

Does APEC Facilitate Bilateral Trade? Evidence from Gravity Model Estimation

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Abstract

Trade agreements and regional forums such as the Asia-Pacific Economic Cooperation (APEC) and Free Trade Agreements (FTAs) are key instruments in promoting trade liberalization, though their effectiveness in enhancing bilateral trade flows remains contested. Unlike FTAs, which are legally binding and involve tariff and non-tariff reductions, APEC is a non-binding forum that facilitates trade through policy harmonization, cost reduction, and improved connectivity. This study evaluates the impact of APEC and FTAs on bilateral trade using the gravity model with Poisson Pseudo-Maximum Likelihood (PPML) estimation, complemented by Pooled OLS for comparison. The results show that APEC membership has a broader and more consistent positive effect on bilateral trade than FTAs, despite the latter's binding nature. Geographic distance remains a significant barrier, while exchange-rate fluctuations are largely insignificant. The findings highlight that APEC's effectiveness is shaped not only by institutional design but also by structural and domestic factors, underscoring the need for adaptive trade policies tailored to country-specific contexts.

Keywords: APEC, Bilateral Trade, Gravity Model.

INTRODUCTION

Over the past decades, regional economic integration has emerged as a salient feature of the global trade landscape. This process reflects closer interactions among economies through systematic arrangements grounded in international division of labor and shared economic interests (Rosca & Trifonova, 2025). Such integration not only stimulates intra-regional trade growth but also strengthens the global standing of regions, Asia, for example, has become increasingly prominent in world markets (Vidya et al., 2020). Moreover, the dynamics of global trade networks are now more strongly shaped by regional powers and strategic alliances, with multilateral frameworks such as the APEC serving as important platforms to support trade and investment liberalization (Kang et al., 2024). Nevertheless, the success of integration faces significant challenges, including policy misalignment and the complexity of intra-regional connectivity, which are exacerbated by shifting global geopolitics (Feng et al., 2024).

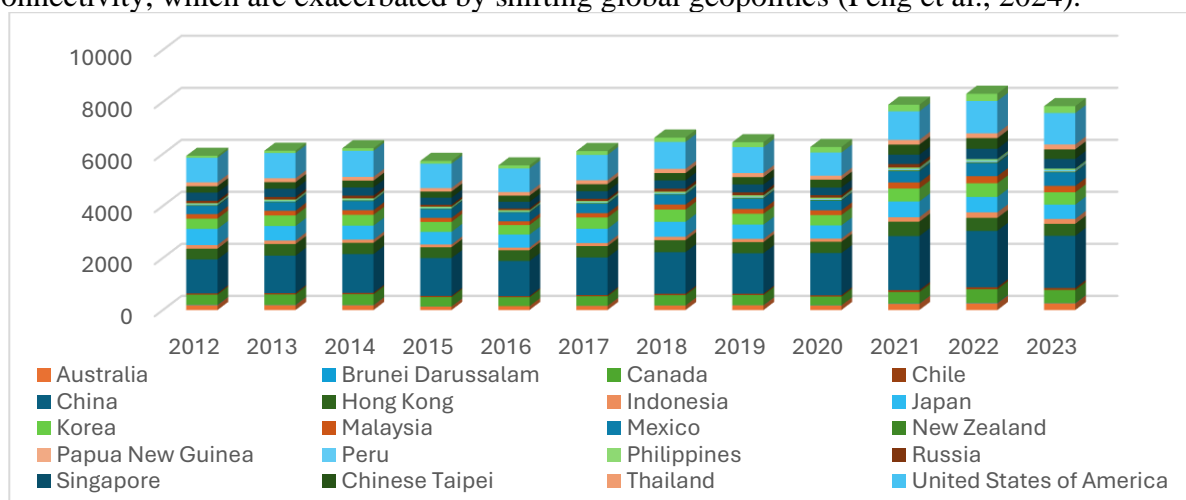


Figure1. Total Exports Among APEC Member Countries, 2012–2023 (Billion USD)

Source: International Trade Centre, processed by author, 2026

APEC was established as a strategic forum to promote trade liberalization and economic integration across the Asia-Pacific. With an emphasis on freer trade, APEC advances trade facilitation by lowering transaction costs, harmonizing policies, and removing administrative barriers that often impede international trade flows (Canton, 2021; Shepherd, 2016). Through an open regionalism approach, APEC seeks to ensure that the benefits of liberalization extend beyond members to trading partners outside the forum (Stenberg & Siriwardana, 2015). This strategy encompasses initiatives such as the adoption of electronic documentation and common standards, which have improved the efficiency of cross-border supply chains (Canton, 2021). In addition, APEC provides a flexible framework for promoting economic openness without compromising national sovereignty, making it a distinctive platform that brings together advanced and developing economies with a shared objective of strengthening regional connectivity (Matsumura, 2021; Xu et al., 2023). However, APEC’s voluntary approach is often viewed as a weakness given the diverse political and economic preferences of its members, which can limit the effectiveness of comprehensive policy implementation (Solís & Wilson, 2017).

As an overview of intra-APEC export trends over the last decade, Figure 1 illustrates heterogeneous dynamics among APEC members. Large economies such as China, the United States, and Japan continue to dominate, notably with sharp increases in 2021–2022 that reflect post-pandemic recovery. Emerging economies like Vietnam and the Philippines show steady export growth, while Indonesia and other developing members exhibit year-to-year fluctuations. It should be noted that export data for Papua New Guinea (2013–2018) and Russia (2022–2023) are unavailable, so the analysis does not cover the full time span for those countries. These trends reveal disparities in economic capacity across APEC members, shaping the patterns of intra-regional trade.

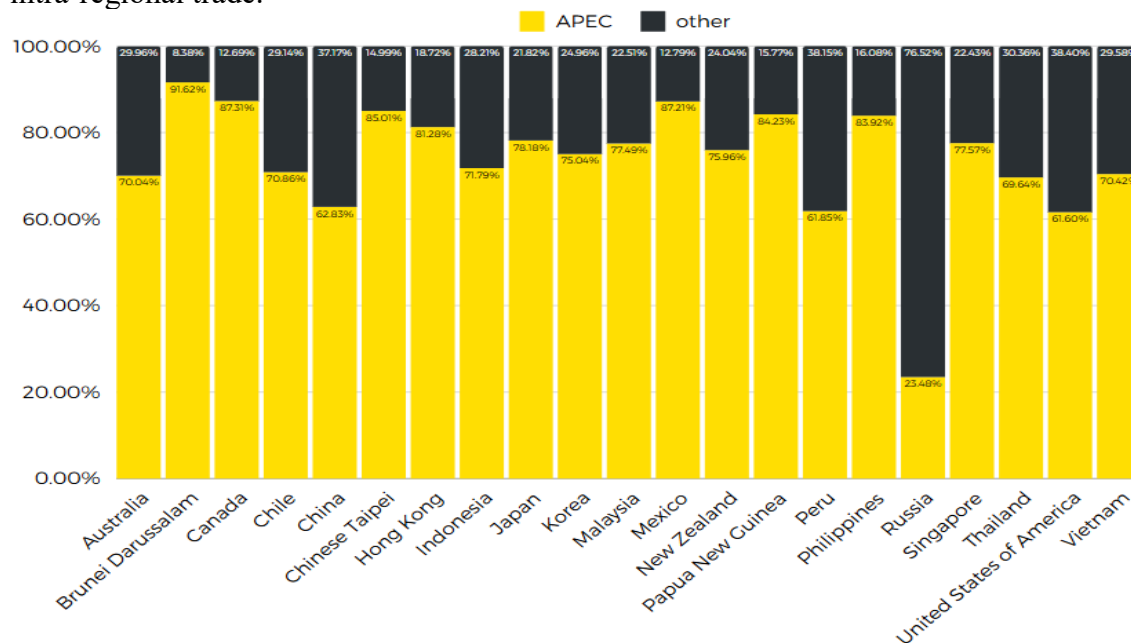


Figure2. Distribution of Intra-APEC Export Shares, 2012–2023

Source: International Trade Centre, processed by author, 2026

Figure 2 presents the share of each APEC member’s exports to fellow APEC countries as a percentage of their total global exports, offering insight into intra-regional trade linkages. The average share of intra-APEC exports varies considerably across members. Countries such as Brunei Darussalam and the Philippines record more than 80% of their exports destined for other APEC members, indicating strong regional dependence. By contrast, Russia allocates only 23.48% of its exports to APEC markets, with a dominant orientation toward non-regional markets. Indonesia occupies a middle position with 71.79%, reflecting substantial regional ties

while maintaining global market diversification. These patterns indicate varying degrees of trade integration that likely mirror differences in economic capacity and national trade strategies (see Appendix 1 for details).

Although APEC is recognized as one of the world's largest economic forums, its effectiveness is frequently questioned due to structural and geopolitical factors. APEC's flexible, voluntary design, while allowing adaptability among members, is often criticized for lacking binding regulatory mechanisms. This results in inconsistent policy outcomes and fragmented interests among members (Solís & Wilson, 2017). The proliferation of bilateral and mega-regional agreements in the Asia-Pacific has also produced overlapping commitments, often described as the "noodle bowl" problem, which complicates the regional trade architecture (Solís & Wilson, 2017). Another major challenge is the geopolitical rivalry between the United States and China, which undermines collective leadership within APEC and further fragments regional integration efforts (Feng et al., 2024). Furthermore, despite APEC's liberalization agenda, developing members frequently struggle to capitalize on these opportunities because of limited domestic capacity, restricted access to technology, and weak industrial competitiveness (Cipollina, 2022). The combination of these factors raises doubts about whether APEC can fully realize its mission as an inclusive and effective catalyst for trade in the Asia-Pacific.

In measuring bilateral trade between countries, the gravity model is particularly relevant because it links variables such as economic size and geographic distance to bilateral trade flows, while accounting for multilateral resistance to avoid estimation bias (Anderson & van Wincoop, 2003, cited in Capoani, 2024). In relation to regional economic cooperation, New Regionalism theory offers a perspective on how globalization fosters the creation of regional institutions that reduce trade barriers and facilitate economic integration among member states (Hettne & Söderbaum, 1998, cited in Börzel, 2016). To understand the concentration of economic activity within particular regions, New Economic Geography explains agglomeration mechanisms that arise from reduced transaction costs and improved market access through regional market integration such as that promoted by APEC (Krugman, 1991, cited in Gaspar, 2020).

Previous studies have extensively explored the role of regional economic cooperation organizations, including APEC, in facilitating bilateral trade using gravity models. Emikönel, (2022) analyzed China's trade with 97 countries and found that APEC membership was significant in static models, but results were less robust in dynamic specifications, suggesting that APEC's influence may depend on methodological choices. Matsumura (2021) emphasized that APEC membership significantly increased trade in environmental goods, particularly for certain advanced and developing economies, though the sectoral focus limits generalizability. These studies underscore the relevance of organizations like APEC in strengthening regional trade, even if findings are often sector-specific or context-dependent. Additionally, Xu et al. (2023) show that technical efficiency in agricultural exports among APEC countries remains low, despite the potential of APEC membership to expand market access.

Studies on other economic cooperation organizations also offer relevant perspectives for international trade. Stender et al. (2021) evaluate the effects of Economic Partnership Agreements (EPAs) between the European Union and ACP countries, finding that these agreements increase imports but do not significantly boost exports from developing countries. Cipollina (2022) highlights correlations between intensive and extensive margins under the EU-SADC agreement, revealing substantial variation across countries and sectors. In the Asian regional context, Gharleghi & Shafiqhi (2020) show that intra-bloc trade rose significantly under agreements such as AFTA and APTA, while extra-bloc trade produced mixed results. These findings underscore that the effectiveness of economic cooperation depends heavily on inter-country dynamics, product composition, and sectoral coverage, providing important background for assessing APEC's role in facilitating bilateral trade.

Although several prior studies have examined APEC's role in international trade, most are limited to sectoral or product-specific contexts (Matsumura, 2021; Vu et al., 2020) or focus on particular countries such as China and Vietnam (Emikönel, 2022; Xu et al., 2023). Moreover, while APEC is frequently included as a variable in gravity models, its role often appears only as a control variable rather than being explored as a primary explanatory factor (Cipollina, 2022; Stender et al., 2021). These limitations point to the need for a more comprehensive and direct examination of how APEC membership affects bilateral trade among all its members. This study addresses that gap by presenting an analysis based on bilateral trade data using a theoretically straightforward yet rigorous gravity-model approach that focuses on core variables.

This paper contributes to the international trade literature by identifying the extent to which APEC membership influences bilateral trade patterns among its members. Through a focused empirical strategy, the article offers an initial assessment of APEC's effectiveness as a platform for regional economic integration. While acknowledging the limitations of the chosen model and variables, the findings aim to open avenues for more detailed follow-up research.

RESEARCH METHODS

The study uses bilateral trade data from APEC member countries (treatment group) and a set of non-APEC countries selected as a control group. The treatment group comprises 20 APEC economies: Australia, Brunei Darussalam, Canada, Chile, China, Hong Kong, Indonesia, Japan, South Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, Taiwan, Thailand, the United States, and Vietnam. The control group consists of 15 non-APEC countries chosen for their similarity in economic characteristics to APEC members, such as GDP size, trade openness, and economic structure, but which are not APEC members: Argentina, Bangladesh, Brazil, Colombia, India, Kenya, Nigeria, Oman, Poland, Saudi Arabia, South Africa, Sri Lanka, Switzerland, Turkey, and the United Arab Emirates. The control group selection aims to ensure a relevant comparison under the assumption that the primary systematic difference between the two groups is APEC membership, allowing a focused assessment of the institution's effect on bilateral trade.

This study employs the gravity model framework, which has been widely recognized in international trade research for its ability to explain bilateral trade flows based on economic size and geographic distance (Anderson & Van Wincoop, 2003). To estimate the model, two approaches are applied: Pooled Ordinary Least Squares (OLS) and Poisson Pseudo-Maximum Likelihood (PPML). Pooled OLS is included as a benchmark specification, but it is prone to bias in the presence of heteroskedasticity and zero trade flows. PPML, as recommended by (Santos Silva & Tenreyro, 2006), is considered more robust because it preserves the multiplicative structure of the gravity equation, accommodates zero trade values, and mitigates heteroskedasticity. Both estimators have limitations, including potential bias from unobserved variables and the implicit assumption of linear relationships among covariates in the OLS specification. By combining both estimators, the analysis ensures methodological rigor and allows for a comparative assessment of consistency and robustness across specifications.

Pooled OLS

$$\ln(\text{trade}_{ijt}) = \beta_0 + \beta_1 \cdot \text{apec}_{ij} + \beta_2 \cdot \text{fta}_{ij} + \beta_3 \cdot \ln(\text{gdp}_i) + \beta_4 \cdot \ln(\text{gdp}_j) + \beta_5 \cdot \ln(\text{ec_dist}_{ij}) + \beta_6 \cdot \ln(\text{geo_dist}_{ij}) + \beta_7 \cdot \text{beer}_{ij} + \beta_8 \cdot \text{covid}_{ij} + \epsilon_{ijt}$$

PPML

$$\text{trade}_{ijt} = \text{trade} [\beta_0 + \beta_1 \cdot \text{apec}_{ij} + \beta_2 \cdot \text{fta}_{ij} + \beta_3 \cdot \ln(\text{gdp}_i) + \beta_4 \cdot \ln(\text{gdp}_j) + \beta_5 \cdot \ln(\text{ec_dist}_{ij}) + \beta_6 \cdot \ln(\text{geo_dist}_{ij}) + \beta_7 \cdot \text{beer}_{ij} + \beta_8 \cdot \text{covid}_{ij}] + \epsilon_{ijt}$$

Table 1. Data and Sources

Variable	Definition	Unit	Source
Trade	Export value of goods (proxy by export values – mirrored assumption)	Thousand US dollars	International Trade Centre (2026)
APEC	Dummy = 1 if both countries are APEC members in year t; 0 otherwise	dummy	APEC (2026)
FTA	Dummy = 1 if both countries are bound by an FTA (bilateral or regional) with status In Force; 0 otherwise	dummy	World Trade Organization (2026)
GDP i	Economic size of exporter: real GDP	Million US dollars	World Bank (2026)
GDP j	Economic size of importer: real GDP	Million US dollars	World Bank (2026)
Economic Distance	Absolute difference in GDP per capita between exporter and importer	US dollars	World Bank (2026)
Geographic Distance	Geographic distance between exporter and importer	miles	Schetter (2022)
Exchange Rate	Bilateral Real Exchange Rate (BRER): exchange rate adjusted for relative price levels (CPI), relative to base year	Relative ratio (base year = 1)	United Nations Trade & Development (2026)
Covid	Dummy = 1 for years 2020, 2021, and 2022; 0 otherwise	dummy	Che et al. (2023)

The dependent variable Trade, measured by the value of goods exports using the mirroring assumption, is chosen in line with common practice in gravity-model studies of international trade.

Membership in economic blocs is captured by APEC and FTA, reflecting fundamentally different institutional commitments: APEC operates as a regional forum focused on trade facilitation without legally binding obligations, whereas FTAs entail concrete tariff and non-tariff liberalization. Including both variables allows testing how these distinct institutional forms affect trade flows.

From the country-characteristics perspective, GDP i and GDP j represent not only economic size but also purchasing power and production capacity. Economic Distance, defined as the difference in GDP per capita, proxies demand differentiation between countries and attempts to capture similarity in consumption preferences.

Geographic frictions are proxied by Geographic Distance, which relates to transportation costs and logistical efficiency. The Exchange Rate variable (Bilateral Real Exchange Rate) is included to capture exchange-rate volatility that can create price advantages or increase trade uncertainty. Finally, the Covid dummy accounts for pandemic-related disruptions to trade activity during 2020–2022, reflecting an important external shock in the sample period

RESULTS AND DISCUSSION

Results

To provide an initial overview of the characteristics of the data used in this study, a descriptive statistical analysis was conducted on the main variables. The following table presents the number of observations, mean values, standard deviations, minimum values, and maximum values for each variable.

Table 2. Descriptive Statistics

Variabel	Obs	Mean	Std. dev.	Min	Max
eks (Trade, million USD)	25,077	5.78	25.20	0.00	583.00
apec (dummy)	25,200	0.333	0.471	0	1
fta (dummy)	25,200	0.189	0.391	0	1
gdp_i (trillion USD)	25,200	1.43	3.40	0.01	22.10
gdp_j (trillion USD)	25,200	1.43	3.40	0.01	22.10
diff_gdp_cap (USD)	25,200	21,829.10	19,739.39	0.26	97,968.07
dist (km)	25,200	8,970.37	5,031.88	301.08	19,630.07
beer (BRER, index)	25,200	313.26	2,051.66	0.00001	55,418.58
covid (dummy)	25,200	0.15	0.35708	0	1

Source: data processed by the author, 2026

The descriptive statistics in Table 2 indicate substantial variability in export values, with a mean of USD 5.78 million and a much larger standard deviation (USD 25.2 million), reflecting a highly uneven distribution across country pairs. The share of country pairs that are both APEC members reaches 33.3%, while only 18.9% of the sample are bound by an active FTA. The average GDP of exporters and importers is around USD 1.43 trillion, but with a very wide range, indicating large economic disparities across countries. The difference in GDP per capita between partners shows a substantial income gap (USD 21,829). The average geographic distance is 8,970 km, with the closest pair at 301 km and the farthest at 19,630 km. The exchange-rate variable exhibits high volatility.

To evaluate the correlation between APEC membership and bilateral trade, this study employs two estimation methods: Pooled OLS and PPML. The table below presents the estimation results from both methods.

Table 3. Estimation Results: Pooled OLS and PPML Models

Pooled OLS								
	APEC	FTA	GDP i	GDP j	Economic Distance	Geographic Distance	Exchange Rate	Covid
APEC	1.799 (.044)***	1.314 (.045)** *	1.147 (.039)** *	.995 (.032)** *	.986 (.032)** *	.648 (.028)***	.648 (.028)** *	.643 (.028)*** *
FTA		2.025 (.041)** *	1.617 (.037)** *	1.243 (.030)** *	1.243 (.030)** *	.538 (.025)***	.539 (.025)** *	.556 (.025)*** *
GDP i			1.163 (.013)** *	1.190 (.011)** *	1.186 (.012)** *	1.254 (.010)***	1.253 (.010)** *	1.255 (.010)*** *
GDP j				1.036 (.010)** *	1.032 (.010)** *	1.099 (.010)***	1.099 (.010)** *	1.101 (.010)*** *
Economic Distance					.045 (.010)** *	.072 (.009)***	.073 (.009)** *	.074 (.009)*** *
Geographic Distance						-1.441 (.017)***	-1.441 (.016)** *	-1.440 (.016)*** *
Exchange Rate							-.005 (.003)	-.005 (.003)***
Covid								-.162 (.034)***

PPML								
	M.1	M.2	M.3	M.4				
Cons	12.026 (.025)***	11.804 (.025)** *	-19.242 (.358)** *	-47.626 (.441)** *	-47.824 (.441)** *	-38.659 (.376)***	-38.659 (.376)** *	-38.760 (.377)***
Obs	25,077	25,077	25,077	25,077	25,077	25,077	25,077	25,077
Prop F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R Squared	0.0642	0.116	0.375	0.580	0.581	0.670	0.670	0.671
Root MSE	3.241	3.151	2.649	2.170	2.169	1.924	1.924	1.923
APEC	.723 (.093)***	.786 (.095)***						
FTA	.282 (.124)**				.407 (.126)***			
APEC x FTA								.699 (.104)***
GDP i	.704 (.044)***	.692 (.046)***			.764 (.048)***			.715 (.048)***
GDP j	.719 (.047)***	.707 (.050)***			.778 (.051)***			.730 (.051)***
Economic Distance	.089 (.045)**	.083 (.043)*			.101 (.046)**			.087 (.043)**
Geographi c Distance	-.940 (.080)***	-.951 (.084)***			-1.055 (.082)***			-.963 (.087)***
Exchange Rate	.007 (.013)	.007 (.013)			.008 (.014)			.007 (.014)
Covid	-.063 (.043)	.023 (.024)			-.123 (.044)***			-.004 (.024)
Cons	-16.985 (1.742)***	-16.142 (1.819)***			-19.043 (1.979)***			-17.370 (1.817)***
Obs	25,077	25,077			25,077			25,077
Pseudo log- likelihood	-50.544.100.000	-51.699.400.000			-56.312.300.000			-53.800.200.000
R Squared	0.824	0.820			0.804			0.813

Source: data processed by the author, 2026

The estimation results from Pooled OLS and PPML reveal various dynamics affecting bilateral trade between countries. First, regarding model fit, the Pooled OLS results show an increase in R-squared from 0.064 in the baseline specification to 0.671 in the full model, indicating a substantial rise in the explanatory power of the independent variables for bilateral trade variation. However, the relatively high RMSE (1.923 in the full model) suggests potential misspecification or persistent heteroskedasticity in the OLS specification. In contrast, the PPML estimation exhibits a substantial improvement in the pseudo log-likelihood from the simpler model (–56.3 billion) to the fully specified model (–50.5 billion), with a pseudo R-squared reaching 0.824, indicating that the model increasingly captures nonlinear relationships in the data. Overall, the higher pseudo R-squared for PPML compared with the OLS R-squared suggests that PPML is better suited to capture bilateral trade patterns, particularly given the presence of zero flows and a strongly right-skewed distribution.

In the PPML baseline (M.1), both APEC membership and participation in FTAs significantly increase bilateral trade. The APEC coefficient of 0.723, statistically highly significant, indicates that trade between pairs of APEC members tends to be higher than trade between non-APEC pairs, reflecting APEC's role as an effective trade-facilitation forum despite its non-binding nature.

A notable finding is that the FTA coefficient is only 0.282, smaller than the APEC coefficient. Theoretically, FTAs would be expected to show a larger effect because they involve formal, binding commitments such as tariff and non-tariff barrier reductions. This discrepancy suggests that APEC membership may confer additional bilateral trade advantages beyond formal agreements, possibly through mechanisms such as policy harmonization and enhanced market confidence.

In PPML specification M.4, where APEC and FTA are combined via an interaction term (APEC \times FTA), the association with bilateral trade remains significant with a coefficient of 0.699. This indicates that countries engaged in both arrangements obtain incremental benefits, although the magnitude is not markedly different from the specification that includes APEC alone.

As expected, exporter GDP (GDP_i) and importer GDP (GDP_j) contribute positively to bilateral export values across all models. In PPML M.1, a 1% increase in exporter GDP is associated with a 0.704% increase in exports, while a 1% increase in importer GDP raises exports by 0.719%. These results align with gravity-model theory, which predicts larger trade volumes for economies with greater economic mass.

Economic distance is also found to have a positive effect, albeit with lower statistical significance. In PPML M.1 the coefficient is 0.089, suggesting that greater differences in GDP per capita between partners are associated with higher trade likelihood, supporting the hypothesis that trade between countries with differing income levels is driven by production specialization and comparative advantage.

Geographic distance consistently shows a significant negative effect on bilateral trade. The coefficient of -0.940 in PPML M.1 confirms that greater physical distance between countries reduces trade volumes, reflecting higher transportation costs and logistical barriers for geographically distant partners.

The bilateral exchange-rate variable does not show a significant correlation in the PPML models, indicating that exchange-rate fluctuations do not play a major role in bilateral trade within this sample. This may be due to exporters' hedging strategies and the relative price inelasticity of certain traded goods.

The COVID-19 pandemic's effect also varies across models. In PPML M.1 the coefficient for the pandemic dummy is -0.063 but not statistically significant. This result indicates that, although the pandemic correlated with global trade disruptions, its association in this model is not strong enough to produce a statistically significant aggregate reduction in bilateral export values. Across PPML specifications, the APEC coefficient tends to be larger than the FTA coefficient. While this finding suggests that APEC membership may contribute to higher bilateral trade, it should not be interpreted straightforwardly without considering other factors that may influence the estimates.

One possibility is that APEC members generally exhibit greater trade openness and deeper integration into global trade networks than countries that participate only in specific FTAs. This could bias the estimates because the APEC effect may partly reflect characteristics inherent to member countries, such as institutional capacity, trade infrastructure, or historical economic proximity, that are not fully captured by the model. Thus, the larger APEC coefficient in these specifications may not solely indicate APEC's institutional effectiveness but also unobserved structural factors.

Moreover, results from Model M.4, which tests the interaction between APEC and FTA, show that when two countries are both APEC members and bound by an active FTA, the association with bilateral trade remains significant. This can be interpreted to mean that APEC's presence cannot be entirely disentangled from other dimensions affecting bilateral trade. While APEC may contribute to reducing non-tariff barriers and broad trade facilitation, the effect of an

FTA is more specific and depends on the agreement's content, its sectoral coverage, implementation mechanisms, and the depth of tariff preferences granted.

To further explore how APEC membership affects bilateral trade, a sub-analysis was conducted for five APEC members with distinct economic profiles: Indonesia, the Philippines, Vietnam, China, and the United States. These countries were selected to reflect variation in development level, roles in international trade, and strategic positions within APEC dynamics. The sub-analysis aims to identify differences in the correlation between APEC membership and trade across countries with diverse economic contexts. PPML estimation results for these country-level analyses are presented in the following table.

Table 4. PPML Estimation Results for Selected Countries

	Indonesia	Filipina	Vietnam	Tiongkok	AS
APEC	-.249 (.242)	.995 (.307)***	.175 (.251)	.629 (.225)***	.885 (.212)***
FTA	-.099 (.168)	.081 (.197)	.145 (.151)	.505 (.174)***	-.009 (.131)
GDP i	.833 (.066)***	.792 (.094)***	.866 (.104)***	.565 (.111)***	.766 (.103)***
GDP j	.949 (.095)***	.595 (.101)***	.944 (.115)***	.526 (.099)***	.761 (.098)***
Economic Distance	.161 (.058)***	.154 (.061)**	.286 (.059)***	.306 (.105)***	-.111 (.047)**
Geographic Distance	-1.638 (.216)***	-1.080 (.172)***	-1.098 (.211)***	-.698 (.200)***	-.992 (.074)***
Exchange Rate	-.008 (.013)	.009 (.041)	-.018 (.015)	.009 (.032)	.060 (.028)**
Covid	-.193 (.080)**	-.007 (.072)	.184 (.070)***	-.002 (.059)	.105 (.060)*
Cons	-21.271 (2.547)***	-16.35687 (4.166)***	27.624 (4.539)***	-11.435 (5.739)**	-17.548 (5.926)***
Obs	1,398	1,398	1,398	1,398	1,398
Pseudo log-likelihood	-950.396.620	-	-1.030.548.436	-13.582.800.000	-7.505.915.073
R Squared	0.839	0.8258	0.871	0.721	0.875

Source: data processed by the author, 2026

Table 4 reports the sub-analysis estimates, showing that the correlation between APEC membership and FTA participation with bilateral trade varies across countries. In the Philippines, China, and the United States, APEC membership is positively and significantly associated with higher trade, whereas in Indonesia and Vietnam the association is not significant. By contrast, the FTA effect is inconsistent, reaching significance only for China and remaining small or insignificant for the other countries. These findings suggest that, despite FTAs being legally binding, their effectiveness depends on additional factors such as implementation and non-tariff barriers.

GDP exhibits a strong positive effect in all countries, confirming that economic size remains a primary determinant of bilateral trade. However, income-elasticities are higher in developing economies such as Indonesia and Vietnam than in advanced economies like China and the United States, reflecting a greater dependence on growth dynamics. Economic distance has a positive effect, particularly in Vietnam and China, supporting trade theories based on factor-endowment differences. Conversely, geographic distance is negatively correlated with trade across all countries, underscoring the role of transportation costs as a trade impediment.

Although the models display relatively high explanatory power (R^2 ranges from 0.721 to 0.875), there remains potential bias due to data limitations and omitted variables. These results

indicate that, beyond APEC membership and FTAs, other structural factors also contribute to shaping bilateral trade dynamics.

Discussion

Regional economic integration, as facilitated by APEC and various FTAs, is a complex phenomenon that depends not only on institutional factors but also on the economic characteristics of individual countries. The results of this study show that the correlations between APEC and FTAs and bilateral trade are not uniform across member states. This is consistent with Matsumura (2021), who highlights that the effects of economic integration are often sectoral and context-dependent. In the cases of the Philippines and Vietnam, participation in APEC is associated with a significant increase in bilateral trade, reinforcing the New Economic Geography argument (Krugman, 1991 in Gaspar (2020)) that economic integration can generate agglomeration effects through complementary market needs.

However, the findings also indicate that APEC membership does not deliver the same benefits to all countries. For example, Indonesia does not show a significant positive correlation between APEC membership and its bilateral trade. This may be linked to domestic structural factors, such as logistical bottlenecks and policy uncertainty, which limit the gains from regional integration (Xu et al., 2023). By contrast, the United States and China derive greater benefits from APEC membership, reflecting Stender et al. (2021)'s observation that countries with larger economic capacities are better positioned to exploit opportunities offered by regional integration, as described by the asymmetry concept in New Regionalism (Hettne & Söderbaum, 1998 in Börzel 2016).

Further analysis that includes the interaction between APEC and FTAs shows that dual membership in both integration schemes is associated with a stronger correlation with bilateral trade than membership in either APEC or an FTA alone. This suggests that APEC's trade-facilitation mechanisms can be complementary to the preferential provisions of FTAs, supporting the argument that complementary forms of economic integration are more effective in promoting international trade.

Geographic distance remains a significant barrier across all models, confirming Vu et al. (2020)'s finding that physical factors continue to be a primary constraint on cross-border trade. Within the APEC context, these geographic frictions point to the need for increased investment in cross-border infrastructure and connectivity to fully realize the benefits of regional integration. Moreover, the mixed results for economic distance indicate that while differences in development levels can stimulate trade in some cases (e.g., the Philippines and Vietnam), regulatory barriers and market access constraints in advanced economies such as the United States remain important impediments.

This study also finds that the exchange-rate correlation with bilateral trade is not consistently significant across models, suggesting that other factors, such as macroeconomic stability and domestic monetary policy, may exert a stronger influence than exchange-rate volatility on trade flows in this sample. Meanwhile, the COVID-19 pandemic's correlation with bilateral trade varies across the countries analyzed, with significant negative effects in Indonesia and Vietnam but not in the United States and China. This indicates that trade resilience to external shocks depends heavily on each country's economic structure and supply-chain robustness.

Although this research contributes to understanding the determinants of bilateral trade under the APEC and FTA frameworks, several limitations should be noted. The study does not fully integrate institutional and regulatory dimensions that may play crucial roles in the effectiveness of regional trade agreements. In addition, the data coverage does not extend to the pre-APEC formation period, limiting the ability to assess long-run changes attributable to regional integration. Future research could address these limitations by incorporating non-economic variables, conducting sector-specific analyses, and using broader historical

datasets to gain deeper insights into bilateral trade dynamics within the context of regional economic integration.

CONCLUSION

This study demonstrates that the relationship between APEC membership, FTAs, and bilateral trade is complex and context-dependent. The empirical results consistently show that APEC membership exerts a broader and more significant positive effect on bilateral trade compared to FTAs, despite the latter being legally binding. This suggests that APEC's role as a facilitative forum, through policy harmonization, reduction of transaction costs, and improved connectivity, can be more influential than formal tariff commitments, particularly when supported by domestic structural capacity.

At the same time, the effect of FTAs is less consistent, highlighting that the legal framework alone does not guarantee trade expansion. Implementation quality, non-tariff barriers, and sectoral coverage remain decisive factors. The findings also reaffirm the importance of economic size (GDP) as a primary determinant of trade flows, while geographic distance continues to act as a significant barrier. The Covid-19 pandemic produced heterogeneous impacts, with stronger negative effects in developing economies, underscoring the vulnerability of supply chains and the need for resilience strategies.

From a policy perspective, governments should not view trade agreements as uniform instruments. Instead, they must identify domestic constraints, such as logistics, regulatory frameworks, and industrial competitiveness, that condition the effectiveness of participation in regional integration. Greater harmonization of trade policies and targeted measures to reduce non-tariff barriers are essential to maximize the benefits of liberalization.

Despite the high explanatory power of the models, limitations remain, particularly regarding omitted variable bias and data coverage. Future research should integrate institutional and regulatory dimensions, explore sector-specific dynamics, and employ broader historical datasets to provide a more comprehensive understanding of bilateral trade under regional integration frameworks.

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