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# Potential Impacts of the TPP on Agricultural Trade in the Asia-Pacific Region Utilizing a Gravity Model Framework

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# POTENTIAL IMPACTS OF THE TPP ON AGRICULTURAL TRADE IN THE ASIA-PACIFIC REGION UTILIZING A GRAVITY MODEL FRAMEWORK

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# ABSTRACT

This study examines the impacts RTAs have had in the Asia-Pacific region regarding agricultural trade flows in order to make a prediction on how the proposed TPP agreement will affect the region. The estimation was carried out using a Gravity Model framework to observe the trade creation and trade diversion effects of five existing RTAs in the Asia-Pacific region. These agreements include NAFTA, AFTA, MERCOSUR, APEC, and CER. It is expected that RTAs were to have a positive effect for trade creation and a negative trade diversion effect. The gravity model included export flows of agricultural commodities (defined as food and live animals) between countries in the Asia- Pacific region to one another as the dependent variable. The right hand side of the equation included the traditional variables in a gravity model: GDP of exporter (importer), population of exporter (importer), and the distance between exporter and importer. It also consisted of additional variables to capture trade effects due to exchange rates, common language between trading partners, shared border, whether a country is landlocked, and mutual membership in a RTA as our independent variables. Of the five agreements examined AFTA, CER, and MERCOSUR resulted in significant trade creation effects while APEC and NAFTA showed signs of possible trade diversion. It was also concluded that GDP and population had the expected positive signs and that distance also had the expected sign (negative). Also, sharing a common border or language did have an effect on bilateral trade. These results suggest that the TPP should expect a trade creation effect with possible trade diversion effects as well.

# CHAPTER 1 INTRODUCTION

## 1.1 Background

The Trans-Pacific Partnership Agreement (TPP) is a proposed regional free trade agreement (FTA) between the United States and 11 other countries. Current negotiating partners include Australia, Brunei, Canada, Chile, Malaysia, Mexico, New Zealand, Peru, Singapore, Vietnam, and Japan, represented in Figure 1. This comprehensive agreement is not only aimed at improving market access for agricultural and manufactured goods by reducing tariffs and other nontariff barriers to trade, but also establishing standards on a range of issues affecting international trade and investment. Some of these issues include intellectual property rights, customs issues, trade facilitation, government procurement, labor and environment regulations, competition policy, and rules of origin (Cooper, Jurenas, & Williams, 2013). The TPP is different than any prior FTA initiatives because of the many different components that make up the agreement consisting of sanitary and phytosanitary measures, electronic commerce, investment, telecommunications and more. This is beneficial in the sense that it adds to the economic value of the agreement, however it also further complicates the negotiation because each country needs to constantly adjust and reevaluate their offers. Since the TPP covers many topics not included on any previous agreements and with a diverse variety of countries, many rounds of negotiations have taken place and are still continuing. There has been 19 formal rounds so far that discuss the 30 chapters that make up the TPP.

Figure 1.1 Current TPP Member Countries
Source:http://shift-magazine.org/magazine/the-trans-pacific-partnership-agreement-a-threat-to-democracy-society-and-the-environment/

The TPP is the most significant multilateral trade agreement for the U.S. since the North American Free Trade Agreement (NAFTA). The TPP negotiations play a major role in the goals of U.S. trade policy by continuing and expanding a policy strategy that began with NAFTA (effective in 1994) of using FTAs to encourage trade liberalization and potentially influence negotiations in the World Trade Organization (WTO) (Cooper et al., 2013). The United States already has existing FTA's with 6 of the TPP countries: Australia, Chile, Peru, Singapore, and our NAFTA partners, Canada and Mexico. The U.S. has an increasing interest in the Asia-Pacific region because of the large growing markets and anticipate the agreement to result in GDP growth. Free trade agreements have a substantial impact on the participant countries in terms of welfare, consumption, production and trade flows. Therefore, the purpose of this study

is to examine the trade creation and trade diversion effects of existing RTAs in Asia-Pacific region by specifying an extended gravity model in order to predict the potential effects that the TPP will have on the region.

In the case of trade diversion, higher cost imports from a bloc member replace lower cost foreign supplies and the RTA is said to be trade diverting from the most efficient supplier. World trade is reduced and at least one country is made worse off if the external tariff is greater than the cost difference between the FTA and non-member sources. In the case of trade creation, if a member is originally trading with a relatively higher cost exporter before the RTA is formed, but the formation of the RTA displaces trade with lower cost exports from a member country then the RTA is said to me trade creating. World output rises and the FTA member is better off in terms of economic welfare without a corresponding loss to the non-FTA member (Plummer, Cheong and Hamanaka, 2010; Viner 1950).

One of the controversies the U.S. policy makers come across is whether the U.S. will be able to achieve its goal of creating a "comprehensive, high-standard agreement" with the many countries representing numerous levels of economic development as well as the varying size and composition of their economies. Figure 1.2 below shows the per capita GDP of the TPP countries for 2014 and how diverse the economies are among the different countries. The shared objective of the TPP countries is for a high-standard agreement to provide a structure of trade within the Asia-Pacific region in the 21st century. As negotiations continue, differing opinions are being revealed about the meaning of "high-standards" (Williams and McMinimy, 2015).

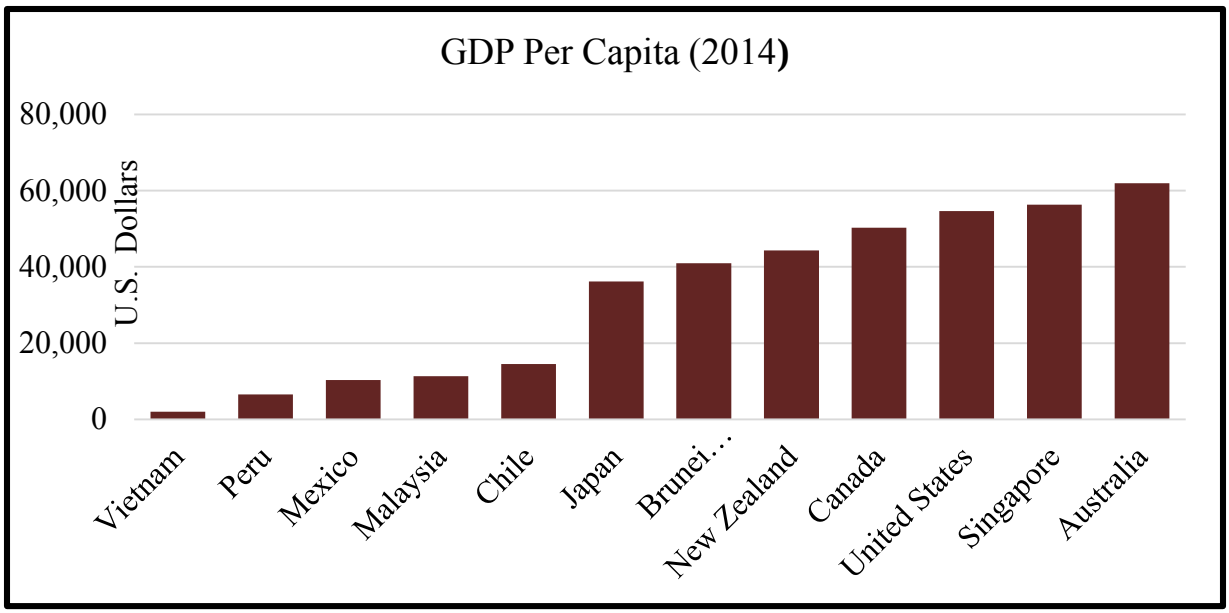

Figure 1.2 GDP Per Capita (2014) of the TPP Countries
Source: World Bank Data

According to the Congressional Research Service, Members of Congress have differing views on which countries should be included in the TPP, and what constitutes "high-standards" for matters like workers' rights, intellectual property rights, protection for pharmaceuticals, and investors rights (Cooper et al., 2013). Overall the TPP countries are "alike" in sharing the same common vision of a high-standard trade agreement and with their overall approach to the negotiations. But each country has a different perspective, opinion and priorities on complex issues (Schott, Muir, and Kotschwar, 2012).

### 1.2 Problem Statement

The TPP aims to reduce or eliminate tariffs between the TPP countries, however there are many concerns about the potential negative impacts the TPP may have on agricultural trade. So with the Trans-Pacific Partnership being the largest proposed regional free trade agreement, an attempt should be made to determine the possible effects it will have on agricultural trade in the

Asia- Pacific region. This will be done by examining the trade creation and trade diversion effects of the existing RTAs in the Asia-Pacific region (e.g. NAFTA, AFTA, APEC, CER and MERCOSER), then we can make a prediction on possible trade flow effects of the future TPP agreement. This research could potentially be useful to U.S. agricultural producers and consumers in their production and consumption decisions if the TPP is passed.

## 1.3 Objectives (General Objective)

The general objective of my thesis will be to analyze existing RTAs in the Asia-Pacific region and what effects they have on agricultural trade flows by generating a Gravity Model equation that will have a conclusive explanatory capability. These results will then be used to make a prediction on how the TPP will effect bilateral trade in the region. The gravity model will include export flows of agricultural commodities (defined as food and live animals) between countries in the Asia- Pacific region to one another as the dependent variable. The right hand side of the equation will include the traditional variables in a gravity model: GDP of exporter (importer), population of exporter (importer), and the distance between exporter and importer. It will also consist of additional variables to capture trade effects due to exchange rates, common language between trading partners, shared border, whether a country is landlocked, and mutual membership in a RTA as our independent variables.

### 1.3.1 Specific Objectives

More specifically, I will conduct a thorough literature review of the TPP and the Gravity Model Equation. Then I will formulate and estimate an empirical/econometric (gravity) model to quantify the effects of the trade flows in the Asia-Pacific region. And finally, I will then

comprehensively discuss those effects as to the trade creation/diversion effects regarding agricultural trade in the Asia-Pacific region.

### 1.4 The Gravity Model

The Gravity Model has been used successfully to describe bilateral trade flows between nations. The traditional gravity model equation sets the volume of trade between two countries proportionally in relation to their gross domestic products (GDP) and inversely refers to the distance between them. It is expected that larger economies will trade more, however the further apart the countries are in distance are predicted to have a lower trade volume. The latter can be attributed to higher transaction costs. Preference of nations to trade with other nations with a common shared geographical region is known as regionalism in this context. Distance is viewed as having a negative impact on trade flows. The expected sign for the distance coefficient should be negative in any econometric equation dealing with trade. The gravity model was first applied to international trade with studies done by Jan Tinbergen (1962) and Pentti Poyhonen (1963). There work was followed by Hans Linnemann (1966) who utilized the gravity model to study world trade flows. Many empirical analyses have been conducted, but a theoretical foundation wasn't developed until 1979 by Anderson with his gravity model based on the properties of the constant elasticity of substitution (CES) expenditure system. His study derives a simple theoretical gravity equation from a framework of two countries under complete specialization (model that assumed product differentiation). Bergstrand (1985, 1989) followed Anderson's work by also exploring the theoretical determination of bilateral trade, in which gravity equations were associated with simple monopolistic competition models. Helpman (1987) used a differentiated product framework with increasing returns to scale to justify the gravity model. Helpman and Krugman (1985) assumed monopolistic competition and increasing returns to scale

to analyze the gravity model in a Hecksher- Ohlin framework. Deardorff (1995) has proven that the gravity equation characterizes many models and can be justified from standard trade theories. Anderson and Wincoop (2001) derived an operational gravity model based on the manipulation of the CES expenditure system that can be easily estimated. The differences in these theories help to explain the various specifications and some diversity in the results of the empirical applications.

The generalized Gravity Model equation is in the form of:

$$(1.1) \quad lnX_{ij} = lnA_j + lnY_i + lnY_j + lnN_i + lnN_j + lnD_{ij} + U$$

where $lnX_{ij}$ is the log dollar amount of the flow of goods from country *i* to country *j*, $lnA_j$ is the intercept term, $lnY_i$ is the log of country *i's* income, $lnY_j$ is the log of country *j's* income, $lnN_i$ is the population of country *i*, $lnN_j$ is the population of country *j*, $lnD_{ij}$ is the distance between countries (usually capitals of the respective countries) and where *U* is a randomly distributed log normal error term, capturing any effects not captured in the independent variables of the model. There can also be additional explanatory variables (also called dummy variables) such as if the countries share a border, common language, whether a country is landlocked or not, and mutual membership of a RTA. Leamer (1974) adds resource endowment variables, Bergstrand (1985) includes price variables, Anderson (1979) checks for prices using a constant elasticity of substitution (CES) utility function.

Analysis of the different trading blocs utilizing the gravity model framework that currently reside in the Asia-Pacific region will be conducted to evaluate the trade creation and trade diversion effects. Table 1.1 shows the different trade agreements analyzed in this study

along with the year of implementation and a list of member countries. A brief summary of each agreement is discussed as to its developments and objectives.

Table 1.1 Regional Trade Agreements in the Asia-Pacific Region

| Regional Groupings | Year Implemented | Members |
|---|---|---|
| NAFTA | 1994 | United States, Canada, Mexico |
| MERCOSUR | 1991 | Argentina, Brazil, Paraguay, Uruguay |
| CER | 1983 | Australia, New Zealand |
| AFTA | 1992 | Brunei, Cambodia, Indonesia, Lao PDR Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam |
| APEC | 1989 | Australia, Brunei, Canada, Chile, China, Hong Kong, Indonesia, Japan, Korea, Mexico, Malaysia, New Zealand, Papua New Guinea, Peru, Philippines, Russia, Singapore, Thailand, Chinese Taipei, United States, Vietnam |
| TPP | N/A | United States, Australia, Brunei, Canada, Chile, Malaysia, Mexico, New Zealand, Peru, Singapore, Vietnam, Japan |

## 1.5 Overview of FTAs in the Asia-Pacific Region

### 1.5.1 NAFTA

NAFTA was preceded by an agreement between Canada and the United States called the U.S-Canada Free-Trade Agreement which was effective on January 1, 1989 and it eliminated or reduced many tariffs between the two countries. The North American Free Trade Agreement has been in effect since January 1, 1994 between the U.S., Mexico and Canada. It was signed by President George H.W. Bush on December 17, 1992 and approved by Congress on November 20, 1993 (NAFTA, 2001). NAFTA was the most comprehensive FTA negotiated at the time and served as a template for future FTAs negotiated by the United States. When it was originally

proposed it was controversial because it was the first FTA involving two wealthy, developed countries and a developing country. Some of the key provisions of NAFTA are similar to the TPP and include tariff and nontariff trade liberalization, rules of origin, services trade, foreign investment, intellectual property rights, labor and environment provisions, and government procurement. After implementation, the agreement aimed to eliminate most trade barriers over a period of 15 years between the member countries. It immediately eliminated tariffs on more than one-half of Mexico's exports to the U.S. and more than one-third of U.S. exports to Mexico. Agriculture is the only section that requires three separate agreements between each pair of parties. The Canada–US agreement contains significant restrictions and tariff quotas on agricultural products, whereas the Mexico–US pact allows for a wider liberalization within a framework of phase-out periods (Moran and Abbott, 1994).

There are many groups and committees that have been established to ensure the effective implementation and administration of NAFTA. Overseeing these committees is the Free Trade Commission (FTC) and it is composed of the U.S. Trade Representative, the Canadian Minister for International Trade, and the Mexican Secretary of Commerce. It supervises the implementation and elaboration of the agreement and helps resolve disputes over interpretation of the agreement. The Secretariat serves as an administrator for the FTC and is organized on a national basis (Naanwaab & Yeboah, 2014).

### 1.5.2 APEC

The Asia-Pacific Economic Cooperation (APEC) forum was established in 1989 seeking to promote trade liberalization consisting of 21 members: Australia, United States, Brunei Darussalam, Canada, Chile, Hong Kong, China, Indonesia, Japan, Malaysia, Mexico, New

Zealand, Papua New Guinea, Peru, The Philippines, Russia, Singapore, Republic of Korea, Chinese Taipei, Thailand and Viet Nam. The main priorities entailed expanding regional economic integration by reducing tariffs and other trade barriers across the Asia-Pacific region leading to efficient domestic economies and increasing exports (Chia, 1994).

In November 1994, leaders of the APEC nations gathered in Indonesia and declared common goals (known as the Bogor Goals), including free trade and investment in the region by 2010 for industrialized economies and by 2020 for developing economies (Williams, 2013). The absence of binding commitments led to slow progress in achieving the Bogor Goals. In 1995, APEC adopted the Osaka Action Agenda which was known as the three pillars. It was a framework established for reaching the Bogor Goals through unilateral trade and investment liberalization, business facilitation, and economic/technical cooperation. With achievements still being slow, the APEC trade ministers endorsed another proposal called the Early Voluntary Sectoral Liberalization (EVSL). This identified fifteen sectors in which members agreed to strive for liberalization, but once again progress was modest. The Pacific Economic Cooperation Council (PECC) has carried out three assessments of progress towards the achievements of the Bogor goals concluding that progress was being made, although the progress was uneven among members and the range of trade policy measures covered by the APEC agenda (Chia, 1994; Shepherd, 2016).

### 1.5.3 AFTA

The Association of Southeast Asian Nations (ASEAN) was established in 1967 to accelerate economic growth while promoting peace and stability in the region. ASEAN consists of 10 countries: Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the

Philippines, Singapore, Thailand and Vietnam. In 1992 an ASEAN Free Trade Area (AFTA) was introduced with the aim of reducing the tariffs and non-tariff barriers within the region and establishing economic integration among its members to promote efficiency and productivity. The original members include: Indonesia, Malaysia, the Philippines, Singapore, Thailand and Brunei (1984). Vietnam joined in 1995, Lao P.D.R. and Myanmar in 1997, and Cambodia in 1999. In 1976, member countries signed the Treaty of Amity and Cooperation in Southeast Asia (Okabe & Urata, 2014). This treaty set the basic principles of their relationship and the conduct of the Association's plans for cooperation. These principles included:

- Mutual respect for independence, equality, territorial integrity and national identity of all nations;
- The right of every state to lead its national existence free from external interference or coercion;
- Non-interference in the internal affairs of one another;
- Settlement of differences or disputes by peaceful means and effective cooperation among themselves.

The need for ASEAN to maintain and improve competitiveness against other countries outside ASEAN and the changes in the economies of its members created pressures and called for the establishment of a free trade area. The agreement on the Common Effective Preferential Tariff Scheme (CEPT) was signed and required that tariffs on locally produced manufactured goods in intra-ASEAN trade to be gradually reduced to 5 to 0 per cent within fifteen years for the six original members. A somewhat longer adjustment period was allowed for the four newer members, with Vietnam committed to reduce its CEPT to no more than 5 percent by 2006, Lao P.D.R. and Myanmar by 2008, and Cambodia by 2010 (Williams, 2013). All import duties are to

be eliminated by 2010 for the former six countries and by 2015 for the latter four. ASEAN members have also the option of excluding products from the CEPT in three cases: temporary exclusions, sensitive agricultural products, and general exceptions. Many AFTA members do not open their markets to some sensitive agricultural products, particularly in the rice and sugar sectors (Bowles, 1997).

### 1.5.4 MERCOSUR

MERCOSUR or the Common Market of the South is made up of Argentina, Brazil, Paraguay, and Uruguay. It was established by the Treaty of Asunción in 1991 with the goal to eliminate high tariffs and income equalities along with promoting free movement of goods, services and people among the membership region and the adoption of a Common External Tariff (CET) (Roett, 1999). MERCOSUR also has five associate members which include Chile, Bolivia, Colombia, Ecuador, and Peru. This means they can join free-trade agreements but remain outside the bloc's customs union. MERCOSUR institutions include the Common Market Council, the Common Market Group, the Trade Commission, the Joint Parliamentary Commission and the MERCOSUR Administrative Secretariat.

The Council is the highest-decision making institution that ensures proper conduct of policy and assesses compliance with the objectives created by the Treaty of Asuncion. The Ministers of Foreign Affairs and the Economy of each member states make up the Council and each preside over the Council on a six-month rotating order. The Council is the political body which issues Decisions. They also formulate policies and promote actions necessary for the development of the Common Market and negotiate agreements with third countries (Campbell, 2015).

The Common Market Group is the executive organization of MERCOSUR that has policy-making and administrative responsibilities. It's controlled by member's Ministers of Foreign Affairs, the Ministers of the Economy (or their equivalents) and the Central Banks. The group coordinates macroeconomic policy between the members and negotiates trade with non-member countries. It also oversees decisions and implements resolutions made by the Common Market Council.

The Trade Commission is the central organ that deals with trade policy between member states who issues Directives and Proposal. It is composed of four members and four alternates from each country who meet monthly. Their duties include monitoring the application of common trade policy instruments, revision of the tariff rates for specific items, proposing new trade and customs regulation or changes in the existing regulations and to analyze the development of trade policies relating to the operation of the customs union. They are also responsible for developing proceedings for consultations and claims for the resolution of conflicts.

The Joint Parliamentary Commission (JPC) is made up of 64 members (16 per member state) selected by their respective Congresses with a term of two years. The JPC acts as a liaison between MERCOSUR and the parliaments of the Members. They make recommendations to the Council as well as respond to questions or consultations from the executive organizations. It is not a part of MERCOSUR's intergovernmental structure, but a cooperating organ.

The MERCOSUR Administrative Secretariat is responsible for registering and archiving decisions made by the different organizations, publishing the Official Bulletin and providing

operating and logistical support for the meetings of the different negotiating groups. The headquarters are located in Montevideo (Rhoett, 1999).

### 1.5.6 CER

The Australia-New Zealand Closer Economic Relations Trade Agreement (CER) was implemented in January 1983. The CER Agreement was built on a series of preferential trade agreements between Australia and New Zealand, including the 1966 New Zealand Australia Free Trade Agreement. The objectives of CER are to strengthen the broader relationship between Australia and New Zealand, develop closer economic relations between member states through a mutually beneficial expansion of free trade, eliminate barriers to trade in a gradual and progressive manner, and develop trade between the members under conditions of fair competition. The CER agreement has undergone three (1988, 1992, and 1995) general reviews which:

- accelerate the achievement of free trade in goods meeting the CER rules of origin, so that by June 1990 all tariffs and quantitative restrictions on trade were eliminated;
- widened the scope of the 1983 agreement to include trade in services; and,
- deepened the CER agreement by seeking to harmonize a range of non-tariff measures that effect the free flow of goods and services, including custom issues, standards and business law.

The Department of Foreign Affairs and Trade conducts the Government's business with the foreign governments, and with international and regional organizations. The headquarters are in Canberra and operates state offices in most Australian capital cities. The Department's role and activities include coordination and promotion of Australia's close bilateral relationship with

New Zealand across a broad range of areas. The Department is responsible to both the Minister of Foreign Affairs and the Minister of Trade (Lloyd, 1999).

### 1.6 Thesis Organization

This study is composed of five chapters. Chapter 1 consists of an introduction, problem statement, objectives and background information. Chapter 2 will be comprised of a literature review of the development of the Trans Pacific Partnership agreement, along with a theoretical and empirical review of international trade theory used as a structural foundation of this study. Chapter 3 will discuss the methodology employed in this analysis along with the data and variables used. Results of the analysis obtained from the model used and its discussions are presented in Chapter 4. Followed by Chapter 5 which will consist of a summary and conclusions.

# CHAPTER 2 LITERATURE REVIEW

## 2.1 Development of the TPP

The TPP (originally known as the Trans-Pacific Strategic Economic Partnership) started negotiations between Singapore, Chile and New Zealand in 2003 which aimed at managing trade and to help the economies of the Asia-Pacific region. Then on November 8, 2006 those three countries plus Brunei (joined negotiations in 2005) reached an agreement known as the Pacific Four (P-4) and became the model for the Trans- Pacific Partnership Agreement (Deardorff, 2013). The P-4 aimed to potentially attract new Asia Pacific members and covered topics such as intellectual property protection, competition policy, government procurement, and customs valuations. In 2008, The United States announced they would join negotiations with the P-4 countries along with Australia, Peru and Vietnam. A change of administration in the U.S. delayed the first round of negotiations, but the Obama Administration reaffirmed in November of 2009 that the U.S. would participate in the negotiations. In October 2010, Malaysia joined during the third round of negotiations and by November 2011 these nine nations had accomplished a broad outline for an agreement that addresses new and traditional trade issues along with 21$^{st}$-century challenges. This new agreement formed the basis for the TPP and included the topics included in the P-4 agreement plus additional areas relating to labor, environment, and technology (Krist, 2012). Mexico and Canada were invited in 2012 during the 15$^{th}$ round of negotiations. And finally, the newest member of the TPP is Japan who officially joined in July 2013 during the 18$^{th}$ round, bringing the TPP membership to 12 (Williams and McMinimy, 2015). Although Japan joined late, its membership is still regarded as significant. Other countries such as South Korea and China also expressed interest in possible joining the TPP negotiations.

The TPP is viewed as a stepping stone toward a broader, region wide Free Trade Area of the Asia Pacific (FTAAP) and negotiators are anticipating new countries joining. They are planning the trade agreement towards these future relations with the other Asia Pacific Economic Cooperation (APEC) members (Schott et al., 2012). The APEC forum is a group of 21 Pacific Rim countries that includes the United States along with countries such as China, Indonesia and Russia and its objective is to promote free trade and economic cooperation in the region.

The U.S. agriculture sector has the possibility of market openings in three significant countries (Japan, Malaysia, and Vietnam) with which they currently do not have FTAs with. Figure 2.1 below shows the TPP trade in agricultural products in 2012, easily showing the opportunity for trade advancements.

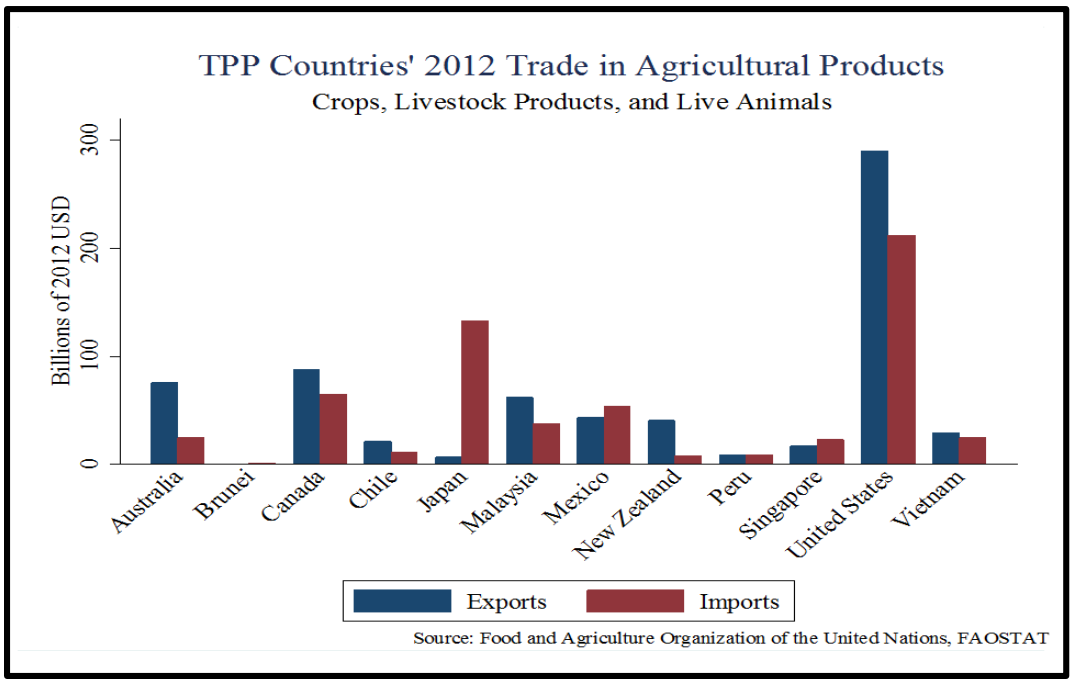


Figure 2.1 TPP Countries' 2012 Trade in Agricultural Products
Source: FAOSTAT

Some key issues discussed in the TPP focus on agricultural products such as dairy, sugar, rice, and beef. New Zealand is the largest dairy exporter followed by the United States and Australia among the TPP countries. These three countries have an interests in expanding shipments to the Asia-Pacific countries. The U.S. is also one of the largest importers of dairy products. Canada and Mexico have high tariffs and sanitary measures on specific dairy products that limit imports and Japan also protects domestic dairy production through high tariffs. Liberalization of dairy protection continues to stall TPP negotiations. The next commodity at stake is sugar. The existing FTA between Australia and the U.S. exempts sugar from the liberalization commitments. The U.S. remains firm on not reconsidering but Australia seeks new export opportunities, possible an increase in its tariff rate quota in the U.S. market. Rice liberalization is also a major conflict. The U.S. wants to open the rice market but countries such as Japan and Malaysia want to maintain existing tariffs. They know they face competition with lower-cost producers like the U.S. Australia, Brunei, New Zealand, Peru and Singapore who all have open rice markets. Rice has previously been excluded in past FTAs and Japan expects that to happen with the TPP negotiations. The last commodity that faces discussions is beef. Korea and Japan banned U.S. imports of beef in 2003 because of disease. Both countries maintained restrictions even after the health concerns were fixed and regulated. Korea committed to opening its market over time with certain health contingencies. If they were to join the TPP, it would impact the beef market (Schott et al., 2012; Williams, 2013; Ferguson et al., 2013).

Overall the TPP can be broken down into five defining features. The first being that the TPP is intended to be a living agreement meaning it can be updated to address emerging trade issues or to include new members. Second, the provisions for comprehensive market-access reforms will eliminate or reduce tariffs and other barriers to trade and investment. Third, the TPP

will support the development of integrated production and supply chains among its members. Fourth, the TPP will address cross-cutting issues, including regulatory coherence, competitiveness and business facilitation, support for small and medium sized enterprises, and the strengthening of institutions important to economic development and governance. Fifth, the TPP aims to promote trade and investment in innovative products and services (Williams and McMinimy, 2015).

### 2.2 The Gravity Model of Trade

The origin of the gravity model dates back to 1687 when Isaac Newton developed the *law of universal gravitation* which describes the gravitational force between two masses as a result of the product of the masses ($M_{i,j}$) divided by the squared distance ($d_{i,j}$) between the two objects, multiplied by a gravitational constant (G), represented by the equation below

(2.1) $$F_{ij} = \mathrm{G} * M_i M_j / d_{ij}^2$$

Tinbergen (1962) and Poyhonen (1963) were the first to apply this gravitational relationship to economics. Tinbergen proposed that same approximate functional form could be applied to international trade flows. He assumed the following relationship

(2.2) $$X_{ij} = A \frac{Y_i^{\alpha} Y_j^{\beta}}{D_{ij}^{\gamma}}$$

This equation has the "flow" from country *i* to country *j* (monetary value of exports) as the dependent variable set equal to the product of the GDP's of country *i* and country *j*, divided by the measured distance between these countries (usually the countries' capital cities), and finally multiplied by some constant (Head, 2003). Tinbergen justifies the importance of including a

countries economic size (GDP) for determining trade flows because it looks at the supply and demand forces affecting each country's market. Economic size is frequently defined as GDP, GNP, income per capita or the country's population size. Distance is a proxy for factors that influence trade such as transportation costs, transaction costs or communication costs.

Linnemann followed Tinbergen's work in his 1966 study of international trade flows and trading activity between nations. His model is based on the Walrasian General Equilibrium Model, with each country having its own supply and demand function for all goods. Aggregate income proxies the level of demand in the importing country and the level of supply in the exporting country. The independent variables in the model were population, GNP (income), distance and a preferential trade variable. Linnemann conducted separate regressions for both exports and imports and found a statistically significant relationship between the volumes (import/export) between nations. He also classified the factors of trade resistance into two groups: Natural Trade Resistance and Artificial Trade Resistance. According to Linnemann, natural trade resistance consists of transport cost, transport time and economic horizon. He proposed to measure the natural trade resistance between any pair of countries by their geographical distance because of the variety of factors distance entails. Artificial trade resistance occurs when goods cannot pass a country's border freely in either direction because of political or economic alliances (preferential trading area). Linnemann corrected the deviation by including a preferential trade factor in his analysis.

Linnemann (1966) applies the trade flow equation constructed from his theoretical foundation to a cross section study in the form of a multivariate single equation regression analysis. He chose to use data from the year 1959 in order to be able to compare his results with those of Tinbergen and considered 80 countries altogether. This set of data was applied to several

sets of models. The first model was estimated statistically using least-squares regression methods as followed:

$$\log X_{ij} = \emptyset_1 \log Y_i + \emptyset_2 \log N_i + \emptyset_3 \log Y_j + \emptyset_4 \log N_j + \emptyset_5 D_{ij} + \emptyset_6 \log P_{ij}^{UUC} + \emptyset_7 \log P_{ij}^{FFC} + \emptyset_8 \log P_{ij}^{PB} + \emptyset'_0 \quad (2.3)$$

There are only three preference factors in the first series of calculations which are the British Commonwealth preference ($P^{UUC}$), French Community reference ($P^{FFC}$) and Belgian and Portuguese colonial preferences ($P^{PB}$). The independent variables in the model were population, GNP (income), distance and a preferential trade variable described above. Linnemann conducted separate regressions for both exports and imports and found a statistically significant relationship among the export/import volumes between nations. Linnemann specified an additional independent variable that took into account the commodity composition of trade between nations to further refine his model. He concludes that the commodity composition variable will change and improve the results to some extent, but usually not in a fundamental way.

**2.3 Theoretical Foundations**

The gravity model has been a success for empirical applications and predicting bilateral trade flows, but a theoretical foundation had been missing until Anderson (1979). In his model he uses the Armington (1969) assumption which implies products are differentiated by their place of origin (production) meaning if two goods of the same kind originated from different countries they are imperfect substitutes in demand (Starck, 2000). Anderson develops many gravity models with the first one based on two countries each producing a single differentiated good and both countries have identical Cobb-Douglas preferences. He specifies that exports $X_{ij}$ from country *i* to country *j* (given by the importing country's income multiplied with the share of

income spent on tradable goods from exporting country) is equal to the product of Income ($Y_i Y_j$) divided by the $\sum Y_j$. Anderson realizes the limitations of this model due to the restrictive assumptions. This leads him to develop a new model where each country produces a tradable and non-tradable good. This model allowed expenditure share to vary across regions. An additional variable $\Theta_i$ is added representing the share of country *i*'s production demanded in country *j*. Another variable,$\phi_j$ was added to account for j's total expenditure arriving at demand for i's tradable good in country j as being represented by the equation, $X_{ij} = \Theta_i \phi_j Y_j$ (Starck, 8).

Helpman and Krugman (1985) model is based on monopolistic competition and thus increasing returns to scale to explain intra-industry trade. Each firm produce a differentiated product under increasing returns to scale and distributes its output to all markets including the domestic market under diminishing returns to scale. Under this model it is assumed consumers have a Dixit-Stiglitz preferences and they derive a gravity equation identical to Anderson (1979). Dixit-Stiglitz preferences refers to love of variety where consumers value varieties and their utility increases for all differentiated varieties of the goods that exist (Dixit and Stiglitz, 1977). A limitation of Anderson (1979) and this model is the absence of trade barriers such as tariffs or transportation costs. They assume that goods are perfect substitutes between importing and exporting countries resulting in a frictionless gravity equation of bilateral trade (Bergstrand, 1985).

Bergstrand (1985) developed the gravity model based on the debate that Linnemann's model lacked price variables and often excludes trade barriers. He derived the gravity model from the general equilibrium model and argued that if aggregate trade flows are differentiated by national origin, Linnemann's model mis-specified the model by omitting certain price variables.

According to Bergstrand, the reason that the model should include price variables is that aggregate trade flows are differentiated by national origin. On the demand side, consumers choose first between domestic and imported products and then choose among import suppliers. On the supply side, suppliers choose between the domestic market and foreign market and then choose within the foreign market. As with Linnemann's basic gravity equation, Bergstrand used variables indicating the presence of preferential trading arrangements as a proxy of a tariff variable. The transport cost factor is proxied by the distance between the economic centers of i and j and a dummy of adjacency. For price variables, he used aggregate price indicies as proxies for import price indices. He also included the exchange rate index to indicate changes in the *i's* currency value of a unit of *j's* currency. The generalized gravity model is estimated for 1965, 1966, 1975 and 1976 based on data from 15 OECD countries. The equation of the gravity model derived by Bergstrand (1985) is expressed in the following form:

$$PX_{ij} = \alpha Y_i^{\beta_1} Y_j^{\beta_2} D_{ij}^{\beta_3} T_{ij}^{\beta_4} E_{ij}^{\beta_5} P_i^{\beta_6} P_j^{\beta_7} K_i^{\beta_8} K_j^{\beta_9} \tag{2.3}$$

Where $PX_{ij}$ is the value of trade flow from i to j, $Y_i$ is Country i's income, $Y_j$ is Country j's income, $D_{ij}$ is the transport-cost factor proxied by the distance between the economic centers of country i and country j and a dummy for adjacency, $T_{ij}$ is the tariff variable between i and j, proxied by dummy variables indicating the presence of preferential trading arrangements, $E_{ij}$ is the exchange rate index indicating i's currency value of a unit of j's currency since the common base period, $P_i$ is Country i's export unit value index, $P_j$ is Country j's export unit value index, $K_i$ is i's GDP deflators and $K_j$ is j's GDP deflators. Bergstrand introduced price variables into the equation and excluded population variables. All the coefficient estimate signs match his hypothesis in all four years. Importer income, adjacency and preferential trading arrangements

have positive coefficient signs similar to the basic gravity model while distance has a negative coefficient sign. The negative coefficient estimate for the importer GDP deflator supports the conclusion about this elasticity of substitution. Empirically the price and exchange rate variables have significant effects on aggregate trade flows. Coefficients estimated suggest that products are differentiated by national origin. The results imply that the elasticity of substitution among imports exceeds unity and that of imported products is below unity and the elasticity of transformation among export markets exceeds that between the production for domestic and foreign markets. Therefore the results support the idea that the gravity equation is a reduced form of a partial equilibrium subsystem of a general equilibrium trade model with nationally differentiated products.

In Bergstrand (1989), the author derives the gravity equation using the Heckscher-Ohlin and Linder trade models. He expands the framework of the generalized gravity equation to include factor endowment variables. He develops a general equilibrium model of trade which now has two different products or industries that are produced using two factors of production - labor and capital which are assumed to be fixed in each country, such that each firm produces a uniquely differentiated product in a market as a Chamberlinian Monopolistic Competitive market. Bergstrand than states that countries have identical CET production technology function. The firm incurs fixed costs and constant marginal costs, and therefore realizes internal increasing returns to scale in production. The equilibrium condition gives a set of reduced forms equation whose solution gives a generalized gravity equation, which includes exporters and importers incomes, exporter and importer per capita incomes and prices. Bergstrand became the first person to fully attempt to integrate the gravity equation into the HO model (factor proportion theory of international trade) and he provides a theoretical foundation for the inclusion of

exporter and importer per capita incomes, and exporters and importers income which is consistent with both traditional trade theories and new trade theories.

Deardorff (1998) derived the gravity equation from international trade theory of the Heckscher-Ohlin (HO) model. He argues that the gravity equation can be derived using he HO and with perfect competitive assumptions, where products differentiation and specialization occur due to non-factor price equalization among countries, rather than the Armington assumption. He derived the gravity equation assuming both frictionless trade and trade barriers. The frictionless gravity equation gives bilateral trade flows in which preferences are identical and homothetic. Allowing for trade impediments, each country produces differentiated products and trade barriers exist for every good in the form of transport costs. Factor prices are not equalized for each country and this allows non-factor price equalization between countries. Deardorff then derives a gravity equation of bilateral trade flows with the Cobb Douglas and the CES preferences.

A more recent study published by Anderson and van Wincoop (2003) contributes to the theoretical foundation of the gravity model by including a multilateral resistance term in the equation. By extending the Anderson 1979 theoretical derivation, they derive that economic distance between countries *i* and *j* is not only determined by a bilateral resistance term between these two countries as in previous work, but also in relation to a weighted average if economic distance to all other trading partners of the given country. He states that in order for the gravity model to be correctly specified it must control for relative trade costs. Their study demonstrates that trade costs are a significant determinant of bilateral trade and are not typically included in the standard gravity model leading to a biased estimation. The multilateral resistance term represents a consideration of the average trade resistance between a country and all of its

possible trading partners. The bilateral relation between the two trading countries no longer determines trade flows, but bilateral trade is dependent on all other trading partners of the exporting and importing country (Starck, 2000). An important part of the model is the introduction of exogenous bilateral trade costs into the gravity model. This incorporation of trade costs, which are directly observable, ensures that prices of the goods can differ across countries, and non-price equalization implies that elasticity of substitution across products is non-unitary which is in contrast to Anderson (1979) that assumes a unitary elasticity of substitution.

# CHAPTER 3 METHODOLOGY

## 3.1 Gravity Model Form and Function

A gravity model involves a regression of trade on a series of explanatory variables and uses dummy variables to determine whether trade is affected by the existence of RTAs. The distance between the countries is used as a proxy for trade costs. Also to capture the trade costs a number of variables are included in the gravity equation. Some examples of dummy variables are if a country is landlocked, language commonality, existing RTAs, and whether the countries share a border. The common formulation of the gravity model is given algebraically by the following equation:

(3.1) $$X_{ij}= \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} N_i^{\alpha_3} N_j^{\alpha_4} D_{ij}^{\alpha_5} A_{ij}^{\alpha_6} e_{ij}$$

Or, by natural logarithms:

(3.2) $$lnX_{ij} = ln\alpha_0 + \alpha_1 lnY_i + \alpha_2 lnY_j + \alpha_3 lnN_i + \alpha_4 lnN_j + \alpha_5 lnD_{ij} + \alpha_6 A_{ij}$$

Where; $X_{ij}$ is the flow of goods from country *i* to country *j*, $Y_i$ and $Y_j$ are incomes of country *i* and country *j*, $N_i$ and $N_j$ are the population of country *i* and country *j*, $D_{ij}$ is the distance between country *i* and country *j*, $A_{ij}$ is any other factor(s) wither aiding or resisting trade between countries *i* and *j*, $e_{ij}$ is the log normally-distributed error term.

Taking into account the economic theory justification of the gravity equation as explained by Linnemann (1966), the hypotheses can be summarized accordingly. The income variables are expected to have a positive effect on the trade flow. An increase in income will indicate greater production available for exports on the supply side. A rise in income on the demand side will

lead to an increase in imports, ceteris paribis. The effect of population variables in trade flow is unknown. Population size can improve trade flow along with restricting it. For instance, a large population may indicate a large resource endowment, self-sufficiency and less reliance on international trade indicating that population size should have a negative effect on trade flow. On the other hand, it is possible that a large population can promote the division of labor and create opportunities for trade in a wide variety of goods consequently the population size has a positive effect on trade flow. Distance has an adverse effect on trade flow between countries, therefore the coefficients are expected to be negative. The longer the distance between trading countries, the higher the cost, leading to lower profit margins for the importer. The coefficients for the dummy variables that aide trade flows are expected to be positive. For example, the dummy variables for countries sharing their land border, countries in the same preferential trading agreements, countries that share a common language, whether a country is landlocked or not will enhance the trade flow between countries.

Often other variables are introduced into the Gravity Model to assist in explaining variations in bilateral trade. Anderson (1979) and Bergstrand (1985 and 1989) developed theoretical foundations for the Gravity Model using the Monopolistic Competition framework. Deardorff (1998) demonstrated that the Gravity Model could be derived using the Ricardian and HO theorems. The basic gravity equation as specified by Anderson (1979) is as follows:

$$M_{ijk} = \alpha_k Y_i^{\beta_k} Y_j^{\gamma_k} N_i^{\delta_k} N_j^{\varepsilon_k} d_{ij}^{\mu_k} U_{ijk} \tag{3.3}$$

where $M_{ijk}$ is dollar flow of good *k* from country *i* to country *j*, $\alpha_k$ is the intercept term, $Y_{i(j)}$ are the incomes in country *i(j)*, $N_{i(j)}$ are populations in country *i(j)*, $d_{ij}$ is the distance from country *i* to country *j*, and $U_{ijk}$ is a log normally distributed error term.

Frankel et al (1995) applied the gravity model to examine bilateral trade patterns throughout the world in order to distinguish between the high level of trade within each region which can be explained by economic factors common to bilateral trade and the level of trade left over to be attributed to a special regional effect. The dependent variable in the model is the total trade volume between pairs of countries in a given year in logarithm form. The data set includes 63 countries and geographical proximity is measured in the log of distance between the two major cities (usually the capitals) of the countries in question. A dummy variable for adjacency is also added to indicate when two countries share a common land border. GNP's were included in the model in product form. Modern theory of trade justifies that under imperfect competition one will choose to trade more with a larger country than a smaller country because it offers more variety for the consumers. GNP per capita is also included in the model because of the belief that GNP per capita has a positive effect on trade because as a countries given size becomes more developed, they tend to specialize and trade more. In a basic form, Frankel et al's equation to be estimated is of the following form:

$$\ln(T_{ij}) = \alpha + \beta_1 \ln(GNP_i * GNP_j) + \beta_2 \ln(GDPpc_i * GDPpc_j) + \beta_3 \ln(DISTANCE_{ij}) + \beta_4(ADJACENT_{ij}) + \gamma_1(EA_{ij}) + \gamma_2(EC_{ij}) + \gamma_3(NAFTA_{ij}) + u_{ij} \quad (3.4)$$

Where; $T_{ij}$ is the total bilateral trade between country i and country j, $GNP_i$ is country i's GNP, $GNP_j$ is country j's GNP, $GDPpc_i$ is country i's GNP per capita, $GDPpc_j$ is country j's GNP per capita, $DISTANCE_{ij}$ represents the distance between country i and country j, and $ADJACENT_{ij}$ is a dummy variable for adjacency.

Three region dummy variables were applied to test the effects of membership in a common regional group: EA (East Asia), EC (the European Community), and NAFTA. The

results show that if two countries are both located in the Western Hemisphere, they traded with each other by an estimated 86 percent more in 1980 than they would have otherwise, after taking into account distance and other gravity variables. Frankel et al also found that when both countries share a common language or colonial ties they tended to trade more.

Elliott and Ikemoto (2004) also include additional variables to the gravity model to study the effects of AFT and the Asian Financial crisis of intra-regional trade in ASEAN using a modified gravity equation as follows:

(3.5) $\log M_{ij} = \log\beta_0 + \beta_1 \log GDP_i + \beta_2 \log GDP_j + \beta_3 \log PGDP_i + \beta_4 \log PGDP_j + \beta_5 \log D_{ij} + \beta_6 \log(PGDP_i\text{-}PGDP_j) + \beta_7 COM_{ij} + \beta_8 ADJ_{ij} + \sum \beta_{9k} RTA_{ijk} + \sum \beta_{10k} imRTA_{ijk} + \sum \beta_{11k} exRTA_{ijk} + \log u_{ij}$

Where; $M_{ij}$ is the U.S. dollar value of country *i* from trade partner *j*, $GDP_{i(j)}$ is country *i(j)'s* GDP, $PGDP_{i(j)}$ is country *i(j)'s* GDP per capita, $D_{ij}$ is the distance between capital cities, $COM_{ij}$ is a complementarity index between countries *i* and *j*, $ADJ_{ij}$ is a dummy variable which has the value 1 when both countries share a common land border, 0 otherwise, $RTA_{ijk}$ is a dummy variable which has the value 1 if both countries *i* and *j* belong to RTA *k*, 0 otherwise, $imRTA_{ijk}$ is a dummy variable which has the value 1 if only the importing country *i* belongs to RTA *k*, 0 otherwise, $exRTA_{ijk}$ is a dummy variable which has the value 1 if only the exporting country *i* belongs to RTA *k*, 0 otherwise.

Elliott and Ikemoto estimate the above equation using pooled data for three five-year periods. Since the data is pooled, changes of real exchange rate over the period of the study can affect the trade relationship. Regarding the trade creation and trade diversion effect, Elliott and Ikemoto include dummies defined as import trade diversion and export trade diversion. The

dummy RTA captures trade creation. The dummy imRTA captures the import diversion as a result of changes to the import structure of the RTA where a negative and significant coefficient indicates that member countries have switched to importing from members rather than nonmembers. The dummy exRTA captures the export trade diversion where a negative and significant coefficient means that the RTA has resulted in a member country finding it better to export to members rather than nonmembers.

Economic theory gives several indications as to the factors that affect trade. These factors include income, population, transaction costs and trade agreements. Higher income countries are believed to trade more while high transaction costs hinders trade. Thus various combinations of microeconomic variables, such as income and geographic distance, are powerful predictors of trade potentials. Hence, gravity equations have been used extensively in the modeling of international trade flow. It is common to augment the basic gravity model through additional bilateral variables. For instance variables are added to account for common language, common border, common colonial history, and common currency. The impact of income and transaction costs on trade can also be explained in the partial equilibrium model. Regional trading agreements are generally perceived to be potentially beneficial in a trade sense. In the short-run, member countries benefit, as long-run trade diversion does not outweigh immediate trade creation effects. Long-run gains occur through the channels of increased efficiency through specialization, economies of scale, increased trade, and investments.

### 3.2 Trade Creation and Trade Diversion

When it comes to estimating and analyzing trade creation and trade diversion effects in trade among countries, and between member countries and non-members, the theoretical literature showed that the formation of free trade areas, customs unions, or other preferential

trading blocs had uncertain effects on economic welfare. Viner (1950) showed that regional trade agreements could be beneficial or harmful to the participating countries because the preferential nature of these trade deals stimulates both trade creation and trade diversion. He defined trade creation as taking place whenever economic integration leads to a shift in product origin from a domestic producer whose resource costs are higher to a member producer whose resource costs are lower. This shift represents a movement in the direction of the free-trade allocation of resources and thus is presumably beneficial for welfare. Trade diversion takes place whenever there is a shift in product origin from a nonmember producer whose resources costs are lower to a member country producer whose resources costs are higher. This shift represents a movement away from free-trade allocation of resources and could reduce welfare.

Trade creation effects should be noticeable in the bilateral trade flows between nations who are joint members of a particular RTA. Referring to the gravity model in this study, the variables selected as being trade creating by nature are expected to have a positive relationship between the RTA dummy variable parameter coefficient and the dependent variable of bilateral trade flows. Figure 3.1 represents trade creation effects resulting from a RTA. Before the presence of a RTA between country *i* and *j*, country *j's* prices were $P_j = P_i(1+\tau)$, with $\tau$ being an external tariff applied to goods from *i.* With the formation of a RTA between country *i* and *j*, the tariff $\tau$ is removed. The imports for *j* are now the difference between Q4 and Q1 rather than (Q3-Q2), which is greater than before. Domestic production of that commodity is displaced by the imported quantity (Q2-Q1), while consumption increases by the quantity (Q4-Q3). The trade creation effect is taken to be the sum of areas *b* and *d* (Viner, 1950).

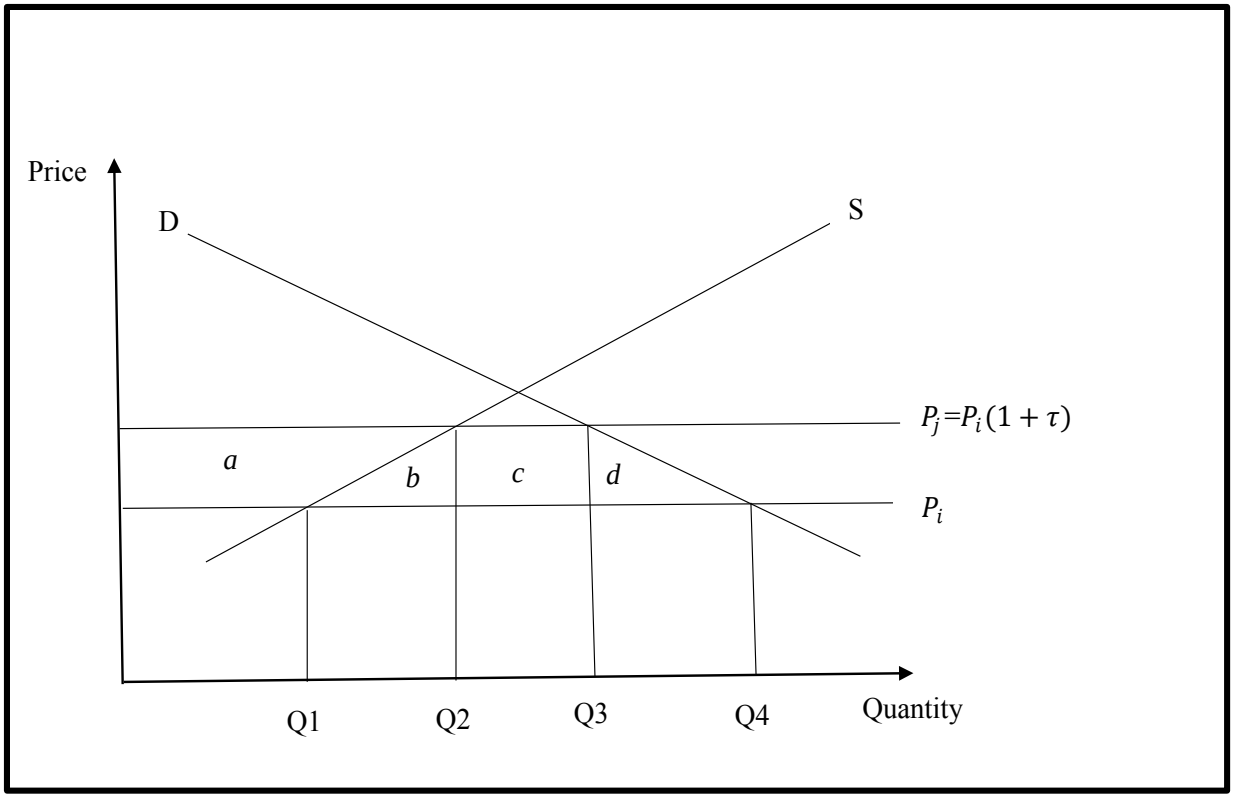

Figure 3.1 Trade Creation Effects of a RTA

Figure 3.2 graphically represents the effects of trade diversion from a RTA. Before the RTA between country *i* and *j*, country *j* has a tariff (τ) on imports. Country *k's* price in *j's* market is $P_j = P_i(1+\tau)$. Country *j* imports (Q3-Q2) from *k* before the RTA is formed. When the union is formed between country *i* and country *j*, *j* now imports (Q4-Q1) all coming from the new RTA partner, which no longer faces a tariff. This trade diversion effect generally means that a free trade area diverts trade that existed otherwise. The net trading effects for country *i* are areas *(b + d)* and area *e* (negative effect attributed to trade that was diverted). Producers in the importing country suffer losses as a result of the free trade area (Q2-Q1), while consumers gain added consumption (Q4-Q3) (Viner, 1950).

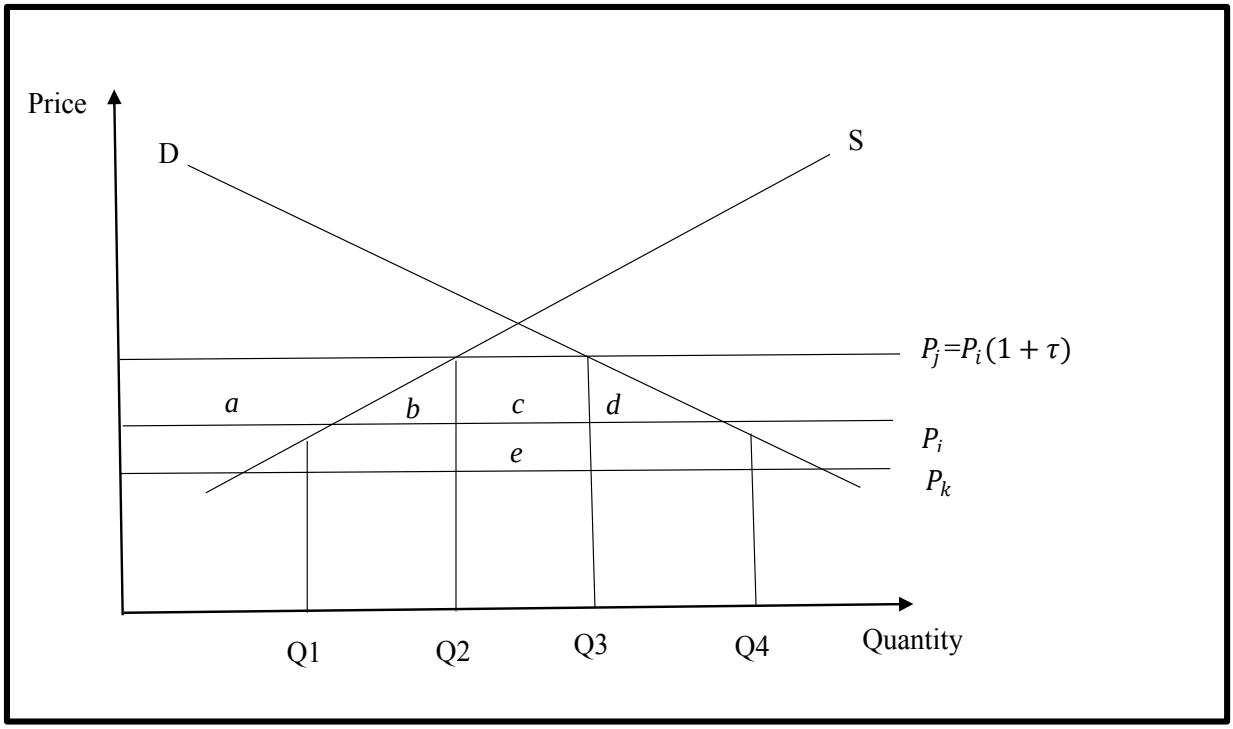

Figure 3.2 Trade Diversion Effects of a RTA

### 3.3 Impact of Income on Trade (Importing Country)

Figure 3.3 represents the effects of changes in the income of the importing country for a small country case in the partial equilibrium model. The initial equilibrium is at $E_0$. World price ($P_w$) is fixed and equal to world excess supply ($ES_W$).An increase in the income of the importing country shifts the domestic demand outward from $D_0$ to$D_1$. This causes the excess demand curve to shift from $ED_0$ to $ED_1$. The increase in quantity demanded causes an increase in quantity supplied from the world from $Q_{world0}$ to $Q_{world1}$. Domestic quantity consumed increased from $Q_0$ to$Q_1$. With a fall in income in the importing country, the demand curve shifts the importing country from $D_0$ to $D_2$, this in turn shifts the ED curve, in the world market, from $ED_0$ to $ED_2$. With a decrease in income in the importing country quantity demanded has decreased from $Q_0$ to $Q_2$ and the quantity supplied by the world market has fallen from $Q_{world0}$ to $Q_{world2}$.

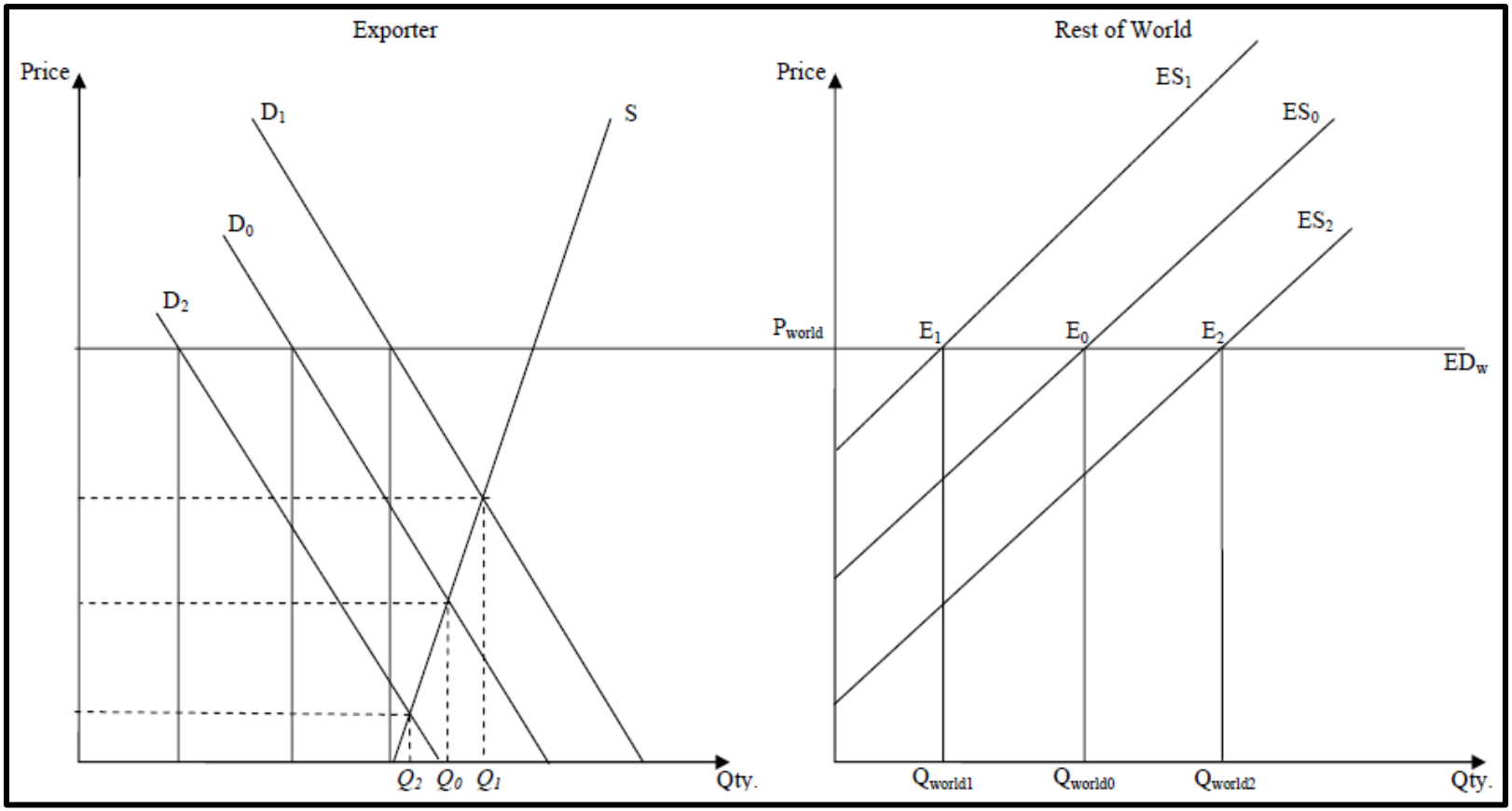


Figure 3.3 Impact of Income on Trade (Importing Country)

### 3.4 Impact of Income on Trade (Exporting Country)

Figure 3.4 illustrates the effects income has for the case of the exporting country. The initial equilibrium is at $E_0$ with initial world quantity at $Q_{world0}$. When there is a rise in exporter's income, the demand curve shifts to the right from $D_0$ to $D_1$ indicating a greater quantity of domestic demand, $Q_1$. This leads to a shift in the excess supply curve from $ES_0$ to $ES_1$ indicating that a lesser quantity is supplied by the exporter from $Q_{world0}$ to $Q_{world1}$. When there is a decrease in exporter's income, the exporters demand curve shifts left from $D_0$ to $D_2$. This leads to a right shift of the excess supply curve from $ES_0$ to $ES_2$. Quantity supplied to the rest of the world would increase from $Q_{world0}$ to $Q_{world2}$. In the gravity model, an increase in exporter income raises the domestic demand. This drives up domestic prices but also helps increase the world price. This increases levels of bilateral trade reflected as a positive relationship between *i's* income parameter and bilateral trade flow. With less domestic demand, excess supply is greater as a result and the quantity supplied to the world becomes greater.

### 3.5 Dynamic Effects of FTAs

It is also important to consider some of the long term implications of FTAs such as economies of scale and variety. Economies of scale exist in the production of some agricultural, natural resource intensive, and manufacturing sectors, as well as services. By creating a larger market for firms operating in partner countries, an FTA will allow producers to take advantage of a larger customer base and, hence, produce at a lower average cost on all sales. (Plummer et al., 2010). Firms will even be able to lower prices for existing customers known as the "cost-reduction effect" (Corden, 1972). As a result, these firms will become more competitive not only at home but also in foreign markets. Customers in each member country will also enjoy

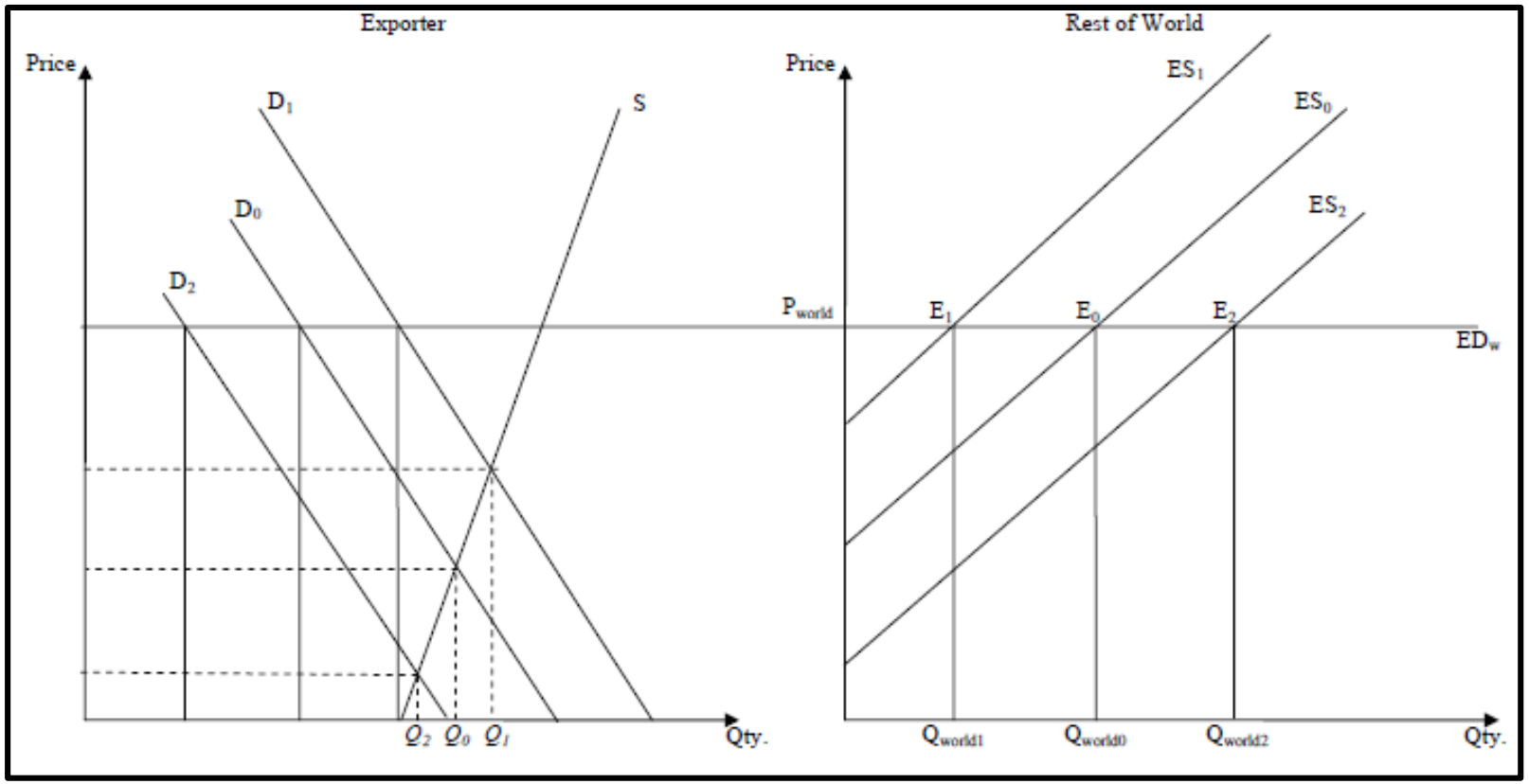


Figure 3.4 Impact of Income on Trade (Exporting Country)

more variety in terms of the goods they can purchase because the larger market created by the FTA allows firms to sell in more markets and, given economies of scale, introduce new varieties that were too costly and unprofitable before the FTA.

Many FTAs that are now developing are effecting deeper integration issues such as quality standards, laws for corporate and public governance, customs procedures, and other sensitive matters that relates to the rest of the economy. The inclusion of these nontraditional areas in FTAs shows how these agreements are shaping the national economic policies of members. With the TPP including such a diverse group of countries and economies, they face more of a difficulty in addressing these nontraditional areas to improve the business environment by reducing costs and pushing policy reforms toward best practices (Plummer, 2007).

**3.6 Gravity Model Equation**

The specific gravity model equation used in this analysis is of the following form:

(3.2) $$\log X_{ij} = \alpha + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(DIST_{ij}) + \beta_6 \ln(EXR_{ij}) + \beta_7 LANG + \beta_8 BORDER + \beta_{10} AFTAtc_{ij} + \beta_{11} APECtc + \beta_{12} NAFTAtc + \beta_{13} MERCOSURtc + \beta_{14} CERtc + \beta_{15} AFTAtd + \beta_{16} APECtd + \beta_{17} NAFTAtd + \beta_{18} MERCOSURtd + \beta_{19} CERtd + e_{ij}$$

Where; $X_{ij}$ denotes exports in agricultural products from country *i* to country *j*, *GDPi* and *GDPj* are the real GDPs of exporting and importing country respectively, *POPi* and *POPj* denote population of exporting and importing country respectively, *DISTij* is the distance between the capital cities of country *i* and country *j* measured in kilometers, $EXR_{ij}$ represents the exchange

rate relative to the U.S. dollar, *LANG* is a binary dummy variable for language commonality, which is 1 if country *i* and *j* share a common language and zero otherwise, *BORDER* is a binary dummy variable which is 1 if country *i* and *j* share a common border and zero otherwise, *LNDLOCK* is a binary dummy variable which is 1 if a country is landlocked and zero otherwise, *AFTAtc, APECtc, NAFTAtc, MERCOSURtc,* $CER_{tc}$ are binary dummy variables to capture trade creation representing 1 if country's *i* and *j* are both members of the FTA at time *t*, 0 otherwise, *AFTAtd, APECtd, NAFTAtd, MERCOSURtd,* $CER_{td}$ are binary dummy variables to capture trade diversion accounting for if country *i* belongs to the FTA, but country *j* does not. 1 if true, 0 otherwise, $\varepsilon_{ij}$ is the error term that is assumed to be normally distributed with mean zero.

**3.7 Data**

Based on past studies, this study will use panel data from 1990 to 2013. The scope of this study includes 24 countries: Australia, Argentina, United States, Canada, Mexico, Brazil, Brunei, Paraguay, Hong Kong, Japan, Uruguay, New Zealand, Indonesia, Malaysia, Philippines, Singapore, Thailand, Chile, China, Korea, Papua New Guinea, Peru, Russia, and Vietnam. The bilateral agricultural trade data for the dependent variable comes from the Commodity and Trade Database (COMTRADE) of the United Nations Statistics Division. Agricultural goods are defined as commodities in category 0 at the one-digit level of the Standard International Trade Classification (SITC Revision 3). Category 0 includes food and live animals; meat, dairy products and birds' eggs, fish(not marine mammals), cereals, vegetables and fruit, sugar, honey, coffee, tea, cocoa, spices, feeding for animals, and miscellaneous edible products. The data for GDP and population information comes from the World Bank's World Development Indicators (WDI). GDP data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. Total population counts all

residents regardless of legal status or citizenship as generally considered part of the population of their country of origin. For exchange rate, the data comes from International Monetary Fund's International Statistics Database and Browser. All currencies are expressed relative to the U.S. dollar. Variables capturing the variation in trade costs such as distance, common language, common border, and RTA membership are collected from the CEPII database and the World Trade Organization web site. The variable for distance comes from CEPII and is measured in kilometers signifying the physical distance between capital cities.

### 3.8 Variables

Exports and bilateral trade flows are the most common dependent variables found in gravity models of trade. The dependent variable in this study is the log form of total bilateral trade flow in agricultural commodities (exports plus imports) for country pairs in a given year. Explanatory variables can be distinguished in the following two groups:

1) Factors indicating demand and supply of trading countries,
2) Factors representing the impedance imposed on a trade flow between countries.

The independent variables are income level (GDP), population, distance and exchange rate. The distance variable is one of the foundation variables of the gravity model. The physical distance between trading countries is a proxy for transport costs. It is expected that the coefficient on distance will be negatively correlated with trade. The distance variable is the geographical distance between the capital cities measured in kilometers. The GDP variables are stated in billions of U.S. dollars and the coefficients are expected to have a positive sign because of the direct relationship between trade, economic size and income. Exchange rate is another variable introduced to augment the basic model. The exchange rate variable is the nominal

exchange rate of the pair of countries converted to U.S. dollars. The population variable is included to show that a country with a larger population is more self-sufficient and therefore less likely to engage in trade, so the expected coefficient will be negative.

Dummy variables will be used to capture trade creation and trade diversion effects. The trade creation dummies are$AFTA_{tc}$, $NAFTA_{tc}, MERCOSUR_{tc}, APEC_{tc}, CER_{tc}$. The dummies for trade diversion are $AFTA_{td}, NAFTA_{td}, MERCOSUR_{td}, APEC_{td}, CER_{td}$. Language, border and landlocked variables are introduced as dummy variables. A value of 1 indicates that both countries share a common language, border, or if a country is landlocked. The signs on these coefficients will indicate whether these variables increase trade between member countries, the expected coefficient dummies for these variables are to be significantly positive.

### 3.9 Estimation Techniques

Early empirical studies rely on cross sectional data to estimate the gravity model, in which the economic framework for the model was cross-sectional analysis (Anderson, 1979; Bergstrand, 1985, 1989; McCallum, 1995; and Deardorff, 1998). For such analysis, the ordinary least squares (OLS) estimation technique or pooled OLS technique is normally employed in its log-linear form. However, the traditional cross-sectional approach is affected by severe misspecification problems and leads to unreliable estimates (Carrerè, 2006). This is because, the traditional cross sectional gravity model usually include time invariant variables (e.g. distance, common language, historical and cultural dummies, border effects), but the model suffers from misspecification problems as it fail to account for country specific time invariant unobservable effects. This unobservable country specific time invariant determinants of trade are therefore captured by the error term. These unobserved variables are likely to be correlated with observed

regressors and since OLS technique is usually used, this renders the least square estimator to be inconsistent, which makes one of its classical assumptions invalid (Ghosh and Yamarik, 2004). In addition, OLS does not control for heterogeneity among the individual countries, which has the potential of resulting into estimation bias as the estimated parameters may vary depending on the countries considered. Therefore, estimating cross sectional formulation without the inclusion of these country specific unobservable effects gives a bias estimate of the intended effects on trade (Matyas, 1997).

The work of Anderson and van Wincoop (2003) refined the theoretical foundations of the gravity model to account for endogeneity of trade costs and the consideration of institutional barriers to trade. Based on a theoretical trade model, they indicated that costs of bilateral trade between two regions are affected by the average trade cost of each region with the rest of its trading partners and provided evidence of border effects in trade using a Non-linear Least Squares (NLS) model. Baier and Bergstrand (2007, 2009) followed the methodologies of Anderson and van Wincoop (2003) and found that time- invariant fixed effects are insufficient to capture the unobservable factors in the gravity equation. So they extended the data series from cross-section to panel to enable time-varying fixed effects to treat multilateral resistance. They reported that their method was comparable with both Anderson and van Wincoop (2003) and fixed effect approaches.

Over the last decade, there has been an increase in the use of panel data in gravity modeling (Egger, 2000; Rose and van Wincoop, 2001; Baltagi, 2003; Melitz, 2007). A unique advantage of panel data is that the panel framework allows the modeling of the evolvement of variables through time and space which helps in controlling for omitted variables in form of unobserved heterogeneity, which if not accounted for can cause omitted variable bias (Baltagi,

2008). In addition, with panel data, the time invariant unobserved trade effects can easily be modeled by including country specific effects. The two common techniques used in fitting the data are the fixed effects and random effect estimation techniques. The fixed effect assumes that the unobserved heterogeneity is correlated with the error term. In contrast, the random effect assumes that the unobserved heterogeneity is strictly exogenous i.e. it does not impose any correlation between the unobserved heterogeneity (individual effects) and the regressors.

# CHAPTER 4 RESULTS

## 4.1 Results

The use of an augmented gravity model of trade proposed by Linneman (1996), was used in this study to determine the bilateral trade flows of agricultural commodities in the Asia-Pacific region. The model also attempts to capture the trade creation and trade diversion effects of the RTAs included in the model. Table 4.1 lists the variables in this gravity model along with their expected coefficient signs followed by Table 4.2 indicating data resources.

In this section, we will examine the results of the gravity model obtained by using STATA. A total of five regressions were estimated using OLS and then incorporating fixed effects into the model. The first regression is estimated using pooled OLS, the second regression is estimated using panel OLS without fixed effects, the third uses time fixed effects, the fourth regression uses time invariant importer/exporter fixed effects and the fifth regression is estimated with time and importer/exporter fixed effects. The results for each are shown below.

(4.1) $\log X_{ij} = -14.88 + 0.747^{*}\ln(GDP_i) + 0.648^{*}\ln(GDP_j) + 0.039^{*}\ln(POP_i) + 0.0806^{*}\ln(POP_j) - 0.699^{*}\ln(DIST_{ij}) - 0.004^{*}\ln(EXR_{ij}) + 0.949^{*}LANG + 0.177^{*}BORDER + 0.852^{*}AFTAtc_{ij} + 0.436^{*}APECtc + 0.05^{*}NAFTAtc + 1.105^{*}MERCOSURtc + 1.473^{*}CERtc + 0.244^{*}AFTAtd - 0.046^{*}APECtd - 0.614^{*}NAFTAtd - 0.069^{*}MERCOSURtd + 0.684^{*}CERtd$

Table 4.1 Variables Utilized in the Gravity Model

| Variable | Expected Sign | Description |
|---|---|---|
| *lXijt* | | Log of bilateral trade flow from i to j at time t |
| *lGDPi* | + | Log of GDP for country i |
| *lGDPj* | + | Log of GDP for country j |
| *lPOPi* | + | Log of population for i |
| *lPOPj* | + | Log of population for j |
| *lDISTij* | - | Log of distance from i to j |
| *lEXR* | + / - | Log of exchange rate |
| *LANG* | + | Dummy variable for language commonality, 1 if countries have an official language in common, 0 otherwise |
| *BORDER* | + | Dummy for a shared border, 1 if countries share a border, 0 otherwise |
| *AFTAtc* | + | Dummy variable for mutual AFTA membership between i and j at time t |
| *APECtc* | + | Dummy variable for mutual APEC membership between i and j at time t |
| *NAFTAtc* | + | Dummy variable for mutual NAFTA membership between i and j at time t |
| *MERCOSURtc* | + | Dummy variable for mutual MERCOSUR membership between i and j at time t |
| *CERtc* | + | Dummy variable for mutual CER membership between i and and j at time t |
| *AFTAtd* | +/- | Dummy variable for when country i is a member of AFTA but country j is not |
| *APECtd* | +/- | Dummy variable for when country i is a member of APEC but country j is not |
| *NAFTAtd* | +/- | Dummy variable for when country i is a member of NAFTA but country j is not |
| *MERCOSURtd* | +/- | Dummy variable for when country i is a member of MERCOSUR but country j is not |
| *CERtd* | +/- | Dummy variable for when country i is a member of CER but country j is not |

Table 4.2 Variable Sources

| Variable | Data Source |
|---|---|
| Biateral Trade Flows | COMTRADE |
| GDP | World Bank WDI |
| Population | World Bank WDI |
| Distance | CEPII |
| Common Language, Contiguity | CEPII |
| Exchange Rates | IMF |
| RTA Membership | WTO |

(4.2) $\log X_{ij} = -14.88 + 0.747^{*}\ln(GDP_i) + 0.648^{*}\ln(GDP_j) + 0.039^{*}\ln(POP_i) + 0.0806^{*}\ln(POP_j) - 0.699^{*}\ln(DIST_{ij}) - 0.004^{*}\ln(EXR_{ij}) + 0.949^{*}LANG + 0.177^{*}BORDER + 0.852^{*}AFTAtc_{ij} + 0.436^{*}APECtc + 0.05^{*}NAFTAtc + 1.105^{*}MERCOSURtc + 1.473^{*}CERtc + 0.244^{*}AFTAtd - 0.046^{*}APECtd - 0.614^{*}NAFTAtd - 0.069^{*}MERCOSURtd + 0.684^{*}CERtd$

(4.3) $\log X_{ij} = -15.59 + 0.774^{*}\ln(GDP_i) + 0.668^{*}\ln(GDP_j) + 0.0225^{*}\ln(POP_i) + 0.0677^{*}\ln(POP_j) - 0.698^{*}\ln(DIST_{ij}) - 0.005^{*}\ln(EXR_{ij}) + 0.951^{*}LANG + 0.179^{*}BORDER + 0.917^{*}AFTAtc_{ij} + 0.674^{*}APECtc + 0.0025^{*}NAFTAtc + 1.394^{*}MERCOSURtc + 1.447^{*}CERtc + 0.285^{*}AFTAtd + 0.204^{*}APECtd - 0.632^{*}NAFTAtd + 0.203^{*}MERCOSURtd + 0.674^{*}CERtd$

(4.4) $\log X_{ij} = -1.512 + 0.688^{*}\ln(GDP_i) + 0.611^{*}\ln(GDP_j) + 0.589^{*}\ln(POP_i) - 0.618^{*}\ln(POP_j) - 0.751^{*}\ln(DIST_{ij}) - 0.02^{*}\ln(EXR_{ij}) + 1.038^{*}LANG - 0.103^{*}BORDER + 0.494^{*}AFTAtc_{ij} - 4.406^{*}APECtc + 1.269^{*}NAFTAtc - 0.009^{*}MERCOSURtc + 1.030^{*}CERtc - 0.119^{*}AFTAtd - 6.965^{*}APECtd - 0.047^{*}NAFTAtd + 0.488^{*}MERCOSURtd + 1.221^{*}CERtd$

(4.5) $\log X_{ij} = 11.66 + 0.592^{*}\ln(GDP_i) + 0.530^{*}\ln(GDP_j) - 0.118^{*}\ln(POP_i) - 0.763^{*}\ln(POP_j) - 0.750^{*}\ln(DIST_{ij}) - 0.022^{*}\ln(EXR_{ij}) + 1.038^{*}LANG - 0.105^{*}BORDER + 0.554^{*}AFTAtc_{ij} - 1.978^{*}APECtc + 1.205^{*}NAFTAtc - 0.331^{*}MERCOSURtc + 3.067^{*}CERtc - 0.062^{*}AFTAtd - 5.095^{*}APECtd - 0.114^{*}NAFTAtd + 0.719^{*}MERCOSURtd + 3.255^{*}CERtd$

The endogeneity problem commonly found in gravity analyses is addressed through the use of time-invariant and time-varying country-specific effects as suggested by Baldwin and Taglioni (2007), Baier and Bergstrand (2007) and Martínez-Zarzoso et al. (2009). Table 4.3 gives a summary of statistical information for the parameters included in the model. The Breusch-Pagan and White's LM tests for heteroscedasticity were both positive and highly significant indicating the need to obtain robust results for our model. While the coefficients for the natural logarithm of continuous variables (e.g. GDP, distance, population, exchange rate) are elasticities, the coefficients for the dummies are not. They need to be transformed as follows in order to be interpreted as elasticities: elasticity = $exp^{\alpha}$-1, where $a$ is the estimated coefficient of the dummy variable.

Regression (1) is first estimated using pooled OLS to provide a benchmark for the following analytical specifications. However, as this specification does not consider heterogeneity caused by country and time-specific effects, the coefficients will be biased and inconsistent. The coefficients for the log of GDP and POP for country *i* and *j* were both positive and significant (p-value < 0.001) as expected. So, with a 1 percent increase in GDPi there would be an estimated 0.75 percent increase in bilateral trade and a 0.65 percent increase of trade with a 1 percent increase in GDPj. Because of the significance of the parameter coefficients, it can be projected that with a 1 percent increase in country *i's* population, there would be a 0.04 percent increase in agricultural bilateral trade flows between *i* and *j*. With a 1 percent increase in country j's population, there would be a 0.08 percent increase in bilateral trade flows between *i* and *j*. Distance was also significant at the one percent level with the expected negative sign for the coefficient. With a 1 percent increase in distance between *i* and *j* there would be a corresponding 0.69 percent decrease in agricultural bilateral trade between *i* and *j*. As mentioned before, the

elasticities of the dummy variables is obtained from the expression $exp^{\alpha}$-1. The estimated dummy coefficients for language and border were both positive and significant at the 1 percent level indicating that sharing a common language increases bilateral trade by 1.58 percent and sharing a border increases agricultural trade by 0.19 percent, as opposed to countries who do not.

Table 4.3 Gravity Model Results

| | Pooled OLS | OLS W/O FE | FE3 | FE4 | FE5 |
|---|---|---|---|---|---|
| | | | | | |
| gdp_i | 0.747*** (0.0137) | 0.747*** (0.0137) | 0.774*** (0.0146) | 0.688*** (0.0424) | 0.592*** (0.0509) |
| gdp_j | 0.648*** (0.0105) | 0.648*** (0.0105) | 0.668*** (0.0110) | 0.611*** (0.0428) | 0.530*** (0.0549) |
| pop_i | 0.0394** (0.0143) | 0.0394** (0.0143) | 0.0225 (0.0146) | 0.589* (0.258) | -0.118 (0.307) |
| pop_j | 0.0806*** (0.0126) | 0.0806*** (0.0126) | 0.0677*** (0.0127) | -0.618** (0.189) | -0.763*** (0.190) |
| contig | 0.177*** (0.0443) | 0.177*** (0.0443) | 0.179*** (0.0442) | -0.103 (0.0568) | -0.105 (0.0566) |
| comlang | 0.949*** (0.0365) | 0.949*** (0.0365) | 0.951*** (0.0363) | 1.038*** (0.0356) | 1.038*** (0.0355) |
| dist | -0.699*** (0.0192) | -0.699*** (0.0192) | -0.698*** (0.0192) | -0.751*** (0.0182) | -0.750*** (0.0182) |
| AFTAtc | 0.852*** (0.0510) | 0.852*** (0.0510) | 0.917*** (0.0522) | 0.494*** (0.125) | 0.554*** (0.140) |
| APECtc | 0.436 (0.246) | 0.436 (0.246) | 0.674* (0.265) | -4.406*** (0.880) | -1.978* (0.973) |
| NAFTAtc | 0.0500 (0.0700) | 0.0500 (0.0700) | 0.00251 (0.0720) | 1.269*** (0.153) | 1.205*** (0.159) |
| MERCOSURtc | 1.105*** (0.257) | 1.105*** (0.257) | 1.394*** (0.277) | -0.00978 (0.412) | -0.331 (0.424) |

(Table 4.3 continued)

| | Pooled OLS | OLS W/O FE | FE3 | FE4 | FE5 |
|---|---|---|---|---|---|
| CERtc | 1.473*** (0.0500) | 1.473*** (0.0500) | 1.447*** (0.0493) | 1.030 (0.663) | 3.067*** (0.798) |
| AFTAtd | 0.244*** (0.0421) | 0.244*** (0.0421) | 0.285*** (0.0431) | -0.119 (0.116) | -0.0620 (0.133) |
| APECtd | -0.0465 (0.251) | -0.0465 (0.251) | 0.204 (0.270) | -6.965*** (1.180) | -5.095*** (1.122) |
| NAFTAtd | -0.614*** (0.0539) | -0.614*** (0.0539) | -0.632*** (0.0544) | -0.0471 (0.0865) | -0.114 (0.0958) |
| MERCOSURtd | -0.0693 (0.247) | -0.0693 (0.247) | 0.203 (0.267) | 0.488 (0.294) | 0.719* (0.305) |
| CERtd | 0.684*** (0.0507) | 0.684*** (0.0507) | 0.674*** (0.0508) | 1.221 (0.664) | 3.255*** (0.800) |
| ex_rate | -0.00481 (0.00373) | -0.00481 (0.00373) | -0.00541 (0.00374) | -0.0200 (0.0153) | -0.0221 (0.0147) |
| _cons | -14.88*** (0.450) | -14.88*** (0.450) | -15.59*** (0.467) | -1.512 (2.908) | 11.66* (4.821) |
| r2 | 0.650 | 0.650 | 0.652 | 0.764 | 0.765 |
| F | 1362.2 | 1362.2 | 606.4 | . | . |
| N | 10491 | 10491 | 10491 | 10491 | 10491 |

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The significant trade creating dummies are AFTAtc, MERCOSURtc and CERtc. APECtc and NAFTAtc have the predicted positive coefficient although they were not significant. The estimate coefficient of MERCOSURtc of 1.105 implies that being a part of MERCOSUR increases trade by 2.02 percent between the country pairs. The significant trade diverting dummies are AFTAtd, NAFTAtd and CERtd. AFTAtd and CERtd have positive coefficient

estimates indicating that they are increasing the trade between members by 1.34 and 4.21 percent respectively and are not necessarily diverting trade with non-member countries. Without any country-pair or time dummies these coefficients are likely biased due to ignoring time- invariant unobserved heterogeneity and multilateral resistance terms.

Regression (2) is estimated with panel OLS without fixed effects. The results are identical to regression (1). A Hausman test was run to determine whether a random effects specification was more appropriate, but the results of this test indicated that this was not the case. A fixed effects model was adopted for all model estimation from this point forward, as this is generally considered most appropriate for use in a gravity model.

Regression (3) reports results where time dummies are added to the regression to account for the changing nature of the relationship over time. The $r^2$ increased slightly from 0.650 to 0.652. The coefficient of GDPi and GDPj remained positive and significant at the one percent level with the magnitude increasing slightly. The estimated coefficient for POP of country *i* remained positive but is now insignificant. POPj, CONTIG and COMLANG also stayed positive and significant. As far as the trade creating variables, APECtc is now slightly significant ($p < 0.05$) with the other trade creation variables (AFTA, MERCOSUR, CER) and trade diversion variables (AFTA, NAFTA, CER) continuing to remain significant.

Regression (4) shows results for time invariant importer and exporter fixed effects. The $r^2$ has increased once again from 0.652 to 0.764. GDPi and GDPj remain significant at the one percent level although there magnitude decreases slightly. POPi is significant again but only with a $p < 0.05$ and POPj has become negative with a $p < 0.01$. CONTIG (shared border) has become negative, but insignificant. AFTAtc and NAFTAtc are trade creating with a positive and significant coefficient estimate. APECtc and APECtd are both negative and significant indicating

APEC is trade diverting. MERCOSURtc, CERtc, AFTAtd, NAFTAtd and CERtd are no longer significant.

Regression (5) includes a time dummy variable with exporter and importer fixed effects. Baier and Bergstrand (2007) recommend that models include importer and exporter time-varying effects to control for all determinants of trade that vary in those dimension. The size of country *i* has a positive and significant impact with an elasticity of 0.59, so that a 10 percent increase of GDP will increase bilateral trade by 5.9 percent. The GDP of country *j* is significant indicating a 10 percent increase in GDP will increase trade by 5.3 percent. It's interesting to note the switch of signs from positive to negative in the population variables in this model. AFTA, NAFTA and CER are trade creating. APEC is trade diverting. MERCOSURtd and CERtd have positive coefficients indicating they are creating trade with both members and nonmembers.

# CHAPTER 5 SUMMARY AND CONCLUSIONS

## 5.1 Summary

The aim of this study was to determine whether AFTA, APEC, MERCPSUR, CER and NAFTA has had an impact on bilateral agricultural trade in the Asia-Pacific Region through examining trade creation and trade diversion effects by using the gravity model. The results of this regression analysis show that the explanatory variables explain about 65-76 percent of the variation in the dependent variables of the standard gravity equation used in this study. It is believed that if two nations are members of the same RTA, then there should be an evident increase in trade between the trading pair. Of the five RTAs examined, AFTA, CER and MERCOSUR resulted in an increase in agricultural bilateral trade. NAFTAtd and APECtd had negative signs indicating that when nations do join a specific RTA, trade is being diverted from traditional trading pairs to pairs of countries in the same RTA.

GDP, population and distance are known variables that are considered important to the foundation of the gravity model. The positive and significant GDP coefficients for both importing and exporting countries suggest that bilateral trade is affected by the trading partner's incomes.

Another determinant of agricultural bilateral trade flows is the population of the respective trading pair. Population size can enhance trade flow as well as retrain it. A large population may indicate a large resource endowment, self-sufficiency and less reliance on international trade. Therefore population size would have a negative effect on trade flow. On the other hand, a large population can promote the division of labor and create opportunities for

trade in a wide variety of goods, implying population would have a positive effect on trade flows. The results from this study suggest that population has a positive effect.

The negative but statistically significant coefficients of the distance variable indicate the trade barrier impact of transaction costs. The farther country i and country j are from each other, the higher the transaction costs. The language commonality variable was positive and highly significant demonstrating that sharing a common language did effect the flow of agricultural bilateral trade. Language commonality between a trading pair in the Asia-Pacific Region does play an important role in trade allowing for easier communication and a reduction in the amount of transaction cost. Also those countries tend to historically have more established trade ties.

Finally, it was notice that contiguity did have an effect on bilateral trade. Sharing a border between trading partners increased trade. This reduces transaction costs and also suggests that the countries may share common colonial and cultural links. The results confirm that countries that share a border trade more.

### 5.2 Conclusions

This study uses a gravity model to examine bilateral agricultural trade involving five trading blocs, with data from 24 countries from 1990-2013. The estimated coefficients from the gravity model show that GDP, population, distance between trading partners, common language and a shared border explain bilateral trade. The trade creation and trade diversion effects varied among the different regressions. AFTA, CER, and MERCOSUR resulted in significant trade creation effects while APEC and NAFTA showed signs of possible trade diversion.

The findings reiterate the importance of controlling for bias caused by heterogeneity and endogeneity in gravity models. The analysis shows that the use of standard OLS estimation of

gravity equations likely leads to severe bias and misleading results. Time-invariant and time-varying country effects should be included to capture all country-specific characteristics and provide a proxy for the multilateral resistance terms proposed by Anderson and Van Wincoop (2003). Fixed time effects should also be included to capture any macroeconomic shocks that may influence international trade. The implications regarding the Trans Pacific Partnership would suggest possible trade creation results as well as trade diversion based on the effects of past trade agreements. With the reduction of trade barriers, various agriculture commodities and markets will open up.

### 5.3 Further Study

By examining the trade creation and trade diversion effects of AFTA, APEC, MERCOSUR, CER, and NAFTA on bilateral agricultural trade in the Asia-Pacific region, predictions were made about the implications that the proposed Trans Pacific Partnership will have on the region. Further analysis should be done in the future after the TPP is passed and implemented to study the effects accurately. It would also be useful to look at the disaggregated effects of different commodities that play a major role in the TPP.

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## VITA

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