From liberalization to fragmentation: new evidence on global tariff dynamics in the WTO era

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Abstract

Purpose – This study aims to investigate the long-run dynamics of global tariff convergence and the emerging fragmentation in the post-2018 period. Focusing on the USA, China, Japan, the European Union and the world average between 1990 and 2020, the research examines whether countries with initially higher tariff levels have gradually aligned with more liberal trade regimes. By combining ß- and s-convergence tests with structural break analysis and a difference-in-differences estimation, the study identifies major turning points related to institutional reforms and geopolitical tensions, particularly the US tariff escalation after 2018. The results highlight both sustained liberalization and increasing political fragility.

Design/methodology/approach – This study employs a mixed empirical strategy to assess long-run tariff convergence and recent divergence trends. A balanced panel dataset covering the USA, China, Japan, the European Union and the world average from 1990 to 2020 is used. First, ß-convergence is tested to examine whether initially high-tariff economies experienced faster reductions, while s-convergence evaluates the decline in cross-country dispersion. Second, structural break analysis, based on Quandt–Andrews unknown breakpoint tests, identifies significant policy turning points. Finally, a difference-in-differences model quantifies the asymmetric impact of the 2018 US tariff escalation. Driscoll–Kraay standard errors address cross-sectional dependence and serial correlation.

Findings – The results confirm a significant long-term convergence trend in global tariffs, as countries with initially higher protection levels reduced their rates more rapidly. s-convergence analysis shows a steady decline in cross-country tariff dispersion, although the pace of convergence slowed after the 2000s. Structural break tests reveal key liberalization episodes in the European Union (1993), Japan (1995) and China (1994 and 2001), aligned with major institutional reforms. In contrast, the USA experienced a clear divergence after 2018. The difference-in-differences estimates show that US tariffs increased significantly relative to other economies, marking the first major reversal in global tariff alignment.

Research limitations/implications – The main limitation of this study is the time coverage of tariff data, which ends in 2020. As a result, the analysis does not fully capture the final phase of the Trump administration's protectionist measures or the broader trade disruptions caused by the COVID-19 pandemic. Additionally, the study focuses solely on tariff indicators, excluding the increasing role of non-tariff measures in shaping trade dynamics. Despite these limitations, the findings highlight an important structural shift in global tariff policy and imply that future research should extend the dataset and incorporate non-tariff barriers to evaluate the persistence of post-2018 fragmentation.

Practical implications – This study provides policymakers with useful insights into the evolving dynamics of global tariff governance. The confirmed convergence trend indicates that international coordination remains essential to sustaining openness, while the identified structural breaks highlight the importance of institutional reforms in accelerating liberalization. The evidence of US divergence after 2018 signals that uncoordinated protectionism can disrupt policy alignment and increase uncertainty for global value chains. Therefore, strengthening the role of the World Trade Organization, improving the compatibility of regional agreements and enhancing multilateral negotiation mechanisms are crucial. The findings also emphasize the need for targeted capacity-building to support developing economies in maintaining trade integration.

Social implications – Shifts in tariff policy have significant implications for social welfare, employment and income distribution. The long-term convergence in tariffs has supported consumer benefits through lower prices, broader product variety and more competitive markets, particularly in developing economies integrating into global value chains. However, the recent divergence led by the USA reintroduces uncertainty that can disproportionately affect workers in trade-dependent sectors and heighten social vulnerabilities in

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export-oriented economies. Disruptions in supply chains may also increase living costs for households. The results therefore underline that stable and predictable trade policies are essential to safeguard social cohesion and inclusive economic opportunities.

Originality/value – This study makes a novel empirical contribution by jointly applying ß- and s-convergence tests, structural break analysis and a difference-in-differences design to global tariff dynamics, offering multidimensional evidence on the evolution of liberalization. Unlike previous research assuming convergence stabilized in the early 2000s, the findings identify the post-2018 US tariff escalation as the first major reversal in the global convergence trajectory. By linking trade policy fragmentation to geopolitical pressures rather than economic fundamentals, the study reveals a new phase in which protectionism emerges within advanced economies. This perspective provides valuable insights for reassessing the resilience and governance of the multilateral trading system.

Keywords Global trade, Tariffs, Convergence, Protectionism, Structural break, Trade liberalization

Paper type Research article

1. Introduction

Over the past 3 decades, the global trading system has experienced one of the most intensive phases of liberalization in its history, marked by steadily declining tariffs and deepening market integration. Within the framework of the World Trade Organization (WTO), multilateral negotiations – particularly since the 1990s – have fostered a marked convergence in tariff rates between developed and developing economies. This long-run decline in trade barriers not only reduced transaction costs but also reshaped global production networks through the expansion of cross-border value chains and the rise of global supply interdependence.

However, by the late 2010s, the momentum of liberalization began to slow – and, in some cases, to reverse. The additional tariffs introduced by the USA in 2018 disrupted not only global trade volumes but also the normative foundations of the liberal trading order. In contrast, major economies such as China, Japan and the European Union maintained relatively stable or even declining tariff levels, signaling a shift toward asymmetric liberalization and a new phase in which protectionist tendencies coexist with continued openness.

Against this backdrop, the main objective of this study is to examine the long-run convergence and divergence dynamics of tariff rates among the world's major economies – namely the USA, China, Japan and the European Union – alongside the global average over the period 1990–2020. The analysis not only traces aggregate trends in tariff reduction but also identifies structural breaks marking turning points in trade policy. Two key events are treated as critical junctures in the evolution of the global trade order: China's accession to the WTO in 2001, which accelerated global tariff convergence, and the USA's post-2018 shift toward protectionism, which signaled a renewed divergence.

Methodologically, the study employs a combination of panel β- and σ-convergence tests, a difference-in-differences (DiD) model to assess policy-induced shocks, and a Quandt–Andrews unknown-breakpoint test to detect a single structural shift in tariff behavior when the break date is not known ex ante. This integrated framework enables both global trend identification and country-specific inference, providing a multidimensional view of trade liberalization and its interruptions.

The results indicate that, while global tariff convergence has remained robust in the long run, the post-2018 reversal in US trade policy introduced a statistically detectable and policy-relevant departure from the liberalization trajectory established since the 1990s. This finding underscores that trade liberalization is neither automatic nor irreversible but rather a process deeply contingent upon political, institutional and geostrategic forces – marking a critical transition from liberalization to fragmentation in the global trading system.

This study contributes to literature in three ways. First, it provides a unified empirical framework combining convergence analysis, structural break detection, and DiD estimation to examine long-run tariff dynamics. Second, it empirically identifies 2018 as a turning point in global tariff convergence, marking a shift from multilateral liberalization to selective fragmentation driven by policy and geopolitical considerations. Third, by focusing on the

world's major trading economies, the paper demonstrates that global tariff convergence is conditional, reversible and shaped by institutional and political constraints.

2. Theoretical and literature framework

Theories of international trade have evolved to explain why nations engage in trade and how they benefit from it, with shifting assumptions over time about the sources of comparative advantage and the role of policy intervention. Since the classical era, the dominant premise has been that trade liberalization enhances mutual welfare. Ricardo's theory of comparative advantage posits that specialization according to productivity differences yields efficiency gains, while tariffs distort resource allocation and welfare. Yet empirical findings refine this classical logic. Hayakawa *et al*. (2022) show that a one-percentage-point tariff cut reduces prices by only 0.1%, reflecting limited pass-through; Bertoletti *et al*. (2018) highlight that consumer preferences and firm heterogeneity alter welfare outcomes and Apokin *et al*. (2017) emphasize the decisive role of transport and integration costs. These results imply that, while Ricardian principles remain central, the magnitude of liberalization gains depends heavily on structural and institutional conditions.

Building on these foundations, the Heckscher–Ohlin (H–O) model extends the analysis by linking specialization to factor endowments, predicting that free trade should equalize factor prices across countries. Empirical evidence partially supports this view but also reveals asymmetry. Zhang and Sun (2022) confirm dynamic comparative advantages in Belt and Road agricultural trade, while Varian (2019) finds labor-economizing specialization patterns in late-Victorian Britain. However, Nyga-Łukaszewska and Napiórkowski (2022) show that resource abundance – such as energy endowments – does not automatically translate into competitiveness, and Dosi *et al*. (2020) caution that open trade without industrial policy support can trap developing economies in structural stagnation. Hence, convergence under the H–O framework is conditional rather than automatic, relying on institutional strength and technological capacity.

As trade expanded and production globalized, New Trade Theory (NTT) emerged in the 1970s, shifting the analytical focus from endowments to economies of scale, product differentiation and firm-level competition (Krugman, 1979, 1980). This approach explained how even similar countries could benefit from trade through increasing returns and variety. Subsequent empirical research reinforced this view. Impullitti and Licandro (2017) show that lower trade costs reduce markups and raise productivity through firm selection effects; Peters (2020) finds that liberalization drives growth by reducing resource misallocation and Yu and Meng (2023) together with Jalil and Rauf (2021) confirm that openness accelerates output growth in industries with complex input structures. However, these gains are not unconditional. Wan *et al*. (2022) warn that excessive export dependence may induce deindustrialization, while Aisbett and Silberberger (2020) and Franco-Bedoya and Frohm (2021) demonstrate that liberalization reshapes regulatory and border dynamics, sometimes producing uneven welfare outcomes. Collectively, this body of work underscores that innovation, scale economies and institutional adaptability jointly determine the trade–growth nexus in modern economies.

During the 1980s, attention shifted again toward the strategic dimension of trade. Strategic Trade Theory (STT) reinterpreted policy not merely as a corrective tool but as an instrument of international competition. Brander and Spencer (1985) seminal model demonstrated that selective protection or subsidies could shift profits toward domestic firms in oligopolistic markets. Recent studies reaffirm this logic in new contexts: Aisbett and Silberberger (2021) find that tariff liberalization can trigger "regulatory chill," where competitive pressures weaken domestic standards, while Goldstein and Gulotty (2021) attribute the US turn toward protectionism to fractured domestic coalitions rather than pure economic rationale. Similarly, Takauchi and Mizuno (2021) and Garella and Trentinaglia (2018) highlight that R&D spillovers and carbon-related trade policies have become strategic tools for capturing

technological rents. Thus, contemporary protectionism emerges less as a rejection of liberalism than as an adaptive response to geopolitical competition and domestic constraints.

As globalization matured, the institutional foundations of trade – represented by the WTO and regional trade agreements – promoted a general convergence of tariff regimes. Yet, the rise of nationalism and fragmented governance structures has increasingly weakened this process. Acharya (2017) conceptualizes the shift as the emergence of a "multiplex world order," while Ripsman (2021), Kornprobst and Paul (2021) and Ikenberry (2018) trace the erosion of the liberal multilateral consensus. In this changing environment, β- and σ-convergence analyses have become vital tools for assessing whether tariff alignment continues amid political volatility. Recent evidence suggests partial and uneven progress: Franco-Bedoya and Frohm (2021) show that free trade agreements (FTAs) remain central drivers of global trade expansion Havranek and Irsova (2016) document declining border effects; and Jakubowski and Wójcik (2023) find convergence among EU members. Together, these findings imply that tariff convergence proceeds asymmetrically, constrained by regulatory, institutional and political heterogeneity.

Finally, a growing empirical literature explores how structural breaks and policy shocks shape trade dynamics. Studies on Brexit by Felbermayr *et al*. (2021), Born *et al*. (2019) and Buigut and Kapar (2023) reveal persistent welfare losses and asymmetric adjustment across sectors. Macroeconomic analyses identify regime shifts in inflation and growth patterns associated with globalization Duran (2019), Wajda-Lichy and Kawa (2018), while Papadopoulos (2021) and Yu and Meng (2023) demonstrate that the growth effects of liberalization depend on favorable macroeconomic environments. In methodological terms, difference-in-differences DiD frameworks have become essential for isolating causal policy effects. Cheptea and Gaigné (2019) quantify the heterogeneous impact of the Russian food embargo on EU exports; Yeo and Deng (2019) introduces an instrumented DiD (iDID) to address unobserved confounding and Kopecky (2023) with Cipollina and Salvatici (2022) apply synthetic counterfactuals to study integration shocks. Collectively, this literature highlights that DiD-based approaches offer robust causal inference in identifying policy discontinuities, structural breaks and protectionist reversals, providing an empirical foundation for the models applied in this study.

Table 1 summarizes the main theoretical expectations regarding tariff behavior under different trade paradigms. The empirical findings in this paper draw primarily from the H–O and New Trade Theory frameworks while also recognizing the growing relevance of strategic and political economy perspectives in the post-2018 trade environment.

3. Empirical strategy and data

3.1 Data description

The empirical analysis relies on balanced panel data covering annual observations for the period 1990–2020, covering the United States (USA), European Union (EU-27 aggregate), Japan (JPN), China (CHN) and the World average (WLD).

The main variable of interest is the weighted mean applied tariff rate (%), all products obtained from the World Bank World Development Indicators (WDI) database. These data capture the trade-weighted average of ad-valorem tariffs imposed on all imported goods, thereby providing a consistent cross-country measure of protection.

The resulting strongly balanced panel comprises five cross-sections and 31 time periods ($N = 155$), forming the empirical foundation for all subsequent estimations.

The selection of the USA, the European Union, China and Japan is motivated by both their central role in the global trading system and their institutional heterogeneity in trade policy formation. Together, these economies account for a substantial share of global trade and have historically shaped multilateral tariff norms under the WTO framework. At the same time, they represent distinct trade-policy regimes: the USA as a dominant agenda-setting economy with increasing unilateral tendencies, the European Union as a highly institutionalized customs

Table 1. Theoretical perspectives on tariffs and trade convergence

Theory	Core assumption	Tariff mechanism	Expected outcome	Relevance to this study
Classical Trade Theory (Ricardo)	Countries specialize according to comparative advantage	Tariffs distort resource allocation and reduce welfare	Tariff reductions are expected to enhance global welfare	Supports the long-term downward trend in global tariffs
Heckscher–Ohlin Trade Theory	Trade patterns are driven by factor endowments	Tariffs prevent factor price equalization and restrict trade	Tariff convergence is expected as liberalization progresses	Provides the basis for β- and σ-convergence hypotheses
New Trade Theory (Krugman)	Economies of scale and product differentiation drive trade	Tariffs limit firm entry, efficiency, and innovation	Lower tariffs are expected to increase productivity and variety	Explains the sustained liberalization trend observed after 1990
Strategic Trade Theory	States use trade policy for strategic advantage	Tariffs or subsidies can shift profits toward domestic firms	Selective protectionism may emerge in key industries	Interprets 2018 U.S. tariff shocks as strategic, not cyclical
Political Economy of Protectionism	Trade policy is shaped by domestic interests and lobbying	Tariffs reflect political bargaining rather than efficiency	Recurrent protectionist waves despite global trade rules	Explain asymmetries in the post-liberalization period

Source(s): Author's own elaboration based on theoretical literature

union, Japan as an early and stable liberalizer and China as a late but transformative entrant following WTO accession. This combination allows the analysis to capture not only aggregate convergence patterns but also asymmetric responses to policy and geopolitical shocks. The inclusion of the world average serves as a benchmark for the global tariff trajectory, enabling a direct comparison between country-specific deviations and the prevailing multilateral convergence path.

3.2 Empirical strategy

The empirical analysis proceeds in three complementary steps to capture both dynamic convergence and structural change in global tariff behavior. The empirical strategy is designed to distinguish between long-run convergence tendencies and discrete policy-induced deviations in tariff behavior. Rather than relying on a single econometric approach, the analysis combines convergence metrics, structural break detection and a quasi-experimental design to capture different dimensions of tariff dynamics. While β- and σ-convergence tests assess whether tariff levels systematically converge over time, they do not identify the timing or causes of potential regime shifts. Structural break tests are therefore employed to endogenously detect turning points in tariff trajectories, and the DID framework is used to isolate the causal impact of the 2018 US tariff escalation relative to a stable global benchmark.

(1) β-Convergence

To examine whether countries with higher initial tariff levels experienced faster declines, a β-convergence model was estimated as follows:

$$\Delta Tariff_{i,t} = \alpha_i + \beta Tariff_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where $\Delta Tariff_{i,t}$ denotes the annual change in tariffs for country i at time t. A fixed-effects (FE) estimator was applied to control for unobserved heterogeneity. A negative and statistically significant β coefficient indicates convergence, implying that countries with higher initial tariff levels reduced them more rapidly (Barro, 1992).

(2) σ-Convergence

Dispersion across tariff levels was analyzed using the standard deviation of tariffs across countries (σ) for each year. Following Sala-i-Martin and Barro (1995) σ-convergence occurs if the cross-sectional variance decreases over time:

$$\ln(\sigma_t) = \alpha + \gamma t + \varepsilon_t \tag{2}$$

where a negative coefficient ($\gamma < 0$) signals decreasing dispersion, i.e. tariff convergence. Importantly, σ-convergence captures dispersion dynamics but cannot distinguish between gradual convergence and abrupt reversals, reinforcing the need for complementary structural break and DiD analyses.

(3) Structural Breaks and Policy Shifts

To capture potential regime changes in tariff dynamics, the study applies a structural break regression model supported by the Quandt (1974) unknown-breakpoint test, which identifies a single structural break when the exact date of the shift is not known ex ante. Interaction terms between time and policy dummies are incorporated to estimate both level and slope changes.

The general specification is defined as follows:

$$Tariff_t = \alpha + \beta_1 t + \beta_2 Post_k + \beta_3 (t \times Post_k) + \varepsilon_t \tag{3}$$

where $Post_k$ represents a dummy variable taking the value of 1 after the hypothesized break year k.

The coefficient β_3 captures a change in the slope of the tariff trajectory after the break, while β_2 measures the level shift.

A joint F-test of $\beta_2 = \beta_3 = 0$ is conducted to assess the statistical significance of each structural change.

This framework allows the identification of major turning points in tariff liberalization across countries without imposing strict parametric assumptions on the number or location of breaks.

(4) Difference-in-Differences (DiD)

To evaluate the 2018 US tariff escalation within a global context, a DiD model was applied:

$$Tariff_{it} = \alpha_i + \delta Post_{2018,t} + \lambda USA_i + \theta(Post_{2018,t} \times USA_i) + \varepsilon_{it} \tag{4}$$

The interaction coefficient θ captures the differential impact of the 2018 tariff war on US protection relative to other economies. Driscoll–Kraay standard errors were used to correct for cross-sectional dependence and serial correlation. Given the stable pre-2018 tariff trajectories across countries, the parallel-trend assumption underlying the DiD specification is considered plausible. Although the DiD design involves a single treated unit, this specification is appropriate given the nature of the policy shock. The USA represents the only economy in the sample that implemented a discrete and abrupt tariff escalation in 2018, while other major economies followed relatively stable or declining tariff paths. In this context, the DiD framework is not used to generalize treatment effects across multiple treated units but to identify a policy-driven deviation from the prevailing global convergence trajectory.

3.3 Econometric diagnostics

Figure 1 visually reinforces the main econometric findings by illustrating both long-run tariff convergence and country-specific regime shifts. While tariff rates across major economies exhibit a clear downward and convergent trend throughout the 1990s and 2000s, the figure also reveals distinct breakpoints aligned with institutional and policy changes. China's sharp decline during the mid-1990s and early 2000s reflects its pre-accession reforms and WTO entry, whereas the European Union and Japan display earlier and more gradual adjustments. Most notably, the post-2018 increase in US tariffs stands out as a visible deviation from the otherwise stable convergence path, suggesting a shift from multilateral liberalization toward selective protectionism.

Panel stationarity and independence were tested using Pesaran (2007) cross-sectional dependence tests, revealing significant contemporaneous correlation among the major economies. Consequently, Driscoll–Kraay robust standard errors were adopted to correct for both cross-sectional dependence and serial correlation, ensuring consistent inference under the small-N, large-T setting. Additional robustness checks using the Pesaran (2007) CIPS unit root test confirmed the trend-stationarity of tariff series.

4. Results and discussion

4.1 Evidence of tariff convergence

The β-convergence regression results (Table 2) reveal a statistically significant negative coefficient for the lagged tariff variable ($\beta = -0.253$, $p < 0.01$), confirming the presence of conditional convergence among the five major economies. This implies that countries with

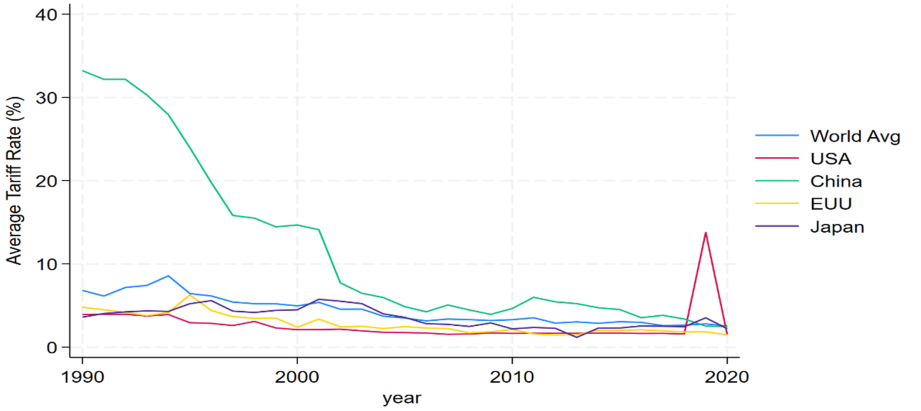

Figure 1. Tariff trends: world vs major economies (1990–2020). **Source:** Author's calculations based on World Bank (WB) data

Table 2. β-convergence results (panel fixed effects model, 1990–2020)

Variable	Coefficient	Std. error	*t*-statistic	Prob.	95% confidence interval
L.tariffs	−0.2532	0.0543	−4.66	0.000***	[–0.3606, −0.1458]
Constant	1.1796	0.3610	3.27	0.001***	[0.4660, 1.8932]

Note(s): *Within* R^2*:* 0.13 *Obs:* 150 *Groups:* 5
Interpretation: A negative and significant coefficient confirms β-convergence; tariff differentials among major economies narrow by roughly 25% per year. *** denote significance at the 1% level

initially higher tariff levels tended to reduce them more rapidly once structural and institutional differences were accounted for. The within-group R^2 (0.13) indicates that although the speed of convergence is moderate, the direction is clearly negative, reflecting a long-term global trend toward greater uniformity in tariff protection and policy alignment under the WTO-led liberalization process.

Complementing these findings, the σ-convergence results (Table 3) show a consistent decline in cross-country dispersion of tariff levels over 1990–2020. The estimated coefficient of time ($\gamma = -0.0847$, $p < 0.01$) in the log-variance regression confirms that the standard deviation of tariffs has steadily decreased, indicating a progressive alignment of protectionist policies across the world. This pattern aligns with successive WTO negotiation rounds and the diffusion of regional trade agreements that have harmonized tariff structures among major economies. Nevertheless, the deceleration captured by the positive quadratic term suggests that this convergence process has slowed in the post-2000s period, likely reflecting institutional fatigue and the growing importance of non-tariff measures – a trend explored in the following section. Importantly, the coexistence of statistically significant β- and σ-convergence with a decelerating trend underscores that convergence in tariff levels does not imply policy uniformity but rather masks underlying asymmetries that become visible only when regime shifts are explicitly modeled.

4.2 Structural breaks in tariff trajectories

The results are presented in Table 4. The DiD model is applied only to the USA, as it represents the sole case of a discrete policy intervention in 2018. Other economies in the sample (EU, Japan, China and the World average) serve as the control group, given the absence of comparable tariff shocks during the same period. This single-treatment design allows for the isolation of the US-specific policy effect from global tariff trends. This result indicates that the post-2018 increase in US tariffs represents not a cyclical fluctuation but a statistically identifiable deviation from the global convergence path.

Table 3. σ-Convergence results (dispersion of tariffs, 1990–2020)

Model	Variable	Coefficient	Std. error	*t*-statistic	Prob.	R^2
(1) Linear	Year	−0.0847	0.0050	−16.78	0.000***	0.648
(2) Quadratic	Year	−10.1148	2.4072	−4.20	0.000***	0.684
	$Year^2$	0.00250	0.00060	4.17	0.000***	

Note(s): *Interpretation:* The negative linear term supports global tariff dispersion reduction (σ-convergence) The positive quadratic term suggests that convergence has decelerated after 2000s. *** denote significance at the 1% level

Table 4. Difference-in-differences: US tariff divergence after 2018

Variable	Coefficient	Std. error	*t*-statistic	Prob.
post2018	−3.1727	1.3599	−2.33	0.021**
usa	(omitted due to FE)			
did2018	6.4792	3.0407	2.13	0.035**
Constant	4.9836	0.3784	13.17	0.000***

Note(s): Within R^2: 0.04 Prob > F: 0.034
Interpretation: Post-2018 tariffs in the U.S. increased significantly relative to other economies, consistent with the trade war effects. ** and *** denote significance at the 5% and 1% levels, respectively

The country-specific structural break estimations, reported in Table 5 and conducted using the Quandt–Andrews unknown-breakpoint test, provide further insights into the timing and asymmetry of tariff policy shifts.

For the European Union, a significant break was detected in 1993, coinciding with the completion of the Single Market. This period marks the harmonization of national tariffs into a unified common external tariff, a defining feature of the EU's customs union. The positive interaction term between time and the post-1993 dummy indicates a change in the slope of tariff liberalization, reflecting how integration strengthened internal market efficiency while standardizing external protection. This structural adjustment represents the EU's transition from fragmented national policies to a coherent regional trade framework – one that facilitated deeper liberalization in subsequent WTO rounds.

In Japan, the identified break year of 1995 corresponds to the early phase of the WTO and Japan's intensified participation in Asia-Pacific trade cooperation. The post-1995 slope coefficient ($\beta_3 = -0.305$, $p < 0.01$) confirms a structural acceleration in tariff reductions during this period, illustrating Japan's alignment with multilateral commitments and its move toward regional economic integration.

For China, two notable turning points are evident. The 1994 break reflects the pre-accession market reforms, while the 2001 break coincides with China's WTO entry. Both episodes indicate substantial downward shifts in tariff levels, though the 2001 effect was particularly strong – signaling China's rapid integration into global trade rules and a structural realignment of its tariff regime.

The USA exhibits a markedly different tariff trajectory compared to other major economies. While the post-2018 interaction term does not indicate renewed convergence toward lower tariff levels, its sign and magnitude point to a persistent divergence from the long-run liberalization trajectory. This pattern suggests that the increase in US tariffs after 2018 reflects a policy-driven deviation from the multilateral convergence path rather than a temporary or cyclical adjustment. Unlike the structural liberalization episodes observed in Europe, Japan and China, the US experience represents a selective and asymmetric reversal, highlighting the growing role of geopolitical and strategic considerations in shaping contemporary trade policy.

Taken together, these results confirm that while Europe, Japan and China underwent structural liberalization episodes tied to institutional and multilateral reforms, the post-2018 US case marks a distinct policy reversal – a break from the decades-long convergence trend, further examined in the following section.

4.3 Panel-level dynamics and cross-sectional dependence

The panel diagnostics confirm strong cross-sectional dependence among the five economies (Pesaran CD = 9.00, $p < 0.01$), reflecting synchronized tariff behavior under the global trade regime, as reported in Table 6. Consequently, Driscoll–Kraay robust standard errors were

Table 5. Country-specific structural break tests

Country	Break year	F (2,27)	Prob.	Interpretation
China	*1994*	4.24	0.025**	Pre-reform vs. post-reform divergence; significant downward shift
China	*2001*	10.91	0.000***	WTO accession break; new tariff regime
Japan	*1995*	18.87	0.000***	Post-Uruguay Round tariff liberalization
European Union	*1993*	511.66	0.000***	Single Market Act impact; structural break confirmed

Note(s): *Interpretation:* All countries, except the USA, exhibit at least one statistically significant break aligned with major trade policy events. ** and *** denote significance at the 5% and 1% levels, respectively

Table 6. Cross-section dependence test (Pesaran CD, 1990–2020)

Variable	CD-test	*p*-value	Average corr	abs (corr)
tariffs	9.00	0.000***	0.511	0.511

Note(s): Interpretation: Strong cross-sectional dependence exists across countries; tariff movements are correlated globally, validating the use of robust standard errors in panel estimations. *** denote significance at the 1% level

employed in the panel FE estimations (Table 5). Given the panel structure ($N = 5$, T = 31), Driscoll–Kraay standard errors were employed to account for cross-sectional dependence and serial correlation. The corresponding results are presented in Table 7. The method is particularly suited for panels with a relatively small cross-sectional dimension (N) and a moderately large time dimension (T), ensuring robust inference (Driscoll and Kraay, 1998). Using Pesaran (2007) second-generation panel unit root test (CIPS), we reject the null of a unit root at the 1% level (CIPS* = −4.990), indicating trend-stationary tariffs under cross-sectional dependence *(see Appendix 1A for detailed results)*. The DiD model for the 2018 shock yields a positive and significant interaction term ($\theta = 6.48$, $p < 0.05$), indicating that US tariffs increased relative to global counterparts after 2018. This finding underscores the divergence of US trade policy from multilateral norms and supports the argument that the recent protectionist episode represents a structural deviation rather than a cyclical adjustment.

4.4 Interpretation and synthesis

Overall, the empirical results support three key conclusions. First, both β- and σ-convergence tests confirm that the world's major economies have converged toward lower and more uniform tariff levels since 1990. Second, the timing of structural breaks demonstrates that tariff liberalization was not simultaneous, but rather sequential – beginning with Europe and Japan in the mid-1990s, followed by China's dual reform episodes in 1994 and 2001. Third, the US case after 2018 reveals a partial reversal of convergence, introducing a new asymmetry in the global tariff system. This divergence, though limited in magnitude, has reintroduced volatility and uncertainty into international trade relations. Taken together, these findings depict a nonlinear trajectory of global trade liberalization: convergence in the long run, interrupted by short-term policy reversals driven by strategic or political considerations.

Importantly, the observed divergence in the post-2018 period should not be interpreted as a complete reversal of global trade liberalization. Rather, it reflects a selective and policy-driven deviation within an otherwise convergent long-run framework. The empirical evidence indicates that convergence remains the dominant structural tendency but one that is increasingly

Table 7. Robustness check – Driscoll–Kraay standard errors

Variable	Coefficient	Std. error	*t*-statistic	Prob.
Year	−0.2795	0.0520	−5.37	0.000***
post2018	1.1588	0.6659	1.74	0.092*
did2018	6.4792	1.7644	3.67	0.001***
Constant	564.8682	104.364	5.41	0.000***

Note(s): F(3,30) = 18.06 Prob > F = 0.0000
Interpretation: The 2018 DiD coefficient remains positive and significant under robust SEs, confirming the validity of the main findings. * and *** denote significance at the 10% and 1% levels, respectively

punctuated by asymmetric shocks and country-specific policy responses. This distinction is essential for avoiding overinterpretation of short-term deviations as systemic collapse.

5. General results synthesis

The findings of this study indicate a clear trend of tariff convergence at the global level between 1990 and 2020, although this process was intermittently disrupted by structural breaks. The negative and statistically significant coefficient obtained from the panel FE model suggests that countries with initially higher tariff levels gradually moved toward lower rates over time, reflecting a long-term process of adjustment in global trade policy. This result is consistent with the evidence from the σ-convergence tests, which show a steady decline in cross-country dispersion of tariffs – signifying strengthened policy alignment and deepening liberalization across economies.

However, this convergence did not progress uniformly across countries or periods. The identified structural breaks in China, Japan and the European Union between 1993 and 1995 marked sharp reductions in tariff levels, corresponding respectively to China's WTO accession reforms, Japan's export-oriented policy shift and the EU's deepening of the Single Market. In contrast, the positive and significant DiD coefficient for the USA after 2018 indicates a reversal of the long-standing convergence trend. This finding highlights that trade liberalization is not a one-directional or irreversible process – it can be disrupted by geopolitical and strategic factors. From a methodological perspective, these findings underscore the importance of combining convergence analysis with structural break and quasi-experimental approaches. While convergence metrics capture long-run tendencies, they are insufficient for identifying discrete policy reversals or asymmetric regime shifts. By jointly applying panel convergence tests, structural break detection and a DiD framework, the study provides a more nuanced interpretation of tariff dynamics that would not emerge from any single method in isolation.

Accordingly, this study stands among the few empirical analyses that demonstrate a breakdown of global tariff convergence in the post-2018 period, challenging the assumption that liberalization had plateaued in the early 2000s. By jointly employing panel-level and country-specific structural break analyses, the research captures both macro-level global trends and micro-level national dynamics. Overall, the results suggest that while the global trading system continues to move toward convergence, the process has become slower, more fragile and increasingly shaped by political considerations rather than purely economic fundamentals.

6. Discussion

The results demonstrate that the evolution of the global trading system over the past 3 decades has not followed a strictly linear liberalization path. Since the establishment of the WTO in the mid-1990s, tariff reductions have generally accelerated, contributing to a narrowing of cross-country differences and supporting the notion of long-run tariff convergence. The negative β coefficient obtained from the panel estimations indicates that economies with initially higher tariff levels tended to liberalize more rapidly over time, pointing to a stabilizing and convergent tendency in global trade policy. These findings are broadly consistent with classical and H–O predictions while also aligning with more recent contributions emphasizing that convergence is conditional on institutional capacity and structural characteristics (Dosi *et al.*, 2020; Zhang and Sun, 2022).

At the same time, the country-specific structural break analyses reveal that convergence has not been uniform across economies or periods. The sharp tariff reductions observed in China following the 1994 reforms and the 2001 WTO accession, Japan's post-1995 liberalization and the European Union's adjustment after the completion of the Single Market in 1993 all highlight the role of institutional integration and policy coordination in shaping liberalization

paths. These episodes support the view advanced in the institutional trade literature that sustained tariff convergence is closely linked to regional cooperation and multilateral commitments rather than to market forces alone (Franco-Bedoya and Frohm, 2021; Havranek and Irsova, 2016).

In contrast, the USA exhibits a distinct post-2018 trajectory. The positive and significant DiD coefficient indicates a policy-driven deviation from the prevailing convergence trend rather than a cyclical fluctuation. This divergence does not imply a collapse of the global liberalization process, but it does signal an asymmetric interruption within an otherwise convergent long-run framework. Consistent with Aisbett and Silberberger (2020) and Goldstein and Gulotty (2021), the US experience suggests that recent protectionist measures are better understood as outcomes of strategic competition and domestic political realignments, rather than as responses to underlying economic fundamentals.

Taken together, these findings contribute to the literature by demonstrating that global tariff convergence is neither automatic nor irreversible. While long-run convergence remains the dominant structural tendency, it is increasingly punctuated by country-specific policy shocks and geopolitical considerations. As a result, contemporary tariff dynamics reflect a more fragile and heterogeneous form of liberalization, shaped jointly by economic integration, institutional arrangements and political constraints.

7. Conclusion

This study examined long-run tariff dynamics using a combination of β- and σ-convergence tests, structural break analysis and a DiD framework. The results indicate a clear tendency toward tariff convergence between 1990 and 2020, suggesting that protectionist barriers across major economies have gradually become more aligned over time. This long-run pattern is consistent with empirical evidence linking trade openness to productivity and growth through reduced trade costs and improved market integration (Impullitti and Licandro, 2017; Yu and Meng, 2023).

At the same time, the analysis shows that convergence has not followed a smooth or uninterrupted path. The post-2018 shift in US tariff policy represents a statistically identifiable and asymmetric deviation from the prevailing convergence trajectory. While other major economies maintained relatively stable or declining tariff levels, the US case illustrates how policy-driven interventions can temporarily disrupt long-run liberalization trends. This finding supports the growing literature emphasizing the role of strategic and political considerations in shaping contemporary trade policy outcomes (Aisbett and Silberberger, 2021; Baccini and Dür, 2018).

Taken together, the results suggest that global tariff convergence remains the dominant structural tendency of the international trading system but one that has become slower and more fragile in recent years. Geopolitical tensions, supply-chain reconfiguration and security-related trade measures have increased the likelihood of asymmetric and country-specific deviations. These developments imply that sustained liberalization cannot be taken for granted and depends critically on institutional coordination and political commitment.

Overall, this study contributes to the literature by demonstrating that tariff convergence is conditional and potentially reversible rather than automatic. By empirically distinguishing between long-run convergence and short-run policy-driven deviations, the analysis highlights the importance of governance structures in shaping the future trajectory of global trade. The findings point to the need for renewed multilateral cooperation mechanisms capable of accommodating national interests while preserving the collective gains from trade liberalization.

8. Policy recommendations

The findings of this study suggest that although global tariffs have exhibited a long-run tendency toward convergence, this process remains sensitive to political and institutional

conditions. From a policy perspective, the results highlight the importance of strengthening the institutional foundations of the multilateral trading system in order to sustain convergence dynamics. In particular, reinforcing the WTO's monitoring and coordination functions – alongside efforts to restore its dispute settlement mechanism – could help limit discretionary and short-term protectionist measures that interrupt long-run liberalization trends.

At the regional level, greater coherence among regional trade agreements may contribute to reducing fragmentation in global trade governance. While regional integration has supported tariff convergence in several cases, the results suggest that alignment across regional frameworks – such as tariff schedules, rules of origin and selected regulatory standards – can enhance predictability and reduce asymmetries between regionalism and multilateralism.

The post-2018 US–China trade tensions illustrate how bilateral policy conflicts can generate spillover effects that extend beyond the directly involved economies. Although this study does not assess welfare or value-chain effects directly, the identified tariff deviations underscore the potential role of multilateral dialogue platforms – such as WTO Ministerial meetings and broader coordination forums – in mitigating uncertainty and restoring confidence in the rules-based trading system.

For developing economies, the results imply that sustained integration into the global trading system depends not only on tariff reductions but also on institutional and administrative capacity. Targeted support for customs modernization, trade facilitation and regulatory infrastructure may help these economies adapt to shifting trade regimes and reduce vulnerability to asymmetric policy shocks.

Overall, the evidence suggests that tariff convergence is a conditional and fragile outcome rather than an automatic process. Maintaining convergence therefore requires policy coordination, institutional credibility and political commitment. Without such coordination, short-term policy deviations may accumulate and weaken the long-run gains from trade liberalization.

9. Limitations and future research

This study is subject to several limitations that should be considered when interpreting the results. First, the dataset covers the period from 1990 to 2020 and therefore does not fully capture the effects of the COVID-19 pandemic or the final phase of the Trump administration's trade policies. While the analysis identifies a post-2018 deviation in US tariff behavior, the persistence or reversal of this deviation in the post-pandemic period remains beyond the scope of the present study.

Second, the empirical framework focuses exclusively on applied tariff rates and does not incorporate non-tariff measures (NTMs), such as sanitary and phytosanitary measures or technical barriers to trade. Given the increasing role of NTMs in shaping trade policy outcomes, future research integrating tariff and non-tariff instruments would provide a more comprehensive assessment of convergence and divergence dynamics.

Third, the relatively small cross-sectional dimension of the panel reflects a deliberate focus on systemically important trading economies rather than a limitation of data availability. While this approach allows for a detailed examination of regime shifts among key actors, extending the analysis to a broader set of countries may help assess the generalizability of the findings.

Future research could extend the time horizon beyond 2020 to evaluate whether the post-2018 divergence represents a temporary disruption or a more persistent shift in global trade governance. In addition, integrating environmental and sustainability-related indicators – such as carbon intensity or green trade measures – could shed further light on how emerging policy objectives interact with trade liberalization dynamics.

Overall, these limitations do not undermine the core findings of the study but rather delineate the boundaries within which the results should be interpreted. Addressing these extensions would deepen the understanding of how global trade convergence evolves under conditions of heightened political, institutional and environmental uncertainty.

Author contributions
All sections of this article, including conceptualization, methodology, analysis, writing and revision, were completed solely by Nil Sirel Öztürk.

Ethics statement
Not applicable. This study did not involve humans or animals.

Informed consent statement
Not applicable. This study did not involve humans.

Data availability statement
The data used in this study are publicly available from the World Bank's World database. All datasets can be accessed online at: https://databank.worldbank.org/

Declaration of competing interest
The author declares that there are no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary material
The supplementary material for this article can be found online.

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