The Impact of Free Trade Agreements on Indonesia's Agricultural Trade Flows: An Application of the Gravity Model Approach

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Utri Dianniar

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Members of the Examining Committee:

Prof. Dr. Peter van Bergeijk (Supervisor)

Dr. Howard Nicholas (Reader)

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Inquiries:

Postal address:

Institute of Social Studies
P.O. Box 29776
2502 LT The Hague
The Netherlands

Location:

Kortenaerkade 12
2518 AX The Hague
The Netherlands

Telephone: +31 70 426 0460
Fax: +31 70 426 0799

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List of Acronyms

ACFTA	ASEAN-China Free Trade Area
AFTA	ASEAN Free Trade Area
ANZCER	Australia-New Zealand Closer Economic Relations
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
CEPT	Common Effective Preferential Tariff Scheme
CGE	Computable Generalized Equilibrium
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
FEM	Fixed Effect Model
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GEL	General Exception List
HSL	Highly Sensitive List
IMF	International Monetary Fund
IL	Inclusion List
IOR-ARC	Indian Ocean Rim Association for Regional Cooperation
MERCOSUR	Mercado Común del Sur
NAFTA	Northern America Free Trade Agreement
OECD	Organisation for Economic Co-operation and Development
REM	Random Effect Model
SME	Small and Medium Enterprises
SL	Sensitive List
TEL	Temporary Exclusion List
UN	United Nations
UNDP	United Nations Development Programme
USDA	United States Departement of Agriculture
VIF	Variance Inflation Factor
WDI	World Development Indicator
WTO	World Trade Organization

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Abstract

Since the end of World War II, regional trade agreements have proliferated across the world. As bilateral and regional trade agreements is becoming increasingly prominent, it is important to ascertain what implications this may have for world trade. In the last two decades, Asian economies have been involved in several FTAs such as ASEAN Free Trade Area (AFTA) and ASEAN-China Free Trade Area (ACFTA). Indonesia, which is the member of ASEAN, has been actively participate in these cooperations.

The purpose of this paper is to analyse the impacts of free trade agreements on Indonesia's agricultural trade flows and to investigate the existence of Linder effect on Indonesia's bilateral trade where trade will be greater when the income per capita of trading countries are more similar. It is focus on agricultural sector because most ASEAN countries, including Indonesia, depend on this sector as a major source of gross domestic product (GDP). Therefore, it is interesting to analyse specifically what the impacts of FTAs on Indonesia's agricultural sector, especially on its trade flows.

The gravity model is chosed to investigate the determinants of Indonesia's agricultural trade flows, from both export and import side. With this objective this paper constructs basic, augmented and gravity model with linder effect and perform cross sectional and panel data estimations. It finds that the fixed effect model is to be preferred than random effects gravity model. The empirical results shows that the membership of AFTA and ACFTA does not bring significant impact on Indonesia's agricultural trade flows. From the linder effect investigation, it reaveals that linder effect does not exist in Indonesia's bilateral trade. Indonesia tends to trade with countries that have high level of income per capita.

Relevance to Development Studies

Trade can be a key factor in economic development. The development of international trade leads to the establishment of various form bilateral, regional and multilateral trade liberalisation. The formation of free trade agreements contributing to large market size and increasing the competitiveness of countries' products, which ultimately enhance economic growth. The findings on this study could somewhat highlight the impacts of FTAs on Indonesia's economiy and reveal other determinant factors to boost Indonesia's trade flows regarding agricultural sector. It can be considered for policy makers to formulate trade policy that can generate a country development and create absolute gains from the free trade agreements.

Keywords

Free Trade Agreement, Gravity Model, Trade Flows, Agriculture, Indonesia

Chapter 1
Introduction

1.1. Background

The development of international trade leads to various form of free trade such as bilateral, regional and multilateral trade liberalisation. A process of trade liberalisation has emerged by the establishment of the General Agreement on Tariffs and Trade (GATT) in 1947, which now has been replaced by the World Trade Organization (WTO). Trade liberalisation is marked by the reduction or even elimination of trade barriers to encourage the flow of goods and services and increase volume and value of trade, which in turn enhance economic growth and prosperity.

Currently, many countries in the world, including Indonesia, have involved to trade liberalization through Free Trade Area. Indonesia has joined to ASEAN Free Trade Area (AFTA) with other five old ASEAN (Association of Southeast Asian Nation) countries, namely Brunei Darussalam, the Philippines, Malaysia, Singapore and Thailand. AFTA was established in 1992 to enhance regional economic competitiveness of South East Asian Nations and make it as a production base of world market, also to attract more investment to this region. It was agreed that the final tariff reduction schedule (ending rate) is 0-5% in 2002.

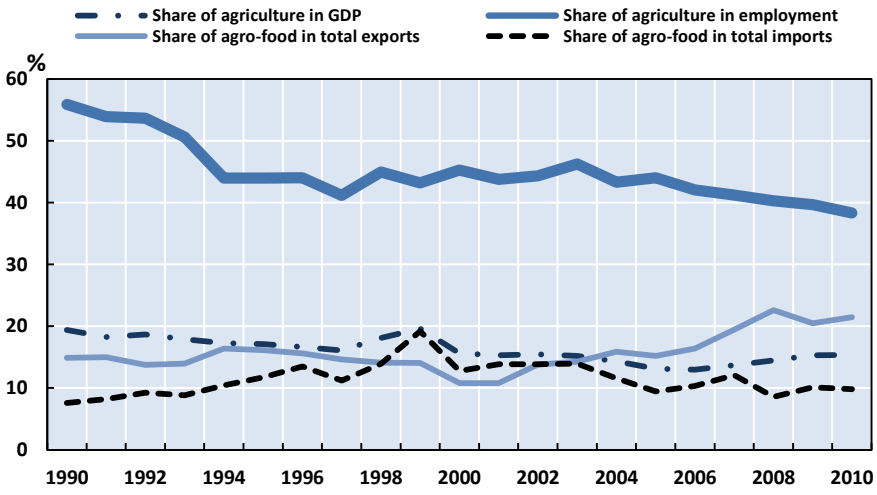
In its development, the free trade relationship expands to include China as trading partner. ASEAN markets covering about 500 million people and China about 1.5 billion people in the largest market in the world. From the economic side, China is a country with the highest growth economies in the world, about 10% over the past decade. China's GDP continue to increase every year. In 2002, China's GDP reached USD 1.4 trillion and was ranked 6th in the world. Moreover, the characteristics of ASEAN's products tend to be complementary to the China's export products. All those potential synergies of the ASEAN-China became motivation to establish trade relationship between countries in this region. In 2002, ASEAN countries have signed an agreement with China under ACFTA (ASEAN-China Free Trade Area). The process of tariff reduction started on January 2004 until the full implementation on January 2010 (Surono 2012).

Liberalisation in the agricultural sector gets greater attention in this agreement, since this sector is considered as strategic by many countries. For Indonesia, agricultural sector is deemed as the backbone of Indonesian economy as it contribute large share of the country's Gross Domestic Product (GDP) and provides employment to about two fifths of the workforce of the country. According to Statistics Indonesia (2010), agriculture contributes 15%

of total GDP. Its share in GDP had decreased from 19% in 1990 to 13% in 2007, but then rose to 15% in recent years (OECD 2012). While the number of people working in agricultural sector accounts for 41.49 million. This number is the largest employment provider in Indonesia (Statistics Indonesia 2010). Its share in employment declined from 56% in 1990 to 38% in 2010 (OECD 2012).

The share of agro-food for the total value of exports fluctuated at about 15% before the Asian crisis, declined to 10% after the crisis, then has upward trend since 2001 driven by increasing export of palm oil. Recently, the share increased to above 20%. While, the share of agro-food for the total value of import increased before and after the crisis, but then it declined until 10% recently as shown by figure 1.1.

Figure 1.1 The Share of Agriculture in GDP, Employment, Total Exports and Imports, 1990-2010



Source: BPS, 2011; Bank of Indonesia (BI), 2011; UN, UN Comtrade, 2011 in OECD 2012

The rapid expansion of trade liberalization undertaken by Indonesia with the aim to increase profit gains from trade will promote economic growth through trade surplus. However, the process of trade liberalisation itself is closely related to the opening of market access of Indonesian exports to the world. At the same time, it will also opening the access of the world to Indonesian market, which means that Indonesian domestic market will also be open to other countries imported products.

Indonesia has been a net exporter of agro-food products from 1990 to 2010. During Asian crisis, the export performance was encouraged by rupiah devaluation that boosts agricultural exports. However, in recent years palm oil exports become the main contributor for surplus on balance of trade. The value of agro-food exports reached more than double of the value of agro-food imports since 2004. The value of exports declined in 2009, but then rose again in 2010. On average, the agro-food sector shows a good trade performance on the export side with a strong integration with international markets.

1.2. Problem Statement

Indonesia's participation in AFTA and ACFTA raise some debate about their effects on national economy that need to be observed further. On the one hand, this would be beneficial for Indonesia since Indonesia's products would have a larger market share and the mechanism of export-import commodities become more efficient due to export tariffs reduction. On the other hand, it appears many concerns about the readiness of Indonesia to anticipate the invasion of imported goods that would overwhelm Indonesia's market products. This situation would threaten domestic agricultural products because they should be able to compete with cheaper and better quality of imported products. The implementation of the FTA means removing tariff barriers that have been useful for the protection of domestic industry.

Table 1.1 Balance of Trade Indonesia–ASEAN and China, 2007-2011 (USD Billion)

COUNTRY	YEAR				
	2007	2008	2009	2010	2011
Singapore	0,662	-8,927	-5,288	-6,518	-7,521
Malaysia	-1,315	-2,490	1,123	0,714	0,591
Thailand	-1,233	-2,673	-1,379	-2,904	-4,508
Philippines	1,494	1,298	1,861	2,475	2,847
Brunei	-1,821	-2,357	-0,565	-0,605	-0,937
China	1,118	-3,611	-2,503	-4,732	-3,271

Source: Ministry of Trade Republic of Indonesia

According to Ministry of Trade Republic of Indonesia data (Surono 2012), there has been a deficit on Indonesia's trade balance with major ASEAN countries. In recent years, Indonesia experienced a significant trade deficit with Singapore, Thailand and Brunei. Trading good performances are shown by trading with Philippines and Malaysia. Indonesia's trade balance against Malaysia for 3 years (2009-2011) show a surplus by the average around USD 809 million (Table 1.1).

Compared to trade with ASEAN countries, the impact of trade relationship with China is more significant, especially for the industrial sector as well as Small and Medium Enterprises (SME) where the products must compete with imported products from China. When we look at the data of Indonesia's trade balance against China (Table 1.1), the general trend of import of goods from China shows an increase rates by approximately 28.8%. This number is greater than the value of export goods from Indonesia to China which only reached 22.45%. It means Indonesia experience a deficit trade with China (Surono 2012).

Referring to the data above, it can be seen that Indonesia relies on imports from other ASEAN countries, and even more dependent on China. The difference between the sum of exports and imports by Indonesia is still large.

In agricultural sector, imports from China increase significantly especially in Horticultural commodities. It was recorded that horticulture faced deficit trade balance against China until 99%. The increase in trade balance deficit peaked in 2008, reaching a value of U.S. $ 434,403,047. The highest jump in volatile trade balance deficit of horticulture from 2004 to 2008 occurred in 2007 which were up by 24.76% from the previous year (Ministry of Agriculture of Indonesia).

This phenomenon raises a question whether Indonesia's agricultural trade flows are affected by Indonesia's participation in FTAs. There is a tendency that countries with high level income would trade more with countries that have simillar level of income. It is interesting to know whether it also affect Indonesia's decision to establish bilateral trade with other countries. Therefore, this study tries to reveal whether FTA determines the pattern of Indonesia's agricultural trade flows by using gravity model approach. The gravity model, which has assumption that bilateral trade flows depend on the distance between two partners and their economic size, has been widely used to analyse the impact of FTA on bilateral trade flows.

1.3. Research Objective

The objective of this paper is to analyse the impact of AFTA and ACFTA on Indonesia's agricultural trade flows. This study also attempts to investigate the existance of Linder effect in Indonesia's bilateral trade, in which trade will be greater when the income per capita of the trading countries are more similar.

1.4. Research Question

Motivated by background that have been described above, the research question of this study are:

1. Do the AFTA and ACFTA affect Indonesia's trade flows in agricultural sector?
2. Does Linder effect, in which countries with similar levels of income per capita will trade more, exist in the case of Indonesia's bilateral trade?

1.5. Scope and Limitations of the Study

The expansion of free trade agreement have affected economic conditions in many countries, not only for the members but also non-members FTAs. The possible impact as the result of free trade agreements are trade creation and trade diversion. However in this paper, I will limit my analysis on a single-country case, which is Indonesia, therefore trade creation and trade diversion to other members and non-members of FTAs are not considered here.

In dealing with bilateral trade flows, there is high probability of zero-valued trade flows which might affect the estimation of the models. Additionally, since the establishment of several FTAs that Indonesia joined in are quite new, less than 3 years, therefore this study will only focus on AFTA and ACFTA.

1.6. Organization of the Study

The research paper is constructed into six chapters, beginning with introduction, background of the study, problem statement, objective and research questions, scope and limitations and organization of the study in the first chapter, continued by chapter two which give an explanation of theoretical framework on concepts and theories of international trade, also literature review with regards to free trade agreements. Chapter three will describe about Indonesia's agricultural trade performance. Data and methodology used in the study will be presented in chapter four. Followed by the result and analysis in chapter five and conclusion in chapter six.

Chapter 2
Theoretical Framework and Literature Review

2.1. Theoretical Framework

This chapter will give brief explanation about the theories related to the study such as international trade and free trade theory. Previous studies about free trade are also presented here.

2.1.1. International Trade Theory

The classical theory of international trade began with mercantilism from about 300 years ago. This theory was based on "commercial revolution" that was the transition from local economies to national economies, from feudalism to capitalism, and from a "rudimentary trade" to a bigger international trade. This philosophy believes that national wealth might be achieved by increasing exports and collecting gold and silver in return. The monarch controlled the economy and their policy was to export to the countries that they controlled and not to import, hence they will have a surplus Balance of Trade. The theory deems that to increase a nation wealth, a country had to export more and import less and to receive in exchange gold and silver (Schumacher 2012).

In the second half of the XVIII century, mercantilism became an impediment for economic progress. In 1776, Adam Smith, through his book "The Wealth of Nations", argued that mercantilist policies only beneficial for producers and disadvantaged the costumers. His idea is that exports is profitable if you can import goods that could satisfy the consumers instead of producing them in the international market. According to Smith "trade is the consequence of the human propensity to truck, barter, and exchange one thing for another" (Schumacher 2012:57). People always try to pursue their own interest whenever they trade with each other because they want benefit from it.

The basic of Adam's theory of international trade is the determinant of the value of goods can be measured from the labour incorporated in them. He imply that the division of labour leads to "the greatest improvement in the productive powers of labour". Furthermore, Smith claimed that international trade will be beneficial for nations because

> [it] gives a value to their superfluities, by exchanging them for something else, which may satisfy a part of their wants, and increase their enjoyments. By means of it the narrowness of the home market does not hinder the division of labour in any particular branch of art or manufacture from being carried to the highest perfection. By opening a more extensive market for whatever part of the produce of their labour may exceed the home consumption, it encourages them to improve its productive powers, and to augment its annual produce to the utmost, and thereby to increase the real revenue and wealth of the society (Schumacher 2012:59).

In free trade, each country can specialize in the production of a commodity that has an absolute advantage and import commodities gained absolute loss. With specialization, each country could increase world production which can be utilized together through international trade. So, through international trade based on absolute advantage, each country involved in the trade will benefit simultaneously through specialization, instead of the sacrifice of other countries; "If a foreign country can supply us with a commodity cheaper than we ourselves can make it, better buy it of them with some part of the produce of our own industry employed in a way in which we have some advantage" (Schumacher 2012:62).

David Ricardo, a British economist, in 1817 introduced the concept of comparative advantage which is the main reason for countries to trade internationally. According to Ricardo, international trade is possible due to differences in labour productivity (Krugman and Obstfeld 2003:12). Countries would export goods that have comparative labour productivity advantage (Anderson 2008:4). In addition, Ricardo argued that even if a country suffered absolute losses, in the sense of not having an absolute advantage in producing both types of goods when compared with other countries, but both countries still can benefit from international trade as long as they do specialisation to produce goods which have the lowest relative cost from other countries (Krugman and Obstfeld 2003).

In line with Ricardo, Heckscher-Ohlin described trading patterns where countries tend to export goods that use relatively abundant factor of production intensively. A country will trade with other countries because the country has a comparative advantage, namely excellence in technology and excellence of production factors. The basis of comparative advantage are factor endowment, such as the ownership of factors of production within a country, and intensity factor, such as technology used in the production process, whether labor or capital intensity (Davis and Weinstein, 2001).

While classical theory of trade by David Ricardo and Heckscher-Ohlin emphasized trade based on the comparative advantage of countries with very different characteristics, New Trade Theory by Krugman argues that trade may also occur between countries with very similar characteristics, technology, and factor endowments. In his paper 'Increasing Returns, Monopolistic Competition and International Trade', Krugman (1979) proposed model of non-comparative advantage trade. According to Krugman, "trade is caused by economies of scale instead of differences in factor endowments or technology" (Krugman 1979:469).

Krugman's model introduced transportation costs, the key in producing the "home market effect", which became the fundamental of Krugman's New Economic Geography; "...ceteris paribus, the country with the larger demand for a good will, at equilibrium, produce a more than proportionate share of that good and be a net exporter of it" (Behrens and Robert-Nicoud 2009:470).

2.1.2. Free Trade Agreements

The development of international economic activity has a tendency to create a multinational trading blocs. It is created from the relation of contiguous states that decide to have common trading policies to face the competition from other countries in terms of tariff and market access. The general reason for the creation of these trading groups is to increase economic growth and gain benefit of the member countries (Kotabe and Helson 2010).

The concept of free trade rose as a reaction to mercantilism; in which government controls all of economic activities. According to Adam Smith, all countries would benefit from free trade because the resources can be utilised efficiency and increase world welfare (Naqvi 1999). Salvatore (1998) has quoted *Haberler* mentioned the benefits of free trade its likely for the developing countries. It indicates that free trade leads to optimal utilisation of resources, therefore economy will move from inefficient production point inside its production frontier to a point on its production frontier.

According to Kotabe and Helson (2010), a Free Trade Area has a higher level of integration than other regional cooperations. It is a formal agreement among two or more countries to reduce or eliminate tariff trade barriers among member countries. However, member countries has freedom to maintain individual tariff schedules for countries that are not the member of the free trade group. The problem with this arrangement is that non-member countries can export goods to the member of an FTA that has the lowest external tariff, and then reexport the goods to the destination country member of FTA without paying the higher tariff if it had export directly to the destination country.

It is widely believed that free trade agreement tends to improve welfare because it included some degree of trade liberalisation until the Viner's model (1950) was developed. Viner's model shows that although free trade agreement leads to an increase in bilateral trade flow, it could also have negative effect on welfare. According to Viner whether free trade agreement would increase welfare or not depends on the net effect of trade creation and trade diversion (Plummer et al. 2010).

Trade creation impact means that FTA eliminates trade barriers between member countries that encourage trade relationship among them. While, trade diversion impact means that the FTA causes the change of imports highly efficient non-members countries by less efficient members. Trade creation would improve resource allocation, while trade diversion creates less efficiency in resource allocation. Trade diversion could also has negative impact for non-member countries because they lose an exporting opportunity. While consumers in FTA members may get benefit as they are able to buy import products with lower price (Urata and Okabe 2007).

Beside the static effect of free trade agreements as have been explained by Viner's model above, free trade agreements also have dynamic effects.

Plummer et al. (2010) considered the dynamic effects of FTAs into several effects, namely economies of scale and variety, technology transfer and foreign direct investment (FDI), and structural policy change and reform, and also competitiveness and long-run growth effects.

Economies of scale in this term can be defined as the reduction in average costs when there is expansion in output. The establishment of FTA creates a larger market for firms to expand their operation in other countries, hence the producer will gain advantage from a larger customer and also be able to reduce production cost (Corden 1972). As a consequence, it will generates competitiveness among producers at home also in foreign markets in which they have to keep production in low cost and increase the variety of the products. While the customer in each member country enjoy the variety of the goods they can purchase in which were too costly before the existence of FTA.

FTA leads to 'investment creation' by creating a more integrated marketplace multinational corporations. A multinational corporation that believe FTA generates greater economic dynamism will invest more in a member country that has low labour and transaction costs (Plummer et al. 2010). According Baldwin (1992) trade liberalisation increases the return on capital which induces capital formation, and ultimately raises output.

The expansion of FTAs creates deeper integration by dealing with 'behind-the-border measures', such as laws to corporate and public government, custom procedures, competition policies, and other sectors. The FTA allows countries to address the nontraditional areas that would improve business environment among members. That could be done by reducing costs, creating the environment that attract foreign investors, and imposing the policy reforms toward best practices (Plummer et al. 2010).

The reduction in trade barriers as a result of FTA, still allows members to get an advantage from the increased of intra-bloc competition. The increased competition from other countries would weed out the less productive firms. It would also increase an efficiency because the firms are given incentives and technology to produce more efficient. These competition might improve structural efficiency and resources allocation because members could specialize in the production of different commodities which ultimately raise FTA members' long-run growth prospects (Plummer et al. 2010).

2.2. Literature Review

A number of previous studies have been conducted by researchers on the impact of free trade agreements on trade flows, either of individual countries or a region. Their findings are vary in terms of size or magnitude.

A study of the impact of APEC trade liberalisation on the Indonesia economy was conducted by Oktaviani and Drynan (2000). An Indonesian Forecasting Model was developed based on the ORANI-F general equilibrium

model for Australia. The result showed that APEC trade liberalisation was generally beneficial in enhancing growth in most APEC members, in both short term and long term, except for North America. The impacts of full APEC trade liberalisation are more positive than the impacts of trade liberalisation by only developed countries that are member of APEC.

In 2004, Hakim conducted research to analysed the implications of the AFTA on agricultural trade using a recursive dynamic general equilibrium analysis. He found that free trade pursued by the ASEAN countries such as global multilateral agreements under WTO, AFTA and APEC, would improve their economies overall. Real GDP in all ASEAN member countries is expected to rise. Compared to real GDP increases in the other ASEAN countries, Indonesia would have the lowest real GDP rise in response to AFTA because it had relatively low trade barriers. However, Indonesia would gain from increased exports resulting from better market access to other ASEAN countries.

Tang (2005) studied the effects of the NAFTA, ANZCER and ASEAN FTAs using gravity model and found that trade within member countries has increased. ANZCER FTA has resulted in trade diversion from non-member countries and ASEAN FTA has led to a trade increase with non-members.

Kalirajan (2007) investigated regional cooperation effects of the Australia and IOR-ARC trade using gravity model and panel data technique. He showed that Australia was expected to have more gains of its potential exports because of the IOR-ARC agreement.

Urata and Okabe (2007) examined the impacts of free trade agreements on trade flows by using two approaches; to examine the changes in trade patterns before and after FTA by using indicators of intra-FTA interdependence and to estimate the impacts of FTAs on bilateral trade flows using gravity model. They found that FTAs bring about trade creation effect and that trade diversion effect is limited. The result also showed different patterns among different products, and they identified trade diversion effect for many products in the case of the EU, the NAFTA, and the MERCOSUR but not for the case of the AFTA.

Gravity model have been widely used in various sectors such as migration, foreign direct investment, and much more related to international trade as well as a reliable tool to analyse the phenomenon of free trade. It begins with the Theory of Newton about gravitational force between two objects that is known as Newton's Law. Inspired by Newton, in 1962 Tinbergen proposed gravity model to analyse international trade flows. According to Tinbergen (1962), bilateral trade between two regions is related to their incomes (GDP) and inversely related to their distance.

Linneman (1966 in Pass 2000) suggests three main factors on gravity model of trade which are exports, imports and factors that create resistance to trade which affect the degree of trade intensity, including ordinary tariff barri-

ers and transportation costs. Works by Anderson (1979) shows that goods are differentiated by the origin country and consumers have preferences of all the differentiated products. Bergstrand (1985) also explore the determinants of bilateral trade and find that gravity model is associated with monopolistic competition models, where identical countries trade differentiated products because consumers have preference of variety. Deardorff (1995) shows that gravity equation can be derived from Heckscher-Ohlin model in homogeneous goods with perfect competition. However, Feenstra et al. (2001) said that gravity equation can be derived for homogeneous goods but also for differentiated goods.

In gravity equation, the most common dependent variables are exports and bilateral trade flows. While the explanatory variables are factors indicating demand and supply of trading countries, and impedance factors of trade flow between countries. The proxies for demand and supply are measures of countries' economic and market size such as income level, population, area size and GDP per capita. GDP per capita represents the income level or purchasing power of exporting and importing countries (Sohn 2005).

The impedance factors include all factors that influence trade flows either positive or negative. The distance variables are a trade resistance factor that indicates transport costs (Martinez-Zarzoso and Suarez-Burguet 2005). It is approximates the distance between countries' economic centers. Other factors such as common language and border adjacency, colonial links, and participation in a trade agreement are the factors expected to affect trade flows between countries (Kepaptsoglou et al. 2010).

Chapter 3
Indonesia's Agricultural Trade Performance

3.1. Indonesia's Agricultural Sector

Indonesia is the world's 4th most populous country and known as the major producer of agricultural products. Indonesia has good economic performance since 1969 to 1996 that can be seen from its growth, on average, around 7 per cent a year. The economy has been slowdown as a result of Asian financial crisis in 1997, but recover after that and reached around 5-6 percent annually. The growth of population also significant. Over the past four decades, it has grown about 1.8 per cent, on average, annually. Indonesia's population was around 240 million people in 2010 which half lives in rural areas (Statistics Indonesia).

As many other developing countries, Indonesia experienced process of industrialisation. Its economy changing rapidly from its traditional role as an agricultural nation to industrialised nation. This change result in a reduction in the contribution of agriculture to Gross Domestic Product (GDP). In 1939, agriculture contributed 61% to total GDP while the contribution of other sectors namely industry, mining, and service only 39%. Its contribution declined from 32% in 1975 to 19% in 1990 and fell even further to only 15% in 2010. Its share in employment also show decreased trend although not as dramatically as its contribution to GDP. In 1939, agriculture share in total employment was recorded at 73%, then it decreased from 56% in 1990 to 38% in 2000 (Statistics Indonesia).

Although there has been a reduction in the contribution to GDP and its share in employment, agriculture continues to provide employment to about 42 million persons. The improvements in labour productivity have followed by an increase in total production. The total employment in Indonesia's agriculture sector has remained stable. This case does not occur in other industrialised countries with strongest growth in labour productivity, such as Malaysia and China, where the employment in agriculture sector has tend to fall. Abundant amount of labour in agriculture with limited agricultural land causing in small-scale production, particularly in food crop production with average from 0.3 ha in Java to 1.4 ha in off-Java. While the large private and state-owned farms producing perennial crops, such as palm oil and rubber, have average size around 2.600 ha in Kalimantan and Sumatera (OECD 2012).

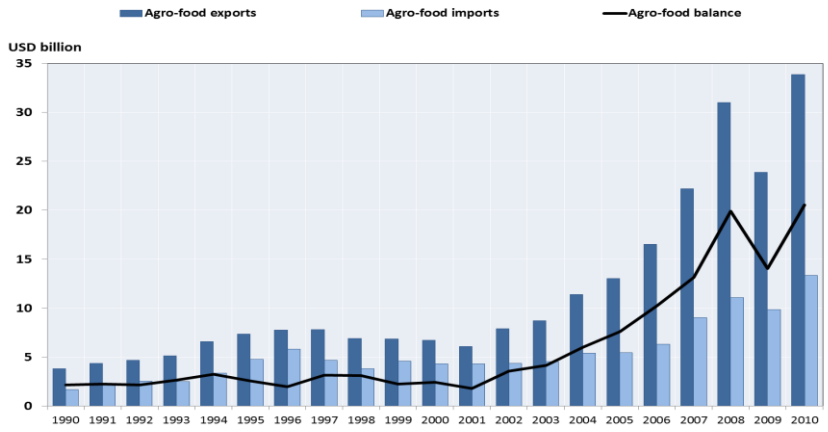
With an average value of agricultural production at USD 66 billion in 2007-2009, Indonesia has become the world's 10th biggest agricultural producer, just behind Turkey and France and ahead of Germany and Argentina. Indonesia also has become the world's most supplier of palm oil, just ahead of

Malaysia, the second biggest natural rubber supplier after Thailand and the third biggest rice producer after China and India (FAOSTAT 2012).

3.2. Indonesia's Agricultural Trade Flows

Over the last two decades Indonesia has constantly been a net exporter of agro-food products (Figure 3.1). Since 2005, the value of agro-food exports has been more than twice the value of agro-food imports. The share of agro-food in total exports rose from 11% in 2000 to 21% in 2010. From 2008 to 2010, palm oil and natural rubber accounted for 60% of total agro-food exports. Their share of Indonesian agro-food exports has increased from around one-half in 1990-1992 to two-thirds in 2008-2010. The ratio of agro-food exports to agricultural GDP at around 31% in 2010 and that of agro-food imports at 12%. While the ratio of total exports to total GDP stood at 22% and that of agro-food.

Figure 3.1 Indonesia's Agro-food trade, 1990-2010



Source: UN, UN Comtrade Database, 2011 in OECD 2012

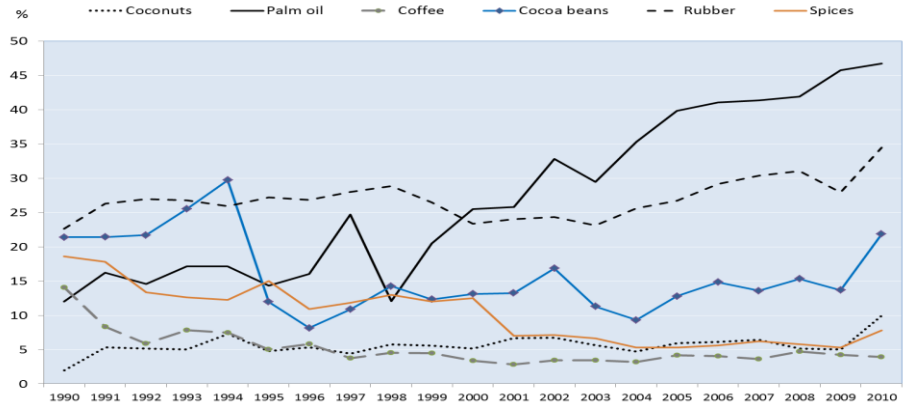
Table 3.1 Agro-food Sector's Integration with International Markets, 1990-2010

		1990	1995	2000	2005	2007	2008	2009	2010
Agriculture, Gross Domestic Product (GDP), current prices	USD billion	22.2	34.6	25.7	37.5	59.3	73.9	82.5	108.4
Agro-food exports	USD billion	3.8	7.3	6.7	13.0	22.2	31.0	23.9	33.9
Agro-food imports	USD billion	1.7	4.8	4.3	5.5	9.0	11.1	9.8	13.3
Agro-food trade balance	USD billion	2.2	2.6	2.4	7.6	13.2	19.9	14.1	20.5
Coverage degree of imports by exports	%	231	154	157	239	246	279	243	254
Share of agro-food trade in total trade									
Exports	%	15	16	11	15	19	23	20	21
Imports	%	8	12	13	9	12	9	10	10
Ratio of agro-food exports to agricultural GDP	%	17	21	26	35	37	42	29	31
Ratio of agro-food imports to agricultural GDP	%	7	14	17	15	15	15	12	12
Ratio of total exports to total GDP	%	22	22	38	30	26	27	22	22
Ratio of total imports to total GDP	%	19	20	20	20	17	25	18	19

Source: OECD calculations based on UN, UN Comtrade Database, 2011; WB WDI, 2011 in OECD 2012

Indonesia's major export products are perennial crops such as palm oil, natural rubber, cocoa beans, coffee and coconut. The production of palm oil, natural rubber, cocoa beans and coffee is driven by external market with the share of exports in production from 51% for cocoa beans to 70% for natural rubber between 2007 and 2009. The share of palm oil in global exports reached almost one-half, that of natural rubber around one-third and that of cocoa close to one-fifth in 2010 (Figure 3.2.). Indonesia is also one of the largest suppliers of spices, such as nutmeg, cinnamon, vanilla, pepper and cloves. Its share to world's exports spices declined from around 20% in early 1990s to about 5% in the second half of the 2000s (Figure 3.2)

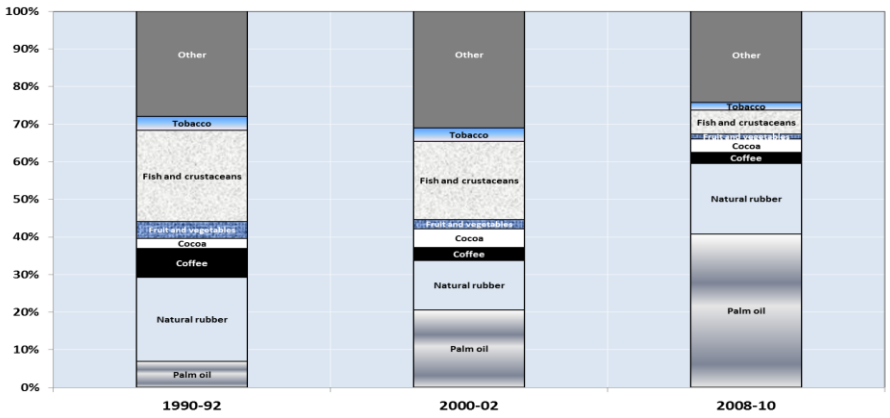
Figure 3.2 Share of Indonesia in World's Exports of Selected Commodities, 1990-2010



Source: UN, UN Comtrade Database, 2011 in OECD 2012

The major agro-food export commodities has changed over time (Figure 3.3). In the early 1990s, the major agro-food export product was fish and crustaceans at about one-fourth of the total agro-food exports, followed by natural rubber and coffee. The exports of palm oil were only 7% of the total. However, in the end of the 2000s, the share of palm oil exports had increased to above 40%, that of natural rubber remained stable at 20%, and that of fish and crustaceans fell dramatically to 6% (OECD 2012).

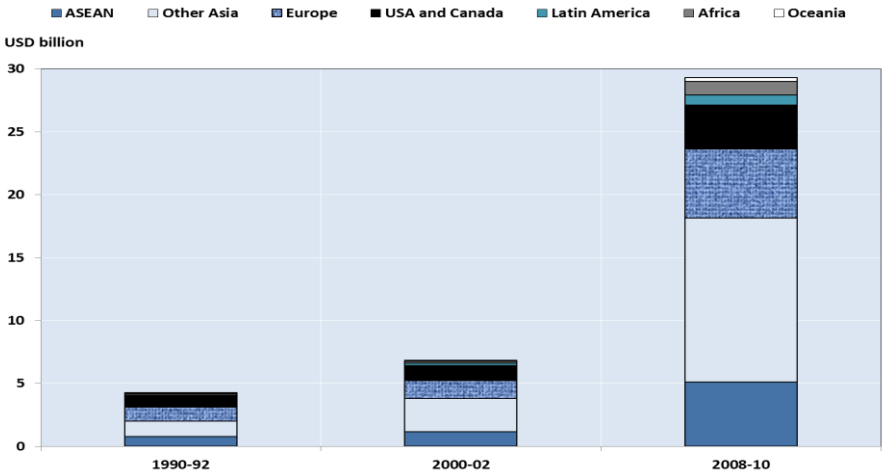
Figure 3.3 Composition of Agro-food Exports, 1990-2010



Source: UN, UN Comtrade Database, 2011 in OECD 2012

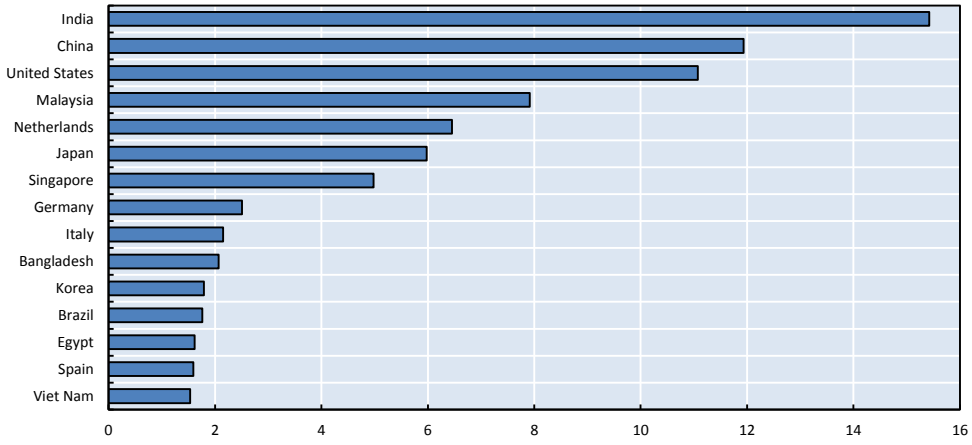
UN Comtrade Database (OECD 2012) records the main destination countries of Indonesia agro-food export are Asian countries with around a half of total exports in 1990-1992 and at almost two thirds in 2008-2010 (Figure 3.4.). Trade liberalisation among the ASEAN countries led to the expansion of trade but at the same rate for other trading partners, hence the share of Asian countries in total Indonesian agro-food exports remained constant at about 17-19%. While the main destination countries are India, China, United States, Malaysia and the Netherlands. India is the most important export market of palm oil, accounted for 15% of total exports, followed by China at 12% and the United States at 11% (Figure 3.4 and 3.5).

Figure 3.4 Indonesia's Agro-food Exports by Region, 1990-2010



Source: UN, UN Comtrade Database, 2011 in OECD 2012

Figure 3.5 Main Export Markets for Indonesia's Agro-food Products, 2008-2010 average

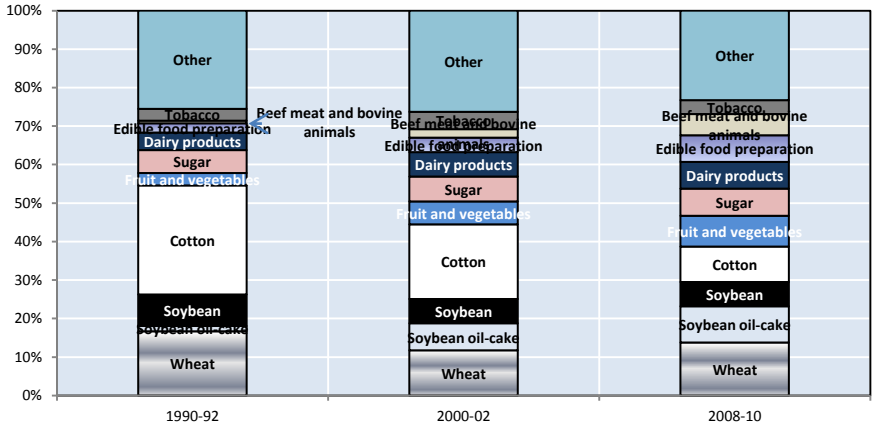


Source: UN, UN Comtrade Database, 2011 in OECD 2012

Agro-food imports are more diversified than exports in terms of commodities. The main agro-food imports are wheat, cotton, soybean, dairy products, sugar, tobacco and beef. Between 1990 and 1992, the share of wheat, cot-

ton and soybeans was above 60% of the total imports, but from 2008 to 2010 their share had decreased to below 30%. The share of cotton lint imports declined significantly from 28% in 1990-1992 to about 9% in 2008-2010. This reduction is caused by high competitiveness from some countries, such as China, India, Pakistan, Bangladesh, Vietnam and Thailand which have modern technologies (Chongbo 2004 in OECD 2012). Imports of soybean oil cake rose because an increase on demand from the livestock sector. The share of dairy products, edible food preparation, beef, fruit and vegetables (such as garlic), and sugar tend to increase as shown by figure 3.6.

Figure 3.6 Composition of Agro-food Imports, 1990-2010



Source: UN, UN Comtrade Database, 2011 in OECD 2012

While, the biggest supplier of Indonesia's agricultural imports are the United States and Australia. Wheat, dairy products, vegetables and live cattle are imported products from Australia. Australia and New Zealand recorded for one-fifth of total agro-food imports in 2008-2010. While the United States is the top supplier of soybeans, however its market share is decreasing due to competition with South America, particularly Brazil (Agriculture and Agri-Food Canada in OECD 2012). Recently, China is also becoming the largest supplier of fresh fruit, vegetables and garlic. While Thailand and other South East Asian countries also India and Pakistan are fresh product suppliers. Wheat, potatoes, cattle feed and food preparations are imported products from Canada. The Netherlands and Denmark are the supplier of milk products (OECD 2012).

3.3. Free Trade Agreements

3.3.1. AFTA and ACFTA as Free Trade Agreement

In the last two decades, there has been a rapid spread of regional trade across the world. It can be seen by the proliferation of free trade agreements (FTAs) among countries. In Southeast Asian region, countries that are members of the ASEAN (Association of Southeast Asian Nations) established

ASEAN Free Trade Area (AFTA) on 28 January 1992 in Singapore. At that time, only six ASEAN members who signed the agreement, namely Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand. Vietnam joined in 1995, Lao and Myanmar in 1997 and Cambodia in 1999.

Tan (1996) identified the driven factors behind the establishment of AFTA; (i)the emergence of economics bloc in the Europe and America where developed countries become protectionist; (ii) it is kind of strategy from government in Southeast Asian region to attract FDI; (iii) the highly competitive environment coming from outside. In addition, Akrasanee and Stifel (1992) considered that the introduction of international production network with lower production cost through technological advances threaten ASEAN industries, therefore it forces ASEAN industries to lower their production cost and to become more competitive.

The implementation of AFTA began in 1993 and the final implementation of the agreement was accelerated from 2008 to 2003. The members agreed to reduce tariffs for all manufactured goods to 0-5%by the year 2003. The list of tariffs reduction was made through the Common Effective Preferential Tariff Scheme (CEPT). All the four latecomers countries were given longer time frames to meet AFTA's tariff reduction obligations.

Under CEPT scheme, all products were grouped into 5 groups, namely Temporary Exclusion List (TEL), General Exception List (GEL), Inclusion List (IL), Sensitive List (SL) and Highly Sensitive List (HSL) (Widyasanti 2010). Unprocessed agricultural products are categorized into three last group (IL, SL, and HSL). Products included in Sensitivity List will have special arrangement by 1 January 2010. While tariff reduction for unprocessed products in the Immediate Inclusion List has begun since January 1996 and will have been completed by 2003 (Hakim 2004:17).

For Indonesia, tariff reductions that are included in CEPT scheme are 11.153 in which 98.9% of them or 11.028 are in Inclusion List. While the rest are in General Exclusion List and Sensitive List (Widyasanti 2010).

Besides AFTA, Indonesia which is joined in ASEAN also involved in some other free trade agreements, namely ASEAN-China (ACFTA), ASEAN-Korea (AKFTA), ASEAN-Japan Comprehensive Economic Partnership (AJCEP), ASEAN-India Regional Trade and Investment Area (AIFTA), and ASEAN-Australia and New Zealand FTA (AANZFTA). Among those FTAs, the agreement with China is the most concrete and has been implemented.

In 2002, China and ASEAN agreed to sign a number of free trade agreements. The aim of the establishment of this FTAs is to create free trade area by reducing even eliminating trade barriers in goods and services either tariffs or non-tariffs, increasing market services and investment, and also increasing economic cooperation to promote welfare of ASEAN and China (Firdaus 2011). By the end of 2009, tariffs would be cut to 0-5 percent for all

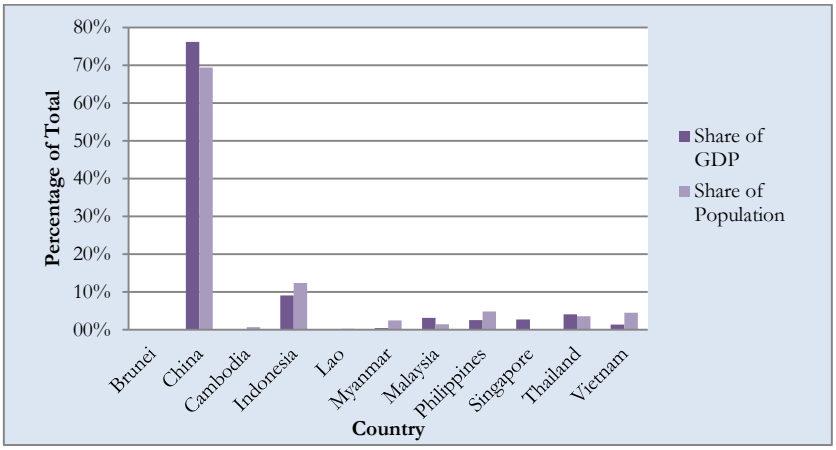
commodities and all non-tariff barriers would be removed. In 2004, the Early Harvest Programme was launced, which mainly focused on reducing bilateral tariffs on 600 agricultural products, insluding live animals, meat, fish, dairy products, other animal products, vegetables and fruits (Yang and Martinez-Zarzoso 2013).

3.3.2. Socio-economic Indicators of AFTA and ACFTA Countries

The AFTA currently consist of 10 members from Southeast Asia countries. In 2010, it was recorded that totally, the GDP of this bloc is around USD 1.9 trillion and the population reached 591 million. Indonesia is a country with the highest GDP and the biggest population in this area.

Meanwhile for ACFTA, with China as additional member, the total GDP is about USD 7.8 trillion and total population is 1.9 billion people. China accounts for almost 80% of the region GDP with total population for more than five times of Indonesia. Brunei Darussalam, Cambodia, Lao and Myanmar share less than 1 percent from the total GDP. Figure 3.7 illustrates the share of GDP and population for each member of AFTA and ACFTA in 2010.

Figure 3.7 Socio-economic Indicators of AFTA and ACFTA Members in 2010



Source: Author, computed based on WDI, World Bank

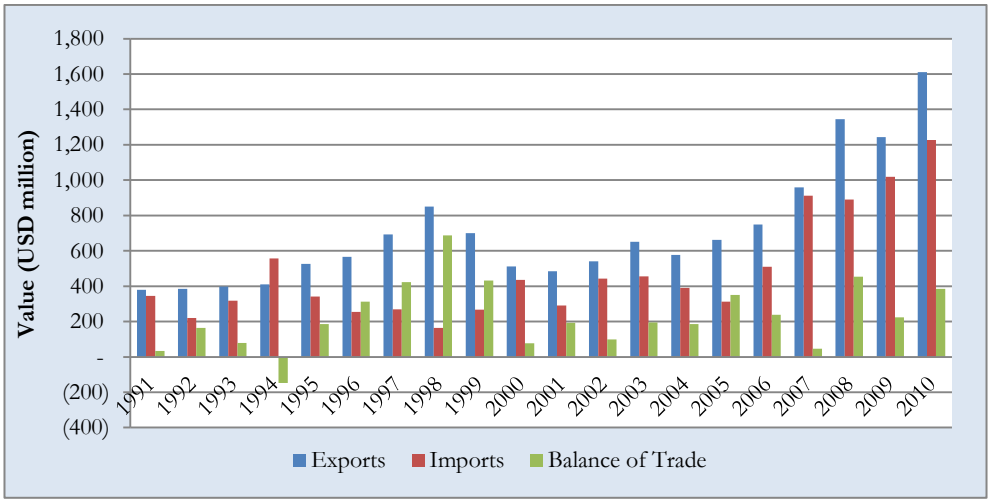
3.3.3. Indonesia's Trade with AFTA and ACFTA

Indonesia plays important role for other AFTA and ACFTA members. Indonesia exports of agricultural goods to other members account for approximately USD 400 million in 1991. This value had continued to increase until around USD 900 million in 1998. However, post Asian financial crisis, it declined to USD 484 million in 2001, but then it grows steadily to about USD 1.600 million recently.

In terms of import, it shows fluctuative trend. In 1991 Indonesia's imports was around 350 million. It increased in 1993-94, but then it fell from USD 158 million in 1994 to below USD 200 million in 1998. The imports increased

sharply from USD 300 million in 2005 to USD 900 million in 2007 and slightly decreased in 2008, but then rose again until above USD 1.200 million in 2010. Generally, Indonesia always has surplus balance of trade on agricultural products to other AFTA and ACFTA countries. The peak of surplus was occured in 1998 when the surplus reached almost USD 700 million. Indonesia only experienced deficit in 1994 when the difference between exports and imports was USD 147 million. The total Indonesia's export, import and balance of trade can be seen at figure 3.8.

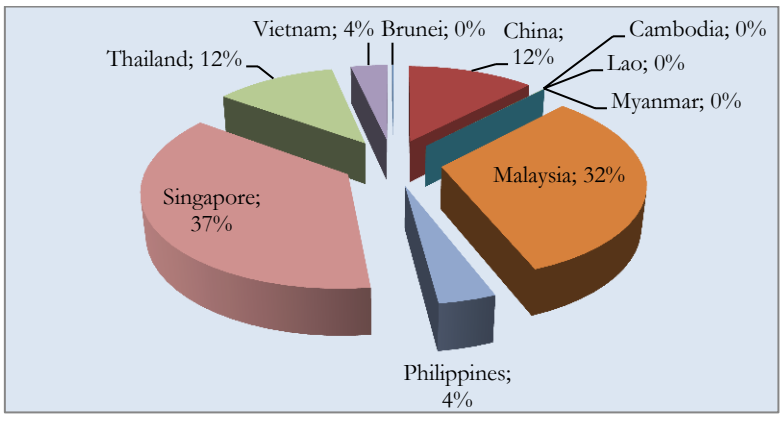
Figure 3.8 Total Indonesia's Agricultural Exports, Imports and Balance of Trade to other AFTA and ACFTA members, 1991-2010



Source: Author, Computed based data from Statistics Indonesia

Figure 3.9 and 3.10 shows the distribution of Indonesia's agricultural exports an imports on average between 1991 and 2010. It can be noted that Singapore and Malaysia are the largest market destination for Indonesia's export, they share 37 percent and 32 percent, respectively. Brunei Darussalam, Cambodia, Lao and Myanmar have only small contribution to Indonesia's agricultural exports.

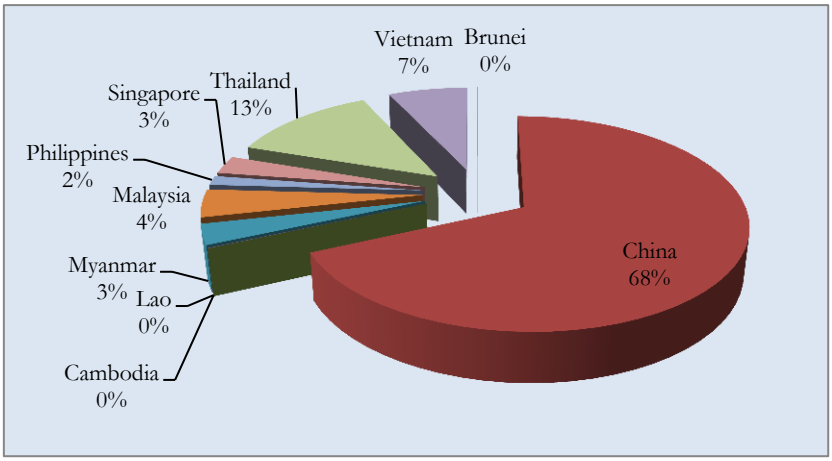
Figure 3.9 Distribution of Indonesia's Agricultural Exports to other AFTA and ACFTA members, 1991-2010 Average



Source: Author, Computed based data from Statistics Indonesia

On the other hand, China is the biggest supporter country for Indonesia's imports of agricultural products. It share is more than a half of the total share of the rest of members. The second largest contributor of Indonesia imports is Thailand. It share accounts only one fifth of China's share. Following by Vietnam and Malaysia which has share for 7 percent and 4 percent, respectively.

Figure 3.10 Distribution of Indonesia's Agricultural Imports from other AFTA and ACFTA Members, 1991-2010 Average



Source: Author, Computed based data from Statistics Indonesia

Chapter 4
Data and Methodology

4.1. Data Source

The data used in this paper is secondary data which are obtained from government institutions and international database. Data of export and import of agricultural products are obtained from Statistics Indonesia and Ministry of Trade Republic of Indonesia. The data on GDP, GDP per capita, and population are obtained from World Development Indicators (WDI) database of the World Bank. While data on distance, common language, contiguous and colonial link are collected online from CEPII. Additional information that is needed in this paper is also obtained from Ministry of Agriculture Republic of Indonesia, Ministry of Financial Republic of Indonesia, FAO, OECD, IMF, and UN Comtrade.

The data are collected for periods 1991-2010, before and after FTA is implemented. It is obtained from bilateral trade flows between Indonesia and other nine ASEAN countries (Brunei Darussalam, Malaysia, the Philippines, Singapore, Thailand, Vietnam, Laos, Myanmar and Cambodia), China and other non-member countries. The sample is not restricted only to member countries but also includes as many non-member countries as possible so that the regression is based on the maximum information available. However because of data constraint, this paper only includes 193 countries (appendix 1). Therefore, the data set consists of 3860 observations.

4.2. Methodology

4.2.1. The Gravity Model

In order to investigate the impact of free trade agreements on Indonesia's agricultural trade flows, this paper uses Gravity Model established by Tinbergen (1962) that applies Newton's formula to bilateral trade flows. It is considered as an alternative approach beside Computable Generalized Equilibrium (CGE) that has several drawbacks for modeling trade flows and examining the impacts of FTA. CGEs models have been criticized by a number of researchers because several reasons; for instance, the data requirements are extensive and usually arbitrarily picked by the modeler; the results of the models may be very sensitive to the assumption and data used; the analysis is lack of a time dimension (Plummer et al. 2010).

According to van Bergeijk and Brakman (2010), the gravity model is a successful econometric approach in trade analysis due to an excellent empirical robustness and its consistency with respect to economic theories in both policy and academic circles to describe trade flows. Gravity models can be applied to

assess FTAs by including a binary variable which indicates whether a pair of trading countries belongs to an FTA or not. Using this variable it can be estimated whether an FTA has statistically significant effect on trade flows or not. If the sign of coefficient is positive and significant, it can be deduced that the FTA has positive impact on trade flows, with a magnitude depends on the size of its coefficients (Plummer et al. 2010).

4.2.2. The Gravity Model Specification

This study applies basic gravity model of trade proposed by Tinbergen (1962), in which bilateral trade between countries i to country j is positively related to their incomes (GDP), but negatively to their geographical distance. However, since FTAs are the main focus in this paper, these variables are also included in the model. The basic gravity model takes the form as follows,

$$\boldsymbol{lnX_{ijt} = \beta_0 + \beta_1 lnDist_{ij} + \beta_2 lnGDP_{it} + \beta_3 lnGDP_{jt} + \beta_4 AFTA_{ijt} + \beta_5 ACFTA_{ijt} + \varepsilon_{ijt}} \quad \textbf{(1)}$$

where X_{ijt} denotes trade flows (the value of exports or imports) between Indonesia and country j; $Dist_{ij}$ measures the distance between Indonesia and country j; GDP_{it} is GDP in dollars in Indonesia; GDP_{jt} is GDP in dollar in country j; $AFTA_{ijt}$ is 1 if Indonesia and country j are the members of AFTA, 0 otherwise; $ACFTA_{ijt}$ is 1 if Indonesia and country j are the members of ACFTA, 0 otherwise and ε_{ijt} is the error term.

Since gravity model constructed by Tinbergen worked so well but lacked of theoretical justification, many researchers have attempted to develop economic theory of the gravity model. They extended the gravity model by adding some variables such as common language, contiguous, and common language. This paper also estimates the augmented gravity model, in which those variables are added to basic gravity model as control variables.

$$\begin{aligned}\boldsymbol{lnX_{ijt}} &= \boldsymbol{\beta_0 + \beta_1 lnDist_{ij} + \beta_2 lnGDP_{it} + \beta_3 lnGDP_{jt} + \beta_4 lnPop_{it} + \beta_5 lnPop_{jt} +} \\ &\quad \boldsymbol{\beta_6 Comlang_{ij} + \beta_7 Contig_{ij} + \beta_8 Col_{ij} + \beta_9 AFTA_{ijt} + \beta_{10} ACFTA_{ijt} + \varepsilon_{ijt}} \quad \textbf{(2)}\end{aligned}$$

where Pop_{it} is average population (in millions of people in Indonesia); Pop_{jt} is average population (in millions of people in country j). While the following are dummy variables: $Comlang_{ij}$ is 1 if Indonesia and country j have a common language, 0 otherwise; $Contig_{ij}$ is 1 if Indonesia and country j share a land border, 0 otherwise; Col_{ij} is is 1 if Indonesia and country j are colonies or have colonial relationship, 0 otherwise.

Following work conducted by Martinez-Zarzoso and Nowak-Lehmann (2003), this paper adds differences in per capita incomes (GDP per capita) to the gravity equation to capture the Linder effect. The Linder hypothesis predicts that nations with similar levels of per capita income will have similar preferences but differentiated goods. On the contrary, the Heckscher-Ohlin hy-

pothesis says that nations with dissimilar levels of per capita income will trade more than countries with similar levels. Hence, the absolute value of the income difference variable for Linder hypothesis is predicted to have a negative effect on the log of trade (Frankel 1997). If the value has a positive effect, it is associated with the Heckscher-Ohlin hypothesis.

The equation of gravity model with linder effect can be specified as follows:

$$\boldsymbol{lnX_{ijt} = \beta_0 + \beta_1 lnDist_{ij} + \beta_2 lnGDPdif_{ijt} + \beta_3 lnPop_{it} + \beta_4 lnPop_{jt} + \beta_5 AFTA_{ijt} + \beta_6 ACFTA_{ijt} + \varepsilon_{ijt}} \quad \textbf{(3)}$$

where $GDPdif_{ijt}$ denotes differences in GDP per capita between Indonesia and trading partners.

Gravity models that have been constructed above are estimated using cross section and panel data. Classical gravity model generally uses cross section data to estimate trade pattern for a given year or on averaged data. Many empirical literature of gravity model are also using cross section data such as Frankel (2007) and Rahman (2003).

However, panel data might provide additional advantages, capturing relationship over variables in time and observing individual effects between trading partners (Antonucci and Manzocchi 2005; Kepaptsoglou et al. 2010). For this reason, this paper also runs panel regressions. According to Egger (2000), the random effects model (REM) would be more appropriate when estimating trade flows between randomly drawn samples of trading partners from a larger population. While, the fixed effects model (FEM) would be a better choice than REM when one is interested in estimating trade flows between a predetermined selections of nations. Since our sample only includes trade exchanges between Indonesia and its trading partners, the FEM might be the most appropriate estimation. However, Hausman test is also conducted to check whether the REM is more efficient that the FEM estimation.

The problem faced by FEM is that it cannot directly estimates variables that do not change over time, such as distance, common language, contiguous and colonial link, because the inherent transformation tends to wipe out such variables (Martinez-Zarzoso and Nowak-Lehman 2003). Therefore, to deal with this problem can be estimated in a second step regression as proposed by Chang and Wall (2003). They suggested after regressing standard FEM, can be followed by running a cross-section regression with the country-specific individual effects as the dependent variable and distance and dummies as explanatory variables.

$$\boldsymbol{\beta_0 = \alpha_0 + \alpha_1 lnDist_{ij} + \alpha_2 Comlang_{ij} + \alpha_3 Contig_{ij} + \alpha_4 Col_{ij} + \mu_i} \quad \textbf{(4)}$$

where β_0 represents country-specific individual effects, while the slope coefficients are assumed to be the same for the whole sample of countries.

4.3. Definition and Chosen Variables

4.3.1. The Dependent Variable

Trade Flows

Majority of the studies on gravity model use total bilateral trade flows as dependent variable. However, the use of total bilateral trade flows could not distinguish between the impact of FTA on export and import term. Therefore, this study uses the value of export and import of agricultural products (in U.S. dollars) as proxy of trade flows.

Although the determinants factors of exports and imports may be different, this study use the same explanatory variables for exports and imports due to comparison purpose.

4.3.2. The Independent Variables

Distance

The distance variable represents transportation costs faced by a country to export or import. The distance may reduce trade flows. The farther the distance, the higher transportation costs, the lower the trade flows.

GDP

The term of GDP that is used in this study is GDP in current U.S. dollars. According to World Bank; "GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products".

Population

Population growth can affect trade flows through the two sides; supply and demand. On the supply side, population growth may represent additional labour to undertake the production of export commodities. While population growth on the demand side, will increase domestic demand which means increase imports.

Dummy Variables

This study includes few dummy variables, namely; language, contiguous, colonial links, and free trade agreements (AFTA and ACFTA). Countries that speak the same language, share a border (contiguous), have colonial links, and belongs to the same FTAs may trade more. Dummy is set 1 if Indonesia and trade partners speak the same language, share a border, have colonial links, and in the same FTAs; otherwise 0.

4.4. Hypothesis

The hypotheses of this study are:

H0 = β0, β1, β2, β3, β4, β5, β6, β7, β8, β9, β10 = 0

(each variable does not influence Indonesia's agriculture exports or imports to trade partners)

H1 ≠ H0

There is a significant effect of $lnDist_{ij}$, $lnGDP_{it}$, $lnGDP_{jt}$, ln $GDPdif_{ijt}$, Pop_{it}, Pop_{jt}, $Comlang_{ij}$, $Contig_{ij}$, Col_{ij}, $AFTA_{ijt}$, and $AFTA_{ijt}$. The expected relationships are:

$Dist_{ij}$ has a negative sign. It means that the farther the distance between Indonesia and the trading partners, the lower Indonesia's agricultural trade flows.

GDP_{it} has a positive sign. It means that the greater the gdp per capita of Indonesia, the greater Indonesia's agricultural trade flows.

GDP_{jt} has a postive sign. It means that the greater the gdp per capita of trading partner, the greater Indonesia's agricultural trade flows.

$GDPdif_{ijt}$ has a negative sign. It means that Indonesia's agricutural trade flows will be greater when the GDP per capita of the trading partners are more similar.

Pop_{it} has a positive sign. It means that the greater the number of Indonesia's population, the greater Indonesia's agricultural trade flows.

Pop_{jt} has a positive sign. It means that the greater the number of population in trading partners, the greater Indonesia's agricultural trade flows.

$Comlang_{ij}$ has a posotive sign. It is expected that Indonesia would have greater trade flow with the countries who have the same language with Indonesia.

$Contig_{ij}$ has positive sign. It is expected that Indonesia would have greater trade flow with the countries who share the same border with Indonesia.

Col_{ij} has positive sign. It is expected that Indonesia would have greater trade flow with the countries that have colonial links with Indonesia.

$AFTA_{ijt}$ has positive sign. It means that Indonesia's bilateral trade volumes expand through AFTA membership.

$ACFTA_{ijt}$ has positive sign. It means that Indonesia's bilateral trade volumes expand through ACFTA membership.

4.5. Econometric Issues in Gravity Model

4.5.1. The Issue of Endogeneity

The problems often arise in gravity models when estimating the effect of FTAs on bilateral trade is the endogeneity problem. The issue is the potential

reverse causality problem between higher trade volumes and FTAs; in which countries with higher level of trade might lead to higher probability for the establishment of an FTA. Countries are likely to form FTAs with trading partners that they have already achieved high trade volumes with (Wonnacott and Lutz 1989; Krugman 1991). Therefore, the dummy variable for FTAs is correlated with the error term because the unobserved characteristic of some pairs of countries explain why they trade a lot and at the same time they would establish a FTA (Bacchetta et al. 2012). As a result the regression might yield biased and inconsistent coefficient estimates (Wooldridge 2002).

Baier and Bergstrand (2007) noted that FTA dummy variables could be endogenous when countries tend to select their FTA partners based on existing level of trade. They argued that several empirical studies failed to show the positive impacts of FTAs on trade flows between member countries because FTA dummies were assumed to be exogeneous random variables. They said that not only FTA dummy variables could explain bilateral trade, but also other unobserved characteristics in the error term such as geographical factors, institutional characteristics, infrastructures, non-tariff barriers and democratic relationships.

Related to this study, the decision made by ASEAN countries and China to establish FTAs could also depends on unobserved heterogeneity such as political, ethic, historical and cultural factors. This raises the problem of endogeneity bias due to omitted variables in the gravity model. In order to overcome endogeneity problem, Chang and Wall (2005) suggested a time and country-pair fixed effects to meet unbiased estimates of the effect of FTA on trade flows. In line with Chang and Wall, Baier and Bergstrand (2007) introducing country-and-time effects and country-pair fixed effects simultaneously, while Martinez-Zarzoso et al. (2009) argued that "...a simple method to measure unbiased estimates is to introduce individual country dummies in cross-sectional studies and bilateral fixed effects as well as country-and-time effects in panel data estimations to eliminate the endogeneity bias effectively."

4.5.2. The Issue of Zero Flows

The second econometric issue of gravity model is a problem with zero trade flows. Zero trade flows problem occurs when estimating log linear gravity equations as the log of zero is not defined (Bacchetta et al. 2012). According to Frankel (1997) and Baldwin and Harrigan (2007), the zero trade flows could exist due to lack of trade among small and distant countries, in which the cost of trade is high. This problem is quite important because about 50% of the total observations were zero in the data sets used by Santos Silva and Tenreyro (2006). In this study, the zero trade flows constitute about 34% for export and 47% for import of the total 3860 observations.

The simple way to address this problem is by omitting zero value observations. This approach presupposes the zeros are randomly distributed and not

informative, therefore they can be dropped. However, if zero trade reflects systematic rounding errors associated with very small trade flows, omit zero trade flows out of the sample leads to a loss of important information (WTO 2012). It will yield biased results (Burger et al. 2009).

Another way to deal with this problem is by using some transformation such as adding a small constant to the value of trade before taking logarithms (Sun and Reed 2010; Yakop and van Bergeijk 2011; WTO 2012). Based on this, this paper conducts this approach to deal with zero trade flows.

Chapter 5
Result and Analysis

Indonesia's trade flows to trading partner in this study are analysed using gravity model. This study aims to analyse whether the free trade agreements affect Indonesia's trade flows in agricultural sector. In this section, the empirical results of gravity models with different estimation techniques measuring the impact of FTAs on Indonesia's agricultural trade flows are presented. In constructing the empirical model, this study uses a balanced panel of annual observations from 193 countries over a 20-year period from 1991 to 2010, so that the data set consists of 3860 observations.

The estimated gravity models for exports or imports are given by,

Basic Gravity Model (Model 1)

$$\boldsymbol{lnX_{ijt} = \beta_0 + \beta_1 lnDist_{ij} + \beta_2 lnGDP_{it} + \beta_3 lnGDP_{jt} + \beta_4 AFTA_{ijt} + \beta_5 ACFTA_{ijt} + \varepsilon_{ijt}} \quad \textbf{(1)}$$

Augmented Gravity Model (Model 2)

$$\boldsymbol{lnX_{ijt} = \beta_0 + \beta_1 lnDist_{ij} + \beta_2 lnGDP_{it} + \beta_3 lnGDP_{jt} + \beta_4 lnPop_{it} + \beta_5 lnPop_{jt} + \beta_6 Comlang_{ij} + \beta_7 Contig_{ij} + \beta_8 Col_{ij} + \beta_9 AFTA_{ijt} + \beta_{10} ACFTA_{ijt} + \varepsilon_{ijt}} \quad \textbf{(2)}$$

Gravity Model with Linder Effect (Model 3)

$$\boldsymbol{lnX_{ijt} = \beta_0 + \beta_1 lnDist_{ij} + \beta_2 lnGDPdif_{ijt} + \beta_3 lnPop_{it} + \beta_4 lnPop_{jt} + \beta_5 AFTA_{ijt} + \beta_6 ACFTA_{ijt} + \varepsilon_{ijt}} \quad \textbf{(3)}$$

Cross-section Regression with the Country-specific Individual Effects

$$\boldsymbol{\beta_0 = \alpha_0 + \alpha_1 lnDist_{ij} + \alpha_2 Comlang_{ij} + \alpha_3 Contig_{ij} + \alpha_4 Col_{ij} + \mu_i} \quad \textbf{(4)}$$

5.1. Empirical Results

5.1.1. Cross-sectional Estimation

Following Frankel (1997), this study uses a cross-sectional gravity approach for single years to estimate model 1, 2 and 3 above. Table 5.1 and 5.2 report the results of those three equations with a log-linear form using the nominal agricultural export and import value between Indonesia and 193 countries in 1991, 1995, 2000, 2005 and 2010 separately. The estimation results for each year from 1991 to 2010 are presented in appendix 2-7.

Table 5.1 Cross-sectional Estimation of Indonesian Exports

Independent Variables	1991			1995			2000			2005			2010		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Dist	-3.100***	-2.760***	-1.728**	-2.025***	-1.518**	-0.779	-1.642**	-1.893**	-1.874**	-2.548***	-2.532***	-1.919**	-1.934***	-1.842**	-1.240
	(0.674)	(0.801)	(0.850)	(0.636)	(0.748)	(0.817)	(0.698)	(0.745)	(0.795)	(0.604)	(0.720)	(0.817)	(0.637)	(0.754)	(0.850)
GDPi	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-
GDPj	2.012***	2.055***	-	2.249***	2.236***	-	1.558***	1.744***	-	1.922***	2.174***	-	1.785***	2.114***	-
	(0.153)	(0.219)		(0.143)	(0.226)		(0.130)	(0.203)		(0.138)	(0.212)		(0.148)	(0.239)	
GDPdif	-	-	0.692***	-		0.813***	-		0.643***	-		0.646***	-		0.432***
			(0.113)			(0.124)			(0.098)			(0.108)			(0.123)
Popi	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)
Popj	-	-0.095	1.440***	-	-0.011	2.032***	-	-0.277	1.349***	-	-0.364	1.556***	-	-0.483*	1.366***
		(0.216)	(0.164)		(0.256)	(0.177)		(0.223)	(0.156)		(0.237)	(0.177)		(0.276)	(0.185)
Comlang	-	0.835	5.205	-	2.222	4.854	-	0.471	1.661	-	-1.564	1.745	-	-0.445	4.191
		(4.151)	4.355		(4.011)	(4.265)		(3.830)	(4.087)		(3.630)	(4.149)		(3.790)	(4.328)
Contig	-	3.306	0.178	-	3.331	2.893	-	-1.005	-1.051	-	2.535	1.043	-	1.962	-0.437
		(3.818)	3.777		(3.686)	(3.694)		(2.988)	(3.191)		(3.124)	(3.582)		(3.265)	(3.764)
Col	-	5.991	1.242	-	3.669	-0.547	-	-1.770	-1.977	-	2.716	3.282	-	2.971	4.129
		(4.962)	4.341		(4.796)	(4.219)		(3.416)	(3.648)		(3.575)	(4.112)		(3.734)	(4.327)
AFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	1.591	1.402	0.776	-0.206	-0.993	-4.298	1.787	0.829	-2.383
							(1.923)	(2.190)	(2.328)	(4.879)	(4.900)	(5.619)	(5.116)	(5.128)	(5.920)
ACFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	-1.670	-0.811	1.651	-2.017	-1.033	1.402
										(4.599)	(4.622)	(5.304)	(4.824)	(4.836)	(5.584)
constant	-12.151*	-14.952*	-10.643	-26.768***	-31.038***	-29.808***	-10.859	-8.593	-3.066	-12.821**	-13.354*	-7.477	-14.646**	-15.947**	-6.508
	(7.161)	(8.113)	(8.535)	(6.767)	(7.616)	(8.357)	(6.921)	(7.332)	(7.741)	(6.360)	(7.236)	(8.221)	(6.833)	(7.711)	(8.735)
R-squared	0.5244	0.5346	0.4115	0.5847	0.5922	0.4904	0.4606	0.4670	0.3944	0.5417	0.5531	0.4019	0.4743	0.4894	0.3184
Adj R-squared	0.5191	0.5186	0.3925	0.5802	0.5786	0.4740	0.452	0.4467	0.3715	0.5318	0.5333	0.3759	0.4625	0.4658	0.2888
Root MSE	4.9005	4.9075	5.4668	4.7289	4.7376	5.2791	4.2891	4.3097	4.5896	4.5222	4.5148	5.1837	4.7308	4.7161	5.4567

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

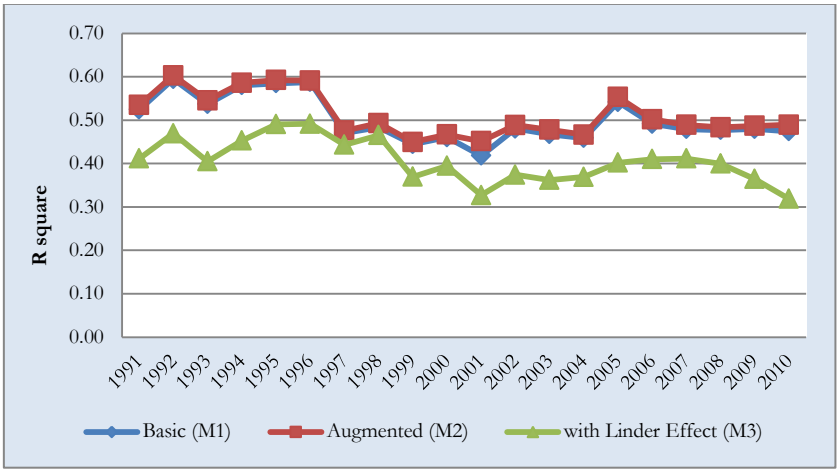
Table 5.2 Cross-sectional Estimation of Indonesian Imports

Independent Variables	1991			1995			2000			2005			2010		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Dist	-1.143	-0.862	0.156	-2.522***	-1.698*	-1.172	-1.731*	-1.637	-1.863*	-2.569***	-1.461	-1.216	-2.076**	-1.756*	-1.391
	(0.782)	(0.935)	(0.950)	(0.756)	(0.860)	(0.854)	(0.975)	(1.016)	1.006	(0.811)	(0.918)	(0.915)	(0.831)	(0.961)	(0.938)
GDPi	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-
GDPj	1.753***	1.580***	-	1.859***	1.093***	-	1.376***	0.795***	-	1.652***	0.756***	-	1.585***	0.829***	-
	(0.177)	(0.256)		(0.171)	(0.260)		(0.182)	(0.277)		(0.185)	(0.270)		(0.193)	(0.304)	
GDPdif	-		0.366***	-		0.493***	-		0.432***	-		0.238*	-		0.089
			(0.127)			(0.130)			(0.125)			(0.121)			(0.136)
Popi	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)	-	(omitted)	(omitted)
Popj	-	0.227	1.384***	-	1.121***	2.102***	-	0.854***	1.632***	-	1.368***	2.028***	-	1.161***	1.911***
		(0.252)	(0.184)		(0.294)	(0.185)		(0.304)	(0.197)		(0.302)	(0.198)		(0.352)	(0.204)
Comlang	-	-0.508	4.047	-	0.924	3.048	-	-4.054	-4.861	-	0.079	1.189	-	-3.049	-0.568
		(4.848)	(4.871)		(4.614)	(4.455)		(5.228)	(5.176)		(4.633)	(4.647)		(4.832)	(4.773)
Contig	-	2.670	0.208	-	4.321	2.891	-	-1.082	-0.527	-	4.165	3.702	-	2.233	1.179
		(4.460)	(4.224)		(4.239)	(3.859)		(4.079)	(4.041)		(3.987)	(4.012)		(4.162)	(4.151)
Col	-	3.633	1.486	-	4.020	-1.591	-	-0.611	-1.318	-	5.032	5.179	-	3.828	4.636
		(5.796)	(4.856)		(5.517)	(4.407)		(4.663)	(4.620)		(4.563)	(4.606)		(4.760)	(4.772)
AFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	2.108	3.514	3.180	-1.199	0.997	-0.276	-0.924	1.101	0.101
							(2.687)	(2.989)	(2.948)	(6.552)	(6.254)	(6.294)	(6.678)	(6.537)	(6.530)
ACFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	2.477	0.013	0.954	1.691	-0.355	0.442
										(6.176)	(5.900)	(5.941)	(6.297)	(6.165)	(6.159)
constant	-23.907***	-26.041***	-22.195**	-12.782	-19.979**	-22.081**	-7.813	-8.330	-6.276	-8.396	-18.651**	-16.956*	-9.957	-12.829	-9.421
	8.306	(9.476)	(9.547)	(8.049)	(8.760)	(8.730)	(9.669)	(10.008)	(9.805)	(8.540)	(9.236)	(9.208)	(8.921)	(9.830)	(9.634)
R-squared	0.3601	0.3661	0.262	0.4177	0.4653	0.4478	0.2647	0.3065	0.3213	0.3345	0.4137	0.4007	0.3045	0.3558	0.3604
Adj R-squared	0.3529	0.3442	0.2381	0.4113	0.4475	0.4300	0.253	0.2801	0.2956	0.3201	0.3878	0.3747	0.2888	0.3260	0.3326
Root MSE	5.6839	5.7322	6.1145	5.625	5.4495	5.5147	5.9926	5.8829	5.8129	6.0726	5.7626	5.8063	6.1759	6.0121	6.0182

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

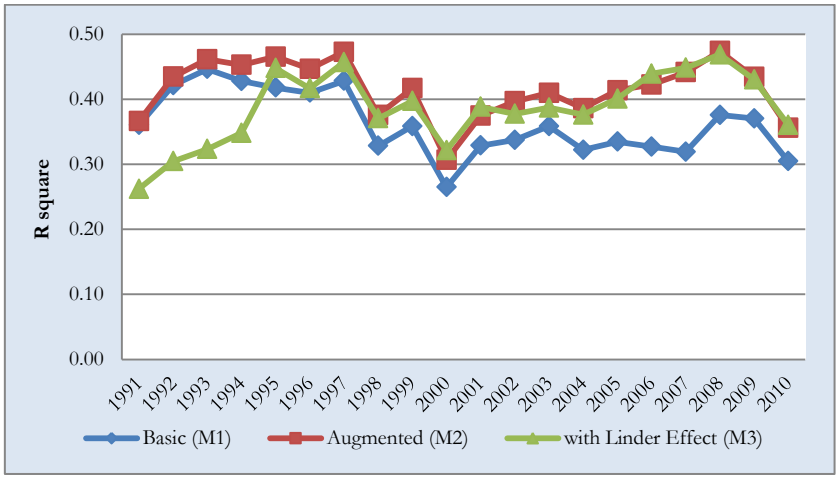
Before move to the variable of interest, first we take a look at the overall performance of the gravity model. Generally, the R^2 value of the three models shows the similar trend, either for export or import. In early years from 1991 to 1996 there is an upward performance of the models, but then it fell in 1997 until 2004 (figure 5.1). It improved in 2005 but has again decreased slightly in recent years. When the decline of the performance of the model for export began in 1997, for import, it started in 1998. Since 2001, the R^2 value has risen but has dropped again recently (figure 5.2).

Figure 5.1 General Performances of Gravity Models for Exports



Source: Author, Computed based on Estimation Result

Figure 5.2 General Performances of Gravity Models for Imports



Source: Author, Computed based on Estimation Result

Comparing the three models, it can be seen from the figures that augmented gravity model has the best performance than basic and gravity model with linder effect, which is indicated by higher value of R^2. The inclusion of additional variables to basic model, namely population, common language, contiguous and colonial link, does not give much improvement for the fit of the regression. For export equation, the average value of R^2 for augmented

model is around 0.51 only 0.01 above the average value of basic model. While for import the difference is slightly larger, 0.05. The average value of R^2 for augmented is 0.42 and 0.36 for basic model.

A tendency of the decline in the value of R^2 over sample periods indicates the weakening ability of the gravity model in explaining Indonesia's agricultural trade flows. It means there are other factors determining Indonesia's trade flows of agricultural products beside the variables used in the gravity models that have been formed in the previous section. The reasonable factors that may be taken into account for example the roles of exchange rate, foreign direct investment (FDI) and the importance of political factors in trade.

Real exchange rate can be included in gravity equation to capture the impact of depreciation (or appreciation) of domestic currency to trade (Thai 2006). The coefficient of exporter exchange rate is expected to be positive, while for importer exchange rate is expected to be negative. Empirical studies have found that the inclusion of exchange rate to gravity model is significant in explaining trade (Bergstrand 1985, Nowak-Lehmann et al. 2007).

The growing role of FDI in the values of international production brings greater attention to the relationship between FDI and trade. Theoretically, the relationship between FDI and trade can be subitutes or complents, but empirically, most studies have found a positive relationship and tend to be complements (Frankel 2007, Fontagne 1999). FDI abroad may stimulate the growth of exports from investing countries, which means this investment is complementary to trade. On the other hand, in host countries, short-term FDI leads to increase imports, while an increase in exports occurs only in long-term (Fontagne 1999).

As illustrated by the figures, the decrease of the value of R^2 began in 1997 when Indonesia faced financial turmoil. The financial crisis of 1997-99 affected Indonesian agriculture through four factors, namely "exchange rates, interest rates and credit availability, national income, and agricultural policy responses" (USDA 2000). As the exchange rate depreciated, the price of imported goods became more expensive domestically. However, the lower exchange rate made Indonesia's exports relative cheaper than exporter goods from the competitor countries with stronger currencies. This condition enhanced agricultural exports and reduced the needs to import.

Due to financial crisis, interest rate was raised dramatically, raising the cost of operating capital. The higher price of production inputs increased the demand of loans. It is getting worse as the availability of credit was severely constrained. Import financing of inputs became very problematic. The high credit cost may also hindered export potential, especially for export commodities that depended on imported inputs. High cost and lack of credit led to the collapse of several industries in Indonesia. In addition, the depreciation could also discouraged domestic consumers. Higher price of goods and lower income reduce domestic consumption (USDA 2000).

Various efforts were undertaken by Indonesian government to overcome the crisis. In the late 1997 and early 1998, the Government of Indonesia (GOI) and International Monetary Fund (IMF) established a framework of reforms for an IMF loan to Indonesia. Most of the government policy changes affecting Indonesia's agriculture were negotiated with IMF as part of reform programmes. The reform programmes proposed by the IMF forced Indonesian economy to be more open and more adaptive to international economy and foreign direct investment (Chandra 2005). The agreement included eliminating the import monopoly of Indonesia's National Logistics Agency (BULOG) and subsidies for wheat, wheat flour, sugar, soybeans, and garlic. Another important policy was the reduction of import tariff rates on all food items to a maximum or 5 percent, and removing all barriers to investment in palm oil plantations (Vocke 1998).

Indonesian investments policies have been opening to foreign investments since the mid-1980s, particularly since 1993 and immediately after the 1997-98 financial crisis (OECD 2010). By late 1994 and early 1995 FDI inflows rose rapidly as a result of foreign investment liberalisation regime in June, which was intended to attract more export. However, in 1997-98 Indonesia hit by financial crisis and suffered of net FDI outflow. Domestic and foreign investment declined sharply due to Indonesia's poor investment climate. The recovery of Indonesia's investment started in 2004 when domestic and foreign investment slightly picked up (Thee 2006). During the 2008 global financial crisis, FDI inflows dropped in 2009 but recovered sharply in the first quarter of 2010 (OECD 2010).

Now let us look at the estimated coefficient on the trade variable. The results of the distance variable has significantly negative coefficients as expected for both export and import side. When population and other geographical factors such as common language, contiguous and colonial link are not included in the gravity equation, the estimated coefficient of distance are around -2.2 for export and -2.4 for import. The estimated coefficients show that holding other variables constant, a 1 percent increase in distance between two nations will result in a decrease in trade between them by about 2.2 to 2.4 percent. The insignificant coefficient only occurs for import in 1991, 1996 and 1997.

When population and other geographical factors are included, the significant coefficient is shown for each year in export side, but for import it only occurs in 1992-1995, 1999, 2003 and 2007-2010. The estimated coefficients on the distance variable are diminished to around -2.0 for export and -2.2 for import. It means that when the distance is increased by 1 percent, trade will fall by about 2.0 to 2.4 percent.

Meanwhile, if GDP variables are dropped out and replaced by the differences in GDP per capita, the significant coefficient both for export and import only occurs in few years. The coefficients are around -1.8 for export and -1.9

for import. Thus, 1 percent increase in distance leads to a decrease in trade by about 1.8 to 1.9 percent.

Those results indicate that geographical distance is an important factor influencing the volume and value of Indonesia's bilateral trade flows. As proposed by Krugman (1991), Deardorff (2001) and Henderson et al. (2001) that the distance is a proxy for transportation cost, therefore, the farther the distance, the higher transportation cost, the lower the volume and value of exports and imports.

On the other hand, GDP for trading partner (GDP_j) shows positive sign and statistically significant at 1% level of significance for basic and augmented model, both for export and import. The only exception is in 2007 for augmented import model, in which the estimated coefficient is insignificant. This implies that Indonesia tends to trade more with larger economy countries. As the size of the country j (GDP_j) is increase by 1 percent, bilateral trade flow will increase by around 1.9 percent for basic and augmented export model and 1.7 for basic import and 1.1 percent for augmented import model.

In line with GDP variable, the difference in GDP per capita (GDP_{dif}) variable also has significantly positive coefficient though this variable is not found significant for 2007, 2009 and 2010 data for import equation. As has been discussed in the previous section that the aim to include GDP_{dif} variable is to test the existence of a Linder effect, in which the expected sign is negative. However, the result of estimated coefficient has positive sign which mean it accept Heckscher-Ohlin theory. Higher differences in GDP per capita have a positive effect on trade. Countries with different level of per capita income will trade more than countries with similar levels (Frankel 1997). It means that Indonesia tends to trade more with countries with dissimilar income per capita.

Population of trading partner (Pop_j), as proxy of market size, presents significant positive coefficient, except for export augmented gravity model that have significant negative sign but only in 2001 and 2010. The positive sign implies that market size of trading partner have strong influence on bilateral trade. The greater population of the country leads to higher ability to produce more goods and services for export and also increase the demand for importing goods to meet domestic needs.

Unexpectedly, having same language, sharing a border (contiguous), having colonial link and the membership of AFTA and ACFTA do not bring positive and significant impact in Indonesia's agricultural trade flows. Only few years that have expected sign but insignificant. According to Nowak-Lehmann et al. (2007), cross-section estimation is unable to capture the relevant relationship among variables over time or the "unobserved country-pair specific effects", therefore the estimation may lead to the biased result due to omission of the correlation between individual effects and the independent variables. In addition, Baier and Bergstrand (2007) argued "...using individual country fixed effects to correct the endogeneity bias induced by prices is not sufficient to

obtain the plausible estimates, as other omitted variable bias still remains, such as time varying country-specific heterogeneity."

5.1.2. Random Effects Model (REM) and Fixed Effects Model (FEM)

To deal with the weaknesses of cross-sectional estimation, this study also conducts panel regression. Table 5.3 and 5.4 below show the estimation results using REM and FEM for the basic, augmented and gravity model with linder effect that have been constructed before. In order to determine which estimation is more efficient, Hausman test is conducted. REM will be more efficient if the null hypothesis hold, otherwise FEM will be more efficient. Based on the Hausman test (appendix 8), all models rejected the null hypothesis, which indicates that FEM are preferred.

Table 5.3 Regression Results for the Random Effects Model

Independent Variables	Model 1 Basic Gravity Model		Model 2 Augmented Gravity Model		Model 3 Gravity Model with Linder Effect	
	Export	Import	Export	Import	Export	Import
Dist	-2.230***	-2.391***	-1.872***	-2.123***	-1.440**	-1.807***
	(0.413)	(0.589)	(0.476)	(0.653)	(0.594)	(0.659)
GDPi	-0.252*	0.126	-3.425***	-0.773***	-	-
	(0.140)	(0.150)	(0.204)	(0.214)		
GDPj	1.884***	1.368***	1.323***	0.982***	-	-
	(0.084)	(0.113)	(0.104)	(0.128)		
GDPdif	-	-	-	-	0.378***	0.117***
					(0.043)	(0.045)
Popi	-	-	30.849***	9.608***	17.530***	9.889***
			(1.438)	(1.514)	(0.862)	(0.886)
Popj	-	-	0.363***	0.424***	0.990***	0.834***
			(0.098)	(0.112)	(0.093)	(0.995)
Comlang	-	-	3.441	-1.691	4.894	0.772
			(2.425)	(3.337)	(3.027)	(3.361)
Contig	-	-	0.751	2.570	0.140	1.213
			(2.105)	(2.913)	(2.649)	(2.943)
Col	-	-	4.187*	3.851	4.008	4.598
			(2.419)	(3.342)	(3.046)	(3.384)
AFTA	1.997	1.281	0.122	0.634	0.067	-0.003
	(1.913)	(1.913)	(1.808)	(1.901)	(1.857)	(0.910)
ACFTA	-1.108	-1.086	-1.228	0.973	-0.520	-0.182
	(1.816)	(1.810)	(1.711)	(1.795)	(1.755)	(1.804)
Constant	-8.093	-5.923	-512.676***	-166.652***	-331.042***	-179.151***
	(4.968)	(6.261)	(23.817)	(25.337)	(17.101)	(17.703)
R-squared	0.477	0.356	0.167	0.392	0.3804	0.3411
F-stat	634.260***	255.770***	1130.630***	324.650***	723.50***	264.38***

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 5.4 Regression Results for the Fixed Effects Model

Independent Variables	Model 1 Basic Gravity Model		Model 2 Augmented Gravity Model		Model 3 Gravity Model with Linder Effect	
	Export	Import	Export	Import	Export	Import
Dist	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
GDPi	-0.502*	0.769***	-2.839***	-0.202	-	-
	(0.204)	(0.201)	(0.215)	(0.224)		
GDPj	2.199***	0.509	-0.267	-0.610**	-	-
	(0.215	(0.211)	(0.227)	(0.236)		
GDPdif	-	-	-	-	0.341***	0.021
					(0.054)	(0.055)
Popi	-	-	36.180***	15.980***	18.494***	11.505***
			(1.604)	(1.667)	(0.871)	(0.884)
Popj	-	-	0.315**	-0.208	0.347**	-0.198*
			(0.132)	(0.137)	(0.135)	(0.137)
Comlang	-	-	(omitted)	(omitted)	(omitted)	(omitted)
Contig	-	-	(omitted)	(omitted)	(omitted)	(omitted)
Col	-	-	(omitted)	(omitted)	(omitted)	(omitted)
AFTA	2.025	1.126	-0.949	-0.145	0.367	0.387
	(1.967)	(1.934)	(1.837)	(1.909)	(1.876)	(1.904)
ACFTA	-1.214	-0.747	-0.209	-0.291	-0.909	-0.767
	(1.857)	(1.827)	(1.731)	(1.799)	(1.768)	(1.794)
Constant	-29.226***	-24.602***	-609.615***	-276.517***	-352.542***	-210.362***
	(3.368)	(3.312)	(25.614)	(26.610)	(16.358)	(16.605)
R-squared	0.446	0.304	0.030	0.243	0.2398	0.0250
F-stat	49.670	23.970	127.960	31.060	111.95***	35.00***

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

In export for basic gravity model, it can be noted from table 5.4 that GDP Indonesia and GDP trading partner countries are statistically significant, while AFTA and ACFTA variables are not significant. However, GDP Indonesia has a negative signed coefficient, which is different to what we expected. Compare to the import side from FEM, only GDP Indonesia that is significant with a positive signed coefficient.

Furthermore it can be observed from table 5.4, for augmented gravity model, the coefficient estimation for GDP Indonesia, GDP trading partners, trading partners' population, AFTA and ACFTA variables present the wrong sign. However, there might be a problem of multicollinearity between GDP and population. Therefore, to check whether there is multicollinearity or not, it is necessary to do the Variance Inflation Factor (VIF) test. The result of VIF test shows that the VIF between GDP and population are around 2 which

mean no indication of multicollinearity. However, if we look at the correlation matrix (appendix 9), the value of R^2 between GDP and population is greater than 0.8, which in general, it can be indicated a problem of multicollinearity.

In order to overcome that problem can be done by dropping one of variables that indicates the cause of multicollinearity as what have been shown by basic gravity model where the population variables are not included in the equation. The result presents the expected sign except for GDP Indonesia in export equation.

In model 3 the GDP difference variable (GDPdif) is included to the equation to estimate the existence of a Linder effect. Since it is suspected that multicollinearity may be present between GDP variables and GDP difference variable, the model is estimated without GDP Indonesia and GDP trading partners. The coefficient of GDP difference has positive sign and it is statistically significant for export but insignificant for import. Population variables are also significant, but AFTA and ACFTA are not significant.

5.1.3. Cross-section Regression with Country-specific Individual Effects

Table 5.5 presents the results of the regression when the fixed effect of model 1, 2 and 3 are regressed on distance, common language, contiguous and colonial link dummies that are fixed over time. The findings reveal only distance and common language are statistically significant but wrong sign for common language, whereas the contiguous and colonial link are not significant. The coefficient of R-squared are very low indicates that there are other determinants of trading-pair effects that influence trade flows.

Table 5.5 Cross-section Regression Results with Country-specific Individual Effects

Independent Variables	Model 1 (eq. 5.1) Basic Gravity Model		Model 2 (eq. 5.2) Augmented Gravity Model		Model 3 (eq. 5.3) Gravity Model with Linder Effect	
	Export	Import	Export	Import	Export	Import
Dist	-0.229	-0.996	-0.121	0.133	-0.044	0.173
	(0.692)	(0.160)	(0.083)	(0.282)	(0.230)	(0.072)
Comlang	-	-	-1.967***	-2.025	1.719	0.366
			(0.427)	(1.446)	(1.180)	(0.371)
Contig	-	-	0.607	1.899	-1.779*	0.271
			(0.379)	(1.274)	(1.040)	(0.328)
Col	-	-	0.035	-0.558	2.335*	0.367
			(0.445)	(1.464)	(1.198)	(0.379)
Constant	39.922***	32.835***	619.431***	282.698***	361.633***	216.140***
	(6.326)	(1.465)	(0.763)	(2.593)	(2.116)	(0.664)
R-squared	0.001	0.002	0.011	0.011	0.015	0.009
F-stat	0.110	0.390	23.410	3.290	5.34	7.52

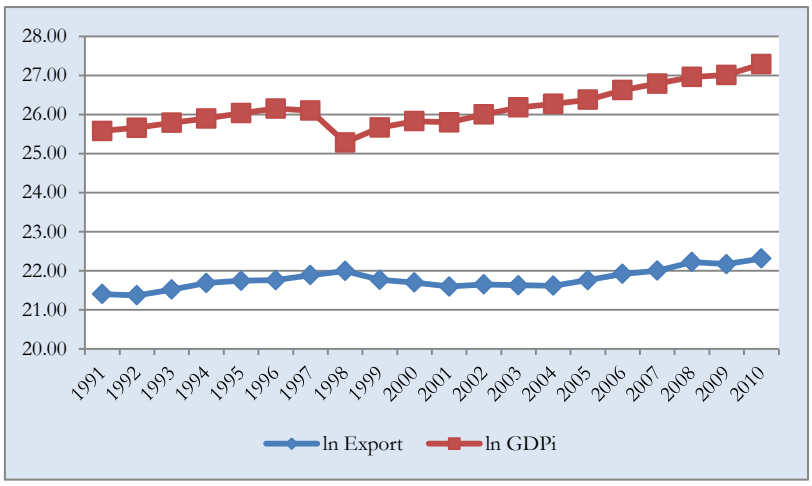
Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

5.2. The Impact of GDP, Population, Distance, Common Language, Contiguous and Colonial Link

The estimation results for GDP shows that GDP Indonesia has a significant impact on Indonesia's trade flows. In import basic gravity model, GDP Indonesia has a positive sign that indicates the greater GDP Indonesia, the higher the value of Indonesia's import. Holding other variables constant, a 1 percent increase in GDP will result in a 0.77 percent increase in Indonesia's imports. However in export side, the coefficient of GDP Indonesia shows unexpected negative sign. The size of the GDP coefficient increased sharply, from -0.5 to -2.8, as population, common language, contiguous and colonial link variables are added. Most of growth-theory literatures imply that there is a positive relationship between GDP and export, either export promotes growth or the other way around, but this is not the case of Indonesia. The possible explanation of this situation might be in accordance with a hypothesis proposed by Bhagwati (1979). She argued that negative relationship between GDP and export is likely to occur if consumer demand is concentrated in exportable and non-traded goods in which case an increase in domestic demand would cause an increase in output but decrease in export. Therefore, the growth of output would lead to a reduction in the growth of export.

If we take a look at the data of Indonesia's Agricultural exports to the 193 trading partners under this study, it reveals that when GDP Indonesia declined, the export increased instead of decreasing (figure 5.3). In early period, export and GDP grew in the same pace until in 1997 when Indonesia hit by financial crisis. GDP dropped drastically while export continued to increase. As have been discussed above, the consequences of the financial crisis is that Indonesia was benefitted from higher export demand for its agricultural products with the devaluation of the country's currency. Therefore, at that time, the decline of GDP did not affect the growth of agricultural export.

Figure 5.3 Indonesia's Agricultural Exports and GDP



Source: Author, Computed based on Estimation Result

Meanwhile, the estimated coefficient on GDP of trading partner (GDP_j) for export basic gravity model is statistically significant with the expected positive sign, but insignificant for import side. It means that the higher the GDP of trading partners, the greater Indonesia's export to them. As the GDP of trading partner is increase by 1 percent, export will increase by about 2.2 percent.

The number of population in Indonesia also in trading partner countries affects Indonesia's trade flows. A greater population leads to a higher export and import. The estimated coefficient on population of Indonesia (Pop_i) variable shows a positive value with a high statistical significance suggesting that higher population is good to enhance bilateral trade flows. This positive effect indicates that a greater people in Indonesia means greater production, better specialization opportunities, also more goods and services to be exported and higher demand for the imports. However, population of trading partners has no significant impact on Indonesia's imports.

The estimation result of time invariant variables presents that distance as one important factor on gravity model has no significant impact on Indonesian trade. It means that the transportation cost is not an obstacle factor for Indonesia to establish bilateral trade with trading partners. This result is different from the finding from cross-sectional estimation, i.e. distance has a significantly negative impact on Indonesian trade. As has been discussed earlier that the result of cross-sectional estimation can be biased due to the weaknesses of this estimation, thus the result of the FEM estimation might be more appropriate. Head (2003) argued that the distance is not really matter for trade; "Even for air travel, great circle distances probably underestimate true distances since they do not take into account that most flights avoid the North Pole. For maritime travel, they do not take into account indirect routes mandated by land and ice barriers. In addition, many air and sea routes are shaped by economic considerations such as "hub economies." Furthermore international shipping cartels often set freight costs that bear little relationship to distance travelled. Also, the cost of packaging, loading and unloading, seem to be primarily fixed costs that do not vary with distance." (Head 2003: 5)

The common language variable has a significantly unexpected negative sign for export in augmented gravity model. This implies that having same language appears to lower trade. This shows that nations that could easily communicate in Malay cannot take the advantage of this potential. It may be due to the fact that only three countries speak in Malay, besides Indonesia, in which although it looks almost similar but in reality there are a lot of similar words that have different meanings. Thus, to reduce misunderstanding when negotiating trade agreement, they prefer to use English to communicate.

Sharing the same border variable also has a negative affect on Indonesian exports. The result is inconsistent with the theory where a shared border will increase bilateral trade between neighbouring countries as transportation cost becomes lower. This finding supports the empirical study conducted by

Hapsari and Mangunsong (2006). They investigated the determinants of trade flows of AFTA members and revealed that shared a common border has negative and significant impact on bilateral exports from ASEAN countries. They argued that the reason behind this might be due to the different role of trade in the neighboring countries. They suspected that it was caused by a negative effect of bilateral trade between Indonesia and Malaysia that shared the same border.

While other factors of gravity model, colonial relationship, is also influence Indonesian export. Historical estimates with the gravity model implies that there is a positive relationship between colonial link and trade (Kleiman 1976; Anderson and Norheim 1993 in Frankel 1997). If we notice the case of Indonesia, the Netherlands as former colonizer, is in the ninth out of top ten destination countries of Indonesia's agriluctural exports.

5.3. The Impact of AFTA and ACFTA

The estimation results of gravity models to investigate the impact of free trade agreements on Indonesia's agricultural trade flows have been presented above. The results from the three models show that Indonesia's participation in AFTA and ACFTA does not have a significant impact on Indonesia's agricultural trade flows. This result is not different from the result of cross-sectional estimation. However, this does not necessarily mean that become a member of FTA would not favorable for Indonesia.

The participation on AFTA contributed a little additional welfare gain for Indonesia because ASEAN remains a weak regional group with a small market size in the global economy and because most international trade by Indonesia is with non-ASEAN countries. Hence, the expected gain from tariff reductions under the CEPT scheme is very small because the tariff reduction is applied only to ASEAN members. Additionally, the progress of AFTA is relatively slow. Particularly since the economic crisis in 1997, Intra regional trade within ASEAN has only grown by around 4 percent, from 19 to 23 percent, although there was an acceleration of the AFTA schedule from 2003 to 2002. Moreover, the implementation of the agreements has had to face many obstacles, for instance, when some member countries refused to lower tariffs on certain sensitive products (Chandra 2005).

According to Feridhanusetyawan and Pangestu (2003) to measure the gains from AFTA cannot just simply by looking at the gains from the AFTA scenario alone. The benefit from the participation in the AFTA process can be seen from its influnced to the process of unilateral liberalisation in ASEAN members. By joining this agreement, the members had to submit schedules of tariff reduction to be achieved by certain period greatly influenced their own unilateral process of tariff reduction.

Not different from the results of Indonesia participation in AFTA, become a member of ACFTA also does not give significant impact on Indonesia trade flows. The empirical insignificant impact may be due to the short period of observation under this study. The ACFTA was signed in 2002, but the tariff reduction on agricultural products began in 2004. The six years observation is relatively short time to investigate the impact of this free trade agreement on Indonesia's agricultural trade flows.

Although insignificant, the estimated coefficient of ACFTA variable has negative sign. It indicates that there is a tendency becomes the member of ACFTA will actually lower Indonesia's trade flows. In fact, based on data from FAO, Indonesia has trade deficits with China for some agricultural commodities such as fruits and vegetables. Year by year, the volume of fruits and vegetables imports from China tend to continue and even increase. Indonesia's import of fruits from China has incresed from 76 mt in 1999 to 722 mt in 2004, while Indonesian export to China was very small and after 2002 Indonesia does not export anymore. For vegetables, Indonesia imports from China but not exports. Its volume of imports rose sharply from 18 mt in 1998 to 4235 mt in 2004. With Indonesia's agriculture condition currently; e.i. lack of land, human resource, technology and technical infrastructure, and low access to capital, Indonesia is predicted will get more losses than benefits from the implementation of ACFTA (Tambunan and Suparyati 2009).

Furthermore, in the process of national economic development, agriculture sector in Indonesia from year to year loses its popularity as the largest sector contributing national income. In particular since the 1997-98 financial crisis when the green revolution programmes by the New Order regime have ended. Agriculture has become marginalized sector (Tambunan and Suparyati 2009).

5.4. Linder Effect

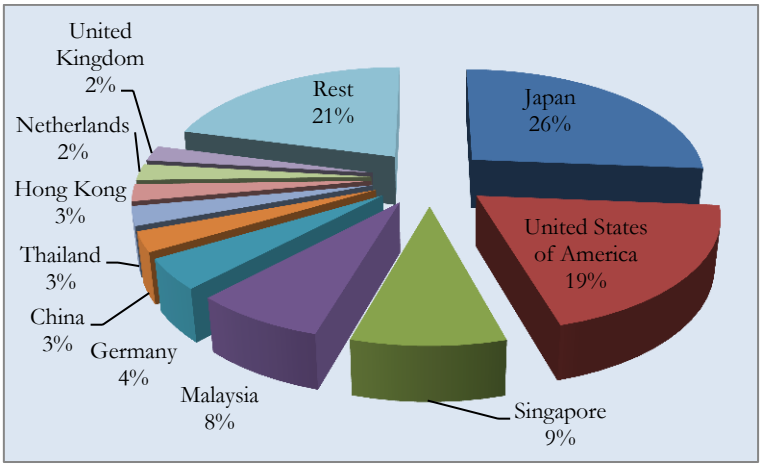
In line with the finding of cross-sectional estimation, the per capita GDP differential variable of FEM estimation also has a positive and statistically significant effect on Indonesian exports. The coefficient of this variable is around 0.3 for export side. The implication is that 1 percent increase of per capita income differential between Indonesia and trading partner results in 0.3 percent increase on Indonesia's agricultural exports. Therefore the estimated results reject the Linder hypothesis and accept Hecksher-Ohlin hypothesis, i.e. countries with dissimilar levels of income per capita will trade more than similar ones. According Hecksher-Ohlin theory "...poor countries produce goods intensive in unskilled labor and trade them to rich countries for goods intensive in capital and skilled labor." (Frankel 1997). This theory implies that international trade is motivated by the differences of factor endowments between two nations.

Figure 5.4 illustrates the top ten destination countries of Indonesia's agriluctural exports. As can be seen from the figure, Indonesia tends to do

bilateral trade with countries that have high level of income per capita. The biggest propportion of Indonesia's agricultural exports goes to Japan at about 26 percent of the total agricultural exports with average value around USD 785 million between 1991 and 2010.

In terms of income per capita on average from 1991 to 2010, Japan is recorded as the worlds 8th highest income per capita country just above the United States. The United States, the 2nd destination country of Indonesian exports, is accounted for about 19 percent of total Indonesia's agricultural exports with average value about USD 580 million.

Figure 5.4 Top Ten Destination Countries of Indonesia's Agricultural Exports, 1991-2010 Average



Source: Author, Computed based data from Statistics Indonesia

In regional ASEAN-China, Indonesia also prefers to trade with countries that have high standard of living, such as Singapore and Malaysia. In this region, Singapore is the highest income per capita country at about USD 25,755 on average. While Malaysia's income per capita is about USD 4,874 on average. Indonesia itself has income percapita around USD 1,200 on average.

Chapter 6
Conclusion and Policy Implication

The objective of this paper is to analyse the impact of free trade agreements on Indonesia's agricultural trade flows and to forecast trade potentials between Indonesia and other FTAs members. With this aim this paper develops basic and augmented gravity model and additional model to test the existence of linder effect and perform cross sectional and panel data analysis involving 193 countries, members and non-members FTAs.

Empirical results show that GDP of Indonesia has positive influence on import, but contrary on export. While GDP trading partner is positively significant for export but insignificant for import. Indonesia population has a large and positive effect both on export and import. Population of trading partner also has positive effect on export but negative on import. Thus, the size in form of income or population does matter in Indonesia's agricultural trade flows.

Distance variable that corresponds to transport costs, do not confirm the theory of gravity. It indicates that transportation costs is not a significant barrier on Indonesia's agricultural export growth. Surpraisingly, the common language and common border variables have negatively significant coefficients on exports. Instead of increasing trade flows, it lower the value of export. While the colonial link factors influence trade positively.

Unexpected results are shown by the membership of FTAs. AFTA and ACFTA do not bring significant impact on Indonesia's agricultural trade flows. However, it does not necessarily mean that by joining these free trade area would decrease trade flows.

From the test of Linder effect, it reveals that Linder effect does not exist in the case of Indonesia's agricultural trade flows. This condition implies that Indonesia tends to trade more with countries that have dissimilar preference, which represent by dissimilar income per capita. Indonesia tends to trade with countries that have high level standard of living, such as Japan, the United States, and Singapore.

The proper policy implication that can be considered from this study is that Indonesia should explore more benefit of these FTAs, particularly related to agricultural products trading agreements. Indonesian government should take correct measures to increase trade volume with other countries not only with the rich countries that have high income per capita but also with other countries that in the similar level with Indonesia. Also attempts should be continued to maintain its high level of trade with the countries where Indonesian has already high bilateral trade.

Lastly, this study is limitted in its explanatory variables. Therefore, for further development of this research it is necessary to take into consideration more explanatory variables that proven significant from other previous studies, such as investment and exchange rate.

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Appendix 1 List of Countries included in the Study

Country							
1	Aruba	26	Brazil	51	Algeria	76	Hong Kong
2	Afghanistan	27	Barbados	52	Ecuador	77	Honduras
3	Angola	28	Brunei Darussalam	53	Egypt	78	Croatia
4	Albania	29	Bhutan	54	Eritrea	79	Haiti
5	Andorra	30	Botswana	55	Spain	80	Hungary
6	United Arab Emirates	31	Central African Republic	56	Estonia	81	India
7	Argentina	32	Canada	57	Ethiopia	82	Ireland
8	Armenia	33	Switzerland	58	Finland	83	Iran
9	Antigua and Barbuda	34	Chile	59	Fiji	84	Iraq
10	Australia	35	China	60	France	85	Iceland
11	Austria	36	Côte d'Ivoire	61	Faroe Islands	86	Israel
12	Azerbaijan	37	Cameroon	62	Micronesia (Federated States of)	87	Italy
13	Burundi	38	Congo	63	Gabon	88	Jamaica
14	Belgium and Luxembourg	39	Colombia	64	United Kingdom	89	Jordan
15	Benin	40	Comoros	65	Georgia	90	Japan
16	Burkina Faso	41	Cape Verde	66	Ghana	91	Kazakstan
17	Bangladesh	42	Costa Rica	67	Guinea	92	Kenya
18	Bulgaria	43	Cuba	68	Gambia	93	Kyrgyzstan
19	Bahrain	44	Cyprus	69	Guinea-Bissau	94	Cambodia
20	Bahamas	45	Czech Republic	70	Equatorial Guinea	95	Kiribati
21	Bosnia and Herzegovina	46	Germany	71	Greece	96	Saint Kitts and Nevis
22	Belarus	47	Djibouti	72	Grenada	97	Korea
23	Belize	48	Dominica	73	Greenland	98	Kuwait
24	Bermuda	49	Denmark	74	Guatemala	99	Lao People's Democratic Republic
25	Bolivia	50	Dominican Republic	75	Guyana	100	Lebanon

Appendix 1 (continued)

Country							
101	Liberia	126	Namibia	151	Saudi Arabia	176	Turkey
102	Libyan Arab Jamahiriya	127	New Caledonia	152	Sudan	177	Tuvalu
103	Saint Lucia	128	Niger	153	Senegal	178	Tanzania, United Rep. of
104	Sri Lanka	129	Nigeria	154	Singapore	179	Uganda
105	Lesotho	130	Nicaragua	155	Solomon Islands	180	Ukraine
106	Lithuania	131	Netherlands	156	Sierra Leone	181	Uruguay
107	Luxembourg	132	Norway	157	El Salvador	182	United States of America
108	Latvia	133	Nepal	158	San Marino	183	Uzbekistan
109	Macau (Aomen)	134	New Zealand	159	Sao Tome and Principe	184	Saint Vincent and the Grenadines
110	Morocco	135	Oman	160	Suriname	185	Venezuela
111	Moldova, Rep.of	136	Pakistan	161	Slovakia	186	Viet Nam
112	Madagascar	137	Panama	162	Slovenia	187	Vanuatu
113	Maldives	138	Peru	163	Sweden	188	Samoa
114	Mexico	139	Philippines	164	Swaziland	189	Yemen
115	Marshall Islands	140	Palau	165	Seychelles	190	South Africa
116	Macedonia	141	Papua New Guinea	166	Syrian Arab Republic	191	Congo (Democratic Republic of the)
117	Mali	142	Poland	167	Chad	192	Zambia
118	Malta	143	Puerto Rico	168	Togo	193	Zimbabwe
119	Myanmar	144	Portugal	169	Thailand		
120	Mongolia	145	Paraguay	170	Tajikistan		
121	Mozambique	146	French Polynesia	171	Turkmenistan		
122	Mauritania	147	Qatar	172	East Timor		
123	Mauritius	148	Romania	173	Tonga		
124	Malawi	149	Russian Federation	174	Trinidad and Tobago		
125	Malaysia	150	Rwanda	175	Tunisia		

Appendix 2 Cross-sectional Estimation of Indonesian Exports, 1991-2010 (Model 1)

Independent Variables	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Dist	-3.100***	-2.857***	-2.131***	-2.797***	-2.025***	-2.769***	-1.605**	-2.132***	-1.680**	-1.642**
	(0.674)	(0.621)	(0.658)	(0.623)	(0.636)	(0.728)	(0.790)	(0.747)	(0.763)	(0.698)
GDPi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
GDPj	2.012***	2.148***	2.117***	2.136***	2.249***	2.207***	1.768***	1.723***	1.612***	1.558***
	(0.153)	(0.139)	(0.150)	(0.141)	(0.143)	(0.146)	(0.145)	(0.137)	(0.140)	(0.130)
GDPdif	-	-	-	-	-	-	-	-	-	-
Popi	-	-	-	-	-	-	-	-	-	-
Popj	-	-	-	-	-	-	-	-	-	-
Comlang	-	-	-	-	-	-	-	-	-	-
Contig	-	-	-	-	-	-	-	-	-	-
Col	-	-	-	-	-	-	-	-	-	-
AFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	1.584	1.354	-0.212	1.653	1.591
						(2.470)	(2.133)	(2.016)	(2.060)	(1.923)
ACFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Constant	-12.151*	-16.842**	-22.458***	-16.847**	-26.768***	-18.971*	-16.241**	-9.751	-11.881	-10.859
	(7.161)	(6.576)	(6.999)	(6.621)	(6.767)	(7.413)	(7.912)	(7.451)	(7.611)	(6.921)
R-squared	0.5244	0.5948	0.5369	0.5806	0.5847	0.5879	0.4700	0.4833	0.4446	0.4606
Adj R-squared	0.5191	0.5903	0.5318	0.5760	0.5802	0.5811	0.4614	0.4749	0.4356	0.4520
Root MSE	4.9005	4.5131	4.8951	4.6353	4.7289	4.7541	4.7019	4.4465	4.5398	4.2891

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 2 (continued)

Independent Variables	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dist	-1.876***	-2.153***	-2.024***	-2.444***	-2.548***	-2.035***	-2.000***	-2.583***	-1.879***	-1.934***
	(0.711)	(0.690)	(0.677)	(0.570)	(0.604)	(0.653)	(0.691)	(0.670)	(0.635)	(0.637)
GDPi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
GDPj	1.442***	1.630***	1.507***	1.518***	1.922***	1.918***	1.983***	1.860***	1.812***	1.785***
	(0.133)	(0.130)	(0.126)	(0.131)	(0.138)	(0.149)	(0.157)	(0.152)	(0.145)	(0.148)
GDPdif	-	-	-	-	-	-	-	-	-	-
Popi	-	-	-	-	-	-	-	-	-	-
Popj	-	-	-	-	-	-	-	-	-	-
Comlang	-	-	-	-	-	-	-	-	-	-
Contig	-	-	-	-	-	-	-	-	-	-
Col	-	-	-	-	-	-	-	-	-	-
AFTA	1.303	-0.387	1.116	0.227	-0.206	2.335	2.189	1.016	-1.632	1.787
	(1.959)	(1.900)	(1.855)	(4.604)	(4.879)	(5.277)	(5.590)	(5.420)	(5.057)	(5.116)
ACFTA	(omitted)	(omitted)	(omitted)	-0.756	-1.670	-1.318	-1.822	-1.962	2.241	-2.017
				(4.340)	(4.599)	(4.974)	(5.269)	(5.111)	(4.792)	(4.824)
Constant	-6.060	-7.915	-6.202	-3.037	-12.821**	-17.857**	-20.015**	-11.219	-15.842**	-14.646**
	(7.049)	(6.857)	(6.715)	(5.988)	(6.360)	(6.887)	(7.312)	(7.119)	(6.818)	(6.833)
R-squared	0.4182	0.4805	0.4677	0.4586	0.5417	0.4914	0.4795	0.4773	0.4796	0.4743
Adj R-squared	0.4089	0.4721	0.4590	0.4468	0.5318	0.4804	0.4683	0.4660	0.4682	0.4625
Root MSE	4.3724	4.2429	4.1344	4.2670	4.5222	4.8896	5.1784	5.0205	4.7566	4.7308

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 3 Cross-sectional Estimation of Indonesian Imports, 1991-2010 (Model 1)

Independent Variables	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Dist	-1.143	-2.483***	-2.757***	-2.400***	-2.522***	-0.619	-1.212	-2.082**	-2.156**	-1.731*
	(0.782)	(0.733)	(0.707)	(0.741)	(0.756)	(0.875)	(0.913)	(0.973)	(0.945)	(0.975)
GDPi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
GDPj	1.753***	1.778***	1.835***	1.870***	1.859***	1.919***	1.846***	1.583***	1.685***	1.376***
	(0.177)	(0.164)	(0.161)	(0.168)	(0.171)	(0.175)	(0.167)	(0.178)	(0.173)	(0.182)
GDPdif	-	-	-	-	-	-	-	-	-	-
Popi	-	-	-	-	-	-	-	-	-	-
Popj	-	-	-	-	-	-	-	-	-	-
Comlang	-	-	-	-	-	-	-	-	-	-
Contig	-	-	-	-	-	-	-	-	-	-
Col	-	-	-	-	-	-	-	-	-	-
AFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	2.754	3.714	1.218	-0.260	2.108
						(2.969)	(2.463)	(2.624)	(2.551)	(2.687)
ACFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Constant	-23.907***	-12.354	-10.778	-14.488*	-12.782	-31.790***	(-23.462**	-10.022	-11.388	-7.813
	8.306	7.762	(7.514)	(7.872)	(8.049)	(8.909)	(9.136)	(9.700)	(9.426)	(9.669)
R-squared	0.3601	0.4215	0.4462	0.4279	0.4177	0.4100	0.4280	0.3283	0.3585	0.2647
Adj R-squared	0.3529	0.4151	0.4402	0.4216	0.4113	0.4003	0.4186	0.3174	0.3481	0.253
Root MSE	5.6839	5.3272	5.2553	5.5109	5.625	5.714	5.4292	5.788	5.6226	5.9926

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 3 (continued)

Independent Variables	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dist	-1.835*	-1.985**	-3.214***	-1.831**	-2.569***	-2.272***	-3.191***	-3.032***	-2.803***	-2.076**
	(0.951)	(0.956)	(0.905)	(0.801)	(0.811)	(0.796)	(0.811)	(0.795)	(0.781)	(0.831)
GDPi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
GDPj	1.557***	1.632***	1.571***	1.636***	1.652***	1.597***	1.517***	1.737***	1.665***	1.585***
	(0.178)	(0.180)	(0.169)	(0.184)	(0.185)	(0.181)	(0.184)	(0.180)	(0.179)	(0.193)
GDPdif	-	-	-	-	-	-	-	-	-	-
Popi	-	-	-	-	-	-	-	-	-	-
Popj	-	-	-	-	-	-	-	-	-	-
Comlang	-	-	-	-	-	-	-	-	-	-
Contig	-	-	-	-	-	-	-	-	-	-
Col	-	-	-	-	-	-	-	-	-	-
AFTA	3.145	2.075	-1.027	-2.385	-1.199	0.273	-0.953	-0.811	-0.916	-0.924
	(2.619)	(2.634)	(2.481)	(6.471)	(6.552)	(6.436)	(6.559)	(6.431)	(6.225)	(6.678)
ACFTA	(omitted)	(omitted)	(omitted)	2.418	2.477	2.749	2.774	1.319	5.298	1.691
				(6.100)	(6.176)	(6.066)	(6.183)	(6.064)	(5.899)	(6.297)
Constant	-11.879	-12.236	1.462	-13.700	-8.396	-9.386	0.915	-5.840	-6.117	-9.957
	(9.425)	(9.508)	(8.980)	(8.417)	(8.540)	(8.400)	(8.580)	(8.447)	(8.393)	(8.921)
R-squared	0.3286	0.3373	0.3584	0.3221	0.3345	0.3269	0.3192	0.3757	0.3702	0.3045
Adj R-squared	0.3178	0.3266	0.348	0.3074	0.3201	0.3124	0.3045	0.3622	0.3563	0.2888
Root MSE	5.846	5.8829	5.5286	5.9978	6.0726	5.9637	6.0762	5.9569	5.8553	6.1759

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 4 Cross Sectional Estimation of Indonesian Export, 1991-2010 (Model 2)

Independent Variables	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Dist	-2.760***	-2.494***	-1.542**	-2.417***	-1.518**	-2.705***	-1.386*	-1.804**	-1.757**	-1.893**
	(0.801)	(0.739)	(0.779)	(0.740)	(0.748)	(0.796)	(0.823)	(0.777)	(0.797)	(0.745)
GDPi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
GDPj	2.055***	2.080***	2.005***	2.017***	2.236***	2.222***	1.564***	1.467***	1.764***	1.744***
	(0.219)	(0.196)	(0.212)	(0.197)	(0.226)	(0.231)	(0.230)	(0.214)	(0.218)	(0.203)
GDPdif	-	-	-	-	-	-	-	-	-	-
Popi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Popj	-0.095	0.068	0.123	0.143	-0.011	-0.040	0.287	0.362	-0.231	-0.277
	(0.216)	(0.196)	(0.211)	(0.198)	(0.256)	(0.260)	(0.258)	(0.238)	(0.237)	(0.223)
Comlang	0.835	0.987	3.622	1.593	2.222	-1.779	0.504	1.688	-1.073	0.471
	(4.151)	(3.832)	(4.1464)	(3.937)	(4.011)	(4.374)	(4.374)	(4.120)	(4.219)	(3.830)
Contig	3.306	2.815	1.341	1.506	3.331	3.054	2.241	2.362	1.826	-1.005
	(3.818)	(3.523)	(3.825)	(3.633)	(3.686)	(3.779)	(3.682)	(3.470)	(3.560)	(2.988)
Col	5.991	4.500	4.610	4.587	3.669	3.870	2.744	2.701	2.659	-1.770
	(4.962)	(4.581)	(4.973)	(4.723)	(4.796)	(4.847)	(4.783)	(4.505)	(4.623)	(3.416)
AFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	1.853	0.836	-1.119	1.656	1.402
						(2.697)	(2.408)	(2.267)	(2.325)	(2.190)
ACFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Constant	(-14.952*	-19.710**	-27.291***	-19.894***	-31.038***	-19.342**	-17.987**	-12.446	-11.175	-8.593
	(8.113)	(7.481)	(7.910)	(7.516)	(7.616)	(7.973)	(8.181)	(7.690)	(7.890)	(7.332)
R-squared	0.5346	0.6030	0.5454	0.5858	0.5922	0.5910	0.4758	0.4931	0.4496	0.4670
Adj R-squared	0.5186	0.5893	0.5299	0.5717	0.5786	0.5750	0.4555	0.4735	0.4284	0.4467
Root MSE	4.9075	4.5294	4.9181	4.6715	4.7376	4.7890	4.7278	4.4525	4.5688	4.3097

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 4 (continued)

Independent Variables	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dist	-2.063***	-1.886*	-1.927***	-2.376***	-2.532***	-1.817**	-1.390*	-2.372***	-1.594**	-1.842**
	(0.743)	(0.736)	(0.718)	(0.683)	(0.720)	(0.780)	(0.826)	(0.803)	(0.759)	(0.754)
GDPi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
GDPj	1.894***	1.688***	1.684***	1.632***	2.174***	2.024***	1.909***	1.931***	1.922***	2.114***
	(0.203)	(0.201)	(0.194)	(0.200)	(0.212)	(0.231)	(0.245)	(0.241)	(0.239)	(0.239)
GDPdif	-	-	-	-	-	-	-	-	-	-
Popi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Popj	-0.652***	-0.078	-0.250	-0.162	-0.364	-0.188	0.108	-0.093	-0.152	-0.483*
	(0.224)	(0.221)	(0.216)	(0.223)	(0.237)	(0.258)	(0.276)	(0.272)	(0.270)	(0.276)
Comlang	-3.093	0.497	-1.874	-0.985	-1.564	3.554	2.139	-0.824	0.453	-0.445
	(3.821)	(3.789)	(3.681)	(3.446)	(3.630)	(3.936)	(4.172)	(4.050)	(3.834)	(3.790)
Contig	1.593	1.953	2.174	1.538	2.535	-2.199	2.123	2.453	2.076	1.962
	(2.977)	(2.954)	(2.874)	(2.966)	(3.124)	(3.386)	(3.591)	(3.490)	(3.307)	(3.265)
Col	3.645	3.353	2.736	3.450	2.716	6.200	4.663	3.306	3.172	2.971
	(3.402)	(3.374)	(3.281)	(3.390)	(3.575)	(3.872)	(4.105)	(3.992)	(3.782)	(3.734)
AFTA	2.224	-0.528	1.637	-0.168	-0.993	1.623	1.871	0.692	-1.440	0.829
	(2.178)	(2.160)	(2.106)	(4.648)	(4.900)	(5.310)	(5.629)	(5.475)	(5.080)	(5.128)
ACFTA	(omitted)	(omitted)	(omitted)	-0.319	-0.811	-0.593	-1.576	-1.625	2.132	-1.033
				(4.384)	(4.622)	(5.009)	(5.310)	(5.166)	(4.813)	(4.836)
Constant	-4.803	-10.561	-7.419	-3.901	-13.354*	-19.529**	-25.611***	-13.505*	-18.807**	-15.947**
	(7.319)	(7.269)	(7.094)	(6.859)	(7.236)	(7.849)	(8.333)	(8.122)	(7.765)	(7.711)
R-squared	0.4515	0.4885	0.4778	0.4665	0.5531	0.5018	0.4891	0.4835	0.4869	0.4894
Adj R-squared	0.4305	0.4689	0.4577	0.4429	0.5333	0.4797	0.4666	0.4607	0.4638	0.4658
Root MSE	4.2918	4.2558	4.1397	4.2821	4.5148	4.8926	5.1867	5.0455	4.7759	4.7161

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 5 Cross-sectional Estimation of Indonesian Imports, 1991-2010 (Model 2)

Independent Variables	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Dist	-0.862	-2.483***	-2.735***	-2.641***	-1.698*	-0.086	-0.754	-1.502	-1.660*	-1.637
	(0.935)	(0.871)	(0.832)	(0.864)	(0.860)	(0.930)	(0.917)	(0.984)	(0.945)	(1.016)
GDPi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
GDPj	1.580***	1.676***	1.671***	1.605***	1.093***	1.236***	1.137***	0.849***	0.896***	0.795***
	(0.256)	(0.231)	(0.227)	(0.230)	(0.260)	(0.270)	(0.257)	(0.271)	(0.258)	(0.277)
GDPdif	-	-	-	-	-	-	-	-	-	-
Popi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Popj	0.227	0.146	0.240	0.410*	1.121***	0.994***	1.042***	1.065***	1.135***	0.854***
	(0.252)	(0.230)	(0.226)	(0.231)	(0.294)	(0.303)	(0.288)	(0.301)	(0.282)	(0.304)
Comlang	-0.508	-2.811	-2.828	-4.753	0.924	-1.617	-2.459	-0.374	-2.082	-4.054
	(4.848)	(4.517)	(4.427)	(4.601)	(4.614)	(5.110)	(4.876)	(5.220)	(5.005)	(5.228)
Contig	2.670	3.802	3.443	1.926	4.321	3.235	4.389	3.410	2.234	-1.082
	(4.460)	(4.153)	(4.084)	(4.245)	(4.239)	(4.415)	(4.104)	(4.396)	(4.224)	(4.079)
Col	3.633	4.084	3.633	3.533	4.020	3.531	2.610	3.687	4.047	-0.611
	(5.796)	(5.399)	(5.310)	(5.520)	(5.517)	(5.663)	(5.332)	(5.708)	(5.484)	(4.663)
AFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	3.640	3.744	0.755	0.070	3.514
						(3.151)	(2.684)	(2.873)	(2.758)	(2.989)
ACFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Constant	-26.041***	-12.196	-10.821	-12.348	-19.979**	-36.234***	-27.313***	-14.792	-15.162	-8.330
	(9.476)	(8.818)	(8.446)	(8.783)	(8.760)	(9.315)	(9.120)	(9.743)	(9.360)	(10.008)
R-squared	0.3661	0.4346	0.4614	0.4526	0.4653	0.4466	0.4726	0.3757	0.4167	0.3065
Adj R-squared	0.3442	0.4151	0.4430	0.4340	0.4475	0.4250	0.4521	0.3516	0.3943	0.2801
Root MSE	5.7322	5.3389	5.2511	5.4593	5.4495	5.5951	5.2705	5.6413	5.4198	5.8829

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 5 (continued)

Independent Variables	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dist	-1.061	-1.265	-2.372**	-1.165	-1.461	-0.840	-2.589***	-2.413***	-1.717*	-1.756*
	(0.987)	(0.981)	(0.930)	(0.920)	(0.918)	(0.890)	(0.887)	(0.880)	(0.893)	(0.961)
GDPi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
GDPj	1.008***	0.963***	0.933***	0.889***	0.756***	0.621**	0.364	0.685**	0.803***	0.829***
	(0.269)	(0.268)	(0.252)	(0.270)	(0.270)	(0.264)	(0.263)	(0.265)	(0.281)	(0.304)
GDPdif	-	-	-	-	-	-	-	-	-	-
Popi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Popj	0.840***	1.012***	0.977***	1.161***	1.368***	1.478***	1.749***	1.589***	1.281***	1.161***
	(0.297)	(0.295)	(0.280)	(0.300)	(0.302)	(0.295)	(0.296)	(0.298)	(0.318)	(0.352)
Comlang	-4.842	-5.969	-1.236	-2.558	0.079	1.887	-2.527	-3.003	0.084**	-3.049
	(5.077)	(5.052)	(4.768)	(4.644)	(4.633)	(4.493)	(4.475)	(4.437)	(4.506)	(4.832)
Contig	4.857	3.871	4.899	3.580	4.165	4.951	0.884	2.126	4.881	2.233
	(3.956)	(3.939)	(3.723)	(3.997)	(3.987)	(3.865)	(3.852)	(3.824)	(3.886)	(4.162)
Col	4.533	4.565	2.152	4.301	5.032	4.798	4.340	5.336	3.662	3.828
	(4.521)	(4.499)	(4.250)	(4.569)	(4.563)	(4.420)	(4.404)	(4.374)	(4.445)	(4.760)
AFTA	4.546	3.932	-1.006	-0.176	0.997	2.315	2.304	1.960	-1.127	1.101
	(2.895)	(2.880)	(2.727)	(6.263)	(6.254)	(6.061)	(6.039)	(5.999)	(5.971)	(6.537)
ACFTA	(omitted)	(omitted)	(omitted)	0.033	0.013	0.359	-0.758	-1.658	5.096	-0.355
				(5.909)	(5.900)	(5.718)	(5.697)	(5.660)	(5.657)	(6.165)
Constant	-19.305**	-19.009*	-6.522	-20.246**	-18.651**	-22.335**	-4.156	-10.900	-15.392*	-12.829
	(9.725)	(9.692)	(9.189)	(9.244)	(9.236)	(8.960)	(8.939)	(8.899)	(9.126)	(9.830)
R-squared	0.3747	0.3966	0.4096	0.3860	0.4137	0.4224	0.4414	0.4740	0.4339	0.3558
Adj R-squared	0.3508	0.3735	0.3867	0.3588	0.3878	0.3968	0.4167	0.4507	0.4085	0.3260
Root MSE	5.7029	5.6745	5.3619	5.7710	5.7626	5.5855	5.5643	5.5280	5.6130	6.0121

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 6 Cross-sectional Estimation of Indonesian Exports, 1991-2010 (Model 3)

Independent Variables	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Dist	-1.728**	-1.689**	-0.758	-1.656**	-0.779	-1.721**	-0.694	-1.552*	-1.352	-1.874**
	(0.850)	(0.804)	(0.870)	(0.830)	(0.817)	(0.866)	(0.839)	(0.800)	(0.848)	(0.795)
GDPi	-	-	-	-	-	-	-	-	-	-
GDPj	-	-	-	-	-	-	-	-	-	-
GDPdif	0.692***	0.730***	0.648***	0.772***	0.813***	0.802***	0.561***	0.477***	0.581***	0.643***
	(0.113)	(0.108)	(0.122)	(0.127)	(0.124)	(0.126)	(0.107)	(0.085)	(0.100)	(0.098)
Popi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Popj	1.440***	1.574***	1.587***	1.621***	2.032***	1.963***	1.758***	1.840***	1.481***	1.349***
	(0.164)	(0.155)	(0.168)	(0.160)	(0.177)	(0.178)	(0.166)	(0.158)	(0.169)	(0.156)
Comlang	5.205	4.752	7.443*	4.979	4.854	0.414	3.635	5.612	1.301	1.661
	4.355	(4.120)	(4.466)	(4.271)	(4.265)	(4.680)	(4.392)	(4.088)	(4.427)	(4.087)
Contig	0.178	0.029	-1.023	-0.718	2.893	2.120	0.430	-1.128	1.362	-1.051
	3.777	(3.570)	(3.863)	(3.692)	(3.694)	(3.775)	(3.442)	(3.205)	(3.499)	(3.191)
Col	1.242	0.459	1.704	0.659	-0.547	-0.961	-2.060	-1.978	-2.979	-1.977
	4.341	(4.106)	(4.443)	(4.244)	(4.219)	(4.250)	(3.931)	(3.678)	(3.954)	(3.648)
AFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	3.846	0.964	-1.797	1.041	0.776
						(2.995)	(2.505)	(2.349)	(2.499)	(2.328)
ACFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Constant	-10.643	-13.009	-20.424**	-14.620*	-29.808***	-19.892**	-19.222**	-10.520	-9.026	-3.066
	(8.535)	(8.092)	(8.760)	(8.390)	(8.357)	(8.781)	(8.393)	(7.806)	(8.330)	(7.741)
R-squared	0.4115	0.4696	0.4047	0.4529	0.4904	0.4917	0.4433	0.4652	0.3693	0.3944
Adj R-squared	0.3925	0.4523	0.3853	0.4351	0.4740	0.4725	0.4223	0.4449	0.3455	0.3715
Root MSE	5.4668	5.1702	5.5919	5.3364	5.2791	5.3232	4.9324	4.6312	4.9277	4.5896

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 6 (continued)

Independent Variables	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dist	-1.883**	-1.561*	-1.460*	-1.939***	-1.919**	-1.198	-0.933	-2.033**	-1.202	-1.240
	(0.819)	(0.807)	(0.776)	(0.734)	(0.817)	(0.831)	(0.872)	(0.854)	(0.838)	(0.850)
GDPi	-	-	-	-	-	-	-	-	-	-
GDPj	-	-	-	-	-	-	-	-	-	-
GDPdif	0.600***	0.492***	0.511***	0.479***	0.646***	0.678***	0.683***	0.714***	0.496***	0.432***
	(0.096)	(0.095)	(0.094)	(0.095)	(0.108)	(0.112)	(0.129)	(0.129)	(0.128)	(0.123)
Popi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Popj	1.045***	1.413***	1.243***	1.319***	1.556***	1.657***	1.828***	1.626***	1.581***	1.366***
	(0.160)	(0.159)	(0.153)	(0.159)	(0.177)	(0.181)	(0.189)	(0.184)	(0.179)	(0.185)
Comlang	-0.585	3.456	0.739	1.716	1.745	6.542	4.602	1.193	3.783	4.191
	(4.196)	(4.141)	(4.020)	(3.729)	(4.149)	(4.227)	(4.435)	(4.338)	(4.278)	(4.328)
Contig	0.588	0.517	0.814	0.133	1.043	-3.510	0.867	1.328	0.275	-0.437
	(3.279)	(3.242)	(3.145)	(3.228)	(3.582)	(3.664)	(3.832)	(3.747)	(3.707)	(3.764)
Col	3.841	3.799	3.086	3.807	3.282	6.337	4.674	3.166	4.020	4.129
	(3.758)	(3.719)	(3.606)	(3.708)	(4.112)	(4.206)	(4.401)	(4.304)	(4.260)	(4.327)
AFTA	1.512	-1.025	1.660	-2.475	-4.298	-1.852	-1.337	-2.408	-2.630	-2.383
	(2.399)	(2.375)	(2.306)	(5.068)	(5.619)	(5.753)	(6.012)	(5.878)	(5.706)	(5.920)
ACFTA	(omitted)	(omitted)	(omitted)	1.458	1.651	1.989	0.837	0.690	3.018	1.402
				(4.784)	(5.304)	(5.430)	(5.675)	(5.549)	(5.407)	(5.584)
Constant	2.327	-4.742	-3.225	0.100	-7.477	-16.578*	-22.046**	-8.711	-11.486	-6.508
	(7.973)	(7.909)	(7.705)	(7.416)	(8.221)	(8.461)	(8.848)	(8.650)	(8.579)	(8.735)
R-squared	0.3271	0.3741	0.3622	0.3691	0.4019	0.4100	0.4114	0.3998	0.3642	0.3184
Adj R-squared	0.3016	0.3504	0.3381	0.3416	0.3759	0.3844	0.3858	0.3737	0.3365	0.2888
Root MSE	4.7303	4.6836	4.5412	4.6738	5.1837	5.3051	5.5460	5.4240	5.3670	5.4567

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 7 Cross Sectional Estimation of Indonesian Import, 1991-2010 (Model 3)

Independent Variables	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Dist	0.156	-1.541*	-1.841**	-1.819*	-1.172	0.623	-0.207	-1.291	-1.307	-1.863*
	(0.950)	(0.911)	(0.908)	(0.921)	(0.854)	(0.931)	(0.912)	(0.977)	(0.948)	1.006
GDPi	-	-	-	-	-	-	-	-	-	-
GDPj	-	-	-	-	-	-	-	-	-	-
GDPdif	0.366***	0.422***	0.391***	0.525***	0.493***	0.461***	0.390***	0.279***	0.261**	0.432***
	(0.127)	(0.123)	(0.127)	(0.141)	(0.130)	(0.136)	(0.116)	(0.104)	(0.112)	(0.125)
Popi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Popj	1.384***	1.370***	1.444***	1.569***	2.102***	2.077***	2.073***	1.906***	1.994***	1.632***
	(0.184)	(0.176)	(0.175)	(0.178)	(0.185)	(0.191)	(0.180)	(0.194)	(0.189)	(0.197)
Comlang	4.047	2.237	2.449	-0.701	3.048	-0.060	0.318	2.609	0.454	-4.861
	(4.871)	(4.668)	(4.657)	(4.741)	(4.455)	(5.031)	(4.771)	(4.995)	(4.947)	(5.176)
Contig	0.208	0.403	-0.011	-0.627	2.891	2.427	2.395	0.322	0.450	-0.527
	(4.224)	(4.045)	(4.028)	(4.099)	(3.859)	(4.058)	(3.739)	(3.916)	(3.911)	(4.041)
Col	1.486	0.345	0.085	-0.112	-1.591	0.017	-1.747	-0.851	-0.743	-1.318
	(4.856)	(4.652)	(4.634)	(4.712)	(4.407)	(4.569)	(4.270)	(4.494)	(4.419)	(4.620)
AFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	5.005	3.887	0.452	-0.119	3.180
						(3.220)	(2.721)	(2.870)	(2.793)	(2.948)
ACFTA	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Constant	-22.195**	-7.286	-4.949	-8.645	-22.081**	-37.797***	-27.732***	-14.051	-14.742	-6.276
	(9.547)	(9.169)	(9.135)	(9.315)	(8.730)	(9.439)	9.117	(9.538)	(9.309)	(9.805)
R-squared	0.2620	0.3047	0.3233	0.3481	0.4478	0.4168	0.4569	0.3706	0.3970	0.3213
Adj R-squared	0.2381	0.2820	0.3012	0.3269	0.4300	0.3947	0.4363	0.3468	0.3742	0.2956
Root MSE	6.1145	5.8579	5.8317	5.9244	5.5147	5.7223	5.3578	5.6589	5.5071	5.8129

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 7 (continued)

Independent Variables	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dist	-1.156	-1.214	-2.008**	-0.901	-1.216	-0.726	-2.447***	-2.246**	-1.559*	-1.391
	(0.977)	(0.990)	(0.935)	(0.912)	(0.915)	(0.863)	(0.870)	(0.873)	(0.882)	(0.938)
GDPi	-	-	-	-	-	-	-	-	-	-
GDPj	-	-	-	-	-	-	-	-	-	-
GDPdif	0.465***	0.323***	0.326***	0.318***	0.238*	0.328***	0.138	0.298**	0.215	0.089
	(0.114)	(0.117)	(0.113)	(0.118)	(0.121)	(0.116)	(0.129)	(0.131)	(0.135)	(0.136)
Popi	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
Popj	1.805***	1.872***	1.800***	1.954***	2.028***	2.082***	2.088***	2.188***	1.988***	1.911***
	(0.191)	(0.195)	(0.185)	(0.198)	(0.198)	(0.188)	(0.188)	(0.188)	(0.189)	(0.204)
Comlang	-4.823	-4.687	-0.161	-1.419	1.189	1.986	-1.994	-2.470	1.442	-0.568
	(5.004)	(5.084)	(4.842)	(4.633)	(4.647)	(4.388)	(4.427)	(4.435)	(4.503)	(4.773)
Contig	4.924	3.135	4.410	3.017	3.702	4.961	0.716	1.888	4.152	1.179
	(3.911)	(3.979)	(3.788)	(4.010)	(4.012)	(3.804)	(3.825)	(3.830)	(3.902)	(4.151)
Col	4.051	4.613	2.299	4.258	5.179	4.400	4.348	5.135	4.006	4.636
	(4.482)	(4.565)	(4.343)	(4.606)	(4.606)	(4.367)	(4.393)	(4.400)	(4.484)	(4.772)
AFTA	4.189	3.562	-0.629	-1.768	-0.276	1.026	1.675	0.626	-1.625	0.101
	(2.861)	(2.916)	(2.778)	(6.296)	(6.294)	(5.972)	(6.001)	(6.009)	(6.006)	(6.530)
ACFTA	(omitted)	(omitted)	(omitted)	1.252	0.954	1.335	-0.284	-0.672	5.497	0.442
				(5.943)	(5.941)	(5.637)	(5.665)	(5.672)	(5.692)	(6.159)
Constant	-16.876*	-15.218	-5.845	-18.938**	-16.956*	-23.259***	-4.263	-10.168	-12.181	-9.421
	(9.509)	(9.708)	(9.281)	(9.212)	(9.208)	(8.784)	(8.831)	(8.843)	(9.030)	(9.634)
R-squared	0.3882	0.3775	0.3869	0.3761	0.4007	0.4392	0.4482	0.4687	0.4304	0.3604
Adj R-squared	0.3651	0.3540	0.3637	0.3489	0.3747	0.4148	0.4242	0.4456	0.4056	0.3326
Root MSE	5.6417	5.7491	5.4703	5.8059	5.8063	5.5077	5.5359	5.5447	5.6493	6.0182

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Appendix 8 Hausman Test

	Export		Import	
	Coefficient	**Conclusion**	**Coefficient**	**Conclusion**
Model 1	8.53***	Reject Ho	23.99***	Reject Ho
Model 2	68.44***	Reject Ho	84.13***	Reject Ho
Model 3	150.21***	Reject Ho	151.29***	Reject Ho

Appendix 9 Matrix Correlation of Augmented Gravity Model (Model 2)

e(V)	lndist	lngdpi	lngdpj	lnpopi	lnpopj	comlang	contig	colony	afta	acfta	_cons
lndist	1										
lngdpi	0.0307	1									
lngdpj	-0.1584	-0.0699	1								
lnpopi	-0.03	-0.8017	-0.0526	1							
lnpopj	0.1795	0.0467	-0.7481	0.0288	1						
comlang	0.2085	-0.0032	-0.2131	0.0506	0.2057	1					
contig	0.1177	-0.0025	0.0923	-0.0203	-0.0452	-0.5358	1				
colony	0.0662	0.0098	-0.092	-0.0109	0.0594	0.1882	-0.2876	1			
afta	0.0524	0.0286	0.0339	-0.0188	0.0259	-0.0963	0.0122	-0.0021	1		
acfta	0.0582	-0.0142	-0.0275	-0.0128	-0.0492	0.0075	0.0051	0.0116	-0.6576	1	
_cons	-0.0278	0.7131	0.0689	-0.9891	-0.0538	-0.0682	0.0152	0.0085	0.0105	0.0174	1