



INTERNATIONAL TRADE AGREEMENTS AND TRADE VOLUMES **INFLUENCE ON THE ECONOMIC GROWTH OF THE COUNTRIES**

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1. ABSTRACT

The objective of this research is to investigate the underlying factors that govern international trade by analyzing the impact of bilateral and multilateral agreements on trade openness and economic growth over a range of economic frameworks. The research utilizes a mixed methods comparison technique, wherein it systematically analyses economic and tariff statistics for four countries (India, USA, China, and Russia) from the year 2000 to the year 2024. The model used in the process is the Gravity Model as well as a general evaluation of participation by these nations in the WTO and FTA. The results indicate that while economic size offers more trade opportunities for these four nations, actual trade volumes can considerably differ due to institutional and political constraints. In addition, it should be noted that WTO membership does not lead to a similar level of trade openness, while the recent return of tariffs leads to uneven changes in trade relations. The study demonstrates the importance of proper strategies and institutional soundness for successful application of trade agreements.

Keywords: Economic Growth, International Trade, Trade Relations, Tariffs, Gravity Model, Trade Liberalization.

2. INTRODUCTION

Modern International trade has been built on a deceptively simple promise: Sign trade contracts, increase trade volume and economic growth will automatically follow. However, modern commerce regularly defies this doctrine. It has been repeatedly proven that expanding trade volume and reducing tariffs do not have a uniform effect. While the WTO did once anchor a predictable global market, recent years have fractured the global space in restricted bilateral trade deals and tariff surges, it is within these fractures that traditional theories fall apart, which



is why this research paper aims to examine and understand the true modern relationship between trade agreements, trade volumes and economic growth.

This relationship between trade and economic growth is one of vital importance, and it remains the central objective of national policies. The increasing levels of global uncertainty from escalating tariff conflicts and exponential growth in Free Trade Agreements (FTA) and Regional Trade Agreements (RTA) make trade policy design an urgent matter for governments aiming to balance openness and protection.

Even though international trade agreements generally lead to greater trade volumes and economic growth, their effects are not equal for all countries. The reasons for these differences lie in factors including institutional quality, the effectiveness of government, domestic policies, and the way in which the trade agreements are designed. Furthermore, the increase in tariffs and the growing uncertainty surrounding trade policy have altered global trade patterns, leading to doubts as to whether trade agreements still provide the same economic benefits.

Most of the existing studies look at WTO membership, FTAs, RTAs, and trade facilitation measures in isolation, which makes it difficult to draw comprehensive comparisons. There is limited research into how the effectiveness of various trade agreements differs between developed and developing countries or as to how institutional quality, the design of the agreement, and the implementation affect trade outcomes.

This study aims to respond to the present gap by examining trade agreements that actually shape trade volumes and economic growth, weighing multilateral commitments with bilateral and regional ones while also accounting for differences in development between countries, government effectiveness and the resurgence of tariffs since 2018.

3. LITERATURE REVIEW

3.1 Introduction

International trade agreements play a vital role in the global economy since they promote international trade and lead to a higher degree of economic integration. The Gravity Model forms the theoretical foundation for the analysis of trade agreements as it describes the connection between trade flows, distance, and the size of economies. Yet the existing literature



indicates that trade agreements go beyond the simple reduction of tariffs; factors such as market expansion, productivity, trade facilitation, and regulatory cooperation also affect their effectiveness. Recent rises in tariffs and greater uncertainty regarding trade policy have also led people to question whether trade agreements are still able to deliver the trade and economic benefits that were identified in earlier studies. In view of these developments, this literature review looks at the Gravity Model, the relationship between trade liberalization and economic growth, the role of WTO membership, the impact of bilateral and regional trade agreements, and the role of international trade agreements in an age of increasing tariffs.

3.2 Theoretical Foundations of International Trade and the Gravity Model

The gravity model remains the theoretical and empirical backbone of trade policy analysis, explaining bilateral flows through economic size and trade costs while correcting for multilateral resistance. This foundation matters because subsequent claims about the WTO, FTAs, and trade openness all depend on how rigorously that resistance is modeled and, as this theme shows, how carefully endogeneity is treated.

Anderson and van Wincoop (2003) showed that earlier gravity estimations lacked theoretical grounding, producing omitted-variable bias, and developed a structural method for correctly estimating comparative statics. Applied to the McCallum border puzzle, it revealed that national borders reduced trade between industrialized countries by a moderate 20-50%. Alongside this theoretical fix, **Silva and Tenreyro (2006)** addressed a separate econometric flaw: log-linearized gravity equations estimated via OLS are biased under heteroskedasticity and zero-trade observations, a problem their Poisson Pseudo-Maximum Likelihood (PPML) estimator resolved and which has since become the field's standard technique. **Piermartini and Yotov (2016)** operationalized both contributions to a practical estimation guide, While **Campos et al. (2024)** extended the methodological toolkit further, introducing a simulation command for modelling general equilibrium trade and welfare effects within the broader "universal gravity" framework. Building on it, **Larch et al. (2019)** re-estimated GATT/WTO effects. They found membership raised trade between members by roughly 171%, considerably above earlier literature, and large enough to warrant caution given the sensitivity of such estimates to specification.



Baier and Bergstrand (2007) reached a structurally similar conclusion for FTAs: correcting for endogeneity via panel methods roughly doubled the estimated trade effect of an FTA after ten years, five to six times larger than naive cross-sectional estimates. Larch and Yotov (2023) extended this approach to the TFA, finding a 1.17% rise in world trade and 2.4% export gains for LDCs. IMF (2016), using synthetic control rather than gravity regression, corroborated the endogeneity story with an 80% export gain over ten years. Researchers **Kutlina-Dimitrova and Lakatos** found something interesting in 2017. If countries were to cancel their existing trade agreements and services costs were to rise, it would lead to big losses. The estimated impact is about a 0.3% drop in global income every year, which is around \$211 billion. And the worst part is that some regions would be hit harder than others, like East Asia and the Pacific, as well as Latin America and the Caribbean. This just goes to show how important these trade agreements are. By looking at it from the opposite side, we can see just how much they're worth to us. **Sachs and Warner (1995)** took a different track, linking a composite openness index to growth. However, **Rodríguez and Rodrik (2000)** showed that the index conflates trade policy with unrelated institutional factors, undermining causal interpretation. Together, these studies suggest that once endogeneity and multilateral resistance are properly modeled, the gravity model will reflect a more realistic world. Having discussed the methodological challenges in analyzing trade impact, the next.

3.3 Trade Liberalization and Economic Growth

Trade liberalization has long been regarded as an important driver of economic growth. By reducing tariffs and other trade barriers, countries gain access to larger international markets, creating opportunities for businesses to expand production, attract investment, and improve productivity. These improvements are generally associated with higher income levels and longterm economic growth. However, researchers continue to debate whether trade liberalization alone is sufficient to generate economic growth or whether broader domestic factors play an equally important role.

A significant body of empirical research supports the view that trade liberalization has a positive effect on economic growth. **Sachs and Warner (1995)** found that countries with more open trade policies experienced stronger long-term economic growth than countries with greater trade restrictions. However, their measure of trade openness was later criticized for combining



trade policy with wider economic and institutional variables, making it difficult to isolate the independent effect of trade liberalization (**Rodríguez & Rodrik, 2001**). **Frankel and Romer (1999)** addressed this limitation by using geographical characteristics as an instrumental variable to examine whether trade itself influences national income. They found that countries whose geographical location made trade easier also had higher national income, providing stronger empirical evidence that increased trade contributes to economic growth. Although the study addressed the causality issue, it did not eliminate concerns that geographical factors may affect economic growth through channels other than trade.

Rodríguez and Rodrik (2001) challenged the earlier literature by arguing that the evidence available was insufficient to conclude that trade liberalization alone causes economic growth. They explained that measures of trade openness often failed to distinguish the effects of trade liberalization from institutional quality, government policies, and wider economic reforms. Their work shifted the debate from whether trade liberalization promotes growth to the conditions under which it is most effective, highlighting the importance of complementary domestic institutions and policies. This broader perspective is supported by the International Monetary Fund (IMF, 2016), which concluded that trade liberalization generally promotes economic growth through higher investment and productivity but emphasized that these benefits are more likely to be realized

When supported by strong institutions and effective government policies. Overall, the literature supports a positive relationship between trade liberalization and economic growth, but the strength of this relationship depends on institutional quality, domestic policies, and the methods used to measure trade openness.

The experiences of India and Zambia provide useful examples of why the effects of trade liberalization differ across countries. India introduced major trade reforms as part of its 1991 economic reforms, alongside wider structural and macroeconomic changes (**Go & Mitra, 1998**). This was followed by greater integration into international markets and stronger economic performance. However, trade liberalization was only one part of a much wider reform process. Zambia also introduced significant trade reforms during the 1990s, including lower tariffs and the removal of quantitative restrictions. Despite these reforms, economic growth remained relatively weak, partly because of the country's dependence on copper, low investment, and other structural constraints (World Bank, 2004). The different experiences of



India and Zambia therefore show that trade liberalization can support economic growth, but it does not necessarily produce the same results across countries. Other economic and institutional conditions also play an important role in determining its benefits, supporting the argument made by Rodríguez and Rodrik (2001).

As trade liberalization is primarily achieved through international trade agreements, it is important to examine whether these agreements deliver the expected trade and economic benefits, which is explored in the next section.

3.4 The Impact of Free Trade Agreements and Regional Trade Agreements on Trade Flows

Trade agreements play an important part in promoting international trade by reducing barriers between countries and improving market access. In the past, international trade was mainly governed through multilateral agreements under the General Agreement on Tariffs and Trade (GATT) and later the World Trade Organization (WTO). Over time, however, many countries have increasingly negotiated Free Trade Agreements (FTAs) and Regional Trade Agreements (RTAs). Unlike traditional agreements that focused mainly on tariff reductions, modern FTAs and RTAs also include areas such as investment, services, intellectual property rights, and digital trade, facilitating countries to achieve deeper economic integration (**Murakami, 2025**). Several studies have examined how these agreements influence trade. Sachs and Warner (1995) found that countries with more open trade policies generally participate more actively in international trade and achieve stronger economic integration. Similarly, **Baier and Bergstrand (2007)** showed that FTAs significantly increase bilateral trade, with member countries experiencing substantial trade growth after agreements are implemented. These findings indicate that easing trade barriers through FTAs create long-term trade benefits.

Research has likewise highlighted the continuing importance of multilateral institutions.

Larch et al. (2019) found that WTO membership increases trade not only among member countries but also between members and non-members, demonstrating that the WTO remains an important foundation for global trade. At the same time, countries increasingly rely on bilateral and regional agreements to address issues that go beyond traditional WTO negotiations.



Recent studies suggest that the effectiveness of trade agreements depends not only on their existence but also on their content. Trade facilitation measures that simplify customs procedures and reduce administrative barriers improve trade performance and welfare (World Trade Organization, 2023). Likewise, deeper regional trade agreements that include investment, services and regulatory cooperation strengthen production networks and further increase trade, although their effects vary across regions and agreement types (Murakami, 2025). Although previous studies have consistently demonstrated that trade agreements encourage international trade, most of them look at multilateral agreements, FTAs, RTAs, and trade facilitation separately. There is limited research concerning the impact of the global move from multilateral trade liberalization towards bilateral and regional agreements on international trade patterns and trade volumes.

3.5 Does joining the WTO Increase Trade

The World Trade Organization aims to facilitate and regulate international trade and the global economy. The idea is that strong global groups help trade openness led to economic growth.

Theoretically, the link between trade openness and economic growth centers upon the efficacy of multilateral institutions. Research addressing firm-level heterogeneity and sample selection bias indicates that the WTO's institutional framework effectively reduces transaction costs and uncertainty, which are critical drivers of trade volume.

Empirically, the impact of membership remains a vigorous debate. The literature still debates the real effect of membership. Economists, such as **Rose (2004)**, have argued that membership in the GATT or WTO does not necessarily enhance trade volume. However, this is challenged by subsequent research by **Helpman (2007)**, which demonstrates that membership significantly expands bilateral trade volumes and promotes the formation of new trading relationships.

Subsequent studies using structural gravity models, such as **Cheong et al. (2014)**, highlight that the trade-promoting effects of WTO membership are often obscured by methodological issues, particularly the correlation between multilateral resistance terms and institutional participation. This methodological sensitivity explains why estimates vary so widely. At the same time, multi-model analyses (e.g., **Harrison, 1997**) show that reforms under the Uruguay Round generated substantial global income gains. However, their realization depended on effective market integration and the removal of persistent non-tariff barriers. Beyond general membership, the



effectiveness of the WTO's work is supported by specific rules. These rules seek to lessen trade problems. The Trade Facilitation Agreement is designed to streamline customs procedures and reduce trade costs by simplifying and harmonizing border procedures, consequently promoting global trade and welfare, as **Beverelli et al. (2015)** explain.

The WTO's creation also brought about important benefits regarding trade liberalization by offering greater legal certainty (**Hu, 2003**). Yet, although progress has been made, a continuing trade gap still exists between developed and developing countries (**Faiqoh et al., 2025**). The complete realization of the trade benefits still relies on effective market integration, on the elimination of hidden non-tariff barriers such as administrative delays and corruption, and on adequate capital investments, all of which remain unachieved in many developing countries. The body of literature indicates that joining the WTO can lead to an increase in trade, but the effects in this regard are conditional; the results vary according to the methodology used, the presence of complementary reforms, and the capacity of countries, particularly developing ones, to eliminate structural barriers.

3.6 International Trade Agreements in the Era of Tariffs

The resurgence of tariffs has renewed interest in the role of international trade agreements within the global trading system. While the post-war trade order was built on progressive liberalization under the General Agreement on Tariffs and Trade (GATT) and later the World Trade Organization (WTO), recent tariff measures and geopolitical tensions have encouraged countries to diversify their trade strategies. Rather than depending solely on multilateral negotiations, governments are increasingly strengthening bilateral and regional trade agreements to secure market access, diversify exports, and enhance supply-chain resilience (**Rotunno & Ruta, 2025**).

Recent literature suggests that higher tariffs have altered the direction of global trade rather than causing a sustained decline in trade volumes. Tariffs imposed on Chinese exports to the United States encouraged multinational firms to relocate production to countries such as Vietnam, Mexico, and India. As a result, these economies experienced higher export demand and greater participation in global value chains, while China expanded trade with ASEAN economies and other emerging markets. These developments demonstrate that tariffs often lead



To trade diversion, with production and trade shifting across countries instead of disappearing altogether (Rotunno & Ruta, 2025).

The literature further indicates that international trade agreements are progressing beyond their traditional focus on tariff reduction. Modern agreements increasingly include provisions on investment, digital trade, customs cooperation, regulatory harmonization, and supplychain resilience. Such “deep” trade agreements reduce non-tariff trade costs, strengthen production networks, and provide countries with greater flexibility to sustain trade in an environment characterized by rising tariffs and geopolitical uncertainty (Murakami, 2025; World Trade Organization, 2023). Although existing studies have recognized that tariffs have changed global Investment, digital trade, customs cooperation, regulatory harmonization, and supplychain resilience. Such “deep” trade agreements reduce non-tariff trade costs, strengthen production networks, and provide countries with greater flexibility to sustain trade in an environment characterized by rising tariffs and geopolitical uncertainty (Murakami, 2025; World Trade Organization, 2023). Although existing studies have recognized that tariffs have changed global trade patterns, only a limited amount of research investigates how this changing tariff situation is affecting the design and effectiveness of international trade agreements. Is important to deal with this gap if we are to understand the changing role of international trade agreements and the effect they have on long-term economic growth

3.7 Literature Summary

Trade agreements play a crucial role in boosting international trade and economic growth, with the gravity model providing the theoretical basis for measuring trade flows. Empirical evidence shows that agreements such as FTAs, RTAs, and WTO frameworks reduce barriers, expand market access, attract investment, and enhance productivity, ultimately fostering growth. However, these benefits are not automatic; their success depends on institutional quality, domestic policies, and effective implementation.

Recent studies highlight rising tariffs and policy uncertainty, which are reshaping the global trade environment. In this context, international agreements are more vital than ever to sustain trade flows and growth, though their effectiveness under current conditions remains uncertain.



4. RESEARCH GAP

While studies confirm that trade agreements boost trade flows, their impacts vary across countries and agreement types, and the reasons remain underexplored. Most research examines FTAs, RTAs, WTO membership, or facilitation measures in isolation, limiting direct comparison. Evidence suggests effectiveness depends on agreement depth, institutional design, and implementation, yet little is known about how these factors interact across contexts. Rising tariffs since 2018 have redirected rather than reduced trade, while agreements themselves are expanding to cover investment, digital trade, and supply-chain resilience. What remains unclear is how evolving tariffs and shifting agreement designs influence effectiveness, particularly across institutional and structural settings. This gap calls for investigation into how different forms of trade agreements shape trade volumes under changing global dynamics.

5. RESEARCH QUESTIONS AND OBJECTIVES

Research Questions

1. To what extent do factors such as institutional quality and government efficiency influence the positive relationship between international trade agreements and trade volumes on the economic growth of a country?
2. How do WTO membership effects differ between developed and developing countries and what institutional or structural factors explain these disparities?
3. How have bilateral and regional trade agreements impacted different countries' trade volume patterns as opposed to multilateral trade agreements like WTO?
4. How has the resurgence of tariffs influenced the role and effectiveness of international trade agreements in sustaining global trade volumes?

General Objective

To examine the influence of international trade agreements on trade volumes and the economic growth of countries by comparing the role of multilateral and bilateral trade agreements and evaluating the influence of institutional quality and government effectiveness on these relationships. While looking into the effect of tariff on trade agreements and volumes.



Specific Objectives

1. To assess how institutional quality, government effectiveness and the design of international trade agreements influence the relationship between international trade agreements, trade volumes and economic growth.
2. To examine bilateral trade in the absence of FTAs and RTAs, while considering the role of WTO membership
3. To evaluate the relationship between trade volumes and the economic growth of countries.
4. Examine how rising tariffs and trade policy uncertainty influence the effectiveness of international trade agreements.

6. METHODOLOGY

6.1 Research design

This study adopts descriptive-correlational-comparative design. the descriptive and correlational components draw on secondary data to outline broad trade-growth patterns. And the comparative component contrasts cases differing in institutional quality, development status, agreement type, and tariff environment to isolate what conditions the trade-growth relationship.

6.2 Nature of the research

It follows a mixed-methods approach, combining qualitative thematic analysis of policy documents and journal articles with quantitative secondary data and existing gravity-model estimates. It seeks to explain whether international trade agreements influence trade volumes and economic growth by using derived relationships from existing theories and empirical studies and comparing data between developed and developing countries along with the effect of tariffs. These methods correspond with the methodological issues identified in the literature review.



6.3 Sample and sampling technique

The population will consist of countries that participate in international trade and have available data on trade volumes, economic growth, trade agreements, tariffs, and institutional quality. The study will apply purposive sampling or judgmental sampling. And countries will be selected according to the availability of reliable economic, tariff and trade data, information on the countries WTO, FTA and RTA membership, to accurately represent developed and developing countries. the proposed study period may be 2000–2024, depending on data availability. The period after 2018 will be examined separately because of the renewed importance of tariffs and trade-policy uncertainty.

6.4 Data collection tools

The study will use a secondary-data collection method. data will be collected from internationally recognized databases, including but not limited to the World Bank Development Indicators, WTO, UN, CEPII.

A structured data-extraction sheet will be used to record:

- Country name and year.
- Trade agreement status.
- Trade volume.
- Economic-growth indicators.
- Tariff rates.
- Institutional indicators.
- Control variables.

6.5 Variables used

Dependent Variable

- Economic growth: Measured using annual GDP growth or real GDP per capita growth.

Independent variable

- Trade volume: Measured using total exports and imports or the value of bilateral trade between two countries.



Control Variables

- WTO membership
- Free Trade Agreement participation
- Regional Trade Agreement participation
- Trade openness: Measured as the ratio of exports plus imports to GDP.
- Tariff rate
- Post-2018 tariff period

6.6 Ethical Considerations

- The study will use publicly available secondary data and will not involve human participants, interviews, or personal information.
- All data sources will be properly acknowledged and cited.
- The analysis will be conducted objectively, without presenting results in a way that deliberately supports a predetermined conclusion.
- Any software, database, or statistical procedure used in the research will be identified where necessary.

6.7 Limitations

- Institutional-quality indicators are based on composite measurements and may contain some degree of subjectivity or measurement error.
- Some countries may have missing or inconsistent data, which may reduce the final sample size.
- The results may show statistical associations but may not fully capture all the political, historical, and social factors affecting trade agreements.
- External shocks may distort trends independently of the agreements studied.

7. DATA ANALYSIS AND INTERPRETATION

This section examines data on international trade, focusing on the relationship between trade agreements and economic growth, with emphasis on WTO membership, FTAs, RTAs, and tariff changes. Findings are presented through tables and figures, covering trade volumes over time, bilateral trade shifts, and tariff trends before and after 2018.



7.1 Trade Volumes and Economic Growth

Description

Here we use GDP, bilateral trade and geographical distance data for India, USA, China and Russia to calculate the Gravity Index for six bilateral trade relationships in 2000 and 2024.

Table 1: Bilateral trade and Gravity Index for India, USA, China and Russia (2000)

Exporter i	Importer j	GDP of i	GDP of j	Distance i j	Annual trade volume	Gravity Index
India	USA	468,395,521,654.46	10,250,952,000,00	11761.81	9,304,913,801	4.0823×10^{20}
USA	India	10,250,952,000,000	468,395,521,654.46	11761.81	3,667,127,918	4.0823×10^{20}
India	China	468,395,521,654.46	1,223,754,919,971.05	3785.013	734,887,748	1.5144×10^{20}
China	India	1,223,754,919,971.05	468,395,521,654.46	3785.013	1,560,736,215	1.5144×10^{20}
India	Russia	468,395,521,654.46	259,710,142,196.94	4341.881	855,661,130	2.8017×10^{19}
Russia	India	259,710,142,196.94	468,395,521,654.46	4341.881	1,081,683,949	2.8017×10^{19}
USA	China	10,250,952,000,000	1,223,754,919,971.05	3943.621	16,184,679,302	3.1810×10^2
China	USA	1,223,754,919,971.05	10,250,952,000,000	3943.621	52,156,428,118	3.1810×10^2



USA	Russia	10,250,952,000,000	259,710,142,196.94	7517.972	2,092,380,131	3.5412×10^{20}
Russia	USA	259,710,142,196.94	10,250,952,000,000	7517.972	4,648,015,624	3.5412×10^{20}
China	Russia	1,223,754,919,971.05	259,710,142,196.94	5795.045	2,233,350,097	5.4844×10^1
Russia	China	259,710,142,196.94	1,223,754,919,971.05	5795.045	5,247,619,974	5.4844×10^1

Table 2: Bilateral trade and Gravity Index for India, USA, China and Russia (2024)

Exporter i	Importer j	GDP of i	GDP of j	Distance i j	Annual trade volume	Gravity index
India	USA	3,760,813,470,500.86	29,298,013,000,000	11761.81	79,441,705,218	9.3680×10^{21}
USA	India	29,298,013,000,000	3,760,813,470,500.86	11761.81	41,752,370,779	9.3680×10^{21}
India	China	3,760,813,470,500.86	18,729,668,435,847.99	3785.013	14,899,427,449	1.8610×10^{22}
China	India	18,729,668,435,847.99	3,760,813,470,500.86	3785.013	120,463,271,143	1.8610×10^{22}
India	Russia	3,760,813,470,500.86	2,186,462,268,813.08	4341.881	4,841,029,765	1.8939×10^{21}



Russia	India	2,186,462,268,813.08	3,760,813,470,500.86	4341.881	67,153,440,506	1.8939×10^{21}
USA	China	29,298,013,000,000	18,729,668,435,847.99	3943.621	143,545,716,168	1.3915×10^{23}
China	USA	18,729,668,435,847.99	29,298,013,000,000	3943.621	525,648,764,497	1.3915×10^{23}
USA	Russia	29,298,013,000,000	3,760,813,470,500.86	7517.972	526,066,141	1.4656×10^{22}
Russia	USA	3,760,813,470,500.86	29,298,013,000,000	7517.972	3,272,046,201	1.4656×10^{22}
China	Russia	18,729,668,435,847.99	3,760,813,470,500.86	5795.045	115,275,861,485	1.2155×10^{22}
Russia	China	3,760,813,470,500.86	18,729,668,435,847.99	5795.045	129,881,357,745	1.2155×10^{22}

*The table shows that larger economies generally have greater bilateral trade potential, while geographical distance can restrict trade. The increase in the Gravity Index between 2000 and 2024 reflects the economic growth of the trading partners. However, differences between the Gravity Index and actual trade volumes suggest that institutional, political and trade-policy factors also influence trade flows.

Gravity Model Used

The basic Gravity Model assumes that bilateral trade between two countries is positively related to their economic size and negatively related to the geographical distance between them. For this study, the following basic Gravity Model is used:



$GI_{ij} = GDP_i \times GDP_j / D_{ij}$ Where:

- GI_{ij} = Gravity Index between exporter i and importer j
- GDP_i = GDP of the exporting country
- GDP_j = GDP of the importing country
- D_{ij} = geographical distance between the two countries in kilometres

Thus, a higher Gravity Index indicates greater potential for bilateral trade, given the economic size and geographical proximity of the two countries.

Calculation Example 1: 2000

India → USA

From the data:

- GDP of India = \$468,395,521,654.46
- GDP of USA = \$10,250,952,000,000
- Distance between India and USA = 11,761.81 km $\square$ Actual trade = \$9,304,913,801 Therefore:
- $GI_{\text{India-USA}} = 468,395,521,654.46 \times 10,250,952,000,000 / 11,761.81$
- $GI_{\text{India-USA}} = 4.0823 \times 10^{20}$

Therefore, the Gravity Index for India–USA in 2000 was approximately 4.08×10^{20} .

The actual bilateral trade recorded for India → USA was approximately \$9.30 billion.

Calculation Example 2: 2024

India → USA

From the 2024 data:

- GDP of India = \$3,760,813,470,500.86
- GDP of USA = \$29,298,013,000,000
- Distance = 11,761.81 km
- Actual trade = \$79,441,705,218 according to the data you provided.

Therefore:

- $GI_{\text{India-USA}} = 3,760,813,470,500.86 \times 29,298,013,000,000 / 11,761.813$
- $GI_{\text{India-USA}} = 9.3680 \times 10^{21}$



Therefore, the Gravity Index for India–USA in 2024 was approximately 9.3680×10^{21} . The actual bilateral trade recorded for India → USA was approximately \$79.44 billion.

The India–USA bilateral relationship shows a substantial increase in both actual trade and the Gravity Index between 2000 and 2024. Actual trade increased from approximately \$9.30 billion to \$79.44 billion, while the Gravity Index increased from 4.08×10^{20} to 9.37×10^{21} . Since geographical distance remained constant, the increase in the Gravity Index is primarily associated with the substantial growth in the GDP of both India and the USA.

Analysis and Interpretation

1. USA–China has the strongest Gravity relationship

The USA–China pair has the highest Gravity Index in both years.

- 2000: 3.18×10^{21}
- 2024: 1.39×10^{23}

It also recorded the highest total bilateral trade in 2024, approximately \$669.19 billion.

This is consistent with the Gravity Model: both countries have very large economies, creating a strong potential for bilateral trade despite geographical distance.

2. India–China shows the largest percentage increase in trade among the India-related pairs

India–China trade increased from approximately \$2.30 billion in 2000 to \$135.36 billion in 2024, representing an increase of approximately 5,796.6%.

The Gravity Index also increased substantially, from:

$$1.51 \times 10^{20} \rightarrow 1.86 \times 10^{22}$$

This reflects the significant increase in the economic size of both countries.

3. India–USA also shows strong growth

India–USA total bilateral trade increased from approximately:

\$12.97 billion → \$121.19 billion The Gravity Index increased from:

$$4.08 \times 10^{20} \rightarrow 9.37 \times 10^{21}$$



Thus, the growth in the economic size of both countries was accompanied by a substantial increase in their trade potential and observed bilateral trade.

4. India–Russia experienced considerable expansion

India–Russia bilateral trade increased from approximately \$1.94 billion to \$71.99 billion, an increase of about 3,616%.

Its Gravity Index also increased considerably:

$$2.80 \times 10^{19} \rightarrow 1.89 \times 10^{21}$$

This indicates a substantial increase in the economic potential for bilateral trade.

5. China–Russia also experienced strong growth

China–Russia trade increased from approximately \$7.48 billion in 2000 to \$245.16 billion in 2024.

The Gravity Index increased from:

$$5.48 \times 10^{19} \rightarrow 1.22 \times 10^{22}$$

This represents one of the strongest expansions among the six bilateral relationships.

6. USA–Russia is the exception

The USA–Russia relationship is particularly interesting. Although its Gravity Index increased substantially:

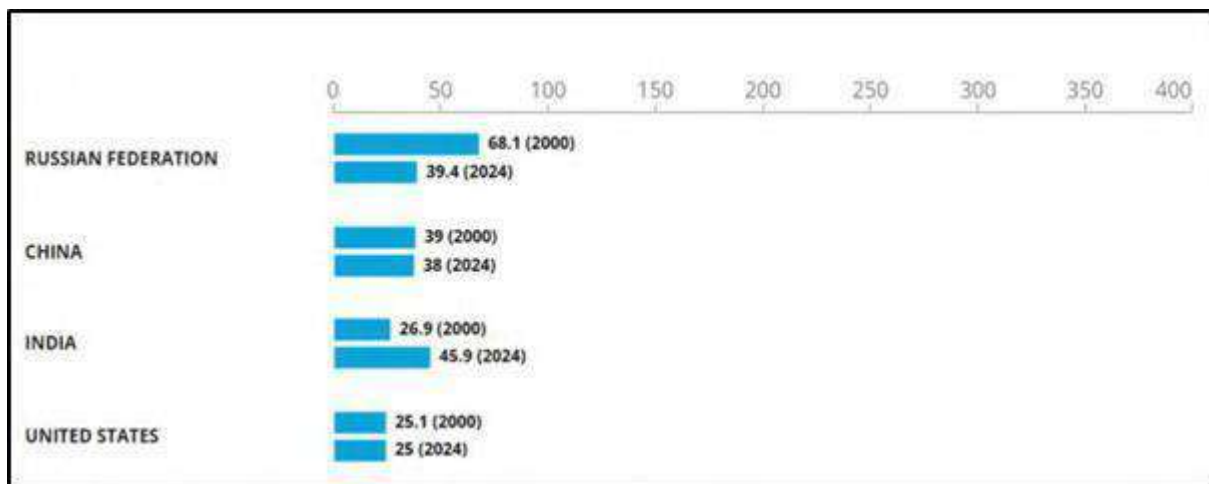
$3.54 \times 10^{20} \rightarrow 1.47 \times 10^{22}$ actual bilateral trade declined from approximately \$6.74 billion to \$3.80 billion

The Gravity Model analysis of India, the USA, China and Russia indicate that economic size is an important determinant of bilateral trade potential. Between 2000 and 2024, the Gravity Index increased substantially for all six bilateral relationships, reflecting the considerable expansion of the economies involved. In most cases, this increase in trade potential was accompanied by substantial growth in actual bilateral trade. The USA– China relationship recorded the highest Gravity Index and the highest bilateral trade volume in 2024, while India– China and China–Russia recorded particularly large increases in bilateral trade compared with 2000.

However, the USA–Russia relationship provides an important exception. Despite a substantial increase in its Gravity Index, actual bilateral trade declined. This demonstrates that economic size and geographical distance alone cannot fully explain international trade flows. Political conditions, trade restrictions, institutional factors and other trade barriers can cause actual trade to deviate from the trade potential predicted by the basic Gravity Model. Therefore, the findings support the basic Gravity Model while also indicating the importance of incorporating institutional and policy-related factors when explaining differences in actual trade flows.

7.2 WTO Accession and Bilateral Trade Volumes: India, USA, China and Russia

Figure 1: WTO Membership and Trade Volume 2000 vs 2024



Description

Here we use trade-volume data, expressed as exports and imports as a percentage of GDP, to compare India, USA, China and Russia in 2000 and 2024 according to their WTO membership status. The comparison particularly highlights changes in China and Russia, which moved from non-membership to WTO membership during the study period, alongside India and the USA, which were already WTO members.



Table 3: WTO Membership Status and trade Volume (% of GDP), 2000 vs 2024

Country	WTO Status 2000	Trade Volume 2000 (% GDP)	WTO Status in 2024	Trade Volume 2024 (% GDP)
Russia	Non- Member	68.01	Member	39.42
China	Non- Member	39.01	Member	37.96
India	Member	26.9	Member	45.9
USA	Member	25.1	Member	25

*The data indicates substantial variation in trade volumes across the four countries. India recorded the largest increase among the established WTO members, while China and Russia experienced declines despite becoming WTO members during the period. This suggests that WTO membership alone does not necessarily lead to higher trade openness and that countryspecific economic and institutional factors may moderate the relationship between WTO participation and trade. The finding provides a comparative perspective for Research Question 2 concerning the role of WTO membership in international trade.

Analysis and Interpretation

Figure 1 compares trade volumes, measured as trade as a percentage of GDP, for India, the United States, China and Russia in 2000 and 2024 in relation to their WTO membership status. The results show considerable variation among the four countries. India recorded a substantial increase in trade volume from 26.9% in 2000 to 45.9% in 2024, whereas the United States remained almost unchanged at approximately 25%. China experienced a marginal decline from 39.0% to 38.0%, while Russia recorded a larger decline from 68.1% to 39.4%. Therefore, the



comparison does not establish a uniform positive relationship between WTO membership and trade volume. The differences suggest that WTO membership alone may not determine trade openness, as economic structure, domestic policies, institutional conditions and other trade related factors may also influence trade patterns.

7.3 Impact of FTAs and RTAs on Trade Patterns

Table 4: Bilateral Trade volume Growth and FTA/RTA Status by Country Pair (2000-2024)

Country Pair	Trade Volume 2000 (US\$ Billion)	Trade Volume 2024 (US\$ Billion)	Change (%)	Bilateral FTA/RTA in Force
India- USA	12.97	121.19	834.4%	Bilateral trade agreement, 2025
India- Russia	1.94	71.99	3616.1%	Bilateral trade agreement 2025
USA- China	68.34	669.19	879.2%	Recently reached a trade agreement in 2025
USA- Russia	6.74	3.8	-43.7%	No formal bilateral trade agreement

*Table 4 compares the bilateral trade volumes of the same selected country pairs used in the analysis, using 2000 and 2024 as the comparison years. The purpose is to identify how bilateral trade patterns changed over the study period and provide a basis for discussing the role of trade agreements.

*Source: Researcher's compilation based on the bilateral trade dataset used in the study.

Description

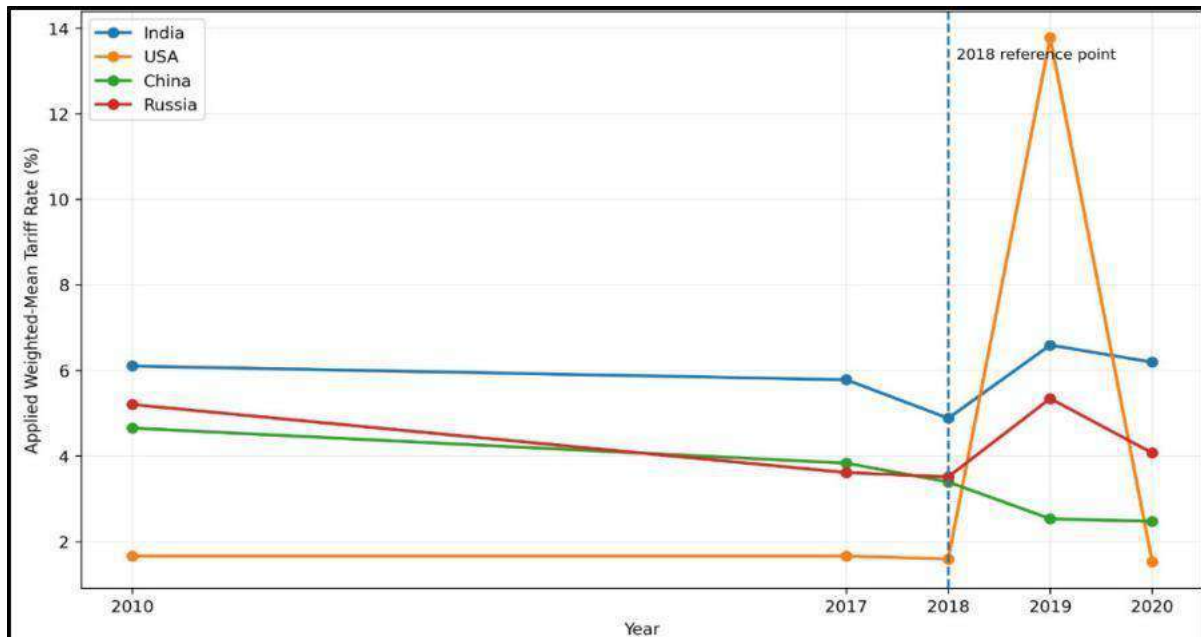
The table shows substantial growth in bilateral trade between 2000 and 2024 for India– USA, India–China, India–Russia and USA–China. In contrast, trade between the USA and Russia declined during the same period.

Analysis and Interpretation

The results show that bilateral trade patterns changed considerably between 2000 and 2024. The largest percentage increase was observed for India–China, followed by India–Russia and USA–China. However, these changes cannot be attributed solely to FTAs or RTAs, as the selected country pairs do not have bilateral FTAs/RTAs in force during the comparison period. Other factors, including economic growth, trade policies, global demand and geopolitical conditions, may also have influenced the observed trade patterns.

7.4 Tariff Trends Pre- and Post-2018

Figure 2: tariff trends pre-and post2018



X-axis: Year



Y-axis: Applied Weighted-Mean Tariff Rate (%) Countries: India, USA, China and Russia
Reference year: 2018

*Source: World Bank/WITS, based on UNCTAD TRAINS and WTO tariff data. The World Bank defines the applied weighted-mean tariff as the average of effectively applied tariff rates weighted by corresponding import shares.

Description

Figure 2 compares tariff trends for India, the USA, China and Russia around the 2018 reference point. The figure shows that tariff movements differed across the four countries rather than following a common pattern.

Analysis and Interpretation

The figure shows a notable increase in the U.S. applied weighted-mean tariff rate from 1.59% in 2018 to 13.78% in 2019, while India's rate increased from 4.88% to 6.59% and Russia's from 3.51% to 5.34%. In contrast, China's rate declined from 3.39% in 2018 to 2.53% in 2019. The differences indicate that the post-2018 tariff environment varied across countries rather than representing a uniform increase in tariffs.

8. FINDINGS OR DISCUSSION

The results of the empirical analysis show several important findings concerning the factors that determine bilateral trade, the effectiveness of formal trade agreements, and the tariff policies. These findings are set out below in accordance with the main research objectives of the study.

8.1 The Quality of Institutions and Political Barriers

(Addressing Objective 1: Institutional Quality & Trade)

The bilateral relationship between the United States and Russia showed a sharp decrease in actual trade volumes even though its Gravity Index was higher from a mathematical point of view. This difference shows that the theoretical trade potential is greatly affected by a country's geopolitical situation, the quality of its institutions, and its domestic policies, these acting as definite barriers to the realization of trade.



8.2 Bilateral Trade Growth in the Absence of FTAs/RTAs

(Addressing Objective 2: the impact of the WTO compared to FTAs/RTAs)

The results of WTO membership are inconsistent since joining it did not lead uniformly to an increase in trade openness. Although India saw a significant rise in its trade-to-GDP ratio after becoming a member, both China and Russia experienced a decrease in this ratio following their accession. This indicates that the advantages of being a member of an institution depend greatly on there being accompanying domestic reforms and on the elimination of hidden structural obstacles.

The data shows that huge increases in bilateral trade are entirely possible without there being any formal Free Trade Agreements (FTAs) or Regional Trade Agreements (RTAs).

Country Pair	Status of FTA	Trade Growth (2000–2024)
India & China	NONE IN FORCE	+ 5,796.6%
USA & China	NONE IN FORCE	+ 879.2%

8.3 The gravity model, economic growth and trade volumes

(Addressing Objective 3: Trade Volumes and Economic Growth)

The analysis used the Gravity Model of international trade to assess the mathematical possibility of bilateral trade. For the country pairs examined—India, the USA, China, and Russia—the Gravity Index increased considerably between the years 2000 and 2024. This rise was naturally due to the huge expansion in GDP among these countries, which confirms the idea that large economies tend to have a high theoretical trade potential.

8.4 Tariff volatility and trade policy uncertainty (Addressing Objective 4: Impact of Rising Tariffs)



An analysis of the weighted-mean tariffs from 2010 to 2020 showed that the rise of global protectionism after 2018 was highly asymmetrical, as the data for the period 2018–2019 made it clear that tariff trends sharply differed among the major players in the global economy.

COUNTRY	Applied Weighted-Mean Tariff (2018)	Applied Weighted-Mean Tariff (2019)	Trend
United States	1.59%	13.78%	Sharp Increase
China	3.39%	2.53%	Decline

The evidence shows that when tariffs are volatile, multinational companies move their production to developing countries (such as India, Vietnam, and Mexico), as a result of which global value chains are shifted and reorganized.

8.5 Key insight

Modern global trade today is increasingly shaped not just by tariffs and agreements on paper, but by institutional strength, geopolitical stability, and global supply chains.

9. CONCLUSION

The study demonstrates that international trade is shaped by far more than trade agreements all alone. While the Gravity Model remains a useful predictor of theoretical trade potential, real-world outcomes are significantly influenced by institutional quality, political barriers and domestic policies illustrated clearly by USA-Russia case, where a high Gravity Index failed to translate into actual trade growth. The mixed results of WTO membership highlight that formal institutions also are insufficient without accompanying reforms, as seen in India's rising trade



to GDP ratio after accession compared with the declines recorded by China and Russia. At the same time, the extraordinary growth in trade between countries without FTAs in force such as India-China's 5796.6% increase underscores the importance of market-driven dynamics that operate independently of formal agreements.

Moreover, the volatility of tariffs in recent years has shown that protectionist measures tend to redirect rather than diminish trade, leading to a reorganization of global value chains. This underscores the need for modern trade agreements to evolve beyond tariff reduction and embrace "deep" integration—addressing non-tariff barriers, digital trade, investment frameworks, promoting cross-border investment, and supply-chain resilience.

In essence, the findings reveal that the future of global trade will depend less on traditional agreements and more on the adaptability of institutions, the stability of policies, and the capacity of economies to integrate across multiple dimensions of globalization.

10. POLICY RECOMMENDATION

1. Strengthen Institutions and Governance

More transparency, eliminate political red tape, simplify regulation, anti-corruption measures to unlock trade potential. Promote diplomatic confidence-building measures to reduce political risk in trade. This is supported by the USA–Russia case, where a high Gravity Index did not translate into actual trade growth due to institutional and geopolitical barriers.

2. Rethink the role of WTO-membership

WTO should be paired with domestic reforms to maximize benefits. Push for WTO modernization to address non-tariff barriers and digital trade. This follows the finding that China's and Russia's trade to GDP ratios declined despite WTO accession, while India's rose significantly over the same period.

3. Manage trade volatility and trade policy uncertainty

Adopt mechanisms to stabilize tariff policies and reduce uncertainty. Encourage multinational firms to diversify supply chains across developing economies (India, Vietnam, Mexico).

4. Enhance global value chain resilience



Countries should incentivize investment in logistics and infrastructure in developing nations to strengthen their role in global supply chains. This reflects the observed shift of production to Vietnam, Mexico, and India following U.S.-China tariff escalation after 2018

5. Move towards comprehensive agreements

Trade agreements should move beyond tariff cuts to include digital trade frameworks, investment protections, and supply-chain resilience clauses. This is supported by strong bilateral trade growth even without formal FTAs/RTAs India–China trade grew 5,796.6% between 2000 and 2024 suggesting future agreements should formalize these market-driven gains rather than rely on organic growth alone.

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