate and capital goods, especially electronic components, auto parts, specialized machinery, and industrial chemicals (Antras, 2020; Baldwin, 2022; World Bank, 2023; OECD, 2024).

The industries rely on highly synchronized multi-stage production processes that extend across multiple nations. Due to such interdependence, small changes in tariffs can produce disproportionate impacts. An imposed tariff on a single important raw material, a semiconductor, or a rare-earth element does not simply raise prices. It tends to provoke a more comprehensive reconsideration of sourcing choices and, more frequently than not, causes companies to permanently redesign their supply chains (Bown, 2023; Handley *et al*., 2024).

This trend represents a fundamental contradiction of the world economy. The highly specialized value chains generate the efficiency benefits but also make them more vulnerable to a change in policy and geopolitical tension (Baldwin & Freeman, 2022; Rodrik, 2018). Companies are retaliating by compressing supply chains or shifting to politically friendly nations. Such changes are the most evident in the areas that are either technologically sensitive or strategically significant (IMF, 2024; World Bank, 2023; OECD, 2024).

The Implications and Discussion Follow:
The Nation's Adaptation and Resilience Are Increasing

Combined, the evidence reveals two general trends in the manner in which nations adapt to conflicting trade pressures. These trends indicate the increasing divergence in the development paths (World Bank, 2023; Rodrik, 2018).

Advanced Economies Capital-Based and Strategic Resiliency

The developed economies, including the United States, Germany, Japan, and South Korea, have been more inclined to react with resource-intensive and coordinated approaches that guarantee their place in the upper-value segments of world production (OECD, 2024; Baldwin, 2022). The general aspects of these strategies are.

- Massive government and business investment in hi-tech production, logistics and supply-chain coordination (Tang & Veelenturf, 2019; WIPO, 2024);
- Selective protection alongside promotion of research and development of skills and workforces, including the U.S. CHIPS Act and the EU Green Deal Industrial Plan (OECD, 2024; IMF, 2024);
- Intentional attempts to consolidate production in clusters of reliable political and security allies (Baldwin and Freeman, 2022; IMF, 2024).

In general, it is a strategic and proactive approach. It is designed to hold dominance in industries that are intensive in innovation and minimize vulnerability to risks associated with key inputs and concentration in the area of supply (Porter, 1990; Grossman & Helpman, 1995).

Emerging Economies Dynamic and Responsive Adaptation

Lightly constrained developing economies like Vietnam, Mexico, India, and Morocco have implemented flexible and adaptive policies, though numerous ones (UNCTAD, 2024; World Bank, 2024). Such reactions are usually concerned with:

They position themselves as alternative production destinations as firms move out of concentrated supply chains by utilizing regional trade agreements, including CPTPP, USMCA, and ASEAN frameworks (Baier & Bergstrand, 2019; Freund & Pierola, 2022);

Providing specific fiscal and regulatory incentives to bring investment linked to supply-chain reorganization (World Bank, 2023);

They are also developing capacities in areas of green and digital value chains where it can be easier to enter and growth prospects are high (OECD, 2024; UNCTAD, 2023).

In these economies, it is a structural problem. The long-term benefits are associated with a shift towards higher-cost production and more resilient production methods, which involve short-term adaptations that lead to long-term advantages (Hausmann *et al*., 2007; Chang, 2002).

Table 3: Developed versus Developing Economies Policy Response (2020-2025) Comparison

Policy Domain	Developed Economies	Developing Economies
Digital Transformation	85% AI integration 70% digital twin adoption 95% e-customs coverage	120% mobile commerce growth 60% SME digital onboarding 75% data localization
Green Transition	25% of renewable energy target 45% of GDP in green R&D 90% CBAM alignment.	18% annual renewable capacity growth $45B in green FDI inflow 40% climate fund access
Geopolitical Alignment	65% friend shoring rate 120 strategic export controls 55% alliance-based trade	78% multi-alignment index 25% trade diversification 85% hedging strategy adoption
Regional Integration	80% deep RTA coverage 90% digital trade chapters 85% sustainability clauses	70% regional bloc utilization 60% preferential tariff use 45% projects in cross border infrastructure.
Supply Chain Resilience	30% near shoring shift 18-month strategic stockpiling 15 supply chain laws	40% SEZ expansion 12 logistics corridors developed 25% buffer inventory increase

Table 3, integrates the adoption rate estimates, growth indicators, and policy coverage across different economic groupings by 2020–2025, which are based on the estimates of the OECD (2024), UNCTAD (2023), and the World Bank (2024), and policy documents that are specific to a particular country.

Trilemma of Policy Security, Competitiveness, and Sustainability

Tension determines modern trade policy. Governments have to aim at achieving three objectives at once, although the advancement of one may be at the cost of the others (Rodrik, 2018; IMF, 2024).

The former refers to economic and national security. This includes finding and fostering strategic and less supply-chain dependent industries, which might be susceptible to political or geopolitical risks (Baldwin, 2022; IMF, 2024).

The second objective is global competitiveness. The global trading system is becoming more fragmented, so countries should keep coming up with new ideas, be open to investment, and stay connected to the export markets (Porter, 1990; World Bank, 2023).

The third objective is environmental sustainability. The governments are being pressured to decarbonize production and be more stringent in terms of climate-related standards, which are increasingly affecting market access (OECD, 2024; Nordhaus, 2015).

We have identified an obvious trade-off. The extensive use of conventional, common tariffs to improve security usually harms competitiveness and environmental growth. The interventions raise costs throughout the supply chains, deterring progressions and offering little support to green upgrading over time (Bown, 2023; Baldwin & Freeman, 2022).

Better practices are likely to be time-constrained, goal-oriented, and collaborative. These measures may involve organized climate actions, which harmonize pricing of carbon, assist in sharing finance and technology diffusion, in smaller-scale trade deals with fewer regulatory strains, and in setting up clearer rules of dispute settlement (Nordhaus, 2015; OECD, 2023; UNCTAD, 2023).

Re-Defining Competitiveness in a Discontinuous Global Economy

National competitiveness is a concept that is evolving. Comparative advantage based on hereditary resources or the endowment of factors alone is no longer a predictor of long-term success (Rodrik, 2018; Hausmann *et al*., 2007).

Competitiveness is instead becoming more and more based on three interlinked pillars.

Connection is still a necessity. However, effective logistics, new ports, and transport networks are important, as well as cross-border data flows and integration into digital trade systems (Tang & Veelenturf, 2019; OECD, 2023; UNCTAD, 2023).

Creative ability is also significant. Long-term productivity and flexibility require long-term investments in research, education, and institutions, which facilitate cooperation between the companies and the state (Grossman & Helpman, 1995; WIPO, 2024; OECD, 2024).

Environmental performance is a determining factor. Cleaner production processes are also becoming the determinants of market access, the right to be covered by climate-related trade regulations, and the chance to identify an investment with the goals of sustainability (OECD, 2024; Nordhaus, 2015; World Bank, 2024).

There is a slight long-run cost for countries that depend on general, defensive protection. They lose their appeal to foreign investors and lose track of the networks that disseminate new ideas, technology, and capital. Conversely, those countries that are open (selectively and intentionally) were more likely to perform well. They capture really essential areas and spend on capacity, green capacity, and long-lasting institutional partnerships that keep them linked to high-worth trade and innovation systems.

CONCLUSIONS

This paper demonstrates that world trade is entering a new era. Tariffs are still there, and they continue to decrease trade, but they are not the main cause anymore. Three overlapping pressures are starting to influence the trade outcomes: geopolitical fragmentation, friend shoring, and bloc alignment; green trade policies, which create a gap between carbon-linked standards; and digital regulations, which determine how rapidly a company can plan and reroute the supply chains in response to data and platform regulations.

The resulting changes create an apparent trilemma of trade policy. Governments are pursuing three objectives concurrently, namely, security and resilience, competitiveness and openness, and environmental sustainability. Any progress in one area can disrupt the others. The results also emphasize the problem of incoherent adjustment ability. Advanced economies are establishing capital-intensive resilience policy, and the majority of developing economies, despite finding new opportunities, are subject to more radical constraints concerning fiscal space, export structure, and climate and digital pressures.

The idea of trade resilience is undergoing changes in general. It is no longer so reliant on the level of tariffs but on a long-term investment in digital capability, environmental performance, and institutional alliances, including next-generation agreements with digital and climate provisions. In this case, withdrawal is not the answer; rather, the creation of secure, interrelated, and compatible trading networks within an increasingly fragmented global economy is the solution.

Practice policy recommendations.

For All Governments:

- Integrate the regional trade agreements with the existing trade operations by incorporating specific and enforceable terms on digital trade and sustainability (Baier & Bergstrand, 2019; OECD, 2024).
- Digital trade systems should be treated as infrastructure. Invest in the digital solution to run the trade: eliminate paperwork in favor of fully paperless customs and shipping, adopt trusted digital IDs that people and businesses can rely on, and come to an agreement on clear and workable rules about how to move information across the borders to ensure that trade information flows safely and swiftly (OECD, 2023; UNCTAD, 2023).
- Be moderate: only things that really require protection (and only in a specific manner) should be defended, and in this case, it should be supported by serious

investment in innovation, skills training, and low-carbon, sustainable industries to ensure that the economy remains competitive in the long term (Rodrik, 2018; World Bank, 2024).

For Developing Economies:

- Invest in more valuable and cleaner production and concentrate on green industrial upgrading, rather than being stuck in carbon-based specialization (OECD, 2024; UNCTAD, 2024).
- Form an alliance with other nations in trade talks on climate matters to achieve balanced regulations, availability of green technologies, and sufficient funding to afford the actual cost of the shift (Nordhaus, 2015; World Bank, 2024).
- Small businesses and underserved communities should not be left out of the digital economy, which means that internet access should be affordable, shared facilities, such as digital ID and payment systems, should be offered, and practical and hands-on training should be provided to allow people to use digital services with ease (World Bank, 2023; ITU, 2022).

Limitations

Limitations and Future Research Possibilities

The paper assesses trade in a fast-changing era, though there is a clear limitation in what the data and the methodology can discover. The limitations also indicate where future research can make the greatest contribution.

Timing and Projection Risk

Such estimates from the 2024-2025 IMF, World Bank, and OECD are dynamic forecasts, which can change quickly due to an economic crisis, a geopolitical crisis, or a mass climate event. Future studies would need to address this issue by updating the indices more often or by applying nowcasting to bridge the gap between a change in policy and its measurement.

Measuring Geopolitical Alignment

Geopolitical alignment is coded as a bloc (e.g., G7, BRICS+, AUKUS), and relationships, which tend to be fluid and occasionally internally controversial, are easier to observe, although a continuous measure of alignment based on observable behavior, e.g., voting patterns in international organizations, defense cooperation, or formal strategic partnership agreements, can be used in future studies.

Sector and Firm Differences

The analysis is conducted at the bilateral-flow and country level, and this can conceal a lot of variation with respect to sectors and firms, with semiconductors being most sensitive to strategic constraint and textiles being most vulnerable to tariffs and less sensitive to digital rules. At the firm level, the responsiveness of multinationals and SMEs is differentiated by diversification, price adjustments, or restructuring of the supply chains.

Unobserved Institutional Factors

Although common gravity controls and fixed effects are used, institutional determinants, which are not easily quantifiable but include regulatory quality, corruption, state capacity, and domestic political constraints, can be factored into future models and complemented with case studies.

The Limits of the Digital and Green Indices

DRI and GTPI are built based on global datasets, and this factor suggests that they might not account for the necessary detail, especially the one that concerns sector-specific or nation-specific rules (OECD, 2023; UNCTAD, 2023). Practically, the digital restriction might be industry-specific, and carbon services are more regulated than e-commerce (Ferracane and van der Marel, 2021) The same can be said about carbon-border exposure, which can be varied depending on exemptions, covered industries, and carbon pricing organizations (World Bank, 2023; OECD, 2024). It would be beneficial to split them into smaller indices by specific regulatory areas next time (Baldwin and Evenett, 2022).

Longer-Run Dynamics

The adjustment is being captured through the 2018-2025 window on a short- and medium-term basis, but other processes are decades-long: value-chain relocation, technology diffusion, and climate adaptation. It would help in extending the

analysis beyond 2025 or in using a more scenario-based model for the 2030s.

Scope of the Sample

This paper covers 20 economies and large traders, but numerous small and least-developed countries are not represented and might have various limitations and insufficient statistical representation (e.g., SIDS). Future studies could add more economies where the data is available, and case studies may be used to represent those that are difficult to capture in a panel dataset.

Non-Linearities and Thresholds

The effects of interaction are also tested; however, some relationships may be non-linear. An example of this is that even when digital readiness is achieved, the threshold penetration or digitization skill can be restrictive, and future research can test threshold and non-linear models (e.g., splines, regime switching) or use machine-learning methods to identify this behavior.

Domestic Political Economy

The framework puts more emphasis on the elements of trade, climate, and digital policy, but the domestic politics also affect the trade decisions, as they may be driven by lobbying, attitude towards globalization, and electoral motives. The integration of political-economic measures should make the explanation of why policies vary across nations and time periods stronger.

Distributional and Ethical Issues

This paper points out the disparity between developed and developing economies; however, it does not explicitly examine within-country distributional impacts or ask questions of just transition and the inclusive policy design. Future research might utilize household and worker-level data to evaluate the welfare impacts and find out which groups incur adjustment costs.

Finally, these shortcomings do not invert the key findings of the study. They indicate the challenge of quantifying trade during a time when tariffs, climate policy, digital regulations, and geopolitics are all in motion simultaneously, and they indicate a feasible research agenda of more detailed and more fine-grained research.

Final Reflection

Trade is still an exchange, but it is no longer a question of prices and efficiency. It has crossed over to security, sustainability, and economic organization.

This study reinforces an established finding. Large-scale protectionism may have the most detrimental effect on developing economies. But it also points to a positive direction. The resilience can be developed in the form of cleaner production, more effective digital connectivity, and alliances that minimize uncertainty and ensure that economies are connected to high-value trade.

Policymakers face an actual test that does not involve increasing or decreasing barriers. Designing trade systems that are robust, adaptable, and just is to design trade systems that are robust, plausible, and credible in green capacity and have a credible digital base. Nations will have a higher probability of attaining sustainable prosperity in the next phase of international trade.

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