

Analysis of the Determinants of International Trade of Countries in The Asia-Pacific Economic Region (APEC)

Muhamad Faiz Asnafi^a, Miftakhul Choiri^b

^{a b} UIN Sunan Kalijaga, Yogyakarta, West Java, Indonesia

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Abstract: International trade is the engine of growth for a country to increase its economic size. This study explores the determinants of trade flows between Asia-Pacific Economic Cooperation (APEC) member economies in the initial period of APEC formation in 1989 to 2020 using Newton's Universal Gravity theory approach. This study uses quantitative analysis method with the estimation technique used is Poisson Pseudo-Maximum Likelihood (PPML). This study uses ten independent variables: GDP of the home country and trading partner, geographical distance, population of the home country and trading partner, and several dummy variables including: common language, contiguous border, common colonial history, membership in the World Trade Organization (WTO), and regional trade agreement (RTA). The results show that trade flows between APEC economies are significantly influenced by GDP of home and trading partner countries, geographical distance, population of home and trading partner countries, and several dummy variables, including common language, contiguous borders, common colonial history, and membership in the WTO. Meanwhile, the Regional Trade Agreement (RTA) variable has no significant effect.

Keywords: *Trade Flows, Gravity Model, PPML, APEC*

Introduction

The economic growth of a country cannot be separated from the role of multinational trade carried out by a country. Salvatore (1994), illustrates international trade as an engine of growth for countries with high demand for goods due to population increase and lack of resources (Salvatore, 2013). So that international trade becomes the main destination for countries that have excess resources to be channeled and utilized better for countries with minimal resources (Amanda & Aslami, 2022).

Asia-Pacific Economic Cooperation (APEC) is a world economic integration forum with 21 member countries covering the Pacific Rim region that was established in 1989 with the main agreement objectives in strengthening economic growth, strengthening communities, and promoting free trade throughout the Asia-Pacific region. The agreement was prompted by the high intensity of transactions in the Asia-Pacific region which certainly did not deny the inevitable emergence of trans-Pacific tensions due to rapid structural changes and the resulting need to provide a secure regional trading environment so that a large influx of new entrants into the international economy could confidently commit to an internationally oriented development strategy. There is also a need to provide a more open alternative to the inward-looking sub-regional arrangements that gained greater legitimacy in the 1980s (Yamazawa et al., 2000).

In the past decade, total export flows between APEC members accounted for 46.6% of total exports in world trade. This makes the Pacific Rim region the region with the highest export flow value in the world with a record transaction in 2021 reaching 13.5 trillion USD which accounts for a total of 47%

*Corresponding Author

 muhammadfaiz142002@gmail.com (Asnafi).

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of the entire export value that occurs between world countries. The high intensity of exports in the Pacific Rim region raises a big question regarding what factors are able to make the swelling of trade flows between APEC member countries. Therefore, this study needs to be conducted to provide empirical evidence of the main factors supporting trade flows in the Pacific Rim region.

This study uses the gravity model approach initiated by Jan Tinbergen in 1962 and developed by Anderson & Wincoop (2003) where a large number of flows of goods and services supplied from the country of origin to the partner country are attracted according to the amount of demand in the partner country, but the flow is inversely proportional to the distance between the two with the possibility of other factors in the form of several dummy variables. This is as in the findings of Ambarita & Sirait (2020); Gulseven et al. (2023); Sabaruddin (2017); and Yuniarti (2007). But there is another view in Khayat (2019), which shows that the partner country's GDP variable has no significant effect and the findings of Contreras (2022) and Eprillia & Aisyah (2023) which show insignificant results from the distance variable on exports.

In theory, the similarity of language and ethnicity as well as the proximity of the region of the two countries as a dummy variable can provide convenience in conducting trade transactions that allow the high value of transactions between these countries (Anderson & Wincoop, 2003). However, this does not apply to the trade of several countries in the Asia-Pacific region, especially ASEAN countries, which tend to have language and ethnic similarities and have regional proximity between countries. As in 2018, where Indonesia exported 412 billion USD with the largest destinations to China (14.3%), Japan (10.3%), and India (7.4%). Therefore, this research is needed as a determinant of dummy factors that become determinants in trade between Asia-Pacific countries.

This study uses PPML estimation using data on bilateral trade flows between APEC member countries taken from export values published in UN Comtrade as the dependent variable. While the independent variables to be studied as factors that are expected to affect trade flows are the GDP variables of the home country and trading partners, geographical distance, population of the home country and trading partners, and several dummy variables based on language, borders, history of colonialism and integration and existing agreements in each member country. The time span of the data used in this study starts from the year the APEC forum was established in 1989 until 2020.

Literature Review

The application of the gravity model to economic patterns is actually an idea originally applied by Ravenstein (1889) in explaining the relationship between populations in two different regions which then resulted in the law of migration. Then in 1962, Jan Tinbergen adopted Newton's gravity model as a reference in determining the pattern of trade flows between supplier countries and their partners. Where a large number of flows of goods and services supplied from the country of origin to the partner country are attracted according to the amount of demand in the partner country, but the flow is inversely proportional to the distance between the two (Anderson, 2011; Baltagi et al., 2017; Salvatici, 2013). Later this theory was developed by Anderson & Wincoop (2003), with the finding that the gravity equation has success in linking international trade flows with GDP, distance, and other factors from dummy variables that can be in the form of country membership in multinational organizations, ethnic ties, language similarities, and international borders.

The findings of Ambarita & Sirait (2020); Contreras (2022); Gulseven et al. (2023); Sabaruddin (2017); and Yuniarti (2007) show a significant and positive relationship between the GDP variables of the home and partner countries on bilateral trade flows. However, in Khayat's (2019) research, the GDP variable of partner countries did not have a significant effect on trade flows.

Overall, studies that use the distance variable as an operational model in their research, harmoniously show significant and negative results on trade except in the research of Contreras (2022) and Eprillia & Aisyah (2023) which show the insignificance of this variable on exports.

*Corresponding Author

✉ muhammadfaiz142002@gmail.com (Asnafi).

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The population variables of the country of origin and trading partners according to Khayat (2019) have a significant and positive effect on bilateral trade flows. Meanwhile, according to Retnosari & Jayadi (2020) and Yuniarti (2007), only the partner country population variable has a significant effect on trade.

In the discussion of dummy variables in the form of language similarity, Contreras (2022) produced findings in the form of negative significance on trade flows. In contrast to Gulseven et al. (2023) which states insignificance. While Chafer et al. (2022) produced significant and positive findings. On the same border variable according to Chafer et al. (2022); Gulseven et al. (2023); and Olayele (2019), that the existence of a common border between two countries has a significant and positive effect on trade flows in contrast to the results of research from Contreras (2022) which states negative results.

Colonial history affects trade significantly and positively in the research of Chafer et al. (2022) and Sabaruddin (2017), but insignificant results were shown in the study of Gulseven et al. (2023). The relationship of involvement in WTO membership has a significant and positive effect on trade in the study of Chafer et al. (2022), but Contreras (2022) showed negative significance. Whereas in the RTA variable, Alleyne et al. (2020); Contreras (2022); Gulseven et al. (2023); Sabaruddin (2017); Suslov (2020); and Yang & Martinez-Zarzoso (2014) show significant and positive results on trade flows.

This study takes as its object all countries that are members of the Asia-Pacific Economic Cooperation (APEC) organization, which includes 20 countries in the Pacific Rim with the exception of Taiwan. This study uses a model that displays a combination of the main variables in previous studies. The dependent variable that is the reference in this study is the bilateral trade flow variable with reference to the value of bilateral exports. The independent variables that will be investigated as factors that are expected to affect trade flows are the GDP variables of the origin and trading partner countries, geographical distance, population of the origin and trading partner countries, and several dummy variables including language similarity, border intersection, common colonial history, membership in the WTO, and attachment to regional trade agreements (RTA).

Methodology

Quantitative analysis was used with the help of Stata.14 as a data processing tool. This study was conducted to determine the determinants of trade flows between countries in the Asia-Pacific economic region using the gravity model approach. The data used in this study were obtained from the CEPII data center, UN Comtrade, and the World Bank in the form of panel data which is a combination of cross section data covering 20 APEC membership countries and time series data taken over a period of thirty-two years starting from the establishment of APEC in 1989 until 2020.

This study uses the Poisson Pseudo-Maximum Likelihood (PPML) estimation method introduced by Silva & Tenreyro (2006) in testing trade patterns using the gravity model. According to Silva & Tenreyro (2006), heteroscedasticity and zero trade conditions are common problems that can lead to biased results, so it is necessary to use a method that can handle these problems. The use of the PPML method is recommended because of its good consistency when faced with heteroscedasticity and is able to deal naturally with the zero trade problem.

This study uses an operational model that includes dependent variables and independent variables. The dependent variable in this study is the bilateral trade flows that occur between APEC member countries. While the independent variables that will be studied as factors that are expected to affect trade flows are the GDP variables of the home country and trading partners, geographical distance, population of the home country and trading partners, and several dummy variables including language similarity, intersecting borders, common colonial history, membership in the WTO, and attachment to regional trade agreements (RTA). The equation model in this study is stated as follows:

$$TRADE_{ijt} = a_0 + a_1 \ln(PDB_{it}) + a_2 \ln(PDB_{jt}) + a_3 \ln(DIST_{ij}) + a_4 \ln(POP_{it}) + a_5 \ln(POP_{jt}) + a_6 COML_{ij} + a_7 CONT_{ij} + a_8 COL_{ij} + a_9 WTO_{it} + a_{10} RTA_{ijt} + \varepsilon_{ij}$$

Description:

TRADE = bilateral trade flows (×1000 US\$)

PDB = Real Gross Domestic Product (×1000 US\$)

DIST = geographic distance between countries that trade (Km)

POP = resident population (×1000)

COML	= dummy 1 if home and partner countries have the same language
CONT	= dummy 1 if home and partner countries have a common border
COL	= dummy 1 if home and partner countries have the same colonial history
WTO	= dummy 1 if the country of origin is a member of the WTO
RTA	= dummy 1 if origin and partner have an agreement in regional trade
ε	= variable error
i	= country of origin/exporter
j	= partner/importing country
t	= time/year of observation
$\alpha_0 - \alpha_{10}$	= coefficient of independent variable

Results and Discussion

The results of the gravity model equation are estimated using the PPML estimator by running regression. Based on 11,752 observations, the panel data results using the regression model for 20 APEC member economies are shown in Table 1.

Table 1. PPML Estimation Results

Variable	Coefficient	Std. Error	z
Cons_	-5,739036	0,4691559	0,000
lnPDB _i	0,5040714	0,014122	0,000
lnPDB _j	0,6179993	0,0175713	0,000
lnDIST	-0,4697374	0,0151531	0,000
lnPOP _i	0,1363105	0,0215243	0,000
lnPOP _j	0,0473498	0,0176828	0,007
COML	0,5037081	0,0311716	0,000
CONT	0,6162652	0,0453213	0,000
COL	1,540429	0,0859702	0,000
WTO	0,2704814	0,0486916	0,000
RTA	0,038953	0,0295352	0,187

Source: Research Estimation Results (2023)

The findings of the PPML estimator show similarity to the initial estimation of the study. Almost all coefficients from the estimator results show statistically significant values for the research variables in influencing trade flows between APEC member economies except for the RTA variable. Similarly, a negative coefficient is produced on the distance variable in table 1.

The GDP variable of the origin country has a coefficient of 0.5040714, which means that every increase in the GDP of the exporting country by 1000 US dollars, the export value will also increase by 0.5040714 thousand USD. The partner country GDP variable has a coefficient value of 0.6179993, which means that every increase in the GDP of the trading partner (importing) country by 1000 US dollars, the export value will also increase by 0.6179993 thousand USD. In the distance variable, the regression coefficient value shows a number of -0.4697374, which means that every increase in distance by 1 km, the export value will decrease by 0.4697374 thousand USD. In the variable population of the country of origin, the coefficient value is 0.1363105. This means that every increase in the population of the exporting country by 1000 people, the export value will also increase by 0.1363105 thousand USD. The partner country population variable has a regression coefficient of 0.0473498 or shows that every increase in the population of trading partner countries (importers) by 1000 people, the value of exports will also increase by 0.0473498 thousand USD.

The findings of the PPML estimator also show a similar relationship in the form of positive significance in the dummy factor which is in accordance with the findings in previous studies. In the

*Corresponding Author

 muhammadfaiz142002@gmail.com (Asnafi).

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language similarity variable, the regression coefficient value of 0.5037081 indicates that if the two partnering countries have the same language users in at least 9% of the total population ($d = 1$), then the export value between the two countries will increase by 0.5037081 thousand USD and if not ($d = 0$), then there will be no increase in export value assuming all variables are constant.

The same border variable has a coefficient value of 0.6162652 so that if the partnering countries have borders that intersect directly, the export value between the two countries will increase by 0.6162652 thousand USD. The colonial history similarity variable has a regression coefficient value of 1.540429 so that if the two partnering countries have in common the country that carried out colonialism against both of them before 1945, the export value between the two countries will increase by 1.540429 thousand USD. The variable membership in the WTO organization has a coefficient value of 0.2704814, which means that if the exporting country has membership status in the WTO organization, the value of exports between the two countries will increase by 0.2704814 thousand USD.

Finally, the coefficient of regional agreement (RTA) shows a number of 0.038953 but with a probability value of more than 5% alpha. This means that the RTA variable does not have a significant effect on trade flows between countries in the Asia-Pacific Economic Area (APEC).

Conclusion

This research study was conducted with the aim of analyzing the determinants of trade flows between countries in the Asia-Pacific Economic Area using the gravity model approach with PPML estimation tools as a solution to the problem of heteroscedasticity and zero value in the dependent variable.

The results show that trade flows between APEC economies are significantly influenced by GDP of home and trading partner countries, population of home and trading partner countries, and several dummy variables including: common language, intersecting borders, common colonial history, and membership in the WTO with a positive effect. And the geographical distance variable has a negative significance on trade flows between APEC members. While the Regional Trade Agreement (RTA) variable has no significant effect.

This study aims to determine the determinants of trade flows between APEC countries that are fixated on only a few member countries, some data also have limited availability such as the country of Taiwan which is still part of China. So it is necessary to expand the scope of data by adding several countries for consideration. The use of other variables such as the political state of the country and the monetary state of a country can be a further consideration for further research.

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*Corresponding Author

 muhammadfaiz142002@gmail.com (Asnafi).

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