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Bilateral Trade Flows and Cultural Factors: The Case of the Philippines and Its Partner Countries Using the Gravity Model of Trade

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Abstract: This study attempts to explain the volume and pattern of international trade activities of the Philippines with its trading partners, by looking at economic and noneconomic, cultural factors using an extended version of the gravity model of trade (GMT). The GMT reveals the strong effects of gross domestic product (GDP) and distance on trade. The empirical results also show that noneconomic and cultural factors, like religion and colonial history, are important in explaining trade patterns of countries. In general, this study suggests that overall trade policy and industrial program should be designed to consider not only the economic aspects, but also the noneconomic and cultural factors that can increase international trade activity and encourage a more prominent role of the Philippines in the world economy.

Keywords: International business, macroeconomics, bilateral trade, gravity model of trade, culture

1 Introduction

In recent years, there has been a surge of interest in the gravity model of trade (GMT), and it is now one of the most widely used tools in applied international economics (Van Bergeijk & Brakan, 2010, Abstract). This is primarily because of the model's elegance in describing one of the most stable relationships in economics – that interaction between large economic clusters is stronger than that between smaller ones, and that nearby clusters attract each other more than the far-off ones. Van Bergeijk and Brakan (2010) explain how amazing and effective (though simple) this concept is from an empirical point of view, and how it can show that a gravity equation can empirically explain several economic phenomena between different locations.

This study uses the GMT framework to examine the bilateral trade activities of the Philippines with the rest of the world. The study augments the basic GMT by adding real GDP per capita in each economy, cultural variables (common language, religion, colonial ties), and a free trade agreement (FTA) dummy. Specifically, this study asks the following questions: *Do trade and traditional factors in GMT promote each other? Likewise, are nontraditional factors, such as cultural factors, important determinants of trade? Do these cultural variables with the potential addition of an FTA between economies stimulate bilateral trade? What policy implications can be drawn?*

There appears to be a dearth of studies on Philippine international trade activities, and this is surprising given the openness of the Philippine economy. Figure 1 shows a rising trade to GDP ratio, and by 2017, the ratio reached 72%. A cursory search of the local literature reveals a limited number of published academic articles beginning with Valdepeñas and Bautista (1977), and several unpublished microeconomic studies and working papers from various local organizations. This study's importance comes to light when one draws from its results some policy implications on how policymakers can further encourage foreign sector participants to increase trade volume by considering the nontraditional factors that affect trading behavior. Through this, opportunities for economic growth are widened given the highly open nature of the Philippines. Knowledge of factors other than distance and size can allow appropriate targeting of industries where these factors are most important.

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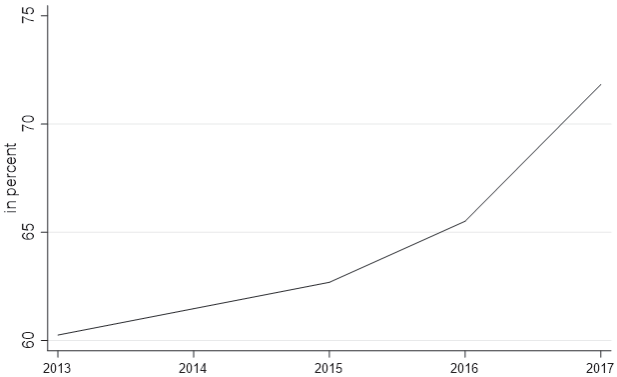
Figure 1. Philippines Total Trade as a Percentage of GDP



Source: WITS, n.d.

2 The Gravity Model of Trade

The conception of the GMT is inspired by Newton's law of universal gravitation, and the formula is computed using the force of attraction between two bodies in relation to their masses and distance:

$$F = G\left(\frac{m_1 m_2}{D^2}\right)$$

where F is the force of attraction between the bodies, D is the distance between them, G is a constant, and m_1 and m_2 are the masses of the two bodies (Stay & Kulkarni, 2015, p. 6). The larger the masses, the greater the force of attraction; and the longer the distance, the lesser the force (Stay & Kulkarni, 2015, p. 6).

This rule can be directly related to the GMT in international economics, with the trading countries considered the *"planets,"* the value of trade the *"gravitational force"* depending on the GDPs of the two trading countries (similar to the economic mass of a country), and their geographical distance. Simply put, the greater the GDP (mass) between the two trading nations (planets), the greater the trade (gravitational force) (Stay & Kulkarni, 2015, p. 2).

2.1 The Basic Model

Bilateral trade flow from one country to another is a multiplicative (or log-linear) function of the two countries' GDPs, their distance, and typically an array of dummy variables assumed to reflect the mutual trade costs between them. This is denoted as the *"traditional"* gravity equation. This equation gained acceptance among economists and policymakers in the last 35 years for three reasons: (1) formal theoretical economic foundations, (2) consistently strong empirical explanatory power (high R^2 values), and (3) policy relevance (Baier & Bergstrand, 2001).

This traditional gravitational model in physics has proven useful in the field of bilateral trade in international economics (Chaney, 2011, p. 2). The GMT is a powerful tool in explaining bilateral trade flows between economies. Krugman, Obstfeld, and Melitz (2015) define the GMT as the proportional value of trade to the product of the two countries' GDP, which diminishes with the distance between the two countries. Using Newton's law of universal gravitation as inspiration, this equation shows an *"ideal"* volume of trade between two trading countries:

$$T_{ij} = A \cdot Y_i \cdot \left(\frac{Y_i}{D_{ij}}\right)$$

where T_{ij} is the value of trade between countries i and j, A is a constant term, Y is the country's GDP, and D is the distance between the two countries. This equation shows the two factors determining the volume of trade, namely, the size of the countries' GDP, and the distance between them (Krugman et al., 2015, p. 13). Intuitively, large economies tend to spend more on imports because they have bigger

incomes, hence attracting large shares of other countries' spending due to their ability to produce a wider range of products.

The gravity equation was first introduced by Tinbergen (1962), and had since then been around in policy circles due to its robustness and versatility in analyzing all kinds of trade policy issues (Chaney, 2011, p. 2). Tinbergen (1962) introduced his trade equation in a straightforward manner as *"a turnover relationship in which prices are not specified,"* providing only a common sense rationale for this quasi-postulated reduced-form equation: trade is determined by supply potential (exporter GDP), market demand potential (importer GDP), and transportation costs (distance). His method estimated the economic potential of trade by explaining the flow of trade volume between any two countries in considering the economic size of both nations as well as the distance between them (Chaney, 2011, p. 2).

Tinbergen (1962) then supervised the PhD thesis of Linnemann (1966), which had become the standard reference for the early version of the gravity equation (Van Bergeijk & Brakan 2010, p. 5). Van Bergeijk and Brakan (2010, p. 5) pointed out that Linnemann (1966) also provided some theoretical arguments to justify the formulation of the trade flow equation, deriving it in the context of a quasi-Walrasian model. They stated that these early contributions started the first wave of trade policy applications in the early 1960s. Since then, Leamer and Stern (1970) mentioned two other noneconomic rationales for the model, simply referring to Newton and pointing out that bilateral trade is the expected value of trade between two partners based on the probability that they meet on the world market.

This gravity equation can be seen as a model representing the degree of spatial interaction between two or more points similar to a physical phenomenon. Anderson (1979) further expanded this concept by deriving from the demand structure an economic theory of gravity, and introducing the GMT based on the preferences of constant elasticity of substitution (CES) along with the products distinguished by the region of origin. Subsequently, this concept was further expanded by considering the absolute difference between the two trading countries' per capita incomes, and applying it to the traditional GMT. An effort was made to explain the disparities and variations in their consumption patterns. Bergstrand (1989) provided a theoretical basis highlighting pricing terms that were absent from previous GMT literatures. Bergstrand (1989) established separate roles for GDP and per capita GDP, and then developed more GMT to deliver demand-generated preferences in the importing country and factor endowments representing the exporting country's supply capability. Anderson and van Wincoop (2003) expanded Anderson's initial research (1979) by incorporating a method for dealing with the complex price index terms correlated with the market structure of the CES, and both coined the term *"multilateral resistance*[1]*."* Their extension had the potential to obtain a wider application of the GMT, especially to theories of trade and investment that had not been considered as an explanatory factor so far. Baier and Bergstrand (2001) suggested a framework to address issues related to the calculation of the conditions of multilateral resistance (Van Bergeijk & Brakan, 2010, p. 12). Using the same assumptions as Anderson and van Wincoop (2003), they first applied the expansion of the first-order Taylor series to multilateral terms of resistance (which depended on weighted commercial costs), and replaced them in a variety of formulas (Van Bergeijk & Brakan, 2010, p. 12).

The distance variable is a crucial factor in the GMT as it is to Newton's law of universal gravitation. Krugman et al. (2015) note that all estimated GMT show a strong negative effect of distance on international trade. A typical estimate says that a one percent increase in the distance between two countries is associated with a decline of about 0.7% to 1.0% in trade activities between those countries (Krugman et al., 2015, p. 14). Remarkably, recent estimates of the gravity equation show that distance-related variables have become more, instead of less, important (Van Bergeijk & Brakan, 2010). A special issue of the *Cambridge Journal of Regions, Economy and Society* (2008) entitled "The World Is Not Flat" states that distance is still one of the most salient characteristics to describe economic interaction in the world economy.

The standard trade theory models answer the following questions: why do countries trade with each other, and what is the pattern of trade? However, certain limitations hinder this model in capturing why the trade links are stronger for certain countries, and not so strong for some. It also

[1] Multilateral resistance consists of price indices between two countries. This depends not only on bilateral variables related to these two countries alone, but also on their position relative to the world economy.

lacks some valuable characteristics of trade that may be significant to trading partners. It is here then that the extensions of the GMT show heightened importance.

The traditional GMT also helps decipher anomalies in economic trade among countries. When trade between two countries is either much more or much less than what the GMT predicts, economists search for the causes of such deviation. Krugman et al. (2015, p. 13) cite that the Netherlands, Belgium, and Ireland trade considerably more with the United States of America (US) than what GMT predicts. They reason that for the Netherlands and Belgium, geography and transportation efficiency probably play a big role in their large trade with the US. This considers the important role of distance in trade preference. Other than the distance factor, economists note that this anomaly is partly because of cultural affinity. Ireland shares the same language and colonial descendants with the US (through Irish immigration). This insight leads the study to further look into other noneconomic factors that are considered by economists as *"trade costs"* affecting bilateral trade preferences (e.g., cultural indicators).

2.2 Extensions of the Model

There are other nontraditional factors, commonly referred to as *"trade costs,"* used in the GMT as well as its modern application to international trade, according to Möhlmann, Ederveen, de Groot, and Linders (2010). They say that these trade costs are the effects of intangible trade barriers that have extended GMT beyond the early GMT, which only considers costs associated with transportation and geographical distance. They also say that it is likely that there are significant additional costs involved in trading besides transportation. Deardorff (1998) suggests that the current amount of global trade is far below the level that will prevail if transport expenditures are the only cost of trading. Moreover, Trefler (1995) and Davis, Weinstein, Bradford, and Shimpo (1997) find that the factor proportions theory of trade predicts trade flows that are missing from actual observations. They argue that home biases in preferences may explain this *"mystery of missing trade."*

Van Bereijk and Brakman (2010) claim that the most important contribution of the gravity equation is that it points out the relevance of trade costs. Their study depends not only on actual distance, but also on the use of dummies to show borders, language similarities, cultural differences, colonial relations, participation in exclusive trading areas, and other things to measure these trade costs. Their study considers not only economic factors such as tariffs and nontariff barriers, but also *"noneconomic"* factors such as cultural differences – variations in culture, common language, the presence or absence of former colonial relations, institutional disparities, technological development differences, and so on. Other studies also contribute to these extensions of the GMT.

Many studies have extended the basic gravity equation with dummy variables suggesting whether the trading partners share a common language, religion, or colonial past (Boisso & Ferrantino, 1997; Frankel, 1997; Geraci & Prewo, 1977; Guiso, Sapienza, & Zingales, 2004; Yeyati, 2003). Most studies have found that these variables have significant positive effects on the magnitude of international trade flows (Möhlmann et al., 2010, p. 231). Although these studies show that these variables matter, they have only captured cultural familiarity in the sense that the trading partners have more knowledge of each other's cultures, and find it easier to communicate and share information (Möhlmann et al., 2010; Rauch, 1999). Möhlmann et al. (2010) have gone beyond just cultural familiarity by focusing on cultural distance, defined as the extent to which the shared norms and values in one country differ from those in another (Hofstede, 2001). It is common knowledge that large cultural distance raises the costs of international trade as these cultural differences make it difficult to manipulate and predict the behavior of other trading partners (Elsass & Veiga, 1994).

Summarized in Table 1 are some recent literature on the extended GMT that incorporates nontraditional variables.

Table 1. List of Recent Noneconomic Variables in Extended GMT

Author (Year)	Description of Nontraditional Variables
Baier and Bergstrand (2001)	Economic integration agreement
Fidrmuc and Fidrmuc (2016)	Foreign language
Figueiredo, Lima, and Schaur (2014)	Currency
Kawai and Naknoi (2015)	Foreign direct investment (FDI)
Lee (2013)	Religion
Möhlmann et al. (2010)	Cultural distance
Rauch (1999)	Network, language, history
Söderström (2008)	Cultural distance, common language, colonizer, common border
Spring and Grossman (2016)	Bilateral trust

Source: Literature review

2.2.1 Cultural and Institutional Distances

Möhlmann et al.'s (2010) study includes a measure of cultural and institutional distances in the traditional GMT, thus offering an empirical perspective on the noneconomic component of border effects. Their study builds on the work of Rauch (1999) by estimating the GMT for different product groups. It uses the Heckman (1979) selection method, which approaches zero trade flows in a more satisfactory manner than ordinary least squares (OLS), which aligns market disaggregation due to the increased absence of trade between trading countries in specific products. Their study also uses a broader view on the different dimensions of distance as suggested by Rauch (1999), wherein *"networks"* are highlighted to be a valuable factor in trade transactions, and a common language or a shared colonial history will make networks more likely to exist.

Rauch (1999) uses a dummy variable showing whether two countries share a common language or colonial history (Möhlmann et al., 2010, p. 226). However, Möhlmann et al. (2010, p. 226) note that this variable does not capture the idea that transaction costs increase when firms have less knowledge about foreign cultures and markets due to cultural differences. So, they use different product categories for the parameters of the gravity equation. For that purpose, the researchers extend the analysis of Rauch (1999) by exploring the impact on different sectors of the economy and on specific products.

The extended gravity equation used by Möhlmann et al. (2010, p. 227) is as follows:

$$\ln T_{ij} = \ln K + \alpha \ln Y_{ij} + \beta \ln y_{ij} + \lambda \ln D_{ij} + \delta M_{ij} + \theta_1 CD_{ij} + \theta_2 ID_{ij} - \ln P_i^{1-\sigma} - \ln P_j^{1-\sigma} + \varepsilon_{ij}$$

where T_{ij} stands for exports from country i to country j, K is a scalar, Y_{ij} and y_{ij} represent the product of GDP and GDP per capita of countries i and j, and D_{ij}, CD_{ij}, and ID_{ij} reflect physical, cultural, and institutional distances between the countries, respectively. P_i and P_j are the price levels in the host and partner countries. The matrix M_{ij} contains additional variables that may affect the ease of bilateral trading, such as a common border, linguistic or colonial links, and common trade bloc membership (such as the ASEAN, EU, and NAFTA). Their key parameters of interest are θ_1 and θ_2, capturing the effects of cultural and institutional distances on trade, respectively. The σ stands for a preference parameter, and finally, ε_{ij} is an error term.

At the level of aggregate trade flows, the impact of cultural and institutional differences tends to be minimal, but remains important at the level of individual consumer classes (Möhlmann et al., 2010). Den Butter and Mosch (2003), and Anderson and van Wincoop (2003) note that trading transaction costs may include several aspects such as transportation costs, taxes, search costs, product, quality information costs, and contract compliance costs. Cost of doing business is likely to increase when there is a significant difference between countries' cultures and markets. Negotiation costs will be higher if the trading partners do not speak the same language (Anderson & Marcouiller, 2002). That is why more recent studies include social and organizational separation tests (Möhlmann et al., 2010).

Results from Möhlmann et al. (2010, p. 246) confirm the network/search theory specified by Rauch (1999), with respect to the effect of linguistic or colonial links. For more differentiated products, this impact is greater. However, controlling for omitted variable bias due to multilateral resistance, and accounting for selection bias due to zero-valued trade flows, geographical distance shows the opposite pattern in their study. They explain the importance of distance to search costs in comparison to more conventional barriers to transport. Their analysis of additional variables of cultural and institutional distance suggests that these effects are quite different across types of products. They show that cultural distance has a negative impact, although institutional distance has a positive impact on goods exchanged on regulated markets; however, both variables are statistically insignificant for trade in differentiated products. They also suggest that the relationship between FDI and trade can provide a possible explanation for the positive effect.

2.2.2 Language

A section of a recent empirical work on international trade emphasizes the role of cultural factors for bilateral trade, particularly common languages, according to Fidrmuc and Fidrmuc (2016, p. 31). They add to this literature by analyzing the importance of speaking foreign languages for international trade, and they use standard and quantile regressions to address this question in a sample of European Union member countries as well as candidate nonmember countries (Fidrmuc & Fidrmuc, 2016, p. 33). Their results suggest that widespread foreign language knowledge promotes international trade in a quantitatively significant manner, and that English expertise tends to play a special role in trade. The language variable in GMT appears to be an important factor.

2.2.3 Religion

According to Lee (2013), religion has two counteracting effects on international trade. First, cross-border religious beliefs can enhance trust and create network effects that reduce trading partners' transaction costs. Second, some religious cultures support international trade, while others oppose international trade. Consequently, a given religion's positive and negative institutional impact on international trade varies from one religious culture to another. Lee (2013) proposes that religion functions as a ubiquitous network that increases international trade in goods and services. The results of his study show that all religions have positive and statistically significant aggregated institutional effects. It suggests that, through global trade in goods and services, religion has positive effects on societies and networks. Therefore, religion develops co-religious networks that positively influence interpersonal trust, ultimately increasing institutional barriers between countries. The results of this study also show that religion leads to increased global trade in goods and services, and promotes trade in services more than trade in goods by creating positive organizational and network impacts.

2.2.4 Somatic Distance

Spring and Grossmann (2016) examine the extent to which bilateral trust across countries affects international trade. The study of Guiso et al. (2004) captures the exogenous variance in *"bilateral trust"* by calculating *"somatic distance"* between partner countries as a factor for the difference in trust between economic agents in two countries. Guiso et al.'s (2004) indicators of somatic distance are constructed based on four anthropometric indicators (hair color, cephalic index, height, and skin color) used by Spring and Grossmann (2016). The first three indicators come from Biasutti (1959), who classifies the world into five categories of hair colors: (1) blond prevails; (2) mix of blond and dark; (3) dark prevails; (4) sporadic presence of blond; and (5) exclusively dark. He further differentiates five categories of average cephalic indexes and six categories of height. The results show no evidence that international trade or migration is influenced by bilateral confidence or cultural proximity. Spring and Grossmann (2016) do not find any robust evidence for the hypothesis that bilateral trust across countries or cultural proximity, apart from language, affects international trade or migration patterns.

Similarly, Söderström (2008) uses cultural distance as a measurement to differentiate norms, values, and beliefs from one country to another. The general view of cultural distance is that as cultural difference increases, the costs of international trade often rise (Hofstede, 2001). The data for this variable is collected from Hofstede (2001), but has been altered from four measures into one. Increasing the cultural gap between nations is expected to adversely affect trade flows between them

as it complicates trade and leads to higher transaction costs. Other variables used by Söderström (2008, p. 4) are common language, common border, and colony/colonizer. The results show that cultural variables add insights into the flows of trade. Research shows that countries with different traditions, values and beliefs interact less with each other than countries with similar cultural features. Because of the negative influence of the cultural gap dummy, trade is stimulated when countries are close (Söderström 2008, p. 13). Consistent with the study performed by Guiso et al. (2004), trust is necessary when it comes to trade (Söderström 2008, p. 13).

2.2.5 Free Trade Agreements

Free trade agreements (FTA) ideally end all formal barriers to trade between countries. Nevertheless, even though most goods and services transported across a national border do not pay tariffs and face few legal restrictions, there is much more trade between regions of the same country than between regions in different countries. The GMT is also an assessment of the effects of trade agreements on actual international trade, that is, whether or not a trade agreement is successful (Carrère, 2004). Such trade agreements will result in significantly lower trade between their partners that will otherwise be expected due to their GDPs and distance from each other.

Carrère (2004) shows the success of seven regional trade agreements on trade flows between member countries. His findings show that most of these regional trade agreements result in an increase in intraregional trade activity, coupled with a reduction in either imports or exports to the rest of the world. This finding shows evidence of trade diversification through the implementation of regional trade agreements.

Hapsari and Mangunsong (2006) also find that the standard gravity variables (GDP, distance) have significant effects on ASEAN members' bilateral exports. Consistent with previous studies, the use of the gravity equation, to estimate the determinants of bilateral trade between countries, has significant results in their study. Their results also show that the reduction of tariff has a significant effect in increasing ASEAN members' bilateral exports; therefore, it can be expected that the successful implementation of the ASEAN Free Trade Agreement (AFTA) scheme, to reduce or eliminate tariff barriers, will improve ASEAN members' trade. Their study also confirms that the more the countries' supply and demand complement each other, the more they trade; as ASEAN members' export and import profiles have become more similar to each other over time, these countries have great potential for intraregional trade. They show that their bilateral exports are positively affected by a different export structure among ASEAN members. Intra-industry trade can therefore be expected to increase intraregional trade among ASEAN members, and support the ASEAN region's further economic integration (Hapsari & Mangunsong, 2006, p. 4).

3 Philippine Trade Profile

The Philippines' import trade data, as of December 2018, showed that imports from the top 10 countries amounted to US$6.57 billion, or 77.5% of total imports (PSA, 2019, #8). Table 2 lists the Philippines' top trade partners and their respective percentage share.

Table 2. The Philippines' Top Trading Partners (as of December 2018)

Trade Partner	Percentage Share of Total Import
People's Republic of China	22.1
Japan	9.7
Republic of Korea	9.2
United States of America	7.8
Thailand	6.7
Singapore	5.58
Indonesia	5.43
Taiwan	4.44
Malaysia	3.76
Vietnam	2.89

Source: PSA, 2019

For the Philippines' export data, the top 10 trading partners account for 70% of the Philippines' export business. Seven of the 10 trading partners are located near the Philippines (Japan, Hong Kong, China, Singapore, Thailand, Korea, Taiwan), while the remaining three trading partner countries (the US, Germany, the Netherlands) have the highest values of GDP in the world (PSA, 2019). Note in this case that distance and GDP are unique indicators of trade activity. There then seems to be a relationship between the distance and size of a country's economy with the volume of its trade.

The country's merchandise exports to East Asia comprised 47.5% of total exports, equivalent to US$2.24 billion, while 16.3% of total exports, valued at US$771.78 million, went to ASEAN (PSA, 2019, #9). East Asia (China, Hong Kong, Japan, Macau, Mongolia, North Korea, South Korea, and Taiwan) was the biggest source of the country's imports at US$4.07 billion or a 48.1% share, while commodities imported from ASEAN member countries comprised 24.5% of the total imports, about US$2.07 billion in value (PSA, 2019, #10). Lastly, imports from European Union member countries registered a value of US$681.27 million (PSA, 2019, #10).

AFTA aims to eliminate tariff barriers among ASEAN member countries, including the Philippines, Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, Thailand, and Vietnam (Hapsari & Mangunsong, 2006, p. 5). The Philippines also engages in other FTAs; namely, ASEAN + 6, European Free Trade Association (EFTA), and Philippines-Japan Economic Partnership Agreement (PJEPA).

4 Methodology and Data Requirements

The gravity model of international trade has its origins in Newton's law of universal gravitation, which states that the force of gravity between two objects is directly proportional to the product of their masses and inversely proportional to the square of the distance between them (Chaney, 2011, p. 2). Bilateral trade between two countries is approximately proportional to their sizes, and is inversely related to the geographic distance between them (Chaney, 2011, Abstract, p. 1). Size (q) is usually measured by the GDP of the two countries. Hence, the basic gravity equation may be written in general as follows:

$$T_{ij} \propto \frac{q_i^{\alpha_1} q_j^{\alpha_2}}{d_{ij}^{\alpha_3}} \tag{1}$$

where bilateral trade (T_{ij}) is calculated as the sum of exports and imports of host country i and is referred to as its total trade with partner country j, d_{ij} is the distance between the two trading partners, and the symbol $\propto$ shows a proportional relation. A meta-analysis by Disdier and Head (2008), of the distance effects on bilateral trade estimated in 103 papers, shows that estimates of α_1 and α_2 are stable and hover around one, while the distance coefficients (α_3) are also close to one but with a larger dispersion (Chaney, 2011, Abstract, p. 2).

Gravity equations are being applied increasingly to panel data, with both large cross-sectional and longtime-series variation. Estimation of gravity equations uses country-specific fixed effects to capture the time-varying terms for each country.

4.1 Estimation of the Gravity Models

Early GMT is easily estimated using a log-linear specification of equation (1), that is, the econometric specification that can be estimated by OLS is as follows:

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln q_i + \alpha_2 \ln q_j + \alpha_3 \ln d_{ij} + \varepsilon_{ij} \tag{2}$$

There are many regression methods that may be deployed for estimating the parameters and the constant for the GMT. The simplest method is the OLS, which can be applied after taking the natural logarithm of equation (2) (Buys, Deichmann, & Wheeler, 2006). This estimation technique, however, has its drawbacks as pointed out by Santos Silva and Tenreyro (2006). First, log-linearization eliminates zero-trade pairs; and hence, a truncated sample reduces the number of observations. Second, trade data are inherently heteroscedastic, making estimation of a log-linearized equation by OLS lead to inconsistent results. Errors arising from the transformed equation estimates will be correlated with the explanatory variables. These problems suggest that a nonlinear least squares (NLS)

estimation procedure must be used. Third, they argue that unlike physical laws, such as that of gravity, economic relations do not have to be exact and only need to hold on the average. If a constant elasticity specification is required, an equation of the form $y_i = \exp(x_i\beta)$ is sufficient. Hence, for n observations and k explanatory variables, one can write an estimable conditional mean model as

$$E(y_i|x_i) = \exp(x_i\beta) \tag{3a}$$

or equivalently

$$y_i = \exp(x_i\beta) + \varepsilon_i \tag{3b}$$

To derive the estimator, one chooses β to minimize the sum of squared errors

$$\sum_{i=1}^{n} [y_i - \exp(x_i\beta)]^2, \tag{4}$$

and obtain the k first-order conditions:

$$\sum_{i=1}^{n} \left[y_i - \exp\left(x_i\hat{\beta}\right)\right] \exp\left(x_i\hat{\beta}\right) x_i = 0 \tag{5}$$

Equation (5) shows that more weight is given to observation i the larger $\exp\left(x_i\hat{\beta}\right)$ is. Accordingly, the resulting NLS estimator arising from equation (5) may be inefficient because it can crucially depend on large observations that cannot only be few, but also typically have large variances. It would be correct to consider known variances as this can be used as weights in the regression. The variance is generally unknown, but if one can assume that the conditional variance of y_i is proportional to its conditional mean, $V(y_i|x_i) \propto \exp(x_i\beta)$, it can be shown that the parameters can be estimated by solving the following first-order conditions (Santos Silva and Tenreyro, 2006, p. 645):

$$\sum_{i=1}^{n} \left[y_i - \exp\left(x_i\tilde{\beta}\right)\right] x_i = 0 \tag{6}$$

Equation (6) shows that equal weights are given to all observations (Santos Silva and Tenreyro, 2006, p. 645). Santos Silva and Tenreyro (2006, p. 645) note that the estimator arising from equation (6) is similar in numerical terms to the Poisson maximum likelihood estimator that is used in analyzing count data. However, in the case of GMT, they point out that the dependent variable is not a count variable or integer value. Accordingly, restricting the type of data to integers or imposing a Poisson distribution is not needed for this estimator to be consistent. As earlier mentioned, a correct specification of the conditional mean, $\lambda_i = E(y_i|x_i) = \exp(x_i\beta)$, must be assumed to be proportional to the conditional variance for consistency (Santos Silva & Tenreyro, 2006, p. 645). They also point out that this specification can easily be estimated using the Stata econometric package's Poisson regression command[2].

In this study, the GMT specified in equation (2) is extended to include other factors that influence international trade activity. The extended model focuses on the analysis of the effects of cultural variables, such as religion, language, and other cultural similarities or dissimilarities between trading partners. The model specified also includes control variables that account for region-specific or country-specific factors, trade agreements or membership in free trade areas, and other factors that may hinder or facilitate international trade flows. Equation (7) is the study's general hypothesis and main equation:

$$\begin{aligned} \ln T_{ij} = \alpha_0 + \alpha_1 \ln q_i + \alpha_2 \ln q_j + \alpha_3 \ln d_{ij} + \alpha_4\, lang_{ij} + \alpha_5 col_{ij} + \alpha_6 rel_{ij} \\ + \alpha_7 FTA_{\mathrm{ij}} + \varepsilon_{\mathrm{ij}} \end{aligned} \tag{7}$$

[2] Note that the Poisson distribution is $P(y_i = y|x_i) = \exp(-\lambda_i)\,\lambda_i^y/y_i!$, where λ_i is the conditional mean as defined earlier and in equation (3a). The log-likelihood of the Poisson regression model is $\ln L(\tilde{\beta}) = \sum_{i=1}^{n}[-\lambda_i + y_i \ln \lambda_i - \ln y_i!] = \sum_{i=1}^{n}\left[-\exp\left(x_i\tilde{\beta}\right) + y_i\left(x_i\tilde{\beta}\right) - \ln y_i!\right]$. Maximizing L with respect to $\tilde{\beta}$ yields the first-order conditions in equation (6). An assumption of the Poisson regression model is one of equidispersion (i.e., the variance is equal to the mean: $V(y_i|x_i) = \lambda_i = \exp\left(x_i\tilde{\beta}\right)$). See Verbeek (2017).

Equation (7) is used as the main equation of the study. The list of variables mentioned in equation (7) are listed in Table 3.

Table 3. List of Variables with Description

Variables	Description
T	Annual Trade data for countries *i* and *j*
Q	Annual GDP data for countries *i* and *j*
D	Distance in KM for countries *i* and *j*
lang	Common Language of countries *i* and *j*
rel	Religion of countries *i* and *j*
col	Colonial ties of countries *i* and *j*
FTA	FTAs of countries *i* and *j*
ε	Error term

Hypotheses 1 (GDP) and 2 (distance) account for the traditional GMT variables, while hypotheses 3 to 6 account for the noneconomic variables such as the cultural variables: language (hypothesis 3), colonizer (hypothesis 4), and religion (hypothesis 5) and an FTA dummy variable (hypothesis 6). Hypothesis 1 states that the larger the economic mass or GDP of countries, the higher the trade between them. Hypothesis 2 states that the greater the distance between trading countries, there is less trade between them. Hypotheses 3 to 6 account for each noneconomic variable, hence these hypotheses account for a positive relationship between the noneconomic factors and trade.

This study uses the Poisson regression procedure based on the first-order conditions in equation (6) as suggested by Santos Silva and Tenreyro (2006). This has been used extensively for other countries (see, for example, Lee, 2013; Spring & Grossmann, 2016). It is important to stress that the data of the dependent variable used in these GMT remain unspecified, and are not count distributions as required by Poisson regression. But as pointed out by Verbeek (2017, p. 241) and earlier discussed, consistent estimation of the conditional mean shown in equation (3a) can be done without having to specify the conditional distribution. Because the Poisson distribution is not valid in these models, the estimators are termed *"Poisson quasi-maximum likelihood (PQML) estimators"* and is a well-known result cited in Santos Silva and Tenreyro (2006, p. 645).[3] The OLS method is also used for comparison purposes.

4.2 Data Description and Sources

Annual data from 1980 to 2017 for the Philippines and its trading partners are obtained primarily from the International Monetary Fund (IMF) *Direction of Trade Statistics* and the World Bank's *World Economic Outlook*, both of which are available in Thomson-Reuters DataStream. The trade data used is an annual aggregate data for goods and services. The lists of macroeconomic data needed for host countries are as follows: real and nominal GDP (US$ in both level and per capita data), and exports and imports of goods and services (in US$). Annual data is gathered from 1980 to 2017. Noneconomic data—such as religion, colonial ties, common language, and FTAs—are sourced through several online sources. The economic and noneconomic data are obtained from the following sources (See Table 4).

[3] Other econometric methods have also been used. The articles in the special issue of *Empirical Economics* edited by Baltagi, Egger, and Pfaffermayr (2016) discuss some econometric procedures used in analyzing trade flows. An example in the issue is the use of quantile regression by Fidrmuc and Fidrmuc (2016). These empirical methods, however, are beyond the scope of this study.

Table 4. Data Sources

Variable	Data Source
Trade (annual, in US$)	"Direction of Trade Statistics," n.d. (IMF)
GDP (annual, in US$)	"Global Economic Prospects," n.d. (World Bank)
GDP per capita (annual, in US$)	"Global Economic Prospects," n.d. (World Bank)
Distance (in kilometers)	"Google Maps," n.d. (Google Maps)
FTAs of countries	"Free Trade Agreements | International Trade Administration," n.d.
Common language	"Language List by Country and Place," n.d. (Australian Department of Social Services)
Religion of countries	"Countries Compared by Religion," n.d. (Nationmaster.com)
Colonial ties of countries	"French Colonies," n.d. (Global Security), "List of Colonies" n.d. (Encyclopedia Britannica, World Atlas), "Spanish Colonies," n.d. (Public Broadcasting Service)

Distance, which proxies for trade costs in GMT, is taken from Google Maps. The distance variable is computed from the capital of both countries. Distance may consider *"transport technology,"* but it does not change radically because of this. This is because technology is stable over time, and distance as a variable is not affected in the model. Technology may have a positive influence on trade, but it does not affect distance as a determinant of trade. To proxy for lower tariff barriers, a dummy for FTAs involving host and selected partner countries is included. These data are obtained from the International Trade Administration ("Free Trade Agreements | International Trade Administration," n.d.).

This research extends the basic model to include noneconomic, cultural factors that are thought to affect the volume of trade. These cultural factors are represented mostly by binary dummy variables, and they are obtained from various sources. A common language is also assigned to country pairs with a value of 1 when both countries share the same dominant language, reflected by an absolute majority of the population. The common language variable is constructed as a binary dummy based on information from "Language List by Country and Place," n.d. (Australian Department of Social Services). Religion data are taken from the "Countries Compared by Religion," n.d. (Nationmaster.com).

Similar to Lee's (2013) study on the effect of religion on international trade, this study obtains intercountry religion data from the Association of Religion Data Archives (ARDA, 2005), and other online sources. This database provides religious affiliations covering 183 countries based on survey results obtained between 2003 and 2005. This study uses the same religious categories as Lee (2013), which divides religions into six dominant groups: Buddhism, Christianity (including Catholicism), Confucianism (including Shintoism), Hinduism (including Jainism and Sikhism), Judaism, and Islam. Country pairs are assigned a value of 1 when both countries share the same dominant religion, reflected by an absolute majority of population.

A further extension is made by including the country colonizers of the partner countries as explanatory variables in the regressions. Colonial ties use the same assignment of values as that of the religion variable. Country pairs are assigned a value of 1 when both countries share at least one similar colonial background. This gives consideration to the colonial history of partner countries as a subgroup within the set of partner countries. This is thought to capture information cost that comes with trading activities. This enters the regression specification as a categorical variable, where each colonizer country is assigned a dummy variable. The variable called Spanish colony signifies partner countries that are likewise colonized by Spain. The 183 partner countries of the host country are listed in Table 5.

The data described earlier are formed as a panel data set by stacking the *"year-partner country"* data subsets on top of each other using Stata. Thus, there are 6,954 observations (38 years × 183 partners). Gaps in the data are reflected in the succeeding results, showing the number of usable observations for each regression.

Table 5. List of Partner Countries of the Philippines (N = 183)

Algeria	El Salvador	Liberia	Serbia
Antigua and Barbuda	Eritrea	Sri Lanka	Sweden
Afghanistan	Estonia	Lithuania	Seychelles
Argentina	Equatorial Guinea	Lesotho	Senegal
Azerbaijan	Spain	Latvia	Saudi Arabia
Albania	Ethiopia	Luxembourg	Slovenia
Armenia	Egypt	Libya	Saint Kitts and Nevis
Angola	Fiji	Malta	Solomon Islands
Australia	Finland	Morocco	Sudan
Bahrain	France	Madagascar	Singapore
Barbados	Gabon	Republic of Moldova	Sierra Leone
Germany	Guinea	Mongolia	São Tomé and Príncipe
Benin	Georgia	Malawi	Suriname
Belgium	Ghana	Macedonia	St. Vincent
Bahamas	Guinea-Bissau	Mali	Switzerland
Brunei	Gambia, the	Montenegro	Slovakia
Bulgaria	Grenada	Macao	Swaziland
Burundi	Greece	Mauritania	Tonga
Botswana	Guatemala	Mauritius	Thailand
Bosnia and Herzegovina	Guyana	Maldives	Tajikistan
Brazil	Haiti	Mexico	Turkey
Bangladesh	Hong Kong	Malaysia	Turkmenistan
Bhutan	Hungary	Mozambique	Tanzania
Myanmar (Burma)	Honduras	Nigeria	Togo
Bolivia	Iran	Nicaragua	Tuvalu
Belarus	Iceland	Netherlands	Trinidad and Tobago
Belize	Indonesia	Nepal	Tunisia
Cameroon	India	Niger	Taiwan
Colombia	Iraq	Nauru	United Arab Emirates
Chad	Ireland	Norway	Uganda
C. African Rep.	Israel	New Zealand	United Kingdom
China	Italy	Austria	Ukraine
Chile	Cote D'Ivoire	Oman	United States of America
Comoros	Jamaica	Panama	Burkina Faso
Canada	Jordan	Peru	Uruguay
Congo	Japan	Papua New Guinea	Uzbekistan
Cyprus	Cambodia	Pakistan	Venezuela
Costa Rica	Kenya	Poland	Vietnam
Croatia	Korea	Portugal	Vanuatu
Cape Verde	Kiribati	Palau	Namibia
Czech Republic	Kuwait	Paraguay	Western Samoa
Djibouti	Kyrgyz Republic	Qatar	Yemen
Denmark	Kazakhstan	Romania	Democratic Rep. of Congo
Dominica	Lao P. D. Rep.	Russian Federation	Zimbabwe
Dominican Rep.	Lebanon	Rwanda	Zambia
Ecuador	St. Lucia	South Africa	

Source: IMF, n.d.

5 Empirical Results

Tables 6 to 11 show the results. Each table has four numbered columns. Columns 1 and 2 are panel Poisson regressions using the pseudo-maximum-likelihood methods. Columns 3 and 4 are panel random effects OLS regressions. Each method uses either exports or total trade (sum of exports and imports) as a measure of trade flows between the host and the partner country.

The study is divided into two models: the basic GMT (See Tables 6 and 7) and the extended GMT (See Tables 8, 9, 10, and 11). OLS regression and Poisson regression are both used to show relative performance of each econometric model. GDP level data and GDP per capita data are used as alternative measures of size or economic mass. The basic GMT (See Tables 6 and 7) only includes traditional gravity variables, such as GDP (real GDP) and distance (kilometers).

The extended GMT is estimated using two specifications. Tables 8 and 9 exclude colonizer dummies, while Tables 10 and 11 include colonizer dummies; each done with real GDP and nominal GDP for comparison purposes.

5.1 Estimates

5.1.1 Basic Gravity Model

In Table 6, the OLS estimates of the basic GMT using GDP level as the size variable are significant and correctly signed. On the other hand, the Poisson regressions show that the host GDP is not significant, and the distance variable is significant and incorrectly signed.

Table 7 shows the basic GMT using GDP per capita data, wherein estimates for the OLS are significant and correctly signed for both variables. While the distance variable for the Poisson regression is significant but incorrectly signed. This shows that the OLS regression performs better than the Poisson regression.

5.1.2 Extended Gravity Model

Table 8 shows the extended GMT with GDP level as the size variable. This model includes, aside from the traditional GMT variables of GDP and distance, cultural variables such as religion, language, FTA (AFTA), and the colonizer country of their partners. The OLS regressions show that all variables are significant and correctly signed, except for the FTA variable. Moreover, the Poisson regressions show that host real GDP, distance, religion, and FTA are not significant. The FTA variable is consistently insignificant for both OLS and Poisson regressions. This result shows FTA has little to no effect on the trade activity between member countries despite the preferential trade arrangements. Indeed, there have been problems in the implementation of AFTA since its inception (see, for example, Jones, 2016; Soesastro, 2002).

Table 9 shows the extended GMT with GDP per capita as the size variable. Consistent across OLS and Poisson regressions, results show that religion, language, and FTA are not significant variables. Specifically, for the Poisson regression, results show that distance is not significant as well as the export data of the host's real GDP per capita.

In Table 10, the OLS regressions perform better than the Poisson regressions. All traditional GMT variables on size and distance are significant and correctly signed. The religion and language variables are significant determinants of trade volume. Trade partners who have also been colonized by Spain matter in explaining Philippine trade as can be seen by the significant Spanish colony dummy. As in previous results, the FTA is not significantly different from zero in both OLS and Poisson regressions, while real GDP level of host country distance and religion are all not significant in the Poisson regressions. Country colonizer dummies (e.g., United Kingdom, France, None) in all regressions in Table 10 are mostly statistically significant.

For Table 11, religion and FTA are both not significant in OLS and Poisson regressions. Export data for real GDP per capita of host, Spanish colony, and Japan are all not significant variables in the Poisson regressions.

Cultural variables that extend the basic GMT show interesting points for further exploration. Spanish colony shows satisfactory results across most regressions, signifying that partner countries who are former colonies of Spain show significant bilateral trade relations. However, FTA (AFTA) is consistently not significant in all regressions. This may be only true for the Philippines and not for

other ASEAN member countries. This can be explored further to check for multilateral effects of AFTA across the other ASEAN countries with the rest of the world.

For the basic GMT, OLS regressions show better results than Poisson regressions. The Poisson regressions give the incorrect sign for the distance variable across all tables, while the OLS regressions give the correct sign to the distance variable, which is also a significant variable in the OLS regressions.

Table 6. Basic Gravity Model of Trade (GDP Levels)

Panel regressions	(1)	(2)	(3)	(4)
	Poisson		OLS	
	Exports	Total Trade	Exports	Total Trade
Real GDP, partner	1.342**	1.461**	0.527**	0.546**
	(0.33)	(0.21)	(0.08)	(0.08)
Real GDP, host	0.495	0.363	1.706**	1.474**
	(0.42)	(0.28)	(0.13)	(0.12)
Distance	3.030**	3.376**	-1.359**	-1.375**
	(1.14)	(0.87)	(0.35)	(0.38)
Constant	-27.986**	-29.133**	-4.853	-1.95
	(6.46)	(5.70)	(3.45)	(3.72)
Wald $\chi^2(3)$	413.85	895.43	364.30	364.01
p value	0.00	0.00	0.00	0.00
No. of observations	6,047	5,965	4,977	5,115

Note: standard errors in parenthesis; + p<0.10, * p<0.05, ** p<0.01

Table 7. Basic Gravity Model of Trade (GDP per Capita)

Panel regressions	(1)	(2)	(3)	(4)
	Poisson		OLS	
	Exports	Total Trade	Exports	Total Trade
Real GDP per capita, partner	2.054**	1.828**	0.687**	0.711**
	(0.43)	(0.30)	(0.13)	(0.13)
Real GDP per capita, host	0.466	0.726+	3.187**	2.789**
	(0.57)	(0.39)	(0.23)	(0.22)
Distance	9.398**	7.874**	-1.424**	-1.441**
	(2.57)	(1.87)	(0.40)	(0.44)
Constant	-92.093**	-80.711**	-29.207**	-24.050**
	(18.77)	(13.58)	(4.61)	(4.86)
Wald $\chi^2(3)$	141.64	402.94	337.21	327.66
p value	0.00	0.00	0.00	0.00
No. of observations	6,032	5,950	4,987	5,119

Note: standard errors in parenthesis; + p<0.10, * p<0.05, ** p<0.01

Table 8. Extended Gravity Model of Trade (GDP Levels)

Panel regressions	(1)	(2)	(3)	(4)
	Poisson		OLS	
	Exports	Total Trade	Exports	Total Trade
Real GDP, partner	1.343**	1.462**	0.569**	0.585**
	(0.33)	(0.21)	(0.08)	(0.09)
Real GDP, host	0.494	0.363	1.671**	1.441**
	(0.42)	(0.28)	(0.14)	(0.12)
Distance	0.209	0.565	-2.083**	-2.024**
	(0.61)	(0.51)	(0.36)	(0.40)
Religion	-0.181	-0.06	1.029+	0.861
	(0.72)	(0.87)	(0.57)	(0.61)
Language	3.878**	2.841**	1.419**	1.318*
	(1.35)	(1.05)	(0.47)	(0.51)
Spanish colony	11.664**	11.055**	1.512*	1.361+
	(3.67)	(2.34)	(0.72)	(0.74)
AFTA	-0.829	-0.247	-1.269	-1.234
	(1.64)	(1.30)	(1.55)	(1.62)
Constant	-10.339**	-11.126**	0.657	2.999
	(3.72)	(4.04)	(3.44)	(3.77)
Wald $\chi^2(7)$	777.79	2,093.77	400.47	387.85
p value	0.00	0.00	0.00	0.00
No. of observations	6,047	5,965	4,977	5,115

Note: standard errors in parenthesis; + p<0.10, * p<0.05, ** p<0.01

Table 9. Extended Gravity Model of Trade (GDP per Capita)

Panel regressions	(1)	(2)	(3)	(4)
	Poisson		OLS	
	Exports	Total Trade	Exports	Total Trade
Real GDP per capita, partner	2.055**	1.829**	0.697**	0.724**
	(0.43)	(0.30)	(0.13)	(0.14)
Real GDP per capita, host	0.466	0.726+	3.181**	2.779**
	(0.57)	(0.39)	(0.23)	(0.22)
Distance	1.558	0.749	-2.033**	-1.970**
	(1.68)	(1.11)	(0.50)	(0.54)
Religion	-3.111	-1.773	0.781	0.609
	(1.94)	(1.22)	(0.67)	(0.72)
Language	2.312	1.809	0.735	0.634
	(2.25)	(1.21)	(0.51)	(0.56)
Spanish colony	23.356**	19.582**	1.622+	1.476
	(5.59)	(4.24)	(0.88)	(0.93)
AFTA	-0.716	-0.373	-0.574	-0.539
	(2.09)	(1.44)	(1.72)	(1.80)
Constant	-34.237*	-27.416**	-24.515**	-19.968**
	(14.33)	(9.96)	(5.19)	(5.57)
Wald $\chi^2(7)$	613.79	938.13	347.72	337.46
p value	0.00	0.00	0.00	0.00
No. of observations	6,032	5,950	4,987	5,119

Note: standard errors in parenthesis; + p<0.10, * p<0.05, ** p<0.01

Table 10. Extended Gravity Model of Trade (with Colonizer Dummies) (GDP Levels)

Panel regressions	(1)	(2)	(3)	(4)
	Poisson		OLS	
	Exports	Total Trade	Exports	Total Trade
Real GDP, partner	1.277**	1.446**	0.602**	0.623**
	(0.33)	(0.22)	(0.09)	(0.09)
Real GDP, host	0.536	0.364	1.535**	1.295**
	(0.45)	(0.30)	(0.15)	(0.13)
Distance	-0.158	0.032	-1.855**	-1.681**
	(0.62)	(0.71)	(0.42)	(0.45)
Religion	1.289*	0.786	1.470**	1.205*
	(0.61)	(0.59)	(0.51)	(0.55)
Language	1.550**	1.609**	1.857**	1.813**
	(0.54)	(0.59)	(0.50)	(0.54)
Spanish colony	1.939+	2.956**	2.132+	2.431+
	(1.10)	(0.98)	(1.13)	(1.37)
AFTA	0.715	-0.314	-1.172	-0.995
	(1.08)	(1.21)	(1.42)	(1.44)
United Kingdom	9.726**	11.242**	5.143**	5.692**
	(2.15)	(1.77)	(1.25)	(1.40)
France	6.933**	6.899**	3.936**	4.013**
	(1.53)	(1.37)	(1.20)	(1.32)
Germany	8.168**	11.902**	4.967**	5.249**
	(2.43)	(3.17)	(1.60)	(1.78)
Italy	3.903**	7.411**	2.494*	3.015*
	(1.34)	(1.81)	(1.19)	(1.37)
Japan	2.447	1.645	6.110**	6.710**
	(1.64)	(1.49)	(1.24)	(1.36)
The Netherlands	7.476**	7.256**	5.896**	5.623**
	(1.96)	(1.64)	(1.29)	(1.42)
Portugal	8.584**	9.552**	5.688**	6.050**
	(2.31)	(1.84)	(1.35)	(1.49)
Russia	7.385**	8.225**	4.400**	5.209**
	(2.13)	(1.48)	(1.32)	(1.51)
United States of America	14.595**	14.616**	7.832**	7.876**
	(2.78)	(2.13)	(1.32)	(1.48)
Soviet Union	8.424**	8.785**	4.488**	4.874**
	(2.25)	(1.56)	(1.47)	(1.62)
Other colonizers	9.350**	10.036**	7.338**	8.035**
	(1.61)	(1.37)	(1.65)	(1.91)
No colonizers	8.353**	9.831**	6.779**	7.527**
	(1.33)	(1.87)	(1.15)	(1.27)
Constant	-16.206**	-16.618**	-5.907	-5.004
	(4.89)	(6.41)	(4.21)	(4.60)
Wald $\chi^2(19)$	785.47	1,624.11	.	.
p value	0.00	0.00	.	.
No. of observations	5,125	5,046	4,176	4,292

Note: standard errors in parenthesis; + p<0.10, * p<0.05, ** p<0.01

Table 11. Extended Gravity Model (with Colonizer Dummies) (GDP per Capita)

Panel regressions	(1)	(2)	(3)	(4)
	Poisson		OLS	
	Exports	Total Trade	Exports	Total Trade
Real GDP per capita, partner	1.944**	1.789**	0.770**	0.777**
	(0.40)	(0.30)	(0.13)	(0.14)
Real GDP per capita, host	0.56	0.754+	3.030**	2.600**
	(0.60)	(0.40)	(0.25)	(0.24)
Distance	0.159	-0.087	-1.875**	-1.712**
	(0.87)	(0.68)	(0.52)	(0.56)
Religion	0.024	-0.227	1.018	0.72
	(0.63)	(0.64)	(0.65)	(0.70)
Language	1.904**	1.443*	1.427*	1.373*
	(0.68)	(0.67)	(0.56)	(0.60)
Spanish colony	0.993	1.299	2.426+	2.719+
	(1.43)	(1.30)	(1.43)	(1.64)
AFTA	0.768	-0.019	-0.667	-0.446
	(1.12)	(1.03)	(1.55)	(1.56)
United Kingdom	8.911**	9.325**	4.306**	4.763**
	(1.87)	(1.35)	(1.32)	(1.47)
France	8.891**	8.744**	2.854*	2.871*
	(1.45)	(1.17)	(1.26)	(1.38)
Germany	6.877**	6.885**	3.091	3.223
	(1.44)	(1.24)	(1.93)	(2.10)
Italy	6.305**	7.083**	2.863+	3.294*
	(1.76)	(1.48)	(1.54)	(1.52)
Japan	0.542	1.281	5.394**	6.040**
	(1.28)	(1.23)	(1.45)	(1.58)
The Netherlands	3.142*	2.831**	3.416*	3.168*
	(1.22)	(1.04)	(1.36)	(1.49)
Portugal	9.245**	10.224**	4.723**	5.026**
	(1.70)	(1.34)	(1.62)	(1.80)
Russia	8.084**	8.427**	4.163**	4.899**
	(1.79)	(1.20)	(1.38)	(1.61)
United States of America	16.085**	14.831**	6.775**	6.679**
	(2.72)	(2.05)	(1.76)	(1.93)
Soviet Union	8.192**	8.261**	3.934**	4.238*
	(1.70)	(1.27)	(1.48)	(1.67)
Other colonizers	9.218**	9.339**	6.544**	7.176**
	(1.41)	(1.19)	(1.77)	(2.04)
No colonizers	11.277**	10.878**	6.464**	7.175**
	(1.42)	(1.18)	(1.22)	(1.35)
Constant	-33.486**	-30.676**	-29.882**	-26.074**
	(9.25)	(7.03)	(5.89)	(6.19)
Wald $\chi^2(19)$	701.02	1,175.13	.	.
p value	0.00	0.00	.	.
No. of observations	6,047	5,965	4,977	5,115

Note: standard errors in parenthesis; + p<0.10, * p<0.05, ** p<0.01

6 Discussion and Conclusion

This study attempts to explain the volume and pattern of international trade activities of the Philippines with its trading partners by looking at economic factors and noneconomic, cultural factors using the extended GMT. The GMT is a powerful tool used in the empirical study of bilateral trade flows. Its application extends to various areas of academic research and policy-generating research.

This study's objective is to analyze trade flows of the Philippines with its country partners by relating trade between any two countries to the sizes of their economies, as well as their proximity to each other. This study provides empirical evidence on the validity of the basic and extended GMTs to evaluate cultural factors and FTAs among trading countries.

The results of this study support the basic GMT framework as all traditional variables (GDP of countries and their distance) are significant. This study, among many others, supports the significance of both countries' GDP as well as their distance with regard to bilateral trade.

Going beyond the basic GMT, the study incorporates cultural variables. It is natural to expect that different trading arrangements and the selection of trading partners depend not only on the distance and economic mass that are the basis of the standard GMT, but also on other noneconomic factors like religion and colonial history. The empirical results show that noneconomic and cultural factors are important in explaining trade patterns of countries.

The results for the extended GMT regressions show that: (1) the Spanish colony dummy is statistically significant across most regressions, implying that partner countries with the same colonizer as that of the Philippines influence bilateral trade relations; (2) the FTA (AFTA) variable is consistently insignificant for both OLS and Poisson regressions – an observation for the Philippines but one that cannot be generalized for other ASEAN member countries; (3) religion is not significant in most regressions; and (4) the Poisson regressions give the incorrect sign for the distance variable across all regressions, while the OLS regressions give the correct sign to the distance variable, which is also a significant variable in the OLS regressions.

In general, this study suggests that overall trade policy and industrial program should be designed to consider not only the economic aspects, but also the noneconomic and cultural factors that can raise international trade activity and encourage a more prominent role of the Philippines in the world economy. Looking at positive signed variables in the regressions (religion, language, and previously colonized by Spain), trade policies can be geared toward the English-speaking countries, mainly Roman Catholic nations or countries previously colonized by Spain. This means that the Philippines can go on trade missions, and/or give trade incentives (i.e., subsidy, tax exemptions) to industries where firms are encouraged to export more to these countries/regions. While for the negative signed AFTA dummy, policymakers should consider reclassifying their trade association, joining other regional groups, or establishing more multilateral agreements with other countries to expand trade linkages and lessen reliance on AFTA. Future studies may attempt to examine and learn about countries' industries in which export/trade activities may be targeted.

This study adds value to the literature through its theoretical, methodological, and policy contributions and implications. Its theoretical contributions are anchored on the use of both the basic GMT framework and cultural variables. Its application of the GMT to updated data is also a contribution of the study. Its methodological contributions are accounted for the use of noneconomic data and both the OLS and Poisson regressions. Lastly, its policy implications suggest that policymakers: (1) include efforts on aligning the economic structure of host countries to cultural factors of their partner countries in enhancing trade; (2) offer incentives by way of tax exemptions or subsidies to firms to encourage them to export more to these countries/regions.

6.1 Limitations and Areas for Future Research

The study hopes to improve the overall understanding of factors that may contribute to bilateral trade. The trade variable may be further tightened by segregating the merchandise from the service sector, as the trade variable used in the study is the annual aggregate data for goods and services which may not completely lend itself to the distance variable.

Further research can be drawn across multilateral and regional groups/countries. Since FTA is consistently not significant in all regressions, it can be further explored as a multilateral variable as

opposed to bilateral trade flow variable. The FTA variable is specific only to a certain trade agreement and can be further adapted as a multilateral trade variable incorporating all ASEAN countries as host countries individually. For the AFTA variable, it would be better to do a total ASEAN bilateral trade study to solely look at the effectivity of AFTA as a trade driver. It can be explored further to check for multilateral effects of AFTA across the other ASEAN countries with the rest of the world. From a regional GMT perspective, extended variables can be tested to produce a solid theoretical ground incorporating cultural variables that are consistently accurate and specific to a certain region. This can then be used as theoretical ground for succeeding GMT literature.

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