

EXPLORING THE RELATIONSHIP BETWEEN TARIFF AND EXIM OF SELECTED COUNTRIES

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Abstract

This study examines the impact of the Simple Average Tariff Rate (SATR) on the Export-Import Index (EXIM) across five major economies—China, India, Indonesia, Pakistan, and the United States—over a nineteen-year period (2005–2024). Using panel data regression techniques, both Fixed Effects and Random Effects models were applied, with the Random Effects Generalized Least Squares (GLS) model identified as most appropriate based on diagnostic tests. The results reveal a negative but statistically insignificant relationship between tariff rates and EXIM across commercial services, merchandise, and agricultural sectors. This indicates that tariff changes alone do not substantially influence trade balance performance, which is instead shaped by structural, institutional, and macroeconomic factors. The study highlights the diminishing role of traditional tariffs in global trade and emphasizes the importance of innovation, competitiveness, and infrastructure in strengthening export potential. Future research may incorporate non-tariff measures and sector-specific determinants to deepen understanding of trade dynamics.

INTRODUCTION

In the increasingly interconnected global economy, international trade serves as the backbone of national growth and competitiveness. The exchange of goods and services between countries not only fuels industrial expansion and job creation but also strengthens economic resilience by integrating nations into global value chains. However, the equilibrium between exports and imports, reflected through the Export-Import Index (EXIM), is often influenced by a country's trade policy framework, especially the tariff structure. Tariffs—defined as taxes imposed on imported goods—remain one of the oldest and most widely used policy tools for regulating international trade.

Historically, tariffs were introduced as instruments to protect domestic industries, generate revenue, and maintain a favorable trade balance. However, in the modern context of globalization and trade liberalization, tariffs have become a double-edged sword. While reducing tariffs can encourage openness and international competitiveness, maintaining or increasing tariffs may shield local industries from foreign competition but also risk lowering export competitiveness and slowing trade growth. Therefore, the relationship between tariffs and trade outcomes such as the EXIM ratio is both complex and context-dependent, varying across countries and economic structures.

The Export-Import (EXIM) ratio serves as a vital indicator of trade performance, representing the proportion of export earnings relative to import payments. A higher EXIM ratio signifies stronger export capability and a favorable trade position, whereas a lower ratio may indicate trade dependency or structural inefficiencies. Since tariffs directly affect the cost and flow of goods and services, understanding their impact on the EXIM ratio provides valuable insights into how policy instruments shape national and international trade dynamics.

According to classical trade theories such as Ricardian Comparative Advantage and Heckscher-Ohlin, nations engage in trade to exploit their factor endowments and specialization. However, in practice, governments often impose tariffs to control imports, correct trade imbalances, or protect strategic sectors. In the neoclassical framework, tariffs create distortions by raising domestic

prices, reducing import demand, and potentially lowering export competitiveness if production inputs become costlier. Conversely, from a Keynesian perspective, moderate protection can stimulate domestic employment and industrial growth in developing economies.

Empirical evidence also highlights mixed outcomes of tariff interventions. While trade liberalization and tariff reductions under the World Trade Organization (WTO) have generally boosted global trade, their direct effect on a country's export-import balance remains inconclusive. The diversity in economic structure, industrial policy, and trade openness across nations means that the same tariff policy can produce varied results depending on the country's stage of development and integration into global supply chains.

The current research builds upon the premise that tariff levels significantly influence the structure and performance of international trade. By examining the Simple Average Tariff Rate (SATR) and its relationship with the Export-Import Index (EXIM), this study seeks to empirically quantify the extent to which tariffs affect the trade balance of selected countries. The countries chosen for this research—China, India, Indonesia, Pakistan, and the United States—represent a diverse mix of advanced, emerging, and developing economies. They have been selected based on population and economic scale to capture varied trade behaviors, policy orientations, and levels of industrial maturity.

Each of these nations plays a strategic role in the global trade system:

- China is the world's largest exporter and a manufacturing hub.
- India and Indonesia are emerging economies balancing export potential and domestic protectionism.
- Pakistan represents a developing economy striving for trade diversification.
- The United States, as a developed economy, has recently witnessed policy shifts toward protectionism and tariff renegotiations.

NEED AND RELEVANCE OF THE STUDY

Despite the liberalization trends of the past decades, tariffs remain a critical determinant of trade competitiveness. Policymakers often rely on tariff adjustments to manage trade deficits, encourage domestic industries, or align with global commitments. However, empirical clarity on how average tariff levels influence a nation's export-import balance—especially when comparing developing and developed economies—remains limited.

The present study addresses this gap by systematically exploring the relationship between the Simple Average Tariff Rate (SATR) and the Export-Import Index (EXIM) over a 19-year period (2006–2024) using panel data analysis. By doing so, it aims to Assess whether tariff variations significantly influence the trade balance.

LITERATURE REVIEW

The relationship between tariffs and trade performance has been a central issue in international economics for decades. Classical trade theory posits that trade liberalization—through tariff reduction—enhances welfare by promoting efficiency and specialization. However, in practice, countries often use tariffs as instruments to manage trade balances and protect domestic industries. Empirical research on this subject presents mixed findings, reflecting variations in country contexts, stages of development, and the composition of trade.

Anderson and Neary (2005) developed the concept of the Trade Restrictiveness Index, demonstrating that higher average tariff rates significantly constrain trade volume and efficiency. Similarly, Wacziarg and Welch (2008) examined the effects of trade liberalization across 130 countries and concluded that economies reducing tariffs experienced faster growth in both exports and GDP. Baier and Bergstrand (2001) found that reductions in tariffs under trade agreements led to substantial increases in bilateral trade, underscoring the role of tariff reform in stimulating trade flows. Complementing these findings, Dollar and Kraay (2004) argued that open trade regimes facilitate higher growth rates and promote poverty reduction, especially in developing economies that integrate into the global market.

Empirical studies from developing countries have revealed that tariff liberalization can enhance export competitiveness by lowering production costs and promoting efficiency. Topalova and Khandelwal (2011) found that trade liberalization in India improved firm-level productivity and export performance, emphasizing the positive spillover effects of tariff reductions. Similarly, Amiti and Konings (2007) provided evidence from Indonesia that lowering tariffs on intermediate inputs significantly increased productivity in downstream sectors. Nicita (2013) analyzed panel data across developing economies and reported that reductions in import tariffs improved export competitiveness by reducing input prices and encouraging foreign investment.

In contrast, some researchers have highlighted the potential short-term disruptions associated with tariff reductions. Ghosh and Yamarik (2004) showed that protectionist policies could have ambiguous effects on the trade balance, depending on domestic production structures and elasticities of demand. Santos-Paulino and Thirlwall (2004) observed that trade liberalization initially led to increased imports but eventually resulted in higher exports as economies adjusted to new competitive environments. Likewise, Goldberg and Pavcnik (2016) cautioned that while trade liberalization generally improves efficiency, it can also cause short-term distributional challenges across industries.

Studies focused on institutional and policy dimensions provide additional insights. Subramanian and Wei (2007) established that World Trade Organization (WTO) membership and tariff reforms significantly enhanced trade performance, although the benefits were unevenly distributed between developed and developing countries. Kee, Nicita, and Olarreaga (2009) constructed trade restrictiveness indices for over 100 countries and found that tariff reductions improve welfare by increasing import penetration and export opportunities. Irwin (2022), examining recent U.S. tariff policies, concluded that protectionist measures had limited success in improving the trade balance and instead increased production costs.

From a macroeconomic perspective, Feyrer (2019) demonstrated that increases in trade costs, including tariffs, reduce income and welfare through decreased efficiency in global value chains. Goldberg and Pavcnik (2016) emphasized that while tariffs may shield certain sectors, they often weaken competitiveness in export-oriented industries by raising input prices. Similarly, Krugman, Obstfeld, and Melitz (2018) argued that tariffs disrupt comparative advantage, distort market signals, and create inefficiencies that hinder both imports and exports.

The broader consensus from these studies is that lower tariffs generally correlate with improved trade performance, although the magnitude and direction of impact depend on structural and institutional conditions. In economies with strong industrial bases and diversified exports, tariff reductions tend to enhance competitiveness and boost EXIM ratios. Conversely, in economies reliant on limited export sectors or with weak manufacturing capacity, tariff liberalization may initially widen trade deficits before stimulating long-term gains.

Overall, the literature suggests a nuanced relationship between tariff policy and trade balance. While trade liberalization through lower tariffs promotes integration and export growth, the specific impact on the Export-Import Index (EXIM) varies by country characteristics, level of development, and policy coherence. Hence, there remains a critical need for comparative empirical studies—such as the present research—that analyze how simple average tariff rates influence trade balance dynamics across both developing and developed nations.

RESEARCH METHODOLOGY

The present study employs a quantitative panel data research design to explore the relationship between the Simple Average Tariff Rate (SATR) and the Export-Import Index (EXIM) across five selected countries—China, India, Indonesia, Pakistan, and the United States—over a period of nineteen years. The countries were chosen purposively based on their population size, trade importance, and economic diversity to ensure representation of both developed and developing economies. The study uses secondary annual data obtained primarily from the World Trade Organization (WTO) statistical database, supported by data from the World Bank and International Monetary Fund (IMF) to ensure consistency and reliability. The dataset forms a balanced panel, combining both cross-sectional (country-wise) and time-series (yearly) observations, which allows for capturing variations within and between countries. The dependent variable, Export-Import Index (EXIM), represents trade performance and is measured as the ratio of total exports to total imports, while the independent variable, Simple Average Tariff Rate (SATR), reflects the average level of import duties imposed by each country.

The study employs panel data regression techniques, using both Fixed Effects and Random Effects models to account for heterogeneity across countries. Prior to selecting the final model, several statistical tests were conducted to ensure the validity and reliability of the analysis. The Breusch-Pagan Lagrange Multiplier (LM) test was applied to determine whether a pooled regression or panel model would be more suitable, while the Hausman specification test was used to decide between fixed and random effects based on the correlation between explanatory variables and unobserved effects. After confirming the appropriate model, the Random Effects Generalized Least Squares (GLS) regression was applied to estimate the relationship between tariff rates and trade balance. Descriptive statistics were generated to summarize the distribution and variability of each variable, identifying both within-country and between-country fluctuations. The analysis was conducted using Stata statistical software, employing commands such as xtset for panel data structuring, xtsum for descriptive analysis, xttest0 for the LM test, hausman for model selection, and xtreg for regression estimation. Ethical considerations were maintained by relying exclusively on publicly available and verified data sources, ensuring transparency and academic integrity. Overall, this methodology provides a robust empirical framework for examining how tariff structures influence trade performance, while effectively addressing country-specific differences and temporal variations within the global trade environment.

DATA ANALYSIS AND INTERPRETATION

Table 1: Impact of Tariff on EXIM of (Export to Import Ratio) Commercial Services - Panel Regression Analysis Summary Table

Breusch and Pagan Lagrangian multiplier test for random effects	EXIM[Country,t] = Xb + u[Country]+e[Country,t]	chibar2(01) = 525.37 Prob > chibar2 = 0.0000
Hausman Test	Fixed – Random	chi2(1) = 0.17 Prob > chi2 = 0.6833

Variable	Dependent	Independent
	EXIM	Simple Average Tariff Rate
Coefficient		-0.0099
p-value		0.401
Sigma_u = 0.4512	Sigma_e = 0.1358	rho = 0.9169
Random-effects GLS regression	Observation = 87 Groups = 5	Wald chi2(1) = 0.71 Prob > chi2 = 0.4006
R-Square	Within	0.0062
	Between	0.1150
	Overall	0.1213

The panel regression analysis for the commercial services sector investigates the influence of the Simple Average Tariff Rate (SATR) on the Export-Import Index (EXIM) across the five selected countries over the study period. The Breusch and Pagan Lagrange Multiplier (LM) test was applied to determine the appropriateness of using a panel data model over a pooled regression model. The highly significant result of the LM test confirmed the existence of country-specific effects, indicating that trade performance varies considerably across countries and that a panel data approach is more suitable than a simple pooled model. To decide between the Fixed Effects (FE) and Random Effects (RE) estimators, the Hausman test was conducted. The test outcome suggested no systematic difference between the FE and RE estimates, validating the choice of the Random Effects Model for this analysis, as it assumes that unobserved individual effects are uncorrelated with the independent variable.

The Random Effects Generalized Least Squares (GLS) regression results reveal a negative coefficient for the Simple Average Tariff Rate, indicating that an increase in tariffs is associated with a slight decline in the export-import ratio. However, the p-value exceeds conventional significance levels, implying that this relationship is statistically insignificant. This suggests that tariff rates do not have a meaningful or direct impact on trade performance in the commercial services sector. In other words, variations in tariffs among the selected countries do not substantially explain differences in their export-import ratios, indicating that other economic, structural, or policy-related factors likely play a more dominant role in determining trade outcomes in services.

The model's R-squared values further support this interpretation. The within R² value is low, signifying minimal explanatory power of the model in capturing changes in the EXIM ratio within a country over time. The between R² is moderately higher, suggesting some explanatory power across countries, while the overall R² indicates that only a small portion of the total variation in EXIM is explained by the tariff variable. This highlights that tariffs alone cannot account for significant differences in trade performance across nations. The rho (ρ) value, representing the fraction of variance due to country-specific effects, is notably high, implying that most of the variation in EXIM arises from inherent characteristics unique to each country—such as policy frameworks, competitiveness in the services sector, market access, and institutional quality—rather than from changes in tariff levels.

Overall, the results suggest that in the case of commercial services, tariff policy has a negative but statistically insignificant association with trade performance. This indicates that tariffs are not a primary determinant of export-import outcomes in this sector. Instead, factors such as digital infrastructure, service innovation, foreign investment, and the quality of human capital likely exert a more substantial influence on the export and import dynamics of services among the studied economies.

Table 2: Impact of Tariff on EXIM of (Export to Import Ratio) Total Merchandise - Panel Regression Analysis Summary Table

Breusch and Pagan Lagrangian multiplier test for random effects	EXIM[Country,t] = Xb + u[Country] + e[Country,t]	chibar2(01) = 646.61 Prob > chibar2 = 0.0000
Hausman Test	Fixed – Random	chi2(1) = 0.11 Prob > chi2 = 0.7372
Variable	Dependent	Independent
	EXIM	Simple Average Tariff Rate
Coefficient		-0.0027
p-value		0.674
Sigma_u = 0.3616	Sigma_e = 0.7281	rho = 0.9610

Random-effects GLS regression	Observation = 87 Groups = 5	Wald chi2(1) = 0.18 Prob > chi2 = 0.6741
R-Square	Within	0.0015
	Between	0.0647
	Overall	0.0424

The panel regression analysis for total merchandise trade examines how the Simple Average Tariff Rate (SATR) affects the Export-Import Index (EXIM) across the five selected countries over the study period. The Breusch and Pagan Lagrange Multiplier (LM) test result indicates strong evidence of country-specific effects, confirming that trade performance in merchandise differs significantly across countries and justifying the use of panel data regression over pooled ordinary least squares. To determine the appropriate estimation method between Fixed Effects (FE) and Random Effects (RE), the Hausman test was conducted. The test results revealed no statistically significant difference between the FE and RE estimators, suggesting that the Random Effects Model is suitable for this analysis, as it assumes that the country-specific effects are uncorrelated with the explanatory variable (SATR).

The Random Effects Generalized Least Squares (GLS) regression shows a negative coefficient for the tariff rate, suggesting an inverse relationship between tariffs and the export-import ratio—meaning that as tariff rates increase, the EXIM ratio tends to decline slightly. However, the high p-value indicates that this relationship is statistically insignificant, implying that tariff changes do not have a measurable or significant effect on merchandise trade performance among the sampled countries. This result suggests that in the context of merchandise trade, the average tariff rate does not serve as a key determinant of the balance between exports and imports. Instead, other factors—such as global demand, exchange rates, industrial capacity, logistics infrastructure, and non-tariff barriers—may have a more pronounced impact on trade outcomes.

The R-squared values further clarify the strength of the model. The within R² is very low, indicating that changes in tariffs explain only a negligible portion of the variation in EXIM within countries over time. The between R² is slightly higher, suggesting limited explanatory power across countries, while the overall R² remains low, signifying that tariff variations alone account for a small share of the overall variation in merchandise trade performance. Moreover, the rho (ρ) value is considerably high, implying that the majority of variance in EXIM arises from country-specific factors rather than from year-to-year tariff adjustments. This reinforces the view that each country's unique economic characteristics—such as industrial competitiveness, production structure, trade agreements, and policy environment—play a more significant role in determining merchandise trade balance than tariff rates alone.

In summary, the findings indicate that tariff levels have a negative but statistically insignificant effect on the Export-Import Index for total merchandise among the selected countries. This outcome suggests that tariffs do not substantially alter the trade balance in goods, and trade performance in merchandise is primarily driven by broader macroeconomic and structural variables rather than tariff policy adjustments.

Table 3: Impact of Tariff on EXIM of (Export to Import Ratio) Agriculture Products - Panel Regression Analysis Summary Table

Breusch and Pagan Lagrangian multiplier test for random effects	EXIM[Country,t] = Xb + u[Country] + e[Country,t]	chibar2(01) = 517.78 Prob > chibar2 = 0.0000
Hausman Test	Fixed – Random	chi2(1) = 0.02 Prob > chi2 = 0.9024
Variable	Dependent	Independent
	EXIM	Simple Average Tariff Rate
Coefficient		-0.0053
p-value		0.717
Sigma_u = 0.7685	Sigma_e = 0.1622	rho = 0.9574
Random-effects GLS regression	Observation = 87 Groups = 5	Wald chi2(1) = 0.71 Prob > chi2 = 0.4006
R-Square	Within	0.0014
	Between	0.0138

	Overall	0.0066
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The panel regression analysis for the agricultural products sector assesses the influence of the Simple Average Tariff Rate (SATR) on the Export-Import Index (EXIM) for the five selected countries across the study period. The Breusch and Pagan Lagrange Multiplier (LM) test strongly supports the presence of significant country-specific effects, confirming that variations in trade performance are not uniform across countries and that a panel data approach is more appropriate than a pooled regression model. Subsequently, the Hausman test was conducted to determine the suitability of the Fixed Effects (FE) or Random Effects (RE) model. The test results revealed no significant difference between the two estimators, implying that the Random Effects Model is appropriate for this analysis, as it assumes that unobserved individual effects are uncorrelated with the explanatory variable (SATR).

The results of the Random Effects Generalized Least Squares (GLS) regression indicate a negative coefficient for the tariff rate, implying that increases in tariff levels are associated with a minor decline in the export-import ratio for agricultural products. However, the high p-value suggests that this relationship is statistically insignificant, meaning that tariff changes do not exert a meaningful or consistent impact on agricultural trade balance. This implies that the tariff structure, while theoretically capable of influencing agricultural exports and imports, does not play a decisive role in determining trade performance in practice. Instead, agricultural trade dynamics are likely influenced more by factors such as climate conditions, productivity levels, government subsidies, trade agreements, global commodity prices, and non-tariff measures like sanitary and phytosanitary standards.

The R-squared values also indicate very low explanatory power of the model, with minimal variation in EXIM explained by tariff rates both within and across countries. The within R^2 value suggests negligible explanatory ability in capturing time-based changes within each country, while the between and overall R^2 values remain very small, indicating limited variation explained across countries. Furthermore, the rho (ρ) statistic is notably high, signifying that the majority of the variation in EXIM is driven by country-specific characteristics rather than by temporal changes in tariff rates. This finding highlights that each country's unique agricultural policies, trade dependencies, and production structures have a greater influence on trade balance than average tariff rates.

Overall, the analysis reveals that tariff rates have a negative but statistically insignificant relationship with the Export-Import Index in the agricultural sector. This suggests that, while higher tariffs may theoretically restrict trade, their practical effect on the agricultural export-import balance is limited. Instead, structural and environmental factors appear to dominate agricultural trade performance across the studied economies, underscoring that tariff policy alone cannot effectively determine trade competitiveness or balance in this sector.

FINDINGS, CONCLUSION, AND FUTURE SCOPE OF THE STUDY

The findings of the study collectively reveal that the Simple Average Tariff Rate (SATR) exerts a negative but statistically insignificant influence on the Export-Import Index (EXIM) across the three trade categories—Commercial Services, Total Merchandise, and Agricultural Products—for the five selected countries: China, India, Indonesia, Pakistan, and the United States. In all cases, the regression outcomes show that increases in tariff levels are marginally associated with declines in the export-import ratio; however, these effects lack statistical significance, indicating that tariff rates alone do not play a decisive role in determining trade performance. The results of the Breusch–Pagan Lagrange Multiplier tests confirm the existence of country-specific effects, suggesting that trade patterns differ meaningfully across nations, while the Hausman tests validate the suitability of the Random Effects Model for analysis. The consistently low R-squared values across models further imply that variations in tariff levels explain only a small portion of the total changes in EXIM, both within and between countries. A high degree of variance attributable to country-specific characteristics (rho values) emphasizes that factors such as economic structure, institutional frameworks, industrial competitiveness, policy orientation, and market conditions largely determine trade dynamics rather than tariff policy adjustments.

In the commercial services sector, tariffs show little explanatory power, suggesting that the performance of service exports and imports is driven more by non-tariff factors such as digital infrastructure, innovation capacity, human capital, and the presence of multinational firms. In the merchandise trade sector, the findings indicate that although tariffs can influence cost structures and competitiveness, their overall effect on trade balance remains minimal, with global supply chains, industrial production efficiency, and demand conditions exerting stronger effects. Similarly, in the agriculture sector, tariffs appear to have limited practical influence, as agricultural trade is shaped predominantly by climatic factors, productivity levels, government subsidies, and international agreements. Collectively, the empirical evidence underscores that the relationship between tariff policy and trade balance is complex, sector-specific, and context-dependent, aligning with prior research that highlights the declining importance of traditional tariff instruments in an increasingly liberalized and globally integrated trade environment.

Based on these findings, it can be concluded that while tariff liberalization may contribute marginally to promoting export competitiveness and economic integration, its direct impact on the Export-Import Index remains weak and statistically insignificant across different sectors and countries. The results reaffirm that modern trade performance is determined more by non-tariff measures, structural reforms, and macroeconomic fundamentals than by tariff rates alone. For policymakers, this

suggests that efforts to enhance trade balance should extend beyond tariff reduction to include strengthening infrastructure, diversifying export bases, improving institutional quality, and promoting innovation and investment in technology-driven sectors. The future scope of the study lies in broadening both the data dimensions and analytical framework. Future research can expand the sample size by including additional countries from various regions to capture a more comprehensive global perspective on tariff-trade dynamics. Moreover, incorporating sector-specific variables such as foreign direct investment inflows, exchange rate movements, non-tariff barriers, and global competitiveness indices could offer a more nuanced understanding of how trade policy interacts with macroeconomic performance. Applying advanced econometric models, such as dynamic panel estimations (GMM), cointegration tests, or causality analysis, could further help establish directional relationships and long-term equilibrium effects. Researchers may also explore the differential impacts of tariff versus non-tariff barriers, and the role of digital trade and trade facilitation measures, which are increasingly relevant in the context of the globalized and service-oriented economy. Overall, future studies should continue to explore the evolving role of tariffs within the broader landscape of trade policy, competitiveness, and sustainable economic development.

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