
| RESEARCH ARTICLE

Philippines - ASEAN Trade Potential: An Application of Intra-ASEAN Augmented Gravity Model

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| ABSTRACT

ASEAN has made great progress toward economic unification and free trade in the area. With the objectives of creating a unified market, expanding intra-ASEAN trade and investment, and attracting foreign investment, ASEAN has been a cornerstone of the Philippines' diplomatic and commercial policies, which is evident in the Philippine policy of creating a more prosperous, secure, and free Southeast Asia through a variety of measures in politics, economics, international trade, and functional cooperation. The researchers revisit Jan Tinbergen's Gravity Theory by using the adjusted augmented gravity model in a panel data of bilateral trade flows between the Philippines and the ASEAN member countries from 1995 to 2019 at the national level using the Poisson-Pseudo Maximum Likelihood estimator and Ordinary Least Squares, both with fixed effects, in a model-comparison approach. Using the fitted trade values from the PPML estimates and the standardized real values of exports and imports of the trading countries through the index of Average Standardized Trade Potential, it was found that the bilateral trade between the Philippines and other ASEAN member countries has been efficiently performing over the past decades, except for Brunei Darussalam, Cambodia, Lao PDR, and Myanmar. Hence, a dynamic and more inclusive approach should be adopted by both the Philippines and its trading partners to reach the optimum bilateral trade potential in the nearest future.

| KEYWORDS

Gravity model; Philippines; ASEAN; international trade; free trade; ppml; international economics; trade potential; trade policy; gravity theory

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1. Introduction

The analysis of the relationship between foreign trade and economic growth dates back to the classic period of the 18th century when David Ricardo and Adam Smith claimed that trade had a widespread impact on the economy's positive growth. The idea of positive economic growth as a result of trade was based on the belief that trade resulted in a more significant accumulation of capital and technological innovation, which ultimately led to an increase in productivity. One thing that should be kept in mind is that economic growth has always existed throughout human history, even though the rate of growth has shifted from slow and erratic to a more rapid, dynamic, and continuous rate as a result of advanced developments in the industrial revolution.

One of the pillars of the Philippines' foreign and trade policies is ASEAN. This is reflected in the Philippines' policy of promoting a more prosperous, secure, and free Southeast Asia by pursuing various initiatives in policymaking, economics, trading, and functional cooperation. The Association of Southeast Asian Nations (ASEAN) is a regional organization that promotes economic, political, and security cooperation among its ten members, namely Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. ASEAN has made significant strides in regional economic integration and free trade. Established in 1992, the ASEAN Free Trade Area aims to establish a single market while increasing trade and investments within ASEAN and attracting foreign investment. Intra-ASEAN trade rose from about 19 percent of the bloc's overall trade in 1993 to 23 percent in 2017. More than 90% of products are exchanged without tariffs across the grouping. Electronics, automotive, rubber-based products, textiles and apparel, agro-based products, and tourism are among

the eleven sectors prioritized for integration by the bloc. Parallel to the multilateral process in which Philippine-ASEAN relations are conducted, there is also a strengthening of bilateral and trading links with fellow member states. The Philippines and Vietnam, for example, have elevated their bilateral relations to a strategic alliance. Given the previous lack of cooperation, the change in ties between the Philippines and Vietnam is noteworthy. Initially, this was because both countries were members of ASEAN and faced similar issues. As a result, the two countries' trade ties have strengthened and improved as well. In 2010, the Philippines ranked as the world's 37th largest exporter and 29th largest importer of products. Meanwhile, it ranked 27th among exporters and 36th among importers in the services trade. The Philippines' outward orientation aided the economy's adaptability to challenges but made it vulnerable to external shocks.

This study seeks explicitly to (1) assess the determinants of bilateral trade flows between Philippines and ASEAN countries, (2) examine the extent to which economic and political factors affect ASEAN trade at the national level, (3) assess the realization level of their trade potential over 1995 to 2019, and (4) provide suggestions for ASEAN policymakers to upgrade and expand their mutual trade activities in the future. This is conducted under the assumption that participating countries, namely Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, Thailand, and Vietnam, do not have economic and/or political conflicts specifically with the Philippines during the period used in the study. Another premise is that there is no other trade obstructing factors such as disease outbreaks, natural calamities, and unexpected domestic-implemented product controls present during the period.

This study focuses on the impacts of the determinants of bilateral trade flows between the Philippines and ASEAN countries. This also aims to examine the impacts of economic and political factors on ASEAN trade at the national level, as well as to assess the realization level of their trade potential over the periods 1995 to 2019 (excl. Brunei Darussalam (1995-2013), Cambodia (1995-1996), Lao PDR (1995), Myanmar (1995-2000)). The data on the ASEAN member countries, namely Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam, will be gathered from different international institutions and organizations such as the Philippine Statistics Authority, World Bank, CEPIL, MacroTrend Consulting LLC, Bangko Sentral ng Pilipinas, The Heritage Foundation, the Correlates of War Project, WTO, and ASEAN. This study does not cover observations from years before 1995 and years following 2019. Countries outside the ASEAN region are also excluded from this study.

2. Literature Review

2.1 Impact of International Trade on the Global Economy

In terms of growth theories, the flow of trade is vital in determining the rate of economic growth since trade allows for the advancement of technology in a region, which ends up playing a critical part in the production and competitive gains. This eventually promotes a specific economy's development and progress. However, some argue that economic growth and progress cannot be achieved solely through commerce and that other elements such as political stability, the extent to which the rule of law is enforced, population growth rate, and secondary and tertiary enrollment, among other crucial concerns, must be considered. All economies must embrace trade openness and international trade to keep up with current trade and technological developments, which will aid them in overcoming their obstacles, whether they are trade-related or not (Samue, 2019).

2.2 Policies and Factors Influencing the International Trade Patterns

The fundamental reasons for current shifts in international trade patterns are based on some issues. While some of the factors may have a short-term impact on international commerce and are cyclical, others are more likely to have a long-term impact and may be linked to trade structural developments (Samue, 2019).

2.2.1 Non-policy Factors

Commodity cycles and macroeconomic factors are two cyclical elements that have contributed to the current downturn of global trade. Massive transformations in global trade have also occurred as a result of recent international trade patterns. Value chains in the global market have also played a significant role in affecting world commerce during the last two decades. Government-implemented incentive schemes, as well as concerns about immigration, are all leading to a closer link between the production process and the consumers.

2.2.2 Policy Factors

The impact of government actions on international trade patterns has been abundantly visible. From a traditional view, protectionist policies have only been common and not broad enough to have a significant impact on the weakness of international trade. During the last decade, when tariffs were low, the number of trade policies expanded significantly, even if they had no clear objective on international commerce but had a significant impact on that same world trade. In general, international trade has become more regulated through a range of non-tariff measures. Although such policies are not protectionist, they are likely to have a significant impact on global trade, both in terms of diversion effects and trade costs (Samue, 2019).

2.3 Consumer Benefits of Trade

International trade is one of the reasons for the decrease in the price of consumer goods, and the gain to importing countries' customers is one of the reasons for this. Depending on one's ability level and the impacted industry's exposure to foreign trade, one's income and earnings may be reduced. International trade may also be blamed for a decrease in real wages in some sectors, resulting in a loss of income for a certain portion of the population. Cheaper imports, on the other hand, may account for a fall in domestic consumer prices, which may have a greater impact on wages than any other factor. When examining the effects of trade on the household sector, both as consumers and as producers, legislators or policymakers should take these factors into account (Marchand, 2017).

Trade can bring lower pricing and more choice to consumers due to a wider range of goods and services available and more competition. Businesses will expand if trade obstacles are lowered, resulting in the opening of new markets for local and domestic industries. Through trading experience, technology, and research and development investment, trade may bring together higher and better innovation. Consumers will be able to purchase things at a lower cost if trade restrictions are removed in general. Furthermore, tariffs take a disproportionately larger amount from those with lower incomes, whereas unrestricted consumption taxes take a proportionately larger amount from those with higher incomes (Nieminen et al., 2017).

2.4 Restrictions and Losses of Trade

According to Adam Smith's *Discovery of Trade Gravity*, the degree of trade barriers and limitations are related to the size of the competitor's country and their proximity. Borders, in terms of political factors, are stated to have a clear impact and influence on the volume of imports that enter a country and the number of exports that leave the country. Politics always could affect international trade (Elmslie, 2018). The increasing quantity of imports and the increasing negative value of the balance of trade commerce, particularly in an international setting, may pose a risk of job loss, resulting in a massive increase in unemployment (Mohler et al., 2018). If unemployment continues to rise, income will decrease, resulting in lower purchasing power and, as a result, lower consumption.

2.5 Association of Southeast Asian Nations (ASEAN)

According to Thompson and Chong (2020), ASEAN countries vary in size, culture, language, historical heritage, and ethnic composition. Due to the lack of a shared cultural and political history to serve as a foundation for regionalism, ASEAN established a set of values and standards to govern inter-state relations within the ASEAN community. ASEAN was established as a vehicle for fostering trust among its members, not as a dispute-resolution forum. ASEAN has been able to lessen interstate conflict in the past thanks to its adherence to the values of consensus, non-interference, and peaceful dispute resolution. Its numerous meetings and social events promote interpersonal trust, allowing for the resolution of several problems without the use of formal judicial processes. On the other hand, this concentration prohibits it from successfully intervening in intrastate disputes that are deemed domestic problems. It's also unprepared to deal with interstate conflicts that cannot be settled during discussions. ASEAN is under pressure to restructure its system and culture due to shifting security dynamics and the impact of other parties in the area, particularly China and the United States. One of the most critical problems to evaluate, given the new challenges posed by growing US-China rivalry, is the continued relevance and feasibility of ASEAN's consensus-based decision-making paradigm.

2.5.1 The ASEAN Economic Community and East Asian Agenda

Economic growth is achieved through international commerce and foreign direct investment (FDI), which allows for a more efficient division of labor, more productive resource allocation, and increased productivity through competition. In the study of Tangkitvanich and Rattanakhamfu (2019), East Asia has a high degree of economic integration: intra-regional trade accounts for nearly half of all trade (47.2 percent) and more than half of all external FDI (53.9 percent). North-East Asia and South-East Asia, East Asia's two sub-regions, are closely linked via commerce and direct investment. In a wider sense, East Asia's intra-regional trade (as a percentage of total regional trade) is lower than that of the European Union but higher than that of North America (the US and Canada). East Asia's intra-regional trade strength index was 1.66 in 2015, lower than the EU (1.98) and North America (1.91) (1.78). This is due to two significant facts.

First, East Asia not only trades within its own country but also maintains close international ties. While East Asia's intra-regional trade share increased marginally from 45.0 to 47.2 percent between 1995 and 2015, the region retains close trade ties with the rest of the world through the triangular trade system, in which manufacturing takes place within the region, but final products are exported out of the region (Tangkitvanich & Rattanakhamfu, 2019).

Second, lowering trade barriers within East Asia would free up more room for intra-regional trade expansion. Without more progress on trade liberalization through the World Trade Organization, the only way to broaden international trade is through

unilateral, bilateral, or regional action with other regional countries. East Asia is still in the early stages of developing free trade agreements (FTAs), so intra-regional trade expansion has a lot of potentials (Tangkitvanich & Rattanakhmfu, 2019).

2.5.2 Asean Free Trade Area (AFTA)

One of ASEAN's objectives is to expand its member states' trading prospects. Importation, on the other hand, might be costly for some registered importers in the region if the commodities or articles being imported are subject to hefty tariffs. Several Free Trade Agreements (FTAs) giving favorable tariff rates have been signed to allow member states' importers to lower their import expenses. In general, all commodities imported into the Philippines from any foreign nation are subject to duty and value-added tax (VAT), which are calculated based on two factors, (1) the dutiable worth of the imported goods; and (2) the imported goods' categorization (Capistrano-Flojo, 2017).

According to Capistrano-Flojo (2017), the Bureau of Customs determines the dutiable value of imported goods primarily by referring to the "transaction value," or the price agreed upon by the seller and buyer as reflected in the commercial documents, with certain additions or adjustments permitted under the Tariff and Customs Code of the Philippines (TCCP), now known as the Customs Modernization and Tariff Act (CMTA). Once the dutiable value is calculated, it is multiplied by the applicable customs duty rate to determine the duties payable. The appropriate duty rates under the ASEAN Harmonized Tariff Nomenclature, as defined in Section 1611 of the CMTA (formerly Section 104 of the TCCP), may range from 0% to 40%, depending on the categorization of each commodity. The customs taxes calculated will be included in the landed cost of the imported commodity, which will be subject to a 12 percent VAT.

It was suggested that AFTA was also formed in response to the emergence of other regional groups, like the North American Free Trade Area (NAFTA) and the European Union's growth (EU). Additionally, it was to capitalize on the region's enormous potentials and complementarities to build and deepen intra-ASEAN industrial linkages, including the development of strong and competitive small and medium-sized firms. Liberalization of trade in the area through the elimination of both intra-regional tariffs and non-tariff barriers has aided in the efficiency and competitiveness of ASEAN's manufacturing sectors in the global market. As a result, consumers can purchase items from ASEAN's more efficient producers, fostering robust intra-ASEAN commerce.

2.5.3 Regional Comprehensive Economic Partnership

ASEAN signed the Regional Comprehensive Economic Partnership (RCEP) deal with Australia, China, Japan, New Zealand, and South Korea on November 15, 2020. The RCEP has become the world's largest free trade agreement, involving approximately 30% of global GDP (US\$26 trillion) and 30% of the world's population. The pact has the potential to boost the global economy by US\$186 billion and its members' GDP by 0.2%. Tariffs on 92% of goods will be reduced over the next two decades as part of the FTA, which will also consolidate Rules of Origin definitions among participating nations. Thus, businesses will only need one certificate of origin to conduct business in the region. Foreign investors will be able to invest in around 65% of the service sector, raising the bar for foreign ownership in different industries such as financial services, telecommunications, and professional services. Through the *China+1* approach, the RCEP will encourage further investment in lower-cost FTA members such as Cambodia, Myanmar, Indonesia, and Vietnam for labor-intensive activities such as garment manufacturing (Medina, 2021).

With the finalization and signature of RCEP, member nations' commitment to deepen regional integration and trade reforms in the Asia-Pacific region was reaffirmed, despite the increase of protectionism and trade tensions in recent years, which was exacerbated by the pandemic's spread. Given several countries in the region's inward-looking policies in the face of the virus's spread, such an initiative seems timely. Lowering tariffs, on the other hand, is insufficient to achieve deeper trade integration. Non-tariff obstacles must be eliminated, especially in times of crisis. The virus's global spread has forced governments to block their borders and restrict physical, economic activity, affecting the smooth flow of international trade, which is unpleasant but unavoidable.

2.6 Philippine Foreign Policy

Foreign policy is a versatile and adaptable instrument that states may use to respond to and, to a lesser degree – at least for middle and smaller powers like the Philippines – to influence events and developments that may or may affect their national interests. On the other hand, it may be a useful barometer of how a country thinks the tide of events is impacting its national security (Heydarian, 2018).

Changes in administrations in the Philippines are followed by a perceptible shift in approaches to key foreign policy challenges, especially the South China Sea disputes, according to recent historical evidence. Relations with the United States have deteriorated under the Duterte administration, while links with China have improved. It aimed to ground his country's foreign policy in a post-American episteme, in which Western allies are only one part of a larger, more geographically diverse basket of strategic partners and interlocutors. In Philippine foreign policy, this was the real "revolution." Understanding Philippine foreign policy, on the other

hand, cannot be limited to examining domestic political changes. External influences have been more often than not decisive in shaping the foreign policy of the mid-sized nation. Smaller powers, after all, are frequently at the mercy of larger forces that dominate the international landscape (Heydarian, 2018).

2.7 Similar Studies

2.7.1 Trade, Investment, and Economic Cooperation of India and Philippines

Despite the signing of a trade agreement in 1979, the India-Philippines trade remained minuscule during the Cold War years. Indian exports include pharmaceuticals, vehicle parts and components, mineral oils, beef, and electrical and electronic goods, while imports include organic and inorganic chemicals, fertilizers, paper products, and mechanical appliances (Mishra, R., 2019).

2.7.2 Japan–Philippines Economic Partnership Agreement (JPEPA)

Japan is one of the Philippines' most important trading partners. The Philippines and Japan began negotiating a bilateral trade deal called the Japan–Philippines Economic Partnership Agreement in February 2004. (JPEPA). The Japan–Philippines Economic Partnership Agreement (JPEPA) goes beyond traditional bilateral trade agreements by including provisions to facilitate capital, technology, and human resource investment. The goal of liberalization is to remove barriers to trade between the two economies. After a one-period lag, Japan's lowering average tariff rate boosts imports from the Philippines. The economic partnership agreement between Japan and ASEAN has a substantial impact on trade between Japan and the Philippines (Navarrete & Tatlonghari, 2018).

2.7.3 Malaysia and ASEAN Exports

Malaysia has one of the fastest-growing economies in the Association of Southeast Asian Nations (ASEAN). Malaysia's exports to ASEAN countries are critical to the country's economic growth and development. Malaysia is also more influential in the region due to its current chairmanship of ASEAN. As a result, one of the study's main goals is to investigate the factors that influence the export success of Malaysia and the ASEAN-5 countries, namely Singapore, Thailand, Indonesia, the Philippines, and Vietnam. The determinants were investigated using panel data from Malaysia and other ASEAN-5 countries from 1990 to 2013, as well as the well-known international trade model "gravity." Width, population size, economic size, and exchange rate are all significant potential determinants of Malaysia – ASEAN exports during the study period, according to the findings. The results of this study provide a clear set of policies for the Malaysian government to implement in order to improve economic growth and development by promoting exports to ASEAN countries (Abidin, Islam, & Haseeb, 2016).

2.8 Augmented Gravity Model

As the most frequently used methodological approach to estimate international trade, the augmented gravity model is also proven to be the most accurate tool in explaining as well as predicting the bilateral trade flows. Trade between the countries is estimated to be positively proportional to the mass of the economy, which is measured by gross domestic product per capita, and negatively proportional to the distances between the countries (Ibitoye, 2021).

Anukoonwattaka (2016) presented the different concepts of the gravity model, which are indicated as follows:

2.8.1 Gravity Force

Equation 1. **Gravity Force Equation**

$$F_{ij} = G \frac{M_i M_j}{D_{ij}^2}$$

Where the force of the gravity between the objects is dependent on the mass and inversely proportional to the square of the physical distance between them.

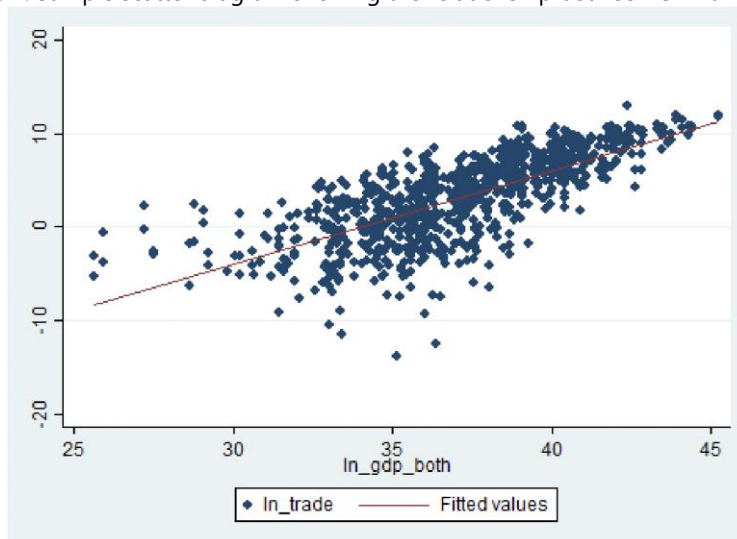
2.8.2 Intuitive Gravity for Trade

Equation 2. Intuitive Gravity for Trade Equation

$$X_{ij} = C \frac{Y_i Y_j}{t_{ij}}$$

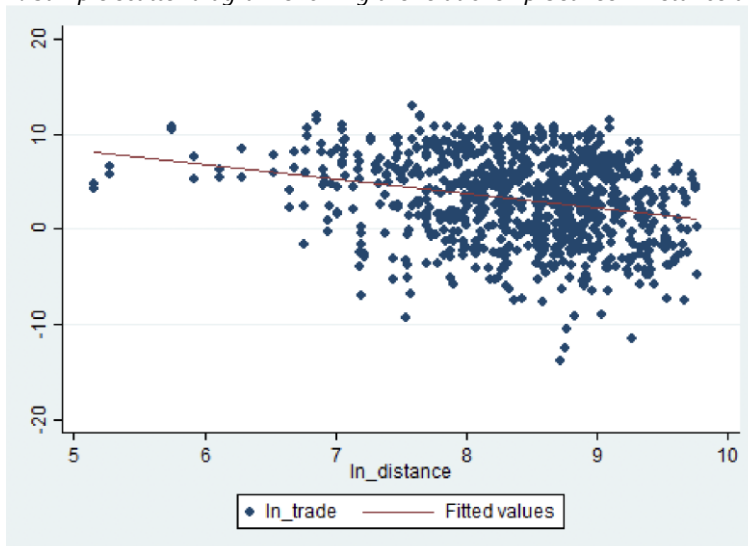
where X_{ij} stands for trade from country i to country j , C as the constant, Y as the GDP of countries i and j , and t as the costs of trade between the participating countries. Here, the exports highly depend on the mass and are negatively related to the costs of trade. It can be inferred that larger countries tend to engage in trading more than smaller countries and that the costs of trade reduce the probability of trading between countries. A scatter diagram is provided below to visualize the effects of GDP and distance on trade.

Figure 1. Sample scatter diagram showing the relationship between GDP and Trade



Source Anukoonwattaka, W. (2016). Session 2: Introduction to the basic gravity model. United Nations ESCAP: ARTNeT- GIZ Capacity Building Workshop on Introduction to Gravity Modelling.

Figure 2. Sample scatter diagram showing the relationship between Distance and Trade



Source Anukoonwattaka, W. (2016). Session 2: Introduction to the basic gravity model. United Nations ESCAP: ARTNeT- GIZ Capacity Building Workshop on Introduction to Gravity Modelling.

2.8.3 Basic Gravity Model

Equation 3. Empirical Equation for Basic Gravity Model

$$\ln X_{ij} = \beta_0 + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_3 \ln(t_{ij}) + e_{ij} \quad \beta_1, \beta_2 > 0 ; \beta_3 < 0$$

where a 1% increase in the Y_{ij} is associated with a $\beta_1\%$ increase in X_{ij} ; and a 1% increase in t_{ij} is associated with a $\beta_3\%$ decrease in X_{ij} .

2.9 Poisson-Pseudo Maximum Likelihood

Estimating through log-linear models has been widely used in approaching research through gravity models; however, there are issues raised on such models that coefficients turn to be biased and that the presence of heteroskedasticity is not recognized. Interpreting the parameters of the log-linear models through the ordinary least squares estimator, its elasticities become misleading due to heteroscedasticity, which resulted in introducing the Poisson-Pseudo Maximum Likelihood estimator. This estimator is a strong substitute for the standard log-linear model (Motta, 2019).

The Poisson estimator provides consistent estimates of the standard non-linear model and has several impressive properties. It can be entered as a dummy variable that is consistent in the inclusion of fixed effects by exporter and importer countries. This estimator also includes those observations with trade values of zero, which prevents the sample selection bias. Its interpretation is straightforward and possesses the same pattern as the one from OLS (Shepherd, 2016).

2.10 Trade Potential

Trade potential is defined as the measure of how much the country gains by moving from the current world with the costs of trade to a frictionless world. This is defined as the change in the real income per capita coming from a change due to the observed equilibrium to the frictionless trade equilibrium. Within the gravity model of international trade, the trade potential takes a simple form proportional to:

Equation 4. Trade Potential Proportion

$$\left(\frac{\lambda_{ii}}{Y_i}\right)^{\frac{1}{1+\theta}}$$

where λ_{ii} is the exporter’s observed share of the home trade, Y_i is the exporter’s real GDP, and θ is the trade elasticity. The key feature of this measurement is that it calculates the potential of the exporter depending on the technology and its endowments summarized by GDP (Waugh & Ravikumar, 2016).

Estimating the gap between the average and actual value of trade is actually the trading potential of a country. The presence of trade potential is indicated by the difference between the actual value and the predicted value of trade in the exporting country. The equation is as follows:

Equation 5. Trade Potential Equation

$$\text{tradepot} = \ln Q_{ij}^t - \ln \hat{Q}_{ij}^t$$

where $\ln Q_{ij}^t$ is the actual average value of exports and $\ln \hat{Q}_{ij}^t$ is the predicted value of exports (Sinaga et al., 2019).

3. Methodology

To examine the impacts of the economic and political factors that affect the bilateral trade flows between the ASEAN countries and the Philippines at the national level, the researchers applied a quantitative research method. The researchers employed the Gravity Theory of Trade which relates to how trade in the international aspect is influenced by three main factors, which are the (1) geographical proximity, (2) economic mass or size of the participating countries, and (3) the similarities in the preferences of the consumers and the development of the economy. This suggests that under the *ceteris paribus* assumption, a participating country will gravitate or be pulled towards trading with neighboring countries and economies of smaller distance with similar mass, cultural preferences, and developmental stages (Pettinger, 2017). This theory originates from Isaac Newton’s law of gravity, where it is stated that the pull of objects gravitates directly to the mass of the objects and inversely to the distances. However, this only comprises a part of the trade equation, for there are other factors that can determine the bilateral trade, such as its history, the similarities in language, time differences, and its culture. The gravity model is modified in this study by considering other affecting factors such as the income per capita, its recognition from the World Trade Organization, coming into an agreement as per the ASEAN Free Trade Area, etc.

3.1 Research Model

In estimating the international trade flows of economies, the gravity model is the most conventional approach. As it has been considered as one of the most successful empirical models in the history of economics, it associates trade flows, both to and from, with the gross domestic product, distance, and other essential factors which may affect the trade and its barriers. It is fully credited to Jan Tinbergen that the trade equation was first fully developed and to Walter Isard and Merton Peck, who worked to empirically link distance with bilateral trade flows. However, it was also argued that the relationship between the distance of the capitals of the countries and the volume of trade, along with the expectations due to trade barriers, are first combined by Adam Smith (Elmslie, 2018).

Citing Anderson and van Wincoop’s work in 2003, to which they proposed that the traditional gravity model is biased due to failing to take into account the effects of resistance in multilateral trade terms, the equation is presented as

Equation 6. Traditional Gravity Model Equation

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln Y_i + \alpha_2 \ln Y_j + \alpha_3 \ln D_{ij} + \alpha_4 \ln R_{ij} + \alpha_5 \ln \pi_{ij} + e_{ij}$$

where T_{ij} represents the import and export trade flows, Y_i represents the exporter's economic size, meanwhile Y_j represents the importer's economic size. On the other hand, D_{ij} is the geographical distance, R_{ij} is the resistances present in multilateral trading, the dummy variables π_{ij} , and random error term e_{ij} .

In a study in 2020 by Hoang, Truong, and Dong, they have evolved the equation given above by Anderson and van Wincoop to examine the bilateral trade flows of Taiwan with each country of the ASEAN. They used the equation

Equation 7. Augmented Gravity Equation (Similar Study)

$$\ln T_{ijt} = \alpha_0 + \alpha_1 \ln gdp_{it} + \alpha_2 \ln gdp_{jt} + \alpha_3 \ln income_{it} + \alpha_4 \ln income_{jt} + \alpha_5 \ln distance_{ij} \\ + \alpha_6 \ln exrate_{ijt} + \alpha_7 \ln culdis_{ijt} + \alpha_8 \ln polipower_{ijt} + \alpha_9 wto + \alpha_{10} comlang + \tau_{ijt} + e_{ijt}$$

Where T represents the trade flows between the exporter i and importer j countries, gdp obviously stands for gross domestic product and $income$ for the per capita income of the specific nations. The variable $distance$ is the physical distance between the capitals of the exporter and importer countries, $exrate$ is the foreign exchange rate between the exporter's local currency unit and the importer's. Acting as proxies to cultural distance and magnitudes of geo-political power are the variables $culdis$ and $polipower$; acting as dummy variables for the legitimacy of membership status in WTO and similarity of community language used between the language spoken in the exporter and importer countries are the variables wto and $comlang$, respectively. Meanwhile, the τ_{ijt} variable symbolizes the vector of time fixed effects and the e_{ij} variable obviously is the error term.

It was suggested that both cultural distance and geo-political power be used as proxies for resistances in multilateral trade. There have been said that there is a relatively close relationship between the geo-political effect and the cultural similarities of nations undergoing trade and that it is just reasonable that these two variables are taken into account to have a stronger explanatory capacity in estimating through the use of the gravity model (Liu et al., 2018; Dong and Truong, 2019; Quer et al., 2017). Dummy variables in the presence of variables wto and $comlang$ are also taken into consideration to magnify the reliability of the estimated results and to have power over the biased issues that may potentially arise along the way. Since this study by Hoang et al. (2020) is all about the bilateral trade flows between Taiwan and the ASEAN countries, they have acknowledged Taiwan's efforts in taking part in global trade through being officially part of the World Trade Organization in 2002. Knowing that WTO is a global system of trade which ensures that the fundamental trading principles in both bilateral and multilateral systems are smoothly implemented and are strictly adhered to, their study inserted into the model the wto variable to capture the effects of the WTO membership on the international trade flows. On the other hand, they believed that the similarities in the language spoken in the exporter and importer countries have potential effects on the trade flows. Noting that Mandarin is Taiwan's most spoken language, they assume that common language is a significant dummy variable since there are countries in the ASEAN that also speak Mandarin, such as Malaysia and Singapore (Hoang et al., 2020). A dummy variable of 1 will only be inserted if the country has more than 9% of its total population speaking that certain language.

There has been empirical evidence and theoretical foundations on the standard gravity model that when aggregate trade is estimated, the possibility of having biased results is high. This bias in the aspect of endogeneity has to be paid attention to because the trade variables may be related to the error term, thus making the ordinary least squares biased and producing inconsistent results of estimates (Xu and Liang, 2017). Biasedness on the aggregate trade may also be due to the effects of intersecting components of the trade. To remedy this problem, the trade flows in bilateral form between the Philippines and the other individual countries in ASEAN are treated separately as exports and imports or as sending and receiving countries. Advantages of these are the mitigation of endogeneity and heterogeneity biases and the determination of the effects of variables that are undetectable. In consequence, it is expected that this study uses panel data of dyadic (country-pair) observations. Nonetheless, it is still theoretically unavoidable that heteroscedasticity is present in cross-section data, and it is believed that using the gravity equation will damage the assumption of homoscedasticity of error terms in many ways.

In the gravity equation shown above, additional multilateral resistance terms are added but are not directly observed. Thus, it is better to use the nonlinear least square (NLS) approach rather than the ordinary least squares (OLS) method. However, many researchers found this approach doubtful since the presence of heteroscedastic variances is commonly ignored (Hoang et al., 2020). To remedy this issue, this study will be using the Poisson-Pseudo Maximum Likelihood (PPML) estimator, which provides estimates consistent with the original nonlinear model, such as the gravity model.

The PPML estimator has impressive properties for research studies using gravity models. Aside from its consistency in the presence of fixed effects, this includes observations on the trade value equating to zero. Also, interpretations of the coefficients in this estimator are straightforward, following the similar pattern that OLS has. However, compared with OLS, the estimates of the

coefficients are significantly different. This is common on gravity models using the Poisson estimator, and this also reflects the influence of violating the homoscedasticity assumption on the original OLS estimates (Shepherd et al., 2019). It was also suggested that a heteroscedasticity-robust reset test (also known as Ramsey-reset test) be performed to verify if the estimator is adequate. The estimation results of this study are interpreted using the augmented gravity model under the Poisson-Pseudo Maximum Likelihood approach.

With the problems in obtaining a complete and balanced dataset for cultural distance, the researchers chose to omit the variable to avoid any errors caused by the imbalance. Deriving from the estimation used by Hoang et al. (2020), this study applied a new augmentation of the already-augmented gravity model to estimate the bilateral trade flows between the Philippines and the other nine countries of the ASEAN. To further analyze the trade effects of both tariff and non-tariff barriers within the ASEAN scope, the researchers devised the “intra-ASEAN augmented gravity model,” which incorporates an additional dummy variable *afta* which represents a country’s membership in the AFTA Council. The final regression equation used in this study is

Equation 8. Intra-ASEAN Augmented Gravity Equation

$$T_{ijt} = \alpha_0 + \alpha_1 \ln gdp_{it} + \alpha_2 \ln gdp_{jt} + \alpha_3 \ln income_{it} + \alpha_4 \ln income_{jt} + \alpha_5 \ln distance_{ij} + \alpha_6 \ln exrate_{ijt} + \alpha_7 \ln polipower_{ijt} + \alpha_8 wto + \alpha_9 afta + \tau_{ijt} + e_{ijt}$$

The common language variable was also omitted due to the violations of the multiple linear regression assumptions brought by the dummy variable. It is important to consider the effects of different magnitudes of geo-political power on international trade through the polipower index. This variable is founded on the Composite Index of National Capability (CINC) and the index of economic freedom. The function for polipower index is

Equation 9. Polipower Index Equation

$$polipower_{ij} = \sqrt{(CINC_i \times CINC_j) \times (EF_i \times EF_j)}$$

The Composite Index of National Capability is a good statistical measure of national power that relies on total population, urban population, primary energy consumption, production of iron and steel, military personnel, and military expenditure. These components, majorly representing the economic, demographic, and military strength, are introduced by J. David Singer, who is a pioneer in conducting quantitative approaches in studies in the field of international relations (Hoang et al., 2020). More recent studies use this index mainly because it focuses on those measurements that are more noteworthy in perceiving true state power; however, this index may only be a good measurement of hard power and may fail to represent the soft power which are the non-coercive powers such as culture, foreign policies, and political values. Nonetheless, it is still reckoned as one of the best-known and most accepted measurements for national capabilities. It did make use of the economic freedom index, which goes the same for cultural distance, to capture the effects of globalization on bilateral trade.

The variable *wto*, which is considered as a dummy variable, is salient in the model as it is believed that a country’s membership with the World Trade Organization would mean greater opportunities for foreign trade to occur and for foreign transactions to administer. This variable acts as a proxy for the global trade agreements network that encourages trading among the participating countries. This variable is expected to have a positive sign as it has a positive effect on trade. Since it’s a dummy variable, it will take a value of 1 if both the trading partners are official members of WTO; otherwise, it will only hold a value of 0.

To examine the trade potential between the Philippines and the other ASEAN members, the researchers employed the Average Standardized Trade Potential (ASTP), which is an index at which trade potentials are measured. Introduced by Luca de Benedictis and Claudio Vicarelli in 2005, the index is formulated as

Equation 10. Average Standardized Trade Potential Equation

$$ASTP_{ij} = \sum_{t=1}^n \frac{1((RT/ET)-1)}{n((RT/ET)+1)}$$

Where *RT* stands for the actual export and import values of the Philippines to/from the other ASEAN member countries, and *ET* is the estimated value of *RT* from the gravity equation. It has been said that bilateral trade between the Philippines and the other ASEAN member countries reached its absolute potential once the *ASTP* reached the critical value of zero. As the average standardized trade potential index approaches zero, the exports and/or imports to (or from) the Philippines from (or to) the 9 other countries approach the critical point. The trade flows are believed to be overtraded for positive *ASTP* and untapped for negative *ASTP* (Hoang et al., 2020).

3.2 Data Selection

The empirical analysis for this thesis contains information from a panel of annual observations covering all the 10 countries of the Association of Southeast Asian Nations, namely Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. These were chosen according to the scope of the study, which aims to research the determinants of bilateral trade and its potential between the Philippines and the other 9 countries of ASEAN. The dataset consists of a total of 197 observations. Data were obtained from different local and international organizations, which were found to provide valid information due to its credibility. Retrieved data were analyzed whilst considering those data that are unprovided and the grounds why such organizations can't provide such data.

Indicated below are the variables introduced and presented in this study:

Table 1. Variables

Dependent Variable	Independent Variables
Trade	Gross Domestic Product (exporter) Gross Domestic Product (importer) Per Capita Income (exporter) Per Capita Income (importer) Geographical Distance Foreign Exchange Rate Geo-political Power WTO Membership AFTA Council Membership

3.3 Data Collection

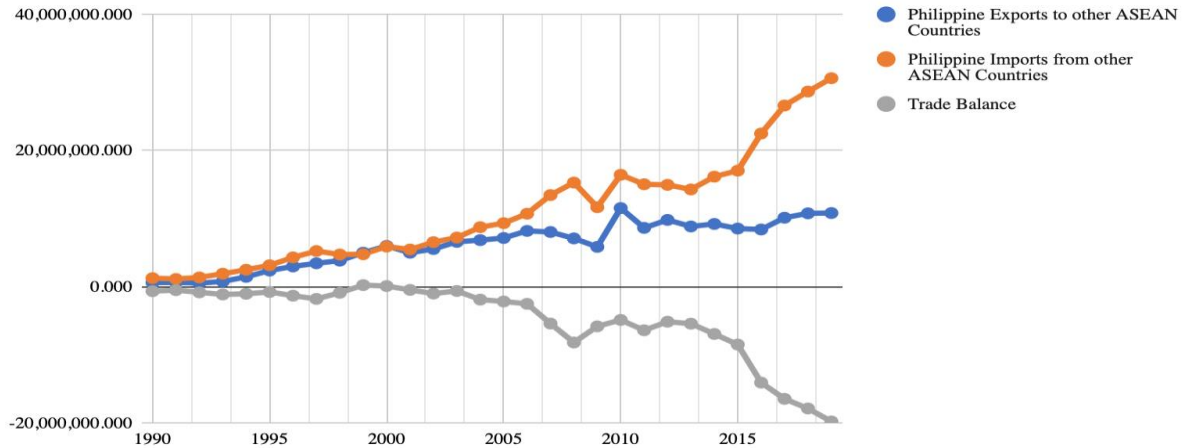
The observations needed for this study are gathered existing or secondary data and compiled in a panel dataset of dyadic observations from 1995 to 2019 (excl. Brunei Darussalam (1995-2013), Cambodia (1995-1996), Lao PDR (1995), Myanmar (1995-2000)). Data on trade between the Philippines and the other members of ASEAN are gathered from the *Philippine Statistics Authority* Annual Yearbooks from 1995 to 2019. As the primary and central statistical body of the Philippines, the Philippine Statistics Authority collects, analyzes, and provides the public with a reliable compilation of data on national accounts. Meanwhile, the data on Gross Domestic Product is obtained from *The World Bank: World Bank Indicators*. With 189 member countries, the World Bank is a global partnership working for sustainable solutions to reduce poverty and help developing countries have shared prosperity. On the other hand, the data on Gross National Income per capita was retrieved from *MacroTrend Consulting, LLC* Website, which is a fundamental research site from Florida, United States, which provides financial data and metrics to consultants and various financial partners. It is important to note that in the research model, the GDP is the measurement of the size of the economy, and the GNI per capita, on the other hand, provides the rough measure of an individual person's annual national income. In theory, those countries that are more likely to participate in trade are the larger and economically richer countries; thus, GDP and per capita income are expected to have a positive impact on international trade. The data on distance was retrieved from GeoDist, CEPII. CEPII or the *Centre d'Etudes Prospectives et d'Informations Internationales* is the leading French center for research and expertise on the world economy. Through independent, in-depth analysis on international trade, migrations, macroeconomics, and finance, the CEPII contributes to the policy-making process around the world. Distance between the capitals of the exporting and importing countries acts both as a proxy for the costs of transportation and as an impediment of trade in bilateral form. To simply put, distance is expected to have a negative effect on trade. The foreign exchange rate for the years 1995 - 2019 is also from the *World Bank* and the statistical records of the *Bangko Sentral ng Pilipinas*, most commonly known as the BSP. The BSP, with its English term as the Central Bank of the Philippines, has the sole responsibility to supervise the operations of all the banks across the country and regulate the stability of the flow of money important to having a sustainable and balanced growth of the economy. For the data on political power, which consists of the function of the economic freedom index and the national capability index, the index of economic freedom was retrieved from *The Heritage Foundation*, a US conservative public policy research organization responsible for formulating and promoting conservative public policies based on the principles of individual freedom, limited government, free enterprise, and strong national defense. On the other hand, the Composite Index of National Capability was collected from the National Material Capabilities data from *The Correlates of War (COW) Project*, a web page facilitating the collecting, analysis, and use of reliable and accurate quantitative data regarding international relations. The said website is intended as a center of data distribution efforts. As for the set of data on the dummy variable *wto*, information on the membership status of participating countries is obtained from the *World Trade Organization* official website. With 164 member countries, WTO is the only global international organization that deals with the rules of trade between nations with the goal of helping producers produce sufficient and sustainable goods and services and to regulate exports and imports in every member

country. Lastly, the official website of the *Association of Southeast Asian Nations* provides the verified agreement information on the ASEAN Free Trade Area and the countries that signed the said agreement.

4. Results and Discussion

Figure 3 shows that over the recent three decades, even though the exports from the Philippines to the other ASEAN member countries are evidently growing over time, it was apparent that it was offset by the amount of growth of the goods and services that are imported to the country. This caused the net exports, also known as the trade balance, to plummet. From 1990 to 2008, the lines for both imports and exports exhibited a steady increase, but suddenly in 2009, the exports fell by around 2 billion US dollars. It recovered quickly as the graph grew back to its increasing rate by the following year.

Figure 3. Total Philippine Imports, Exports, and Trade Balance to and from ASEAN Members

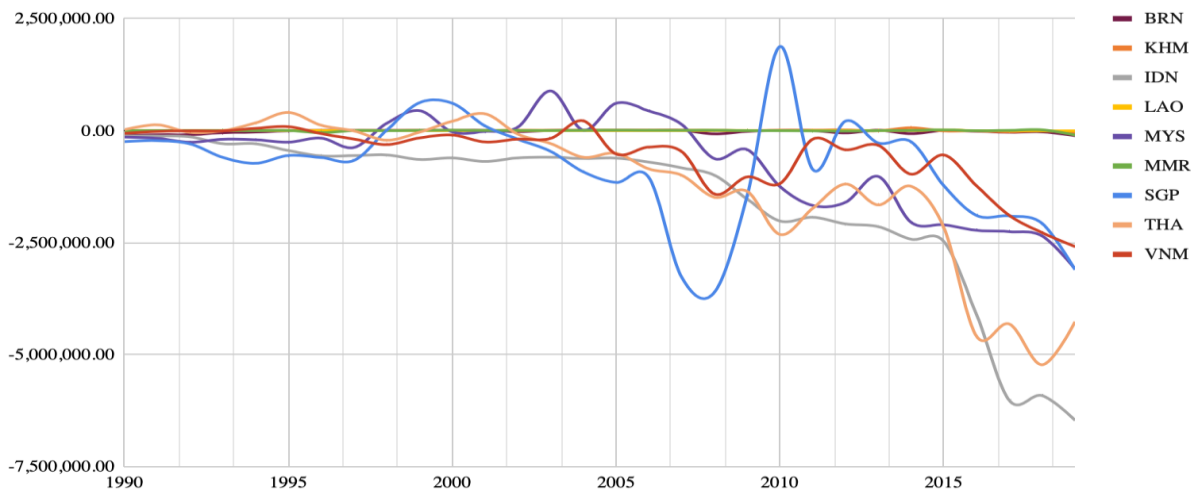


Unit Free on Board Value in Thousand US Dollars

Source Philippine Statistics Yearbook, Philippine Statistics Authority

For the record of the three whole decades shown above, only in 1999 and 2000 did the Philippine exports to the other ASEAN members exceed the number of imports to the country. It is only in these years that the trade balance got above the 0 line. Looking at a more specified graph, Figure 4 illustrates the individual net exports of the Philippines to every ASEAN trading partner.

Figure 4. Philippine Net Exports to ASEAN Trading Partners



Unit Free on Board Value in Thousand US Dollars

Source Philippine Statistics Yearbook, Philippine Statistics Authority

The lines for Brunei Darussalam, Cambodia, Lao PDR, and Myanmar did not exhibit an exciting movement as it did not stray away from zero. What is found to be the most interesting is the Philippine net exports to Singapore as it showed both extreme fall and rise from 2006 to 2011. In the case of Vietnam and Malaysia, it showcased a similar trend with each other as they both showed a slowly increasing rate from 1990 to 2003, and both fell in the succeeding years. For Thailand and Indonesia, with the trade history the Philippines have with them, it unsurprisingly showed a decreasing trend in the trade balance as the Philippines have been importing goods and services from them more than they are exporting from time immemorial. Their trend exhibits a worrisome decrease comes 2014 when it plummeted uncontrollably from then on.

Table 3. Descriptive Statistics

Variable	Obs	M	SD	Min	Max
<i>trade_{ijt}</i>	197	915,592	1,212,637	22	7,318,943
<i>lngdp_{it}</i>	197	205,800,000,000	75,264,230,000	109,200,000,000	361,100,000,000
<i>lngdp_{jt}</i>	197	206,400,000,000	240,424,500,000	2,840,000,000	1,204,000,000,000
<i>lnincome_{it}</i>	197	2,193	1,003.75	1,020	3,850
<i>lnincome_{jt}</i>	197	7,912	13,801.96	120	58,390
<i>lndistance_{ij}</i>	197	2,220	399.03	1,262	2,792
<i>lnexrate_{ijt}</i>	197	7.22	11.63	0	39.05
<i>lnpolipower_{ijt}</i>	197	4.04	1.76	0.79	7.59
<i>wto_dummy</i>	197	0.81	0.39	0	1
<i>afta_dummy</i>	197	0.98	0.12	0	1

Source Author's estimation, R Project for Statistical Computing

Note Complete data sets can be found in the Appendices.

Table 3 presents the descriptive statistics of the data gathered and inspected for the study. All variables have a fair 197 number of annual observations.

Table 4 depicts the correlation among the individual independent variables. It can be seen that (1) the Philippine GDP and GNI per capita, and (2) the political power and GDP of trading partners have a very high positive linear correlation. With a positive linear correlation are (1) GDP of partner and GNI Per capita of partner, (2) GDP of partner and geographical distance, (3) GNI Per capita of partner and foreign exchange rate, and (4) political power and geographical distance.

Table 4. Correlation Matrix

	$lngdp_{it}$	$lngdp_{jt}$	$lnincome_{it}$	$lnincome_{jt}$	$lndistance_{ij}$	$lnexrate_{ijt}$
$lngdp_{jt}$	0.14					
$lnincome_{it}$	0.97***	0.14				
$lnincome_{jt}$	0.37*	0.50**	0.38*			
$lndistance_{ij}$	-0.10	0.61**	-0.10	0.14		
$lnexrate_{ijt}$	0.00	0.27	-0.01	0.69**	0.26	
$lnpolipower_{ijt}$	-0.08	0.88***	-0.07	0.15	0.62**	0.11

* (.) correlation > 0.30 (-0.30) ; ** (..) correlation > 0.50 (-0.50) ; *** (...) correlation > 0.70 (-0.70) ;**** correlation = 1

Source Author's estimation, R Project for Statistical Computing

With a low positive linear correlation are (1) Philippine GDP and Per capita income of partner, and (2) Philippine Per capita income and Per capita income of the partner. Other variables have a linear correlation with another variable in the study (negative and positive) but are not as significant as those stated.

The estimated results on trade flows with intra-ASEAN augmented gravity equation under the Ordinary Least Squares, and Poisson-Pseudo Maximum Likelihood estimators with fixed effects and robust fitting are depicted in Table 5.

Table 5. Comparison of OLS and PPML Estimation Results

Variable	OLS			PPML		
	Estimate	p-value		Estimate	p-value	
$lngdp_{it}$	0.67835	0.1029190		0.44838	0.21450	
$lngdp_{jt}$	0.35043	0.3470732		0.88160	0.0000000366	***
$lnincome_{it}$	-0.97685	0.0336955	*	-0.85061	0.00280	**
$lnincome_{jt}$	0.91586	0.0008088	***	0.48014	0.0000000000000000	***
$lndistance_{ij}$	-4.14538	0.0062095	**	-3.69825	0.0000000000000063	***
$lnexrate_{ijt}$	0.06898	0.3700228		0.16153	0.0000000000000062	***
$lnpolipower_{ijt}$	3.71335	0.0020318	**	1.20332	0.0000671	***
wto_{dummy}	-0.1814	0.5900415		-0.24298	0.41640	
$afta_{dummy}$	0.68421	0.1932752		1.73065	0.8168	
$_cons$	12.32055	0.2879225		6.80394	0.5286	

Observations	197			197		
R ²	0.9507			0.7243		
Breusch-Pagan	36.347	0.00003440	***	20.408	0.01555	*
Durbin-Watson	0.9584497	0	***	0.6383616	0	***
Reset Test	2.279	0.1053		44.104	0.00000000000000002200	***

* p < .05 ; ** p < .01 ; *** p < .001

Source Author's estimation, R Project for Statistical Computing

The regression estimated using the OLS and PPML both have 197 observations. Both have shown positive coefficients in the gross domestic product of the Philippines and its trading partners, Per capita income of trading partners, foreign exchange rate, political power, and the dummy variable for AFTA. On the other hand, it manifests a negative coefficient for Philippine Per capita income, geographical distance, and the dummy variable for WTO. The estimation using OLS gives an R-squared value of 0.9507; meanwhile, the PPML gives a lower value of 0.7243. The two estimators mainly differ in their p-values. For OLS, only the $lnincome_{jt}$ is considered significant in the 0.1% level, $Indistance_{ij}$ and $lnpolipower_{ijt}$ in the 1% level, and only the $lnincome_{it}$ in the 5% level. The estimates for variables $lngdp_{jt}$, $lnexrate_{ijt}$, wto_dummy , and $afta_dummy$ are considered insignificant. Meanwhile, for the PPML estimators, considered significant in the 0.1% level are $lngdp_{jt}$, $lnincome_{jt}$, $Indistance_{ij}$, $lnexrate_{ijt}$, and $lnpolipower_{ijt}$; and $lnincome_{it}$ at 1% level. The estimates for the variables wto_dummy , $afta_dummy$, and the $lngdp_{it}$ are considered insignificant.

To test for violations, both OLS and PPML estimations for Durbin-Watson statistics have p-values of less than 0.001. To test for heteroscedasticity, the OLS estimations showed a p-value of less than 0.001 for the Breusch-Pagan Test, while the PPML estimations are just a bit higher than the former, giving a p-value of less than 0.05. For the Ramsey RESET Test, the OLS has a higher p-value than the PPML, where the latter gives a p-value of less than 0.001.

Table 6. Average Standardized Trade Potential of the Philippines with ASEAN Members

Country	Exports				Imports			
	ASTP	Scenario	ASTP (last 5 years)	Scenario	ASTP	Scenario	ASTP (last 5 years)	Scenario
<i>Brunei</i>								
<i>Darussalam</i>	-0.952066	Untapped	-0.953114	Untapped	-0.766959	Untapped	-0.794131	Untapped
<i>Cambodia</i>	-0.189774	Untapped	-0.106013	Untapped	-0.706756	Untapped	-0.353361	Untapped
<i>Indonesia</i>	-0.174746	Untapped	-0.121694	Untapped	-0.078472	Close (-)	0.023279	Close (+)
<i>Lao PDR</i>	-0.677660	Untapped	-0.415292	Untapped	-0.924007	Untapped	-0.681646	Untapped
<i>Malaysia</i>	0.062957	Close (+)	-0.101407	Untapped	0.123576	Overtraded	0.041301	Close (+)
<i>Myanmar</i>	-0.490298	Untapped	-0.243042	Untapped	-0.723856	Untapped	-0.646790	Untapped
<i>Singapore</i>	-0.018582	Close (-)	-0.092639	Close (-)	0.019346	Close (+)	-0.152627	Untapped

<i>Thailand</i>	-0.086718	Close (-)	0.036952	Close (+)	-0.134833	Untapped	0.055952	Close (+)
<i>Vietnam</i>	0.111719	Overtraded	0.318880	Overtraded	0.049555	Close (+)	0.074013	Close (+)

Untapped ASTP: $n < - 0.1$; Close (-) ASTP: $- 0.1 < n < 0$; Close (+) ASTP: $0 > n > 0.1$; Overtraded ASTP: $n > 0.1$

Source Author's estimation, Microsoft Excel; World Bank

Employing the Average Standardized Trade Potential index, results show that for the Philippine exports, most countries are untapped for the whole period covered in the study, and only Vietnam is overtraded. Malaysia, Singapore, and Thailand exhibit a "close" scenario which means that the Philippines are close to approaching optimum trade potential with these countries. For the exports in the ASTP index from 2015 to 2019, the results for most countries remain to be untapped, Singapore and Thailand remain to be close to 0, and Vietnam remains to be overtraded. Philippine exports to Thailand grew from being close (-) to 0 to being close (+).

For the imports, Brunei Darussalam, Cambodia, Lao PDR, Myanmar, and Thailand are untapped for the whole period covered in the study, while only Malaysia is overtraded. Singapore and Vietnam are close (+), and Indonesia is close (-) to optimum trade potential. For the imports in the ASTP index from 2015 to 2019, Brunei Darussalam, Cambodia, Lao PDR, and Myanmar remain to be untapped, and Vietnam remains to be close (+). For Indonesia, it changed from close (-) to close (+), Malaysia changed from overtraded to close (+), Singapore changed from close (+) to untapped, while for Thailand, it changed untapped to close (+).

Comparing the estimates from the Ordinary Least Squares method and the Poisson-Pseudo Maximum Likelihood estimator, there is not much difference between their coefficient estimates. Both of them showed the same sign for the coefficients, which implies that GDP combined, Per capita income of trading partner, foreign exchange rate, political power, and the dummy variable for AFTA have a positive correlation with the dependent variable trade, and that Philippine Per capita income, geographical distance, and the dummy variable for WTO, on the other hand, have a negative correlation. It is observed that using the OLS estimator gives an R-squared value of 0.95, which indicates a higher variability that the response data surrounds its mean than the R-squared value using the PPML estimator of just 0.72, which is a much lower value. With OLS estimation having the higher R-value, in general, the model better fits the data using the OLS estimator than the PPML. However, the differences in the p-values should be taken into consideration in the overall implications of the estimates.

On the Average Standardized Trade Potential, it is worth noting that Brunei Darussalam, Cambodia, Lao PDR, and Myanmar have a lot more room to trade with the Philippines because the indexes obtained from the functions of trade potential for both the exports and imports showed untapped scenarios and are much more likely to be far away from 0 or the optimum trade potential for bilateral trade flows. The results estimated relate to the reality of the trade history and current trade activities between the Philippines and the said countries. This is in consideration of the diplomatic limitations in their economies and the entry barriers for trade. In general, it is most likely that the Philippines are reaching its optimum trade potential with Thailand and Vietnam. However, the Philippine government may want to consider slowing down the flow of trade for the other countries, especially those who are tagged with overtraded scenarios on the import side, such as Malaysia.

5. Conclusion

Over the past three decades, the trade flows between the Philippines and the other ASEAN member countries, especially the imports, have rapidly expanded. In the field of trading, Malaysia, Thailand, Vietnam, and Singapore have become key trading partners to the Philippines for quite some time already. However, the tendency of trade imbalance in the side of the Philippines is high considering the flow of trade for the past 10 years; trading would benefit the other countries more, although the Philippines would not lose the benefits that it can gain from cross-country trade.

By employing the Poisson-Pseudo Maximum Likelihood estimator with fixed effects and robust-fitting, at the national level, the researchers found the vital role of geographical distance, per capita income of the trading partners, and the country's membership to the AFTA council as the main influencing factors for the increase in the flow of exports from the Philippines to other countries. Although it cannot be directly seen that those countries with a much smaller capital distance from Manila have recorded more trade with the Philippines, it can still be supported, considering that they joined the WTO and/or the AFTA Council later than the other countries and also, the trade barriers to entry that they currently have in their market. On the contrary, at both OLS and PPML estimations, the countries' membership to the World Trade Organization did not affect the national level bilateral trade flows, evidence in the Philippines and the other ASEAN member countries. Also, the GDP of the Philippines was found to have been not significantly affecting the Philippine exports to the other ASEAN countries.

This study was able to prove the theory that the GDP of the trading partners has a positive relationship with the trade exports and that the geographical distance has an inverse proportion to the trade exports. This supports the idea that as the distance between the countries increases, the less the flow of trade there will be. An increase in the per capita income of the trading partner countries has direct proportion to the trade flows as increasing income would mean increasing purchasing power parity; hence, an increase also in the trade in the country. The foreign exchange rate is also proven to have a significantly positive effect on the Philippine trade exports.

Results of the estimation also indicated that the Philippines, along with its trading partners in the Association of Southeast Asian Nations, have realized the potential of bilateral trade flows as the Average Standardized Trade Potential indexes for the imports and exports have reached close or above optimum trade potential, except for Brunei Darussalam, Cambodia, Lao PDR, and Myanmar. Considering the competition pressed onto these countries, it could be implied that a more dynamic and efficient trade approach be implemented to promote trade with these three countries as a unifying step in embracing globalization in every country.

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References

- [1] Abidin I., Haseeb M., & Islam R. (2016). Regional Integration of the Association of Southeast Asian Nations Economic Community: An Analysis of Malaysia - Association of Southeast Asian Nations Exports (pp. 646-652). *Econ Journals*. from https://www.researchgate.net/profile/Muhammad-Haseeb-33/publication/301921254_Regional_Integration_of_the_Association_of_Southeast_Asian_Nations_Economic_Community_An_Analysis_of_Malaysia_-_Association_of_Southeast_Asian_Nations_Exports/links/58d2068f458515b8d285e112/Regional-Integration-of-the-Association-of-Southeast-Asian-Nations-Economic-Community-An-Analysis-of-Malaysia-Association-of-Southeast-Asian-Nations-Exports.pdf
- [2] Anderson, J. E., & van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1), 170–192. <https://doi.org/10.1257/000282803321455214>
- [3] Anukoonwattaka, W. (2016). Session 2: Introduction to the basic gravity model. United Nations ESCAP: ARTNeT- GIZ Capacity Building Workshop on Introduction to Gravity Modelling.
- [4] Capistrano-Flojo, T. R. (2017). Maximizing benefits from ASEAN Free Trade Agreements. PriceWaterHouseCoopers. Retrieved from <https://www.pwc.com/ph/en/taxwise-or-otherwise/2017/maximizing-benefits-from-asean-free-trade-agreements.html>
- [5] De Benedictis, L., & Vicarelli, C. (2005). Trade potentials in gravity panel data models. *The B.E. Journal of Economic Analysis & Policy*, 5(1). <https://doi.org/10.1515/1538-0653.1386>
- [6] Dong, C. V., & Truong, H. Q. (2019). The determinants of creative goods exports: Evidence from Vietnam. *Journal of Cultural Economics*. <https://doi.org/10.1007/s10824-019-09359-y>
- [7] Elmslie, B. (2018). Retrospectives: Adam Smith's Discovery of Trade Gravity. *The Journal of Economic Perspectives*, 32(2), 209-222. Retrieved from <http://0-www.jstor.org.ustlib.ust.edu.ph/stable/26409432>
- [8] Heydarian, R. (2018). CSCAP REGIONAL SECURITY OUTLOOK 2018 (34-37, Rep.) (Huisken R., Brett K., Milner A., Smith R., Vermonte P., & Wanandi J., Eds.). Council for Security Cooperation in the Asia Pacific. Retrieved from <http://0-www.jstor.org.ustlib.ust.edu.ph/stable/resrep22262.13>
- [9] Hoang, N. T., Truong, H. Q., & Van Dong, C. (2020). Determinants of trade Between Taiwan and ASEAN countries: A PPML Estimator Approach. *SAGE Open*, 10(2). doi:10.1177/2158244020919516
- [10] Ibitoye, O., & Ibitoye, L. (2020). Determinants of Intra-ECOWAS Regional Food Trade: An Augmented Gravity Model Approach. *Journal of Global Economics, Management and Business Research*, 12(4), 30-46.
- [11] Isard, W., & Peck, M. J. (1954). Location theory and international and Interregional Trade theory. *The Quarterly Journal of Economics*, 68(1), 97. <https://doi.org/10.2307/1881920>

- [12] Liu, Y., Ge, Y., Hu, Z., & Wang, S. (2018). Culture and capital flows-exploring the spatial differentiation of China's OFDI. *China Economic Review*, 48, 27–45.
- [13] Marchand, B. U. (2017). How does international trade affect household welfare? *IZA World of Labor (Evidence-Based Policy Making)*, 1-11. doi:10.15185/izawol.378
- [14] Medina, A. F. (2021). ASEAN's Free Trade Agreements: An Overview. ASEAN Business News. Retrieved from <https://www.aseanbriefing.com/news/aseans-free-trade-agreements-an-overview/#:%7E:text=International%20businesses%20can%20benefit%20from,as%20tax%20holidays%20and%20deductions.>
- [15] Mishra, R. (2019). INDIA AND THE PHILIPPINES: TIME TO GO BEYOND THE ASEAN FRAMEWORK (pp. 3-5, Rep.). S. Rajaratnam School of International Studies. Retrieved April 20, 2021, from <http://0-www.jstor.org.ustlib.ust.edu.ph/stable/resrep20012.4>
- [16] Mohler, L., Weder, R. & Wyss, S. (2018). International trade and unemployment: towards an investigation of the Swiss case. *Swiss J Economics Statistics* 154, 10 doi:0.1186/s41937-017-0006-7
- [17] Motta, V. (2019). "Estimating Poisson pseudo-maximum-likelihood rather than a log-linear model of a log-transformed dependent variable," *RAUSP Management Journal*, 54(4). 508-518. <https://doi.org/10.1108/RAUSP-05-2019-0110>
- [18] Navarrete, A.F.C., Tatlonghari, V.M. (2018). An empirical assessment of the effects of the Japan–Philippine Economic Partnership Agreement (JPEPA) on Philippine exports to Japan: a gravity model approach. *Economic Structures* 7, 31. <https://doi.org/10.1186/s40008-018-0129-8>
- [19] Nieminen, R., Laura, P., & Andre, M. C. (2017). Analysis of the economic added value of international trade and the impact of increased trade barriers: Cost of Non-Europe Report. *European Parliamentary Research Service*, 1–74. doi:10.2861/868352
- [20] Pettinger, T., & Nigora. (2017). Gravity theory - economics. Economics Help. Retrieved from [https://www.economicshelp.org/blog/27917/concepts/gravity-theory-economics/.](https://www.economicshelp.org/blog/27917/concepts/gravity-theory-economics/)
- [21] Quer, D., Claver, E., & Rienda, L. (2017). Cultural distance, political risk and location decisions of emerging-market multinationals: A comparison between Chinese and Indian firms. *Journal of the Asia Pacific Economy*, 22(4), 587–603.
- [22] Samue, A. (2019). International Trade and Its Impact on the Global Economy (1-85). Retrieved from https://www.researchgate.net/publication/335703233_International_Trade_and_Its_Impact_on_the_Global_Economy. Marchand, 2017
- [23] Shepherd, B. (2016). Chapter 4: Alternative Gravity Model Estimators. In *The Gravity Model of International Trade: A User Guide* ((Updated Version) ed 50-58). *United Nations Economic and Social Commission for Asia and the Pacific*.
- [24] Sinaga, A., Masyhuri, Darwanto. D.H., & Widodo, S. (2019). Employing Gravity Model to Measure International Trade Potential. IOP Conference Series: Materials Science and Engineering. <https://doi.org/10.1088/1757-899X/546/5/052072>
- [25] Tangkitvanich, S., & Rattanakhomfu, S. (2018). The ASEAN Economic Community and the East Asian agenda. In ARMSTRONG S. & WESTLAND T. (Eds.), *Asian Economic Integration in an Era of Global Uncertainty* (185-216). Australia: ANU Press. Retrieved from <http://0-www.jstor.org.ustlib.ust.edu.ph/stable/j.ctt20krz01.14>
- [26] Thompson, D., & Chong, B. (2020). (Rep.). US Institute of Peace. Retrieved from <http://0-www.jstor.org.ustlib.ust.edu.ph/stable/resrep26022>
- [27] Waugh, M., & Ravikumar, B. (2016). Trade Potential: A New Measure of Openness, 2016 Meeting Papers 1329, Society for Economic Dynamics
- [28] Xu, T., & Liang, X. (2017). Measuring aggregate trade costs and their empirical effects on manufacturing export composition in China. *China Finance and Economic Review* 5, 6. <https://doi.org/10.1186/s40589-017-0049-z>