THE IMPACT OF FREE TRADE AGREEMENTS ON COMMODITY TRADE FLOWS (CASE STUDY: INTERNATIONAL PALM OIL TRADE)

M.Sc. Thesis

“Tropical and International Agriculture – International Agribusiness”

Faculty of Agricultural Sciences

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3rd March 2014

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Statuary Declaration

I, Riska Pujiati, hereby declare that the thesis entitled:

The Impact of Free Trade Agreements onCommodity Trade Flows (Case Study: International Palm Oil Trade)

is submitted independently without having used any other source or means stated therein.

3rd March, 2014 Signature : ________________

Acknowledgment

This research would not have been impossible without the support of many people. I would like to appreciate everyone that has assisted me.

First of all, all praise to God, who is most precious and the most merciful for his blessing on all stages of this research process.

I would like to acknowledge the support of the National Education Ministry of Indonesia for funding my study in Germany. I am indebted to my first supervisor Prof. Dr. Bernhard Brümmer from the University of Göttingen, Germany who supported me academically in writing this thesis from the beginning until the end. I would also like to thank him for his insight and his constructive criticism of my work.

I would like to thank my supervisor Prof. M. Firdaus and Mr Andriyono K Adhi from Bogor Agricultural University, Indonesia for their evaluation and valuable comments on this research. I would also like to acknowledge Prof. Rita Nurmalina, as the head of the Master Science of Agribusiness.

My sincere thanks to Thomas Kopp in developing this thesis. My special thanks to Katie Wilhelm for proofreading this thesis. My special thanks to Heti Mulyati, Dessy Anggraeni and Manoj KV for their advice on this work.

Furthermore, my thanks to all of my friends and family in the SIA program and in the Göttingen Indonesian Student Community, especially for the 'SIA-IPB Batch 2 and 3", Maryam, Labudda, Ella, Triana, Puspi, Venty, Angga, Ahmad, Cahya, Ecaand my flatmate, Hombe Gowda for providing me a friendly and warm environment during my stay in Göttingen.

Finally, I would like to thank all of the members of "Bapak Haji Edi Djunaedi family" for their love and their support. I dedicate this work to my beloved grandparents, Mr. Edi Djunaedi and Ms. Onyas Rostini, my parents, Mr Agus and Ms. Ika, aunts, uncles and cousins who always give me their love and support.

Göttingen, March 2014
Riska Pujiati

Table of Contents

List of Figures

List of Tables

List of Abbreviations

ASEAN	Association of Southeast Asian Nations
ACFTA	ASEAN-China Free Trade Area
AFTA	ASEAN Free Trade Area
ARIC	Asia Regional Integration Centre
AVW	Anderson and Van Wincoop
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
COMESA	Common Market for Eastern and Southern Africa
ECM	Error Correction Model
EEC	European Economic Community
EFTA	European Free Trade Association
EU	European Union
FAO	Food and Agriculture Organization of United Nations
FELDA	Federal Land Development Authority
FFB	Fresh Fruit Bunch
FTAs	Free Trade Agreements
GDP	Gross Domestic Product
HS	Harmonized System
IMP	Industrial Master Plan
MERCOSUR	Southern Cone Common Market
NAFTA	North American Free Trade Agreement
NBPML	Negative Binominal Model
NES	Nucleus Estate and smallholder scheme
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
PPML	Poisson Pseudo Maximum Likelihood
RTA	Regional Trade Agreement
RESET	Regression Specification Error Test
SITC	Standard International Trade Classification
UNCOMTRADE	United Nations Commodity Trade Statistic Database
WITS	World Integrated Trade Solution
WTO	World Trade Organization
ZINBPML	Zero Inflated Negative Binominal Model
ZIPPML	Zero Inflated Poisson Model

Abstract

This study analyzes the impact of Free Trade Agreements (FTAs) on the international palm oil trade for two primary exporters of palm oil: Indonesia and Malaysia. The study used 21annual observations for 77 export destinations which contain 19 percent zero observations. The gravity model with Ordinary Least Squares (OLS) Fixed Effect (FE) and Poisson Pseudo Maximum Likelihood (PPML) regression are utilized to quantify the changes of palm oil trade flows. The differentiation of palm oil into crude and refined is used for a deeper analysis of the impact of FTAs. As a result, the PPML estimation provides more satisfactory results than the OLS FE model due to the treatment of zero values data. The impact of FTAs is shown by the regression results of the different types of palm oil: crude (HS 151110) and refined (HS 151190). In addition, the estimation output shows that the FTAs have a larger impact on the Malaysian palm oil trade than the Indonesian palm oil trade.

Key words: Free Trade Agreements, Poisson Pseudo Maximum Likelihood, Palm Oil, Gravity model

1. Introduction

In recent years, international trade has becomea complex subject instead of the basic exchange of goods and services that it started out as. Moreover, trade liberalization becomes a critical issue for the trade of goods between countries. During the globalization process, due to the development of communication, technology and transportation, international trade has increased dramatically. The report from the World Trade Organization (WTO) indicates that the total value of worldwide trade is three times larger than it was in the year 2000. As of 2012, international trade is estimated at around US$ 17.9 trillion, whereas it was only approximately US$ 6.4 trillion in 2000. The contributing sectors are agriculture (9.3 percent), fuels and mining (23.1 percent) and manufacturing(64.1 percent). The trade value has increased from US$ 0.5 trillion in 2000 to US$ 1.6 trillion in 2012 for the agriculture sector (World Trade Organization [WTO], 2012).

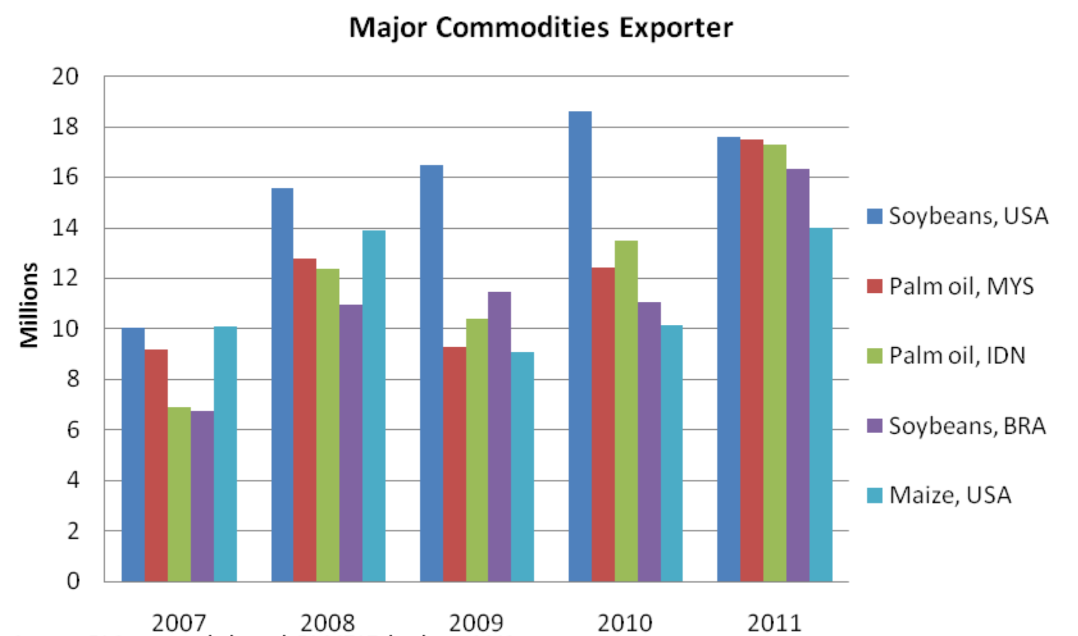
International agricultural trade is important, especially in developing countries. The total share of agricultural exports from developing countries increased slightly over the two decades between 1990 and 2010, from 37 to 43 percent (Cheong et al., 2013). Agriculture plays an important role for developing countries as a primary source of income (Aksoy & Beghin, 2004). In many developing countries, agriculture also becomes a strategic sector which absorbs a high number of employment opportunities.

Southeast Asia is a region that consists of middle income developing economies, with two countries contributing as the region's major exporters, Indonesia and Malaysia. In 2012, the value of the total agriculture exports reached US$ 45 billion for Indonesia and US$ 34 billion for Malaysia (WTO, 2012). The major commodity which contributes to the high value of export is vegetable oil initially originated from palm oil.

Palm oil is predicted to become an important commodity throughout the international trade community. Currently, the international trade values for

Malaysian and Indonesian palm oil ranks second and third after the total international trade value for soybeans in 2011. Due to the high demand in the international market, the combined value of palm oil between Indonesia and Malaysia accounted for US $34 billion in 2011 alone (Food and Agriculture Organization [FAO],2013). Figure 1.1 shows the performance of palm oil trade compared to the five largest traded commodities in international market.

Figure 1.1: Major Commodities Exporter

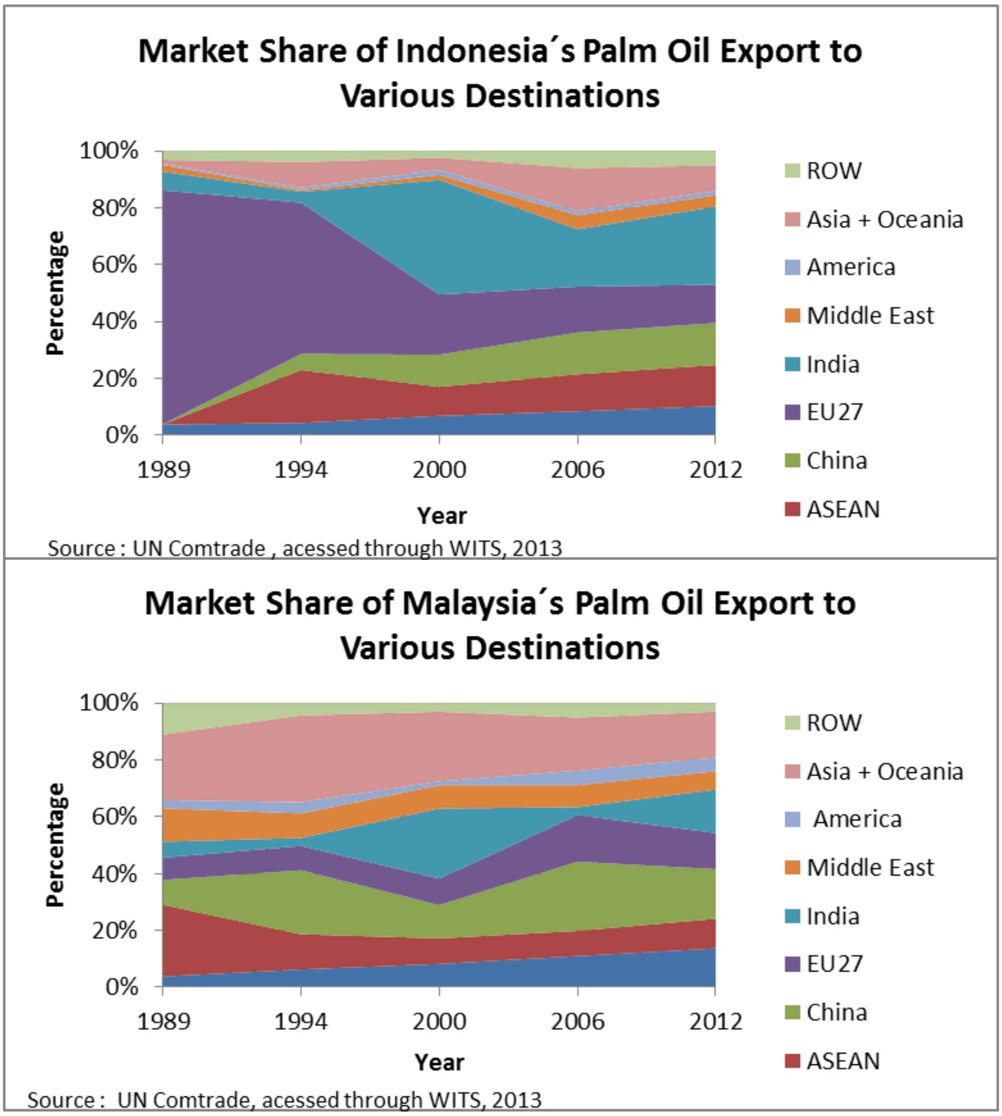


Source: FAO, accessed through FAOSTAT database, 2013

The figure above shows that the growth of the palm oil trade has increased from 2007 to 2011 for both Indonesia and Malaysia. The average annual growth of Indonesian palm oil was 24%, whereas the average annual growth for Malaysian palm oil was 17%. The total value of exports increased by more than 150 percent in 2011 compared to the value in 2007 for Indonesia, while for Malaysia it increased by only 90 percent. The high growth of palm oil trade is also supported by the increase in palm oil production in both countries.

The extensive use of palm oil in various trade sectors such as the food, non-food and energy sectors led to a high demand of palm oil in the international market. Palm oil is also considered to be the cheapest vegetable oil and has a higher yield than soybean and rapeseed, which are also commonly used to produce vegetable oil. Palm oil is exported in two primary forms: crude and refined. Furthermore, there are more than 100 countries listed as the destination of Indonesian and Malaysian palm oil. Figure 2 shows the palm oil market share for both countries.

Figure 1.2: Market Shares of Indonesia and Malaysia´s Palm Oil Export



According to the figure above, Indonesia and Malaysia have different shares of the palm oil market between the periods of 1989-2012. The European Union (EU) was the primary trading partner of Indonesia with the total market share reach by 82 percent in 1989, this share dropped significantly to 14 percent in 2012. For Malaysia, the share for the EU increased slightly from 8 percent in 1989 to 13 percent in 2012. China is considered to be the new emerging nations, both in economy and population, and is therefore showing a tremendous increase in the import of the palm oil. For palm oil originating from Indonesia, the export share to China reached 15 percent in 2012 compared to three percent in 1989, while for Malaysia, the export share to China reached 17 percent in 2012 compared to 9 percent in 1989. Another country which shows dramatic import increases of palm oil is India. In 2012, Indonesia's palm oil export share reached 28 percent while in 1989 the share was only 7 percent. Similar cases apply to Malaysia, where the export share to India reached 15 percent in 2012, three times larger than in 1989 at only 5 percent. Similar to China and India, the export share of Indonesia's palm oil to countries grouped to the Association of Southeast Asian Nations (ASEAN) has increased to 14 percent in 2012. Contrary to Malaysia, the export share of Malaysia´s palm oil to ASEAN market decreased from 25 percent in 1989 to 11 percent in 2012.

The change of the palm oil export proportion is influenced in part by the establishment of trade agreements among countries. Indonesia and Malaysia are involved in similar free trade agreements, which are part of the ASEAN Free Trade Area (AFTA) Agreement. During the period between 2000 and 2012, there has been an expansion of partnership with ASEAN; newly added countries are: China (2005), Korea (2007), Japan (2008), India (2010) and Australia/New Zealand (2010).

As two of the largest producers, joining the AFTA become an opportunity for Indonesia and Malaysia to promote trade because of the reduction in trade barriers. Although Indonesia and Malaysia produce similar products, involvement in the RTA will give different results in the flow of goods. Based on the description above, the research question of this study is:

What is the impact of the establishment of RTA on the Indonesian and Malaysian palm oil trade flows, respectively?

According to the research question above, the purpose of this research is to analyze the impact of the establishment of regional trade agreements on Indonesia and Malaysia's palm oil trade flows.

The study is organized as a follow: Section 2 contains the previous study on the impact of FTAs, the empirical studies of gravity estimation, and the previous research concerning the international palm oil trade. Section 3 describe the theory related to the international trade, the gravity model, and the trade cost. Section 4 cover the explanation of methodology in this study . Section 5 is the overview of palm oil and free trade agreements in southeast Asia region. Section 6 present the result and discussion. Section 7 is the conclusion and policy recommendations.

2. Literature Review

This chapter contains an overview regarding empirical studies which relate to the economic impact of trade agreements, this chapter also looks at previous studies pertaining to the use of the gravity model on international trade, particularly to examine the *ex-post* effect of the formation of trade agreements. Furthermore, this chapter also describes the international trade of palm oil in Indonesia and Malaysia.

2.1. Empirical Studies on Free Trade Agreement Impact

Following the recent proliferation of trade agreements, bothbilateral and multilateral, researchers have dedicated efforts to examining the welfare effect of trade agreements. From this increase in interest regarding trade agreements, the question of trade enhancements or the potential generation of threats has arisen. Viner introduced the terms trade creation and trade diversion in1950; trade creation refers to a shift of product origin from expensive domestic producers to more efficient producers which are a member of trade agreement. Trade diversion occurs when a member country transfers its imported goods from a country that is outside of the trade agreement to a member country within the trade region (Feenstra& Taylor, 2008). Trade creation is associated with welfare improvement and trade diversion is welfare reduction. This two concepts serve as the basis for the majority of studies of regionalism and contributes to extensive theoretical literature (Magee, 2004).

Research conducted by Aitken (1973) relating to the Regional Trade Agreements used gravity models to look at the differences between European Economic Community (EEC) and the European Free Trade Association (EFTA) to shows that trade creation had occurred between member. Grinols (1984) analyzed the impact that joining the EEC had Britain in 1973. The results indicate that membership in the EEC caused a 2% decline in the Britain`s GDP from 1973 through 1980 (Feenstra, 2007).

Due to the increasing number of trade agreements established in various regions of the world, the research regarding the impact of trade agreements (both multilateral and bilateral) increased and was applied for various type of commodities. Krueger (1999) examined the impact of the regional trade agreement called the North American Free Trade Agreement (NAFTA), which includes the United States, Canada, and Mexico. Her research found that NAFTA had a weak impact during its first three years of existence. The gravity estimation using three-digit Standard International Trade Classification (SITC) levels show that the total world import originating from NAFTA decreased while trade within NAFTA increased. Subsequent research concluded that NAFTA displayed characteristics of trade creating rather than of trade diverting (Krueger, 2000). Jayasinghe and Sarker (2008) estimated the trade creation and trade diversion effects on NAFTA by using disaggrerated trade data from six agrifood commodities consisting of red meat, vegetables, grains, sugar, fruits, and oilseeds within the period from 1985 to 2000. Their results show that there has been a significant increase in trade between NAFTA members.

Korinek and Melatos (2009) conducted the research on the effect of the ASEAN Free Trade Agreement (AFTA), the Common Market for Eastern and Southern Africa (COMESA), and the Southern Cone Common Market (MERCOSUR) in the aggregate agricultural sector. Their results from the gravity model indicate trade creation for member of these agreements, and also displayed no strong proof of trade diversion for countries outside the agreement. Upon the comparison of the result, it can be seen that the the effect on MERCOSUR is larger than the effect on both AFTA and COMESA.

Research performed by Gilbert, et al.(2001) focused on the regional trade in Southeast Asia. Their research on the agriculture, manufacturing, and service sectors shows a positive effect for trade within the agriculture and manufacturing sector. More specific, they conclude that the ASEAN Free Trade Agreement (AFTA) only been boosted the trade in manufacturing through year, while the impact on agriculture declined after 1992. The effect of the AFTA partnership was examined by Yang and Martinez-Zarzoso (2013), through their research on the effect of the ASEAN-China Free Trade Area (ACFTA). The research was conducted with the use of a panel data set from 31 countries from 1995 to 2010. Their research found that the ACFTA has a different impact for each product; there was a significant effect of trade creation applied to manufactured goods and chemical products, while for agricultural raw material, machinery goods and transport equipment, the estimation report insignificant result. Overall, the ACFTA had a positive result on trade among its members and even on countries outside the ACFTA.

Rose (2004) used panel data from 175 countries of the WTO over a50 year time span (year to year) to determine the implications for a country that is joining a multilateral trade agreement. He concludes that the membership in the WTO has no significant effect on trade. Two possible reason that exist for there being little effect to the member when joining the WTO : First, the WTO cannot force most countries to lower trade barriers, especially for developing countries and second, the WTO membership has little effect on trade policy. Another study was conducted by DeRosa (2007), where he applied the gravity model on a panel data set with annual data from 1970 to 1999 covering 156 countries and 46 preferential trade agreements. The research was conducted on manufacture products and the econometric estimation shows that major preferential trade agreements tend to create trade rather than divert trade. This effect also applied to the non -member countries.

Concerning agricultural commodities, Lambert and McKoy (2009) performed the research on the agricultural and food product on various FTAs. Their research covering three periods of data series, 1995, 2000 and 2004. Their results from the gravity model estimation indicates that FTA generally increases trade in agriculture and trade sector. However, the trade diversion occurred for the members of Caribbean Community and Common Market, the Central American Common Market, and COMESA.

Philippidis et al. (2013) examine the bilateral trade flow on 20 single agricultural commodities between period 2001 to 2004 within 95 country by using gravity model with Poisson Pseudo Maximum Likelihood (PPML) estimation. Their research result shows the various impact of the FTAs for different single commodities, the FTAs has significant impact to trade on wheat and other cereal gains; and paddy rice.

2.2.The Gravity Model for International Trade

The gravity model is one of the most established model for empirical studies in international trade. Over the last decades, the gravity model has successfully explain the determinant of bilateral trade. Moreover the model has been used to asses capital flow, trade resistance, and the impact of regional trade agreements on bilateral trade. The gravity model for international trade derived from the classical gravity model of Newton.

The Gravity model began to be used as a tool to analyze social and economic interaction after the research conducted by Ravenstein in the 19th century. Ravenstein (1885) explains that migration of population is influenced by the "absorption of centers of commerce and industry, but grow less with the distance proportionately". The empirical application of Newton´s gravity model on international trade was introduced by Tinbergen(1962) in "Shaping the World Economy". According to this model, trade between countries is explained by economic sizes, populations, direct geographical distances and a set of dummy variables. Tinbergen concluded that a country´s income and distance have a statistically significant affect on trade between countries.

Gross Domestic Product (GDP) as a measurement for economic country size is an important variable which helps to construct the gravity equation. GDP indicates the market size in both countries, as a quantifier of 'economic mass'. The market size of the importing country represents the potential demand for bilateral imports, while the GDP in the exporting country shows the potential supply and variety of products. Helpman (1987) performed research that stresses the effect of varied country size. His research applied to OECD countries and he concluded that when a country is more similar in size, trade opportunities are expanded. Hummels and Levinsohn (1995) further develop Helpman`s work by including non-OECD member as a means of comparison. Debaere (2002) uses several different methods to determine the share of a country´s GDP, rather than using the nominal GDP, Debaere made theGDP conversions by using nominal exchange rates, as well as Purchasing Power Parity (PPP) exchange rate. Furthermore the research also uses the populations of the countries as an instrumental variable for GDP.

Bilateral distance helps to determine the trade relation between countries, the closer two countries are, the greater the amount of trade they will have (Feenstra & Taylor, 2008). According to (Head, 2003), there are several explanations for why distance variable is so important. First, distance represents transportation cost. Hummels (1999)has declared that the cost of shipping helps to explain the importance of distance. The second explanation looks at the length of time during shipment which can have a significant effect on the final product. When looking at perishable goods, for example, the probability of damage or spoil is higher when the time is longer. Distance also influences synchronization costs, communication costs, transaction costs, and cultural gaps between countries (Head, 2003). According to Hirsch and Hashai (2000), distance can be divided into economic and geographical distance. The first refers to the differences in absolute income per capita between trading countries, the second is concerned with kilometers or miles between destinations.

Disdier and Head (2008) estimated the effect of distance through the use of the gravity equation with data comprised of 595 regressions between 1928 to 1995, from 35 separated studies. The result shows that if distance is doubled, then trade will decrease by one half. The effect of distance on regional trade was demonstrated by Martinez-Zarzoso and Lehmann D (2004). They conduct a study focused on MERCOSUR and EU trade. The result shows that for some industries, geographical distance has a high significant effect, this is also true in relation to the economic distance.

Particularly, the gravity model has been augmented by the addition of several critical variables by several author. Common variables which might influence the bilateral trade are commonborders, common language, colonial links and the presence of landlocked countries. Regarding to the policy impact, the gravity model is widely used to estimate the influence of monetary unions and regional trade agreements.

2.3.Empirical Study on International Palm Oil Trade

Extensive research has been conducted to examine the determining factor of palm oil trade in the international market. Suryana (1986), Tondok (1998), Ibrahim (1999), and Basiron (2001) analyzed the outlook of palm oil in the international market for Indonesia and Malaysia. Shamsuddin et al. (1997) examined the determinant and implication of policy instruments on the Indonesian and Malaysian palm oil. Lubis (1994), Shamsuddin et al. (1994), and Susila (1995) who examined Malaysia´s palm oil supply and demand system.

Yulismi and Siregar (2007) calculate the elasticity of price and income for Indonesian and Malaysian palm oil export. The research using annual data from between year 1990 to 2004 analyzed through demand model. The result shows that the price and income elasticity of Indonesian palm oil export are inelastic in India and elasticin China´s market. For the Malaysian palm oil, the price and income are elastic in India and China, while in the EU market the price is elastic.

The impact of the Free Trade Agreements (FTA) proliferation to acountry´s overall trade especially palm oil was describe by Ernawatiet al.(2006). The export of Indonesianpalm oil was analyzed by using an Error Correction Model (ECM), along with having China, India, Europe, and rest of the world (ROW) as partner country. The simulation shows that a reduction of tariff in export and import has varying impacts on partner country. The palm oil demand isinfluenced by price, as is the price of substituted commodities such as rapeseed oil and soybean oil; exchange rate and lag export, are also shown to be influenced in the simulation.

Rifin(2010), performed a study comparing the market share of Indonesian and Malaysian palm oil in Asia, Europe, and throughout Africa. The commodities were differentiated into crude and refined palm oil. The market share was analyzed by constant market share analysis (CMSA). The results show that Indonesia´s market share increased during the period between 1999 and 2001 as well as between 2005 to 2007 for both products in Asia and Africa region. Indonesia has a higher level of competitiveness due to seeing an increase in market share in two regions instead of one, as was the case in Malaysia. Malaysia´s palm oil market share increased only in the Europe region.

Furthermore, another study concerning the impact of FTAs was conducted by (Balu & Ismail, 2011). According to their descriptive research, for Malaysia´s palm oil industry, the FTAs was a good opportunity because it helped to increase market share and tariff reduction lead to a higher profit. The competitiveness of traded goods will likelyenhance due to liberalization of tariffs.

3.Theoretical Framework

This chapter contains an overview about the theories which support this study. The first part is about the theory of international trade, the second part states the definition of the Free Trade Agreements (FTAs) and its static and dynamic impact. The third section explains about the theory development of the gravity model, and the final part gives an overview of trade costs

3.1.International Trade Theory

International trade is a part of international economics which refers to “the exchange of goods and services among the countries of the world” (Reinert, 2012) The theory of international trade was first developed by British economist, Adam Smith. Adam Smith (1776) stated that trade among nations is influenced by its absolute advantages (Reinert,2012). Whena country has the best technology and specialization in production of one good it has an absolute advantage. The country that has an absolute advantage will gain from export (Feenstra and Taylor, 2008).

David Ricardo (1821) developed the theory of comparative advantage. This theory state that even if a country has no absolute advantage in producing two types of goods than any other country, the beneficial trade can occur as long as the ratio of prices between countries are different than in an autarky (no trade) situation. As stated by Krugman, et al. (2012) “A country has a comparative advantage in producing a good if the opportunity cost of producing that good in terms of other goods is lower in that country than it is in other countries” (p. 56). The classical trade theory was developed to measure the economic efficiency of resource distribution in the production of goods.

The development of trade patterns proposed by Eli Heckscher (1919) and Bertil Ohlin (1924) explained that comparative advantage arises from differences in a country´s endowment factor. The Heckscher Ohlin (HO) theory is also called the factor-proportion theory because itstresses the interaction between the different proportions of the country’s production factors, as well as the differences in the usage of these factors on producing a wide range of items (Krugman,et al., 2012). The assumption of this theory is that the technologies are the same across both trading countries. The HO model predicts that a country tends to export the good which uses its abundant factor intensively (Feenstra &Taylor, 2008).

The modification of assumptions on the HO and Ricardian models result in a new trade theory. For this modification, the assumption of homogenous goods changes into differentiated goods. The market structure in this new trade theory is different than with perfect competition. The concept of monopolistic competition was introduced by Krugman (1980), and states that the two main assumption are differentiated goods and increasing returns to scale. By creating various types of products, firms are able to control the product´s price, the firm also acts as a price taker. In monopolistic competition, a firm cannot set prices as high as in a complete monopoly. The second point of interest is economies of scale. By increasing production, the average cost will be reduced, so the firm will sell more not only in the domestic market, but also in the foreign market. Increasing returns to scale is one of the primary reasons for doing international trade when the trading countries have similar technologies and resources (Feenstra & Taylor, 2008). The monopolistic competition model is able to explain current trade patterns such as intra industry trade, the gravity equation, and the impact of regional trade agreements.

The development of the new trade theory by Melitz (2003) and Bernard et al. (2003) focused on the presence and behavior of heterogeneous firms in the international market. The heterogeneity of the firms appears due to not all of the firms being involved in export activities, only several firms are actively exporting. Moreover, not all firms export goods to all countries due to the higher costs involved with theinternational market than with the domestic market. Hence, only firms which have high productivity are able to cover all costs and export their products. Therefore, the bilateral trade flow may contain many zero values. The presence of zero trade has an important implication on the gravity model.

3.2.Impact of Free Trade Agreement

3.2.1.Static Impact

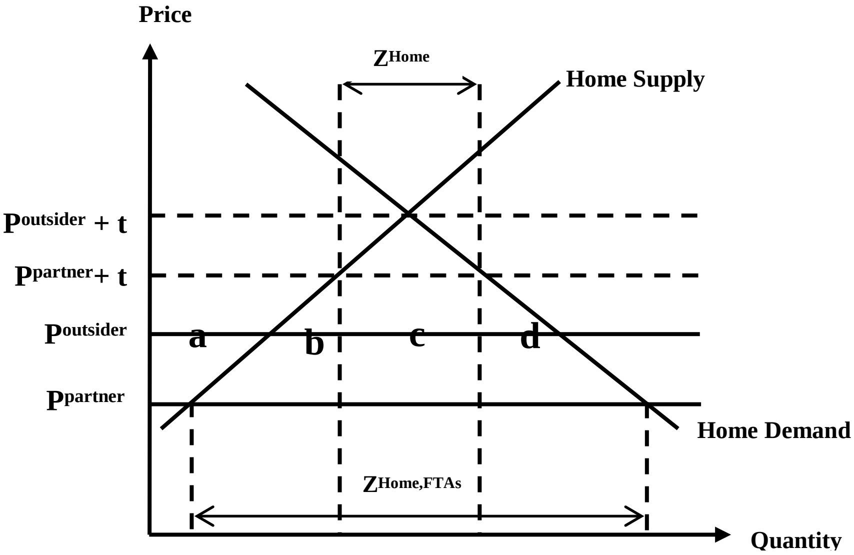
As mentioned in chapter 2, the impact of trade agreements was first introduced by Viner (1950). Viner's model is important because it refuses the conventional wisdom of Free Trade Agreementsthat they tend to improve welfare because they include some degree of trade liberalization. Viner's model shows that a regional trading agreement could have a negative impact on welfare. His model remains important as part of theanalytical framework because it lays out several conditions that determine whether an FTAs will be beneficial or harmful. The main concepts in his model are trade creation and trade diversion (Plummer, et al., 2010). Both of which counted as the static impact of trade agreement.

The term trade creation indicates the benefit of a country by joining an FTAs. Countries begin to trade with one another, whereas they previously produce all goods internally at a high cost. The definition of trade creation is the converting of imports from a high cost producer to a low cost producer. Contrary to trade creation, trade diversion represents the negative efficiency effect of FTAs, when a country begins to trade, a country which had previously been importing good from a non member with lower production costs must begin importing from a member country with higher production costs due to the establishment of trade agreement (Feenstra & Taylor, 2008; Reinert, 2012). An illustration of trade creation and trade diversion can be seen in Figure 3.1.

Figure 3.1 displays the demand and supply of a certain good in the domestic market, which is referred to as the "home" country, other FTAs-member countries are referred to as "partner" countries, and non-member countries as "outsider." The assumption for home is a small economy, so that it is unable to influence international prices; also, the import price is constant. Previously, the price in the partner country is cheaper than in the outsider country. Before FTAs, Home has aset tariff (t) for unit good imported from both partner and outsider. Due to $P^{partner} + t < P^{outsider} + t$, Home imports the goods from partnerand the import quantity at the beginning is Z^{Home}. After Home joins the free trade agreement with Partner, the tariff is eliminated from Partner. Due to $P^{partner} <$

$P^{outsider}$+ t, Home continuously imports the good from Partner, the quantity is then expanded from Z^{Home} to $Z^{Home,FTAs}$, and the price falls from $P^{partner}$ + t to $P^{partner}$.

Figure 3.1: Trade Creation Effect



source : Reinert (2012), author´s modification

As an implication of the agreement with Partner, the consumer surplus in the home country increases by a + b + c + d.The producer surplus decreases by a and the government revenue from tariffs is then reduced by c. The net increase as a result of trade creation is b + d. To summarize:

Consumer surplus	: a + b + c + d
Producer surplus	: -a
Government revenue	: -c
Net welfare	: b + d

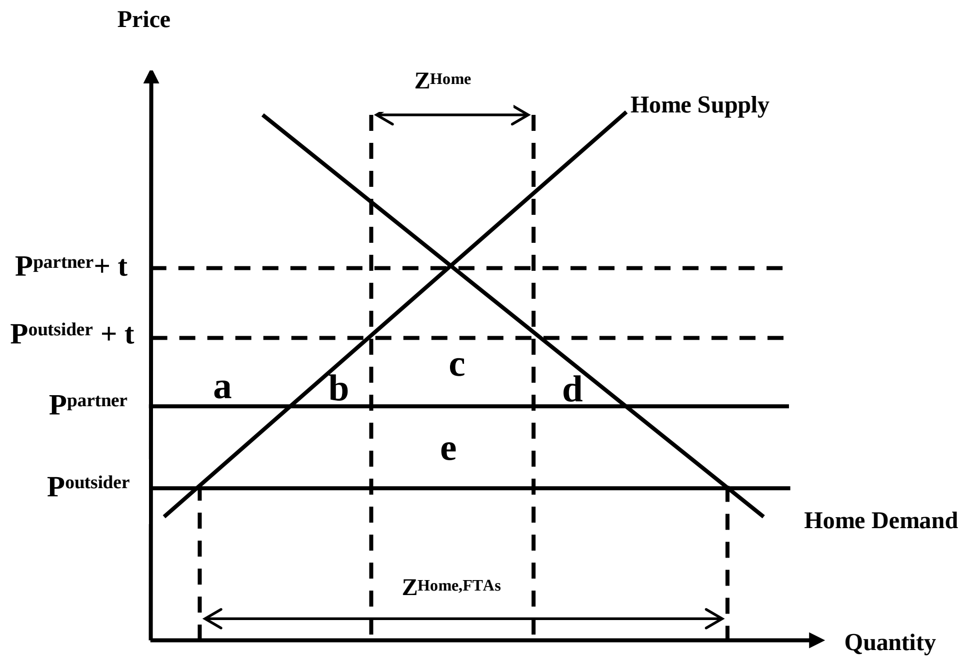
The change of import which originated with a high cost producer (Home) and was transferred to a low cost producer (Partner) in a trade-creating FTA generates the increasing net welfare in Home. In contrast to Figure 3.1, Figure 3.2 illustrates the impact of a trade diverting FTAs.Outsider is now considered to be lowest cost producer, rather than Partner. Then, $P^{outsider} < P^{partner}$ .Due to $P^{outsider} + t < P^{partner} + t$, priorto the FTAs, Home imports the good from Outsiderand the beginning import level is Z^{Home}. When Home joinsthe FTAs withPartner, however, $P^{partner}<$

$P^{outsider}$ + t, so Home will still transfer its import to the partner country. Import quantity will expand to $Z^{Home,FTAs}$as the domestic price falls from $P^{outsider}$ + t to $P^{partner}$.

As a consequence of a FTA with Partner, Home´s consumer surplus increases by a + b + c + d, the producer surplus is reduced by aand the government revenue decreases by c + e. Therefore, the net increase in welfare is b + d – e. To summarize :

Consumer surplus : a + b + c + d
Producer surplus : -a
Government revenue : -c + e
Net welfare : b + d – e

Figure 3.2: Trade Diversion Effect



source : Reinert(2012), author´s modification

The net welfare effect is depends on the relative size of b + d + (-e). The area b + drepresents trade creating, i.e., the change of import from the higher cost of Home to the lower cost producer of Partner. However, area e denotes the trade diverting effect of changing imports from the lower cost producer (Outsider) to the higher cost producer (Partner). If the trade diverting effect is larger than the trade creating effect (e > b + d), then the FTA reduces welfare in Home (Reinert, 2012).

3.2.2.Dynamic Impact

As has prevously been mentioned, in assessing the impact of FTAs, the majority of researchers have focused only on the static (one-time) changes while ignoring the dynamic (medium and long-term) outcomes of FTAs. The dynamic effects of an FTA are important to analysed because the dynamic effect is more substantial and pervasive (Plummer, et al., 2010); it is necessary to consider what the FTAs are and how they affect the country's development. Some of the important dynamic effects in FTAs to consider are: economies of scale and variety, technology transfer and foreign direct investments (FDI), structural policy change and reforms, as well as competitiveness and long run growth effects. These effects will be discussed in more detail in the following segments.

a. Economies of scale and variety

Economies of scale are described as the reduction in average costs due to an expansion in output. It will occur due to an improvement in technical efficiency in large-scale production, a higher ability to distribute administrative costs and reduceoverhead costover a larger operation, dealer´s bulk discounts or better logistic systems as the production volume increases. Economies of scale occurs in the production of some agricultural, natural resource intensive, manufacturing, and service sectors. Due to the establishment of FTAs, the larger market that is created allows firms to take advantage of a larger customer base in domestic and foreign markets. Firms will produce at a lower average cost andare thus able to set lower prices for existing customers, this is called the "cost reduction effect" (Plummer et al., 2010). As a consequence of low costs, the firm has a higher competitiveness in both home and foreign markets. Customers in each country will also enjoy a greater variety of goodsbecause the firms in each country will have access to a wider array of goods.

b. Impacts on foreign direct investment

The establishment of FTAs, both bilateral and regional create a more integrated marketplace and a larger risk sharing investment flow. Another benefit for multinational corporations is that they can enjoy a regional division of labour with lower transaction costs, further developing economies of scale. Due to these effects, many multinational corporations are interested in investing more into FTA members due to the dynamic of having a larger economy; this is called "investment creation." An FTA may encourage more FDI flows into the region by working with other multinational countries located outside the region. This is another reason that FTAs may also encourage intra-bloc investments by working with multinational companies of a specific regional origin.

However, if the multinational company chooses to invest in the member country not because of an increase in dynamism but because it will now have preferential access to the FTA market, then it is called an "investment diversion." Although investing in an outsider country might have higher costs, the multinational company diverts investments to the FTA because of the regional agreement.

c. Structural Policy Change and Reform

Several policiy changes have occurred as a result of the establishments of FTAs.Changes relate to some of the following aspects : quality standards, corporate and public governance laws, customs procedures; the national treatment of partner-country investors, competition policy, the reform of state-owned enterprises, and other "sensitive sectors" which have an important influence on the economy. The inclusion of these areas in FTAs shows the extent to which FTA are shaping and harmonizing themember country´s policies. Generally, member country will respond to joining an FTA by improving the business environment through cost reduction, extending the opportunity to join the FTA to foreign investors, and by pushing policy reforms to encompass best practices (Plummer et al., 2010).

d. Competitiveness and Long-Run Growth Effects

Although FTA members face lower trade barriers, there is still some level of competition surrounding this issue. Firm which has a lower level of productivity will be eliminated from the competition. The more productive firm will improve their structural efficiency, as well as their allocation of resources. The competitive market will give firms a greater incentive to invest in more efficient productive processes and technology. The combination of effects of increased competition on productivity and efficiency will lead to long run growth prospects among member countries. (Plummer et al., 2010).

3.3.Theoretical Gravity Model

The basic foundation of the gravity model in international trade is the classical gravity model introduced by Newton. Newton (1686) states that the gravitational attraction between two objects is a function of the mass of each object and inversely relates to the distance's square, resulting in the following formula:

(3.1) $F = G\frac{m_1 m_2}{r^2}$

Where F denotes the force between two masses, m_1 refers to the mass of the first object, m_2 represents the mass of the second object, r shows the distance between two objects, and G is the gravitational constants. If the formula isapplied to international trade, F denotes the flow of trade between country i and country j, G is constant, m_1 and m_2 refer to the a economic size of country i and j, and r represents the distance or trade cost between country i and j. The initial gravity model can expressed as :

(3.2)$X_{ij} = \beta_0 (Y_i)^{\beta_1} (Y_j)^{\beta} (D_{ij})^{\beta_3} \mu_{ij}$

where X_{ij} is the value of bilateral trade (export or import) in current US dollars, Y_i and Y_j represent exporter and importer´s economic size, D_{ij} is the distance between the two countries, μ_{ij} is the disturbance term, and the βs are the unknown parameters of the equation.

The initial development of the gravity model has presented a degree of problems because the formula is based more on physics than on economic analysis. The gravity equation was not very well appreciated in the decade between1970 and 1980, due to lacking a strong theoretical foundation in economics. According to Deardorff (1984), thegravity equation has a “theoretical heritage” which is dubious. In his subsequent research, Deardorff (1998) noted that gravity model can be rationalized with many existing trade theory such as the Ricardian and the HO models, as well as with monopolistic competition.

Anderson (1979) was the first who established a microeconomic foundation for the gravity model. In Anderson´s theory the goods are differentiated by their origin. However, Anderson´s model was not really recognized by trade economists (Head&Mayer, 2013). The next theoretical foundation of the gravity equation set by Bergstrand (1985, 1989) who developed a connection between endowment factors and the bilateral trade model.Bergstrand (1989) shows that the gravity model is a practical example of the monopolistic competition theory as developed by Krugman in 1980.

The renowned work of Anderson and Van Wincoop (2003) “gravity with gravitas” has successfully laid the theoretical foundation of the gravity equation and has been completed by many other researchers.Principally, the Anderson and Van Wincoop (AVW) gravity model originated from a demand function. The structure of the model was based on the final formula of the constant elasticity of substitution equation for consumer preferences. Consumers have “love of variety”, by consuming a greater variety of goods, the overall utility increases. The second assumption of the AVW gravity model follows Krugman´s (1980) production function; under the condition of increasing returns to scale, each firm produces one particular product. The large number of firms diminish the competition, the price is constant and can cover firm the firm´s marginal costs and fixed costs. In international trade, trade cost´s regularly occurand become somewhat of a barrier.

The AVW model shows the importance of controlling relative trade costs. Their results indicate that bilateral trade is influenced by relative trade cost. Country j imports from country i and must pay a price which is influenced by the weighted average trade cost being paid to all other trading partners. The derivation of the AVW model can be seen in the appendix. The cross sectional gravity equation by AVW is summarized below :

$$(3.3) X_{ij} = \frac{Y_i Y_j}{Y} \left(\frac{\tau_{ij}}{\Pi_i P_j} \right)^{1-\sigma}$$

Taking the logarithm on both sides:

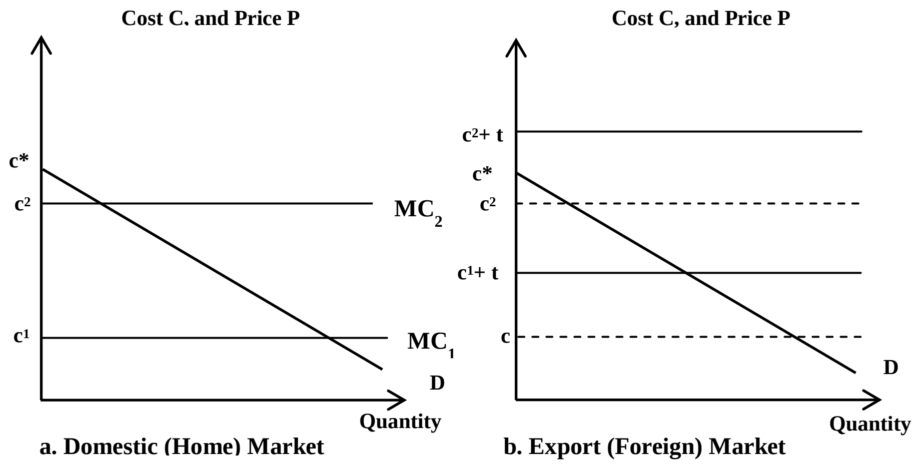
$$(3.4) \ln X_{ij} = \ln Y_i + \ln Y_j - \ln Y + (1-\sigma) \ln \left(\frac{\tau_{ij}}{\Pi_i P_j} \right)$$

where X_{ij} is the trade value from country i to j, and Y represents the world GDP. Y_i is the GDP of country i, Y_j is the GDP of country j, σ_k denotes the elasticity of substitution and τ_{ij}^k represents trade costs. Two important features of the AVW model is the two additional variables, Π_i^k and P_i^k. Π_i^k is called the outward multilateral resistance, and P_i^k is called the inward multilateral resistance. The outward multilateral resistance denotes the exports from country i to country j depending on trade costs across all possible export markets. The inward multilateral resistance denotes the imports into country i from country j depending on trade costs across all possible suppliers (Shepherd, 2013). Generally, these figures are low if a country is isolated from world market (Bacchetta, 2012). Inward multilateral resistance is also called the price indexand outward multilateral resistance is called competition (Fally, 2012).

3.4.Trade Cost

Trade costsare animportant feature thatdetermines many other elements of international trade. On the firm level, the term `trade cost´ is used to explain why the firms pay great attention to their costumer´s location and why some firms decide not to reach out to buyers in other countries. Trade costs become an important consideration in a firm´s decision to export because they are a major factor in diminishing export profits. (Krugmanetal., 2012). A graphical illustration of trade costs at the firm level can be seen in Figure 3.3 below.

Figure 3.3: Firm´s Decision to Export based on Trade Costs



source : Krugman,et al. (2012)

It is assumed that the firm must set an extra cost (t) for every unit of output which it sells tothe buyer through the country´s border. The firm´s behavior in the domestic and export markets are analysed separately. Accordingly, the firm will set a different price for the domestic and export markets, this will lead to the difference in profit due to the quantities sold in each market. Taking into consideration that the firm´s marginal cost is constant, the firm´s decision to sell in domestic market will have no effect on the export market in terms of pricing and quantity sold.

There are two assumption that need to be considered for explain trade cost: First, there are twofirms that both exist in the home country, and second, both countries are identical in consumer preference and technologies. Both firms face a similar demand curve in the foreign country as well as in the home country. The marginal cost in the foreign country is higher than in the home country, the line shifts upward from c1 to $c^1 + t$ for Firm 1 . For Firm 2, the cost shifts upward from c^2 to $c^2 + t$. In accordance with a previous explanation, the higher the marginal cost, the more a firms is encourage to raise its price, further reducing the quantity sold, and thus lowering profits. If the marginal cost is higher than c*, the firm cannot operate effectively in that market due to a loss in profitability. Figure 3.1 shows that firms 2 is able to operate effectively only in the domestic market, because its costs are below c* (c^2), but in the export market, the cost is higher than c* ($c^2 + t > c^*$). Contrary to Firm 2, Firm 1 is able to operate effectively in both the domestic and export markets because its cost is lower than c* ($c^1 + t < c^*$). The extended explanation is applied to all firms based on their marginal cost c^i. The firms with the marginal cost lower than c* ($c^i \leq c^* - t$) will export, the higher cost firms with $c^* - t < c^i \leq c^*$ will still operate in the domestic market but will doing export, the firms which have highest cost with ci >c* are not able to operate in either market and will eventually quit (Krugman, et al., 2012).

The presence of trade costs in the gravity equation are modelled as “iceberg cost”. This term is used to explain that not all of goods that are shipped will arrive at the destination. The goods that do not arrive at the destination are considered to have been lost (or melted) in transit. Definitely, if the CIF value is used to measure imports, trade flows are reduced by transport costs(Bacchetta, 2012). Following the Anderson & Van Wincoop (2003) model,Shepherd (2013) has derived the trade cost equation from the firm`s marginal cost equation :

(3.5)$p_i^k(v) = \left(\frac{\sigma_k}{\sigma_k - 1}\right) w a_i^k$

wherea_i^k shows the variable cost, w represents the wage rate, i represents country, and k denotes the firm´s sector. The terms in brackets are a constant markup within the sector, because the numerator must be larger than the denominator. Thus, there will be a positive wedge between the price at the firm´s factory gate and its marginal cost. Since the wedge is influenced by the sectoral elasticity of substitution, it remains constant for all firms within the sector.

This is true when a firm ships goods from country i to country j, it must send $\tau_{ij}^k \geq 1$ units in order for a single unit to arrive. The difference is seen as “melting”(like an iceberg) towards the destination. At the same time the marginal cost of producing oneunit of a good in country i that is subsequently consumed in country i is $w a_i^k$, but if the same product were to be consumed in country j then the marginal cost is instead$\tau_{ij}^{k} w a_{i}^{k}$. Hence, costless trade gives$\tau_{ij}^{k} = 1$, and τ_{ij}^{k} corresponds to one plus the ad valorem tariff rate. Since the size of the trade friction associated with a given iceberg coefficient does not depend on the quantity of goods shipped, the iceberg costs are treated as variable (not fixed) costs.

Using two countries i and j, the incidence of iceberg trade costs occurring means that the price of goods in country j that are produced in country i is determined as follows :

(3.6)$p_{j}^{k}(v) = \left(\frac{\sigma_k}{\sigma_k - 1}\right) \tau_{ij}^{k} w a_{i}^{k} = \tau_{ij}^{k} p_{i}^{k}(v)$

In a more general form, a country´s price indexit can be written as follows:

(3.7)$p_{j}^{k} = \left\{ \int_{v \in V_{j}^{k}} [\tau_{ij}^{k} p_{i}^{k}(v)]^{1-\sigma_k} \, dv \right\}^{\frac{1}{1-\sigma_k}}$

In the above equation, the index includes varieties in goods that are produced and consumed in the same country: eachτ_{ij}^{k}terms is set to a point of unity, that can indicate the absence of internal trade barriers.

4.Research Methodology

This chapter gives a brief description of the material concerningthe methodological aspect of this research. First, the description regarding data types and sources used in this study is given. Second, the estimation technique of the gravity model is discussed and finally is the explanation of the modelling for the palm oil trade. The goal in this chapter is to utilize the gravity trade model for analyzingthe impact of regional trade agreements to the international palm oil trade flows.

4.1.Data Types and Sources

This study uses secondary data available from various sources. The bilateral trade of palmoil annual data from the period between 1991 and 2011 has been generated from the United Nations Commodity Trade Statistic Database (UN COMTRADE) and further incorporated with the World Integrated Trade Solution (WITS) software. The data consists of a nominal value of bilateral trade from Indonesia and Malaysia to 77 partner countries that have conduct trade more than ten times within the 21 year period. The total palm oil and its fraction which has Harmonized System (HS) code:1511, divided into crude palm oil(HS code:151110) and refined palm oil but no chemically modified (HS code:151190). The geographical distance between countries was obtained from the *Centre d'Etudes Prospectives et d'Informations Internationales* (CEPII), the importer´sGDP andthe exchange rate of Purchasing Power Parity (PPP) data came from the World Bank, along with FTA information from the Asia Regional Integration Centre (ARIC). The value of palm oil production is generated from the FAO.

4.2.The Gravity Estimation Analysis

The gravity model estimation is utilized to analyse the research question of whether the regional trade agreement influences trade flow or not. The software used for the data processing in this study is STATA 12.

4.2.1.Ordinary Least Squares: Fixed Effect Estimation

Ordinary Least Squares (OLS) estimation has been widely used to estimate the gravity equation. The basic form of the multiplicative gravity model is as following:

(4.1) $Y_{ij} = \beta_0 (GDP_i)^{\beta_1} (GDP_j)^{\beta_2} (D_{ij})^{\beta_3} e^{\beta_4 FTA_{ij}} \varepsilon_{ij}$

Taking the natural logarithm, the baseline a log linear gravity model is as follows:

(4.2) $\ln Y_{ij} = \beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln D_{ij} + \beta_4 FTA_{ij} + \varepsilon_{ij}$

whereY_{ij} denotes the export value from country i to j, subscript i refers to the exporter, while subscript j refers to the importer, D denotes the distance between countries and FTA is a binary variable assuming a value of 1 if i and j has a free trade agreement and 0 otherwise, ε_{ij} is the error term.

The objective of OLS is to obtain the value of β by minimizing the sum of square errors(Gujarati, 2011) The OLS estimation has to fulfill the following criteria to become the best and efficient estimator:

a. The error term (ε_{ij}) must follow a normal distribution with zero mean and must also be uncorrelated to the explanatory variable
b. The variance of the error term must remain constant (homoskedastic)
c. There must be no perfect linear relationships among explanatory variable (no multicolinearity assumption)

If all three properties are fulfilled, then the OLS estimator is consistent, unbiased, and efficient. A consistent estimator means that the OLS coefficient estimation converges to population value when the sample size increases, unbiased means that the estimators are equal to their true values, and efficient means that there is no other estimation than OLS which has a minimum variance of standard error.

Furthermore, the use of panel data and panel econometrics in the gravity model show an increasing trend. According to Baltagi(2009), panel data can control individual heterogeneity, give more informative data, give a stronger degree of freedom and efficiency, and is less likely to have problems with autocorrelation and multicolinearity than time series data. Panel data also deals with time invariant omitted variable.

There are two estimation techniques for panel data, the fixed effect (FE) and random effect technique. The fixed effect model assumes that individual heterogeneity is captured by the intercept term which means that every individual has his own intercept β_0 while the coefficients along the slope remain the same. The fixed effect is also known as the Least Square Dummy Variable due to the use of a dummy variable (Gujarati, 2011). The fixed effects model has been used in the majority of gravity estimation studies over the last decade and tends to provide better results (Kepaptsoglou, et al.,2010).

Concerning the unobservable multilateral resistance terms (MRTs), the fixed effect technique can be used to control these MRTs[1]. Anderson and Van Wincoop (2003) emphasized that the MRTs should be taken into account in order to avoid a biased estimation of the model parameter. Fixed effect is applied by put the dummy of country specific and country pair into the estimation. Country specific dummy variables are used to capture all of the time invariant individual effects of exporters and importers that are excluded from the model specification such as preferences, institutional differences, etc. Country pair dummies are used to address the bias due to the correlation between the bilateral trade barriers and the multilateral resistance. Furthermore, the time dummy variable will take into account to control for macroeconomic effects such as the global economic recession. The equation considering individual country specific effects, country pair effects and time effects is specified as:

(4.3)

$$\ln Y_{ijt} = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln D_{ij} + \beta_4 FTA_{ij} + \pi_{ij} + \delta_i + \varphi_j + \gamma_t + \varepsilon_{ijt}$$

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1. F
From Martinez-Zarzoso (01/13/2014), lecture slides on Empirical Trade Issues, University of Goettingen p. 10

Where Y_{ijt} denotes export value from country i to j at time t, δ_i stands for the fixed effect of country i (exporter fixed effects), φ_j represents the fixed effect of country j (importer fixed effects), π_{ij} denotes country pair fixed effects, and γ_t refers to the time effect.

According to Baier and Bergstrand (2007), one important econometric issue that arises when estimating the impact of FTAs is endogeneity. The problem arises due to the correlation between FTAs terms with the error term (ε_{ijt}). Many researchers wrongly assume that the FTAs is an exogenous random variable (Yang & Martinez-Zarzoso, 2013), for example, a country decision to join a trade agreement is not related to unobservable factors. Following the hypotheses of "natural trading partner" as proposed by Krugman (1991), the countries prefer to have trade agreements with partners who already have high value trade. Baier and Bergstrand (2007) also noticed that the FTA is not the only cause of bilateral trade, but other unobserved factor such as non-tariff barriers, democratic relationship, infrastructureand institutional characteristics also play a role. The research by Baier and Bergstrand (2009) verified that a country´s decision to join an FTAs depends largely on their economic size and the difference in factor endowments.

The endogeneity problem can be solved in several ways. Baier and Bergstrand (2007)argue that instrumental variable can be applied to solve the endogeneity, but it is not easy to find appropriate variables for FTA. They suggest using country-and-time effects and country pair fixed effects. Baldwin and Taglioni (2006) suggest that applying time varying country dummy variables can counteract the endogenous bias, Martínez-Zarzoso et al. (2009)suggest using country specific dummy variables in cross sectional data and bilateral fixed effects to remove the endogenous bias.

4.2.2.Poisson Pseudo Maximum Likelihood Estimation

Several things need to be taken into consideration when using the gravity model to analyze disaggregated data, the first being the presence of zero trade. In sectoral trade, zero values appear more frequently than with aggregate data. There are two possible causes for zero trade, first, the high cost of transport due to excessive distances and trading partners having small economy. Second, are the consequences of firms self-selecting to export to a particular destination due to high fixed costs(Bacchetta, 2012).

The zero value will automatically be dropped when using the OLS method, the implication of dropping the zero is that the useful information will be lost which will further lead to inconsistent result (Bacchetta, 2012). There are three main approaches to dealing with zero trade. The first option is an ad hoc solution which is done by adding a small value (0.0001) to the trade data, so the zero is defined by log (0.0001) and then the tobit estimation is used after this process. However, the ad hoc solution has no basic statistical theory. The second commonly used approach is the Poisson model, and the third is the Heckman model.

The Poisson Pseudo Maximum Likelihood (PPML) method was introduced by Gourieroux et al. (1984) and is commonly used for the count data model. The most influential research concerning the use of PPML as a tool for estimating the gravity model was conducted by Santos Silva and Tenreyro (2006). They argued that the log linear transformation result in an inconsistent bias in the presence of heteroskedasticity, the result from the PPML estimation will provide better result by including the zero value rather than truncating OLS.

The PPML estimator has several properties which are desired for analyzing the impact of policies (Shepherd, 2013). First, it is consistent with the existence of fixed effects; second, the Poisson estimator will include zero value observations, and third, the interpretation of the PPML is directly follows the OLS. The subsequent research by Santos Silva and Tenreyro (2011) shows that the PPML is consistent and performs well in the presence of over dispersion (the conditional variance is not equal to the conditional mean) and excess zero values. The use of PPML and Poisson family regression models such as the zero-inflated poisson model, (ZIPPML), negative binominal model (NBPML), and zero-inflated negative binominal model (ZINBPML) in disaggregate data, especially in singe trade commodity has increased. Following Burger et al.(2009), the assumption for bilateral trade flow between countries i and j has a Poisson distribution with the conditional mean μ_{ijt}, which is a function of the independent variables. As Y_{ij} is assumed to have a non-negative integer value, the exponent of the independent variable is captured in order to assure that μ_{ij} is zero or positive. The PPML estimation takes the following form:

$$(4.4)\ \Pr[Y_{ij}] = \frac{\exp(-\mu_{ij})\mu_{ij}^{Y_{ij}}}{Y_{ij}!}, (Y_{ij} = 0, 1, 2, \ldots)$$

where the conditional mean μ_{ij} is connected to an exponential function of a group of regression variables, X_{ij}'

$$(4.5) \mu_{ij} = \exp(\alpha_0 + \beta' X_{ij} + \delta_i + \varphi_j)$$

where α_0 is constant, X_{ij} is the 1 x k row vector of the explanatory variables that correspond to the parameter vector β which represents trade barriers, δ_i is the exporter effect, φ_j is the importer effect. The assumption of this model is equi dispersion; the conditional variance of the dependent variable is equal to its conditional mean.

Sun and Reed (2010)was the first author who applied PPML on the effect of FTAs with disaggregated data for agriculture commodities. The result of PPML is superior to the OLS result. Following Sun and Reed (2010), the empirical model is specified as:

(4.6)

$Y_{ijt} = \exp\{\beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln D_{ij} + \beta_4 FTA_{ij} + \pi_{ij} + \delta_i + \varphi_j + \gamma_t + \varepsilon_{ijt}\}$

whereY_{ijt} denotes the export value from country i to j at time t, δ_i stands for the fixed effect of country i (exporter fixed effect), φ_j represents the fixed effect of country j (importer fixed effect), π_{ij} denotes the country pair fixed effect, and γ_t refers to the time effect.

4.3. TheRegression Specification ErrorTest (RESET)

Ramsey (1969), introduced theregression specification error test (RESET) to check thesignificance of the regression of a residual on a linear function. This is done by assuming an approximation vector of mean residuals from the least-squares estimate of the dependent variable and a ranking of the squared residuals.RESET then basically checks whether the regression of the residual vector against its rank is significant or not. This is why this test is also famously known as a rank correlation test.

RESET is generally used to test the specification of a linear regression model by examining whether or not a non-linear combination of the fitted values can help with explaining the dependent variable. If the non-linear combination of the dependent variable is statistically significant, then the model is misspecified. The model is explained with the following equations:

(4.7)$\hat{y} = E\ \{y|x\} = \beta_x$

The RESET Ramsey test then examines whether$(\beta_x)^2$,$(\beta_x)^3$,.., $(\beta_x)^k$ has any influence on y. This is performed by estimating the equation as follows:

(4.8) $y = \alpha x + \gamma_1\ (\hat{y})^2 + \ldots + \gamma_{k-1}\ (\hat{y})^k\ +\ \varepsilon$

afterwards, the significance of γ_1 through γ_{k-1} is determined through the use of an F-test. The null hypothesis is that the coefficient γ is equal to zero. If the null hypothesis is rejected, then the model suffers from misspecification.

4.4.Econometric Modelling of International Palm Oil Trade

Estimating the gravity model for a single commodity can lead to biased estimationsif the GDP of exporter countries are used as a proxy for the economic size of the exporter (GDP_{it}). Therefore, the production value of palm oil is used in this study as a proxy for the exporter's economic size. In order to examine the impact of free trade, the dummy variable (FTAs) is divided into two parts one before and one for after the year 2000. The main reason for splitting up the dummy variable is the proliferation of FTAs for both Indonesia and Malaysia after year 2000, which increase the member of free trade agreement in southeast Asia region.The gravity model of international palm oil takes the following form:

(4.9)

$$\ln Y_{ijt} = \beta_0 + \beta_1 \ln Prod_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln D_{ij} + \beta_4 FTAs\_early_{ijt} + \beta_5 FTAs\_after\_2000_{ijt} + \beta_7 FTAs\_early\_IDN_{ijt} + \beta_8 FTAs\_after\_2000\_IDN_{ijt} + \beta_9 \ln ppp\_cnvrt_{jt} + \pi_{ij} + \delta_i + \varphi_j + \gamma_t + \varepsilon_{ijt}$$

(4.10)

$$Y_{ijt} = \exp\{\beta_0 + \ln Prod_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln D_{ij} + \beta_4 FTAs\_early_{ijt} + \beta_5 FTAs\_after\_2000_{ijt} + \beta_7 FTAs\_early\_IDN_{ijt} + \beta_8 FTAs\_after\_2000\_IDN_{ijt} + \beta_9 \ln ppp\_cnvrt_{jt} + \pi_{ij} + \delta_i + \varphi_j + \gamma_t + \varepsilon_{ijt}\}$$

where

Y_{ijt}	= annual palm oil export from i to j at year t in US$
$Prod_{it}$	= annual palm oil production value of i at year t in US$
GDP_{jt}	= annual GDP of importer country (j) at year t in US$
D_{ij}	= bilateral distance between countries in km

FTA_early_{ijt} = Dummy variable for FTAs before year 2000, 1 if exporters and importers have signed agreement at time t, otherwise 0

$FTA\_after\_2000_{ijt}$ = Dummy variable for FTAs after year 2000, 1 if exporters and importers have signed agreement at time t, otherwise 0

$FTA\_early\_IDN_{ijt}$ = Dummy variable for FTAs before year 2000, 1 if Indonesia as an exporter and have signed agreement with importer country (j) at time t, otherwise 0

$FTA\_after\_2000\_IDN_{ijt}$ = Dummy variable for FTAs after year 2000, 1 if Indonesia as an exporter and have signed an agreement with importer country (j) at time t, otherwise 0

With the above setting thus we expect positive sign for the coefficient of importer´s GDP and the coefficient of palm oil production. This means that the export of palm oil will increase as long as there is growth in economy. The distance variable is expected to have negative sign because it is considered as trade barrier. The further destination country the less export quantity is expected. FTAs dummy variable is expected to have positive sign since the commencement of FTAs is meant to reduce trade barriers.

5. Overview of Palm Oil Industry and FTAs in Southeast Asia

5.1.History and Policy

Palm oil trees was first planted in the Bogor botanical garden in 1848. Later, in 1911, the Dutch colony set up the first large scale palm oil plantation in Deli, Sumatra. Looking at the progress of these seeds, the British traders also set up palm oil plantations in Malaysia. Due to the second world war, when Indonesia gained its independence in 1945, Dutch plantation owners had no longer had support from the Dutch colony which leads to the collapse of several plantations. Production declined further as the former Dutch colony´splantations were transferred to the “New State Plantation Company” (Perusahaan Perkebunan Baru) in 1957. The Indonesian government started more palm oil plantations through state owned enterprise until 1968. In 1978, the Indonesian government took the initiative to involve small farmers by introducing the PIR (Perkebunan Inti Rakyat) or NES (Nucleus Estate and smallholder scheme) and various other organizations intended to encourage further establishment of palm oil plantations (Zen et al., 2006).

Accordingly, the government, or private owned, plantation (called Inti) planted palm oil trees and within three to four years the planted area was transferred to the smallholder farmer this was called ‘the plasma‘. During these three to four years, farmers were actively working on the plantation. After the tree production, Inti had to purchase the Fresh Fruit Bunch (FFB) from the plasma and then deduct the harvesting fund paid for the area transferred to the plasma. The private plantation investment increased significantly after the Indonesia economic crisis in 1997-1998. In 2001, the NES system was terminated, only the state owned enterprise and private companies managed the plantation. (Zen et al., 2006).

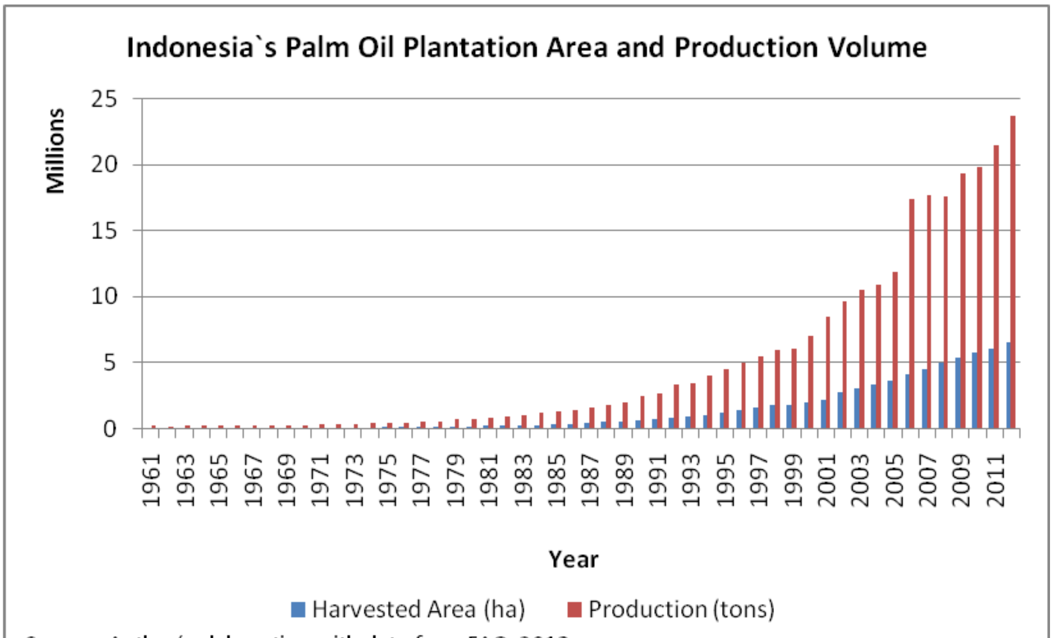
In 1917, palm oil was established on a commerciallevel in Malaysia, however, this remained relatively unknown by the rest of the world until the 1950s. From the 1950s to 1960s due to the nationalization of the palm plantation in Indonesia and the crisis in the Congo as the leading producer palm oil at that time, the Malaysian palm oil industry grew significantly (Rifin, 2010). Major companies including Unilever started to invest in Malaysia rather than in Indonesia. The government of Malaysia introduced the Federal Land Development Authority (FELDA) in 1961 for managing oil palm plantation (Rasiah & Shahrin, 2006) FELDA has set the different scheme during several years.Malaysia's government took control of the foreign palm oil company by buying the company's share during 1970s until 1980s. The Industrial Master Plan (IMP) was introduced by the Malaysian government in 1985 where its goal is to regulate the palm oil refining and fractionation in order to increase efficiency and competitiveness in the world market (Rasiah &Shahrin, 2006). IMP I caused the processing capacity's exceeded the supply of CPO. Hence, in 1996, Malaysian government introduced the IMP II. It focused to increase the value added of downstream industry through focusing in biotechnology. Also, it encouraged Malaysian firms to seek raw material in the form of Crude Palm Oil from other source, especially Indonesia. Malaysian companies acquired more than 1.3 million Ha of oil palm are in Indonesia in 1999(Rasiah & Shahrin, 2006).

The difference between Malaysia and Indonesia policy is the Malaysia has export orientation policy, while Indonesia focused on the domestic consumption (Rasiah and Shahrin, 2006). One of the strategies for support the Malaysian palm oil export is the internationalization of its company. The Malaysian companies has joint venture scheme in several developed and developing countries mainly in palm oil refining and the downstream industry (oleochemical). Within the member of ASEAN, Malaysia has built the palm oil refinery factory in Thailand in 1981 and in Vietnam in 1995.

5.2. Plantation Area and Production

The palm oil plantationarea in Indonesia was approximately 70,000 hectares (ha) in early 1960, and then the plantation area had increased tremendously reaching roughly 8 million ha in 2010. Half of the plantations are located in the Sumatra, 27% in Kalimantan (Borneo) and 23% in other areas. The ownership of plantation area aredivided into three groups: state owned enterprises, private companies, and smallholders. According to Indonesian Ministry of Agriculture (MOA), 54% of total palm growing area is owned by private companies, 38% by smallholders, with the state enterprises operate the remaining by 8% in 2010. The large availability of land positions Indonesia as the top palm oil producer. In line with the expansion of the production area, the palm oil production volume has grown from 150,000 tons in 1961 to 23 million tons in 2012 (FAO, 2013). Along with having the greatest proportion of the growing area, palm oil originated from the Sumatra Islands contributes 65 percent of the total production in Indonesia. Indonesia´s palm oil plantation area and production volume can be seen in Figure 5.1 below.

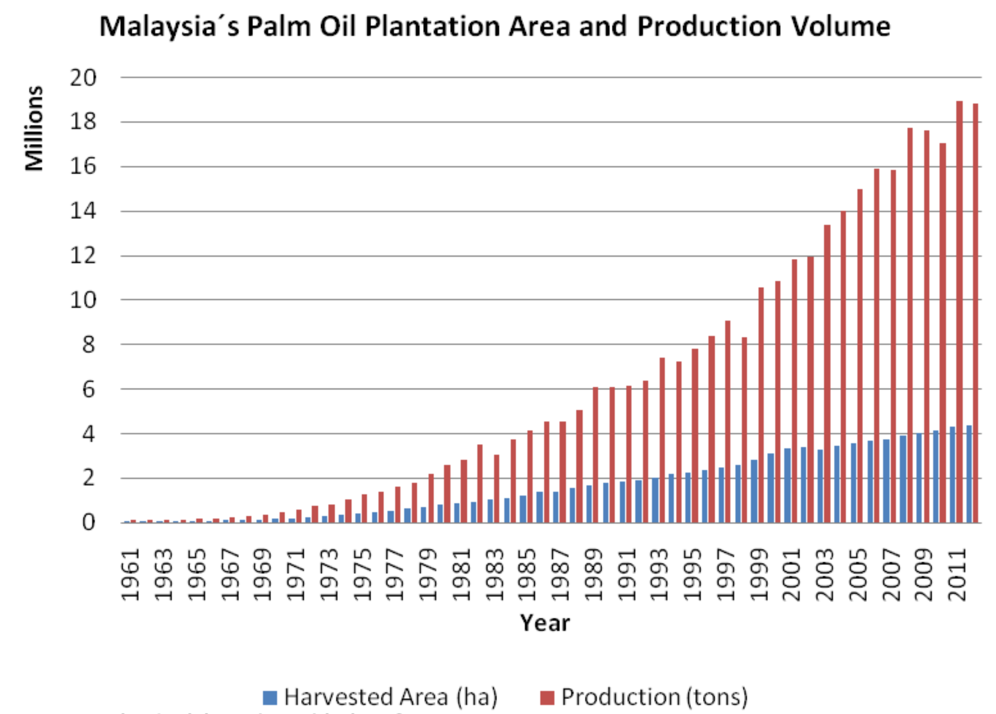
Figure 5.1 Indonesia´s Palm Oil Plantation Area and Production Volume



Source : Author´s elaboration with data from FAO, 2013

In early 1960, the palm oil plantation area in Malaysia was approximately 55,000 hectares (ha), it is had increased tremendously to 3.8 million ha in 2010. According to the Malaysian Ministry of Plantation Industries and Commodities, 60% of the total palm oil plantation area is owned by private companies, 25% by state enterprises, and 15% by the smallholders. Along with the expansion of the production area, the palm oil production volume has grown from 94,000 tons in 1961 to 18.7 million tons in 2012 (FAO,2013). Malaysia´s palm oil plantation area, and their production volume can be seen in Figure 5.2 below.

Figure 5.2: Malaysia´s Palm Oil Plantation Area and Production Volume

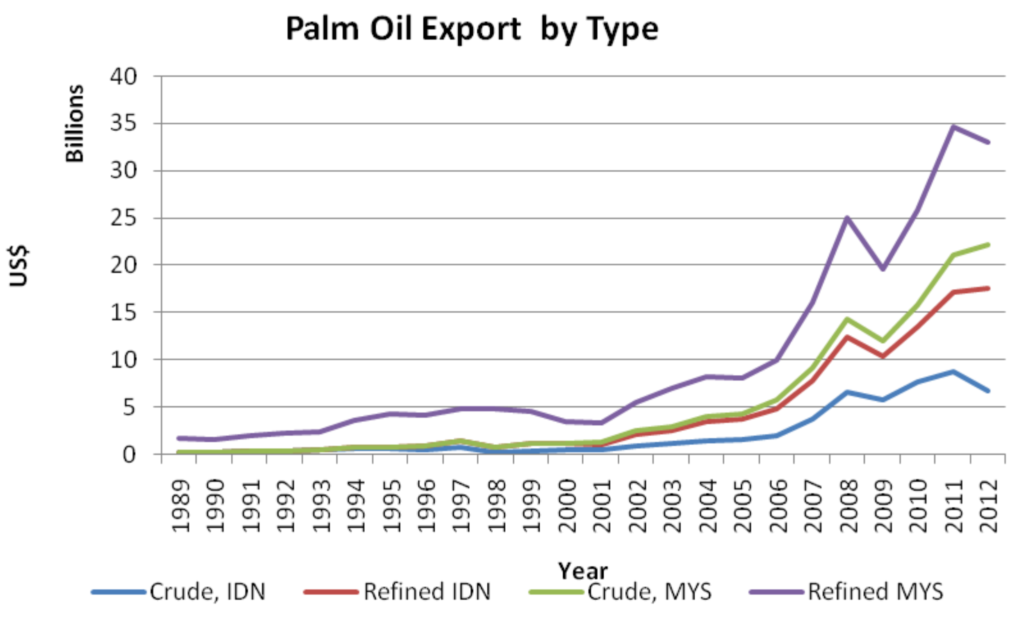


Source : Author´s elaboration with data from FAO, 2013

5.3. Palm Oil Export and Import

The export of palm oil is classified into two groups: crude palm oil (CPO) and refined palm oil. In 1981, the proportion of CPO exports in Indonesia was 82 percent. However, the share has decreased to 37 percent in 2012. In contrast with CPO, the proportion of the refined palm oil export increased from 18 percent to 62 percent between 1989 and 2012. On the other hand, the proportion of Malaysia´s CPO export was 0.5 percent in 1989, and increased to 29 percent in 2012. Furthermore, the share of refined palm oil export was 99 percent in 1989, the share decreased to 71 percent in 2012.The overall performance for Indonesian and Malaysian palm oil exports to the world market are shown in Figure 5.3.

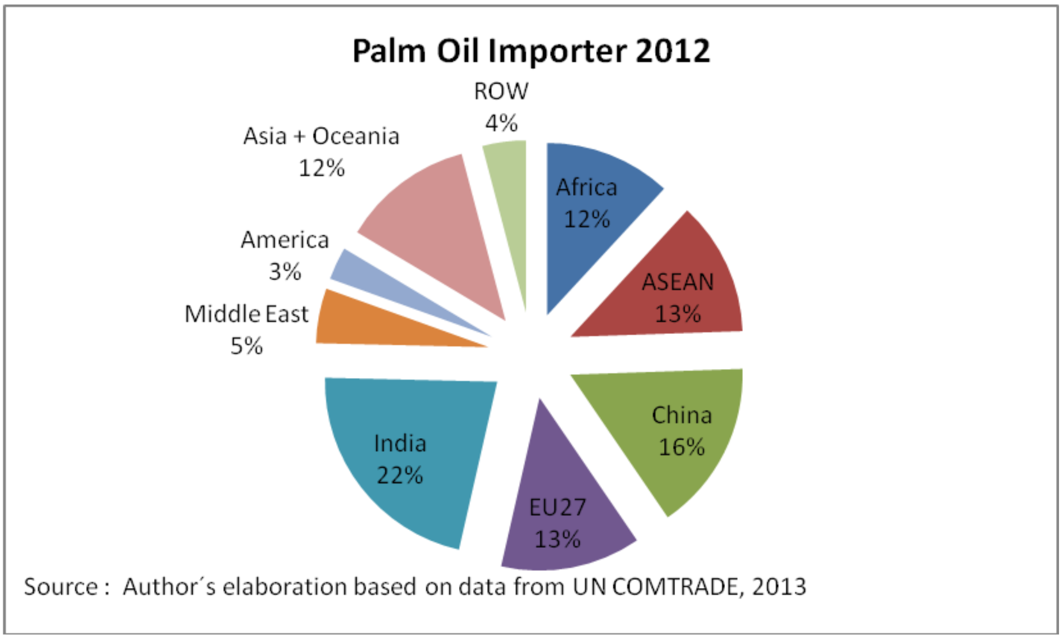
Figure 5.3: Export Performance of Indonesian and Malaysian Palm Oil



Source : WITS, Integrated Data Warehouse (acessed December 1, 2013)

On the demand side, the palm oil consumption ranked first in the world for total vegetable oil consumption. In 2011, the proportion of palm oil consumption reached 32.8 percent, followed by soybean oil (28.4%), rapeseed oil (16%) and sunflower oil (8.6%). Approximately more than half of all palm oil has been consumed for foodstuffs, while the rest has been used for industrial products such as chemicals, animal feed and fuels. The palm oil demand is projected from 51 million tons in 2012 to 75 million tons in 2050 (OECD-FAO, 2013).In 2012, the major importers of palm oil were China (16%), India (22%), the EU (13%) and the ASEAN countries (13%). The palm oil importer countries can be seen in Figure 5.4

Figure 5.4: Palm Oil Importer 2012



5.4. Current Status of FTAs in Effect

Free trade agreements (FTAs) in the ASEAN region have a large impact on palm oil trade in Indonesia and Malaysia. Palm oil is a product that is always traded without tariffs in the ASEAN region. Palm oil always include to the reduction of tariffs. The ASEAN Free Trade (AFTA) agreement itself was established in 1992 and the network of member countries has grown steadily since. One of the major milestones for FTAs occurred in 2008 when the total effectuated countries reached 30 nations (Table 5.1). The FTA network was further enlarged through its integration with AFTA (This development would lead ASEAN to become an important hub of FTA networks in Asia.Non-ASEAN countries such as Japan have both multilateral and bilateral FTAs with each ASEAN country. Furthermore, ASEAN member countries can have both multilateral and bilateral FTAs with many other countries in Asia, for example Singapore with Japan, Korea, China, New Zealand and India. The list of FTAs that all already enforced can be seen in Table 5.1 while the schedule of tariff reduction among the member of FTA can be seen in Table 5.2.

Table 5.1: Major FTAs in Effect in the Asia-Pacific Region

FTA	Date in effect
Australia-New Zealand	January, 1983
Laos-Thailand	June, 1991
AFTA	January, 1992
Singapore-New Zealand	January, 2001
Japan-Singapore	November, 2002
Singapore-Australia	July, 2003
ASEAN-China	January, 2004
Thailand-India	September, 2004
Thailand-Australia	January, 2005
Thailand-New Zealand	July, 2005
Singapore-India	August, 2005
Singapore-South Korea	March, 2006
Trans-Pacific Strategic Economic Partnership Agreement	May, 2006
Japan-Malaysia	July, 2006
ASEAN-South Korea	June, 2007
Japan-Thailand	November, 2007
Japan-Indonesia	July, 2008
Japan-Brunei	July, 2008
China-New Zealand	October, 2008
ASEAN-Japan	December, 2008
Japan-Philippines	December, 2008
Singapore-China	January, 2009
Japan-Vietnam	October, 2009
ASEAN-Australia-New Zealand	January, 2010
ASEAN-India	January, 2010
South Korea-India	January, 2010
Malayssia-New Zealand	August, 2010
Hong Kong-NZ	January, 2011
Malaysia-India	July, 2011
Japan-India	August, 2011

Source: Shiino (2012)

Table 5.2: Status of AFTA and ASEAN+1 FTAs

FTA		Status/Tariff Reduction and Elimination Schedule
ASEAN (AFTA)		Tariff reductions have been adopted by some ASEAN members (Thailand, Malaysia, Indonesia, the Philippines, Brunei and Singapore); meanwhile CLMV countries (Cambodia, Laos, Myanmar and Vietnam) will join later. The goal is to eliminate tariffs on almost all items by 2015.
ASEAN	China	Starting in 2004, efforts to implement FTA regulations have been applied for agricultural and fishery products. Non-agricultural/fishery products were included starting in July 2005. China and the original ASEAN members have eliminated tariffs on about 90% of items; meanwhile CLMV countries will eliminate tariffs on nearly all items by 2015.
	South Korea	Starting in 2010, South Korea and the original ASEAN member countries eliminated tariffs on about 90% of items. While CLMV countries will start to eliminate their tariffs beginning in 2016
	Japan	The process is still under ratification for some countries, but Japan already has bilateral FTAs in effect with Singapore, Malaysia, Thailand, Indonesia, Brunei, the Philippines and Vietnam.
	Australia NZ	FTAs are already enforced for some countries (Australia, New Zealand, Singapore, Thailand, Malaysia, Philippines, Vietnam, Brunei, Mynamar, Laos and Cambodia). Other countries will join later, such as Indonesia in 2012 and CLMV countries in 2020.
	India	Already enforced for India, Veitnam, Brunei, Myanmar, ASEAN and Laos; further tariff eliminations will come gradually until 2019. CLMBV (Cambodia, Laos, Myanmar, Brunei and Vietnam) countries will accomplish tariff eliminations by 2021.

Source: Shiino (2012)

From the tariff elimination schedule as presented in Table 5.2, six original members of ASEAN (Thailand, Indonesia, Malaysia, Philippines, Singapore and Brunei; or ASEAN6) had already eliminated tariffs on 99 percent of tradable products by 2010. Meanwhile, the other four new members (Vietnam, Cambodia, Laos and Myanmar) will eliminate their tariffs gradually through 2015. The progress has been sufficient; for example, Vietnam currently has eliminated about 80% of its tariffs, with other countries having reached approximately a 60% elimination rate.It is important to keep in mind that ASEAN6 has established a unique set of guidelines for AFTA members (all ASEAN countries plus China, South Korea, Japan, Australia, New Zealand and India) because the ASEAN6 had lowered the tariffs of their tradable items prior tothe establishment of AFTA. Countries in this region will continue lowering tariffs gradually, with the task being projected to be finished in 2020 (Shiino, 2012).

6. Results and Discussions

This chapter describes the result of the gravity estimation based on two different techniques, the OLS fixed effect (FE) and the poisson pseudo maximum likelihood (PPML) method. This chapter organized as the follow, first part is comparison between OLS and PPML estimation result, and second part is PPML estimation for impact of FTA in different type of palm oil export, crude and refined. The separation of palm oil type is to capture the differences between Indonesia and Malaysia palm oil policies.

6.1. Comparison of OLS and PPML Regression Result

The results of the basic model using OLS with united FTA dummy variables and without including the time and country effects are reported on the appendix. The gravity equation was estimated in the log linear form. All zero observations are dropped in the OLS estimation. The basic model is estimated without variables for time, country specific and country pair effect. Furthermore, the modified Wald test for heteroskedasticity indicated that data set used in this study was not homoskedastic. The result from the heteroskedasticity test can be seen in the appendix. The null hypothesis is constant variance (homoscedasticity). The test is statistically significant at the one percent level, and gives a *p*-value of 0.0000. Hence, the null hypotheses is rejected, heteroskedasticity is present. To solve this problem, the robust and cluster processes are used in STATA to estimate the data without heteroskedasticity.

Table 6.1 shows the empirical result of the OLS and PPML regression with the various combinations of time and country effect. As mentioned in Chapter 4, the objective of various dummy variables is to control for unobserved endogeneity. The first column includes time effects (t), the secondcolumn is regression with country-specific effect (i,j), the third column is the addition of country specific effect and country-pair effect (ij). The fourth column is the combination of the time and country-pair effect, and finally the fifth column is the inclusionof all effects. The inclusion of different effects give a different value to the R^2 which can be seen at the bottom of the table. The value of R^2 is increasing with the addition of time and country effect. The number of observations are less in OLS than in PPML because of the elimination of zero values while using the OLS technique.

The estimation results showthat the coefficients for all continuous variables has a different sign and various significances with different effects. The coefficient for palm oil production value is positive for both estimations and all effects, except for the time effect of the OLS estimation. The coefficient for palm oil production value is statistically significant for all effects of PPML estimation, except the time effect, while in OLS, the coefficient is statistically significant for all country specific effects, as well as the combination between country specific and country pair effects.

The estimated GDP coefficients have the expected positive sign for all of the estimations and are statistically significant for all effects with the OLS regression. In contrast to OLS, the GDP coefficient with the PPML regression is statistically significant only for the time effect. The exchange rate coefficients have negative signs with the OLS regression and are statistically significant for all effects except for the country specific effect and for the combination of country specific and country pair effects.While with the PPML regression, the coefficient has negative signs only for the time effect and arestatistically significant for all effects.

As expected, the coefficients of the distance variable are negative with the OLS regression for all effects, except for the country specific effect, combination of time effect and bilateral effect where the sign is positive.The coefficient is statistically significant for time effect and combination of country specific and country pair effect. With the PPML regression, the distance coefficient has a negative sign for all effects, except for the country specific effect. The distance coefficients are statistically significant for all effects.

The coefficients of the FTAs dummy variables before year 2000 have a negative sign with the OLS estimation, as well as with the PPML regression. The coefficient is statistically insignificant for all effects with the OLS regression, while with PPML the coefficients are statistically significant for all effects except country specific effect.The estimated FTAs after year 2000 dummy coefficients have negative signs for all effects with the OLS regression, except for the country specific effect and are statistically significant for all effects, except for the time effect and combination of country specific effect. The PPML estimation shows that the coefficients of FTAs after 2000 have positive signs only for the time effect and country specific effect, the FTAs dummy variable after year 2000 is statistically significant only for combination of time, country specific, and country paireffects.

The regression result for Indonesia´s FTAs dummy variable before year 2000 coefficient shows positive signs with the OLS estimation for all effects, except the country specific effect, while with the PPML the sign is positive for all effects, except for the country specific effect. The coefficient of Indonesia´s FTA before 2000 is statistically insignificant for all effects in the OLS result, whereas in the PPML estimation, the coefficient is statistically significant for all effects, except for the country specific effect. The coefficients of Indonesia´s FTA after year 2000 dummy variable have a positive sign, except for time and country specific effects with the OLS estimation, all coefficients are statistically insignificant. The PPML estimation for Indonesia´s FTA after year 2000 dummy variable shows a positive sign for all effects and are statistically significant for all effects, except for the time effect.

The result of the heteroskedasticity-robust RESET test is shown at the bottom of the table. For the OLS regression, the test shows significant p-values, so the hypotheses that the coefficient on the test variable is 0 are rejected. This applied to all model in OLS and indicates that the OLS estimations with a logarithmic transformation are inappropriate. In contrast to OLS, all the models with a PPML estimation pass the RESET test except for the regression which only includes the time effect. The model which passes the RESET test provides no evidence of misspecification.

Table 6.1: OLS and PPML Estimation Result for Palm Oil Export as Dependent Variable

VARIABLES	1		2		3		4		5	
	t		i j		i j ij		t ij		t,i,j,ij	
	OLS	PPML	OLS	PPML	OLS	PPML	OLS	PPML	OLS	PPML
ln_Prod_val	-0.200	0.0323	0.645***	0.994***	0.663***	1.036***	0.210	0.391***	0.210	0.391*
	(0.121)	(0.145)	(0.119)	(0.0995)	(0.118)	(0.0985)	(0.344)	(0.140)	(0.344)	(0.206)
ln_GDP	0.716***	0.431***	1.090***	0.0193	1.109***	0.0256	1.224***	0.00272	1.224***	0.00272
	(0.0560)	(0.148)	(0.240)	(0.0339)	(0.237)	(0.0367)	(0.355)	(0.0222)	(0.355)	(0.0109)
ln_PPP_cnvrt	-1.747***	-1.330**	-0.389	0.434*	-0.435	0.457**	-0.831*	0.588***	-0.831*	0.588***
	(0.313)	(0.546)	(0.368)	(0.228)	(0.366)	(0.205)	(0.491)	(0.228)	(0.491)	(0.109)
ln_dist	-0.637**	-0.630***	0.710	2.317*	-0.679**	-13.08***	0.657	-2.730***	-0.516	-13.08***
	(0.261)	(0.215)	(0.925)	(1.242)	(0.311)	(0.00183)	(0.434)	(0.290)	(0.365)	(1.700)
fta_early	-1.426	-2.082***	-0.347	-0.624	-0.716	-1.375***	-0.512	-1.616***	-0.512	-1.616***
	(0.917)	(0.709)	(0.824)	(0.661)	(1.016)	(0.280)	(1.052)	(0.312)	(1.052)	(0.234)
fta_after_2000	-0.0324	0.436	0.107	0.0217	-0.664***	-0.230	-0.664***	-0.225	-0.664***	-0.225**
	(0.516)	(0.432)	(0.325)	(0.159)	(0.250)	(0.164)	(0.246)	(0.141)	(0.246)	(0.0891)
fta_early_IDN	0.524	1.730**	-0.607	-0.00889	0.778	2.197***	0.904	2.312***	0.904	2.312***
	(1.344)	(0.693)	(0.368)	(0.598)	(1.023)	(0.263)	(1.034)	(0.258)	(1.034)	(0.299)
fta_after_2000_IDN	-0.722	0.292	-0.841	0.552**	0.682	0.664***	0.624	0.724***	0.624	0.724***
	(1.038)	(0.345)	(0.652)	(0.223)	(0.529)	(0.173)	(0.521)	(0.0953)	(0.521)	(0.135)
Constant	5.626	11.86**	-28.07***	-16.48*	-19.50***	87.54***	-26.62**	32.75***	-14.47	101.7***
	(3.793)	(5.371)	(8.837)	(10.01)	(6.425)	(2.228)	(11.81)	(1.281)	(13.50)	(12.53)
Observations	2,563	3,234	2,563	3,234	2,563	3,234	2,563	3,234	2,563	3,234
R-squared	0.431	0.544	0.688	0.796	0.758	0.889	0.762	0.921	0.762	0.921
RESET	F(3,2527) =2.40	chi2(1) =47.02	F(3, 2470) = 7.77	chi2(1) =0.69	F(3,2401)=2.54	chi2(1) =0.11	F(3,2381)=2.47	chi2(1) =0.10	F(3,2381)=2.47	chi2(1) =0.10
	Prob>F =0.0661	Prob>chi2 =0.0000	Prob > F = 0.0000	Prob>chi2 =0.4072	Prob>F =0.0548	Prob>chi2 =0.7379	Prob>F =0.0600	Prob>chi2 =0.7544	Prob>F =0.0600	Prob>chi2 =0.7544

Note : standard errors (SE) in parentheses, * p<0.1, ** p<0.05, *** p<0.01, SE were calculated using White's heteroskedastic robust standard errors. R-squared for PPML is the squared correlation between actual and fitted values of Xij

6.2. PPML Result for FTA

The PPML estimation result will be applied for further analysis concerning theimpact of FTAs on the commodity trade flow. TheFTA dummy variable is utilized to quantify the change of trade flow due to the establishment of the FTA. As discussedbefore in Chapter 4, the estimation usetwo main separate dummy variables, before and after year 2000. Furthermore, based on the results from table 6.1,the PPML with the combination of time, country pairs and country specific effectis applied to the next estimation. In particular, for deeper analysis the dependent variable are divided into three:total palm oil and its fraction (HS1511), crude palm oil (HS151110), and refined palm oil but no chemically refined (HS151190).The result of the PPML estimation for different palm oil export type can be seen in Table 6.2.

Table 6.2: PPML Estimation Result for HS1511, HS151110, and HS151190

	(1)	(2)	(3)
VARIABLES	HS1511 (total palm oil and its fraction)	HS151110 (crude palm oil)	HS151190 (refined palm oil)
ln_Prod_val	0.391*	-0.638*	0.578***
	(0.206)	(0.381)	(0.163)
ln_GDP	0.00272	1.150	0.00170
	(0.0109)	(0.787)	(0.0235)
ln_PPP_cnvrt	0.588***	-0.588	0.713***
	(0.109)	(0.810)	(0.233)
ln_dist	-13.08***	0.758	10.44***
	(1.700)	(0.518)	(0.905)
fta_early	-1.616***	-1.991***	-1.493***
	(0.234)	(0.706)	(0.314)
fta_after_2000	-0.225**	0.481*	-0.143
	(0.0891)	(0.279)	(0.169)
fta_early_IDN	2.312***	1.993***	3.796***
	(0.299)	(0.490)	(0.363)
fta_after_2000_IDN	0.724***	-0.519***	0.691**
	(0.135)	(0.187)	(0.349)
Constant	101.7***	-6.267	-81.23***
	(12.53)	(24.63)	(8.576)
Observations	3,234	3,234	3,234
R-squared	0.921	0.966	0.884

Note : standard errors (SE) in parentheses, * p<0.1, ** p<0.05, *** p<0.01
Source : Author´s estimation

For total palm oil, the estimated coefficients for palm oil production have the expected positive signs and are statistically significant at the ten percent level, this means that one percent increase in palm oil production would be associated with an increasing in the average export of palm oil by approximately 0.39 percent, *ceteris paribus* (cp). A positive sign was also determined for refined palm oil (HS 151190), with the average export value increasing by about 0.58 percent when the production value increases by one percent, *cp*. The increasing of palm oil export is supported by the increase in the plantation area of palm oil trees. In contrast, the coefficient for the palm oil production variable has a negative sign and is significant for crude palm oil (HS151110), this means thatwhen the production value increases by one percent, the average crude palm oil export will fall by 0.64 percent*cp*.The reason behind the declining of crude palm oil export is that the majority of palm oil are exported had passed the refining process.

The GDP coefficient has a positive influence on the palm oil export, the GDP variable was not influential on the palm oil export and is statistically insignificant for all types of palm oil export. The results are contrary to the gravity theory that trade is influenced by the economic size of the importer. As expected, the distance variable has a negative sign and is statistically significant at the one percent level for total palm oil (HS 1511). This indicates that when the bilateral distance increases by one percent, the average palm oil export will fall by 13.08%. This result indicates that distance acts as trade barrier. The distance coefficient has positive signs for crude and refined palm oil and is statistically significant at one percent level for refined palm oil. This contrary result indicates that for high value product (refined palm oil), the distance does not influenced trade.

Furthermore, the trade flow experiences different changes for Indonesia and Malaysia due to the establishment of trade agreements. Generally, for FTA before 2000, the coefficients are statistically significant and have a negative sign for all types of palm oil. The estimated FTA after 2000 coefficients have a positive result for crude palm oil, and the sign is statistically significant for total and crude palm oil. For Indonesia itself, the coefficient of FTA before 2000 is positive and statistically significant for all types of palm oil, while after 2000, the FTA coefficients have a negative impact on crude palm oil export. The summary of the percentage changes of exports can be seen in Table 6.3.

Table 6.3: The Change of Palm Oil Export due to FTA establishment (%)

Palm Oil HS	Indonesia (%)		Malaysia (%)	
	Before 2000[2]	After 2000[3]	Before 2000[4]	After 2000[5]
HS 1511	100.57	64.71	-80.13	-20.15
HS 151110 (Crude)	0.20	-3.73	-86.34	61.77
HS 151190 (Refined)	900.41	99.57	-77.53	-13.32

Source : Author´s Calculation

For FTA before year 2000, the results show different effects for Indonesia and Malaysia. For Malaysia, the average total export of palm oil decreases by 80.13 percent, while for crude and refined palm oil, FTA establishment causes an average export decline of 86.34 percent and 77.53 percent respectively, *ceteris paribus* (*c.p.*). In particular, the tremendous effect occurs for Indonesia´s total palm oil export, as indicated with the variable FTA before year 2000, the average palm oil export increased by 100.57 percent, 0.20 percent, and 900.41 percent, for HS 1511, HS 151110, and HS 151190 respectively, *c.p.*

The average export of Indonesian palm oil increased by 64.71 percent after the establishment of the FTA from 2001 to 2011. For crude palm oil, the average export decreased by 3.73 percent while for refined palm oil, the average changes of export was 99.57 percent higher than export without FTA, *c.p*. The use of crude palm oil for domestic consumption may become the reason why the change in export of crude palm oil is different than the change in refined palm oil. In fact, Indonesia also counted as the largest consumer of cooking oil which originated from palm oil. The increase in

[2] The effect of FTA before 2000 for Indonesia is the summation of fta_early coefficient and fta_early_IDN coefficient , then calculated by {[exp$^{(\beta)}$-1]x100}
[3] The effect of FTA after 2000 for Indonesia is the summation of fta_after_2000 coefficient and fta_after_2000_IDN coefficient , then calculated by {[exp$^{(\beta)}$-1]x100}
[4] The effect of FTA before 2000 for Malaysia is similar with fta_early coefficient, then calculated by {[exp$^{(\beta)}$-1]x100}
[5] The effect of FTA after 2000 for Malaysia is similar with fta_after_2000coefficient,then calculated by {[exp$^{(\beta)}$-1]x100}

Indonesia´s refined palm oil export after the establishment of AFTA could be influenced by the higher demand of palm oil in the international market. The rapid economic growth of countries in the southeast Asia region have become the primary factor for the increased consumption of palm oil, thus, Indonesia's palm oil exports have shifted their destinations to other FTA member countries.

In contrast, the FTA after year 2000 negatively impacted the total value of Malaysia´s palm oil export. The establishment of FTA after year 2000 caused the average export value decrease by 20.15 percent. The opposite effect applied to HS 151110 (crude palm oil), where the average export of crude palm oil increased by 61.77 percent compared to export without FTA, *c.p.* The reason for the higher export volumes of crude palm oil is due to the establishment of bilateral trade agreements with China, India and Myanmar. In fact, the market share of Malaysian palm oil in China´s market has reached 61 percent, while the Indonesian share in China's market only reaches 39 percent. Moreover, the Malaysian company has built a refinery in China by doing a joint venture mechanism with a China´s company in the beginning 1995. Taking this into consideration, along with the FTA establishment, Malaysia has additional opportunities to process refined palm oil into downstream products such as oleochemicals (Nor, 2012)[6]. This is one of the examples of the dynamic effect that has occurred due to the establishment of RTAs, as mentioned in Chapter 3, the investment creation effect.

For refined palm oil, the FTA after year 2000 has a negative sign, this means that the average export of Malaysia`s refined palm oil decreased by 13.32 percent after the FTA was established, *c.p.* This result is correlated with the increased export of crude palm oil, as mentioned previously. Furthermore, the Malaysian export oriented policy has pushed the development of refineries in Malaysia itself, the refined palm oil is then exported to fulfill the demand for countries outside of the Asian region. Since the year 1990, Malaysian palm oil has acquired the oleochemical industries in several developed countries such as the Netherlands, Germany, Switzerland and the United States (Nor, 2012).

[6]Malaysia acquired Shanghai Jinshan Jinwei Chemical Company Ltd on 2007 (specialty chemicals) (Nor,2012)

7. Conclusion and Policy Implication

In summary, the use of the gravity model for single commodities, especially in the agriculture sector which contains a high number of zero values, the PPML gives better result than the OLS. The different combination of time and country effects corresponds to the different results in both estimations. Furthermore, the gravity estimation gives a satisfactory result for examining the impact of FTA establishment on the palm oil trade flow.

In addition, the flow of exports is not only influenced by the trade agreement itself, but also by the government policies that are put into effect. The Malaysian government's focus on the production of high value palm oil is the critical difference between the policies established in Malaysia and Indonesia. The Malaysian government has also further utilized free trade agreements by investing in the downstream opportunities of the palm oil industry in other FTA membership countries, especially with China. This is one of the most sufficient pieces of evidence for the positive dynamic effect of FTAs.

For further research, it is recommended that the researcher should focus not only on palm oil commodities, but also in the derivatives of palm oil products. Also, the potential use of other techniques on gravity estimation, such as the Heckman Estimation Model, can likely give a more satisfying result.

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Appendix

Derivation of the Anderson and Van Wincoop (2003) Gravity model Following Bergeijk and Brakman (2010)

Step 1: Supply equals demand equation.

$p_{ij}x_{ij} = S_{ij}E_j$, where p_{ij} =import price, from i to j,

S_{ij} =Share of i in j's expenditure, E_j

The value of the trade flow from country i to j $p_{ij}x_{ij}$, must equal the share country i has in expenditure of j which includes the related prices from the expenditure share identity.

Step 2: Expenditure function

Expenditure shares are assumed to depend only on relative prices, not on income. All Goods are traded and a demand structure based on a CES utility function is employed:

$S_{ij} = \left(\frac{p_{ij}}{p_j}\right)^{1-\sigma}$ Where $p_j = \left(\sum_{i=0}^{n} n_i (p_{ij})^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$

$\left(\frac{p_{ij}}{p_j}\right)$ is the real price of p_{ij}, as p_j is "nation-j's ideal CES price index" (Baldwin & Taglioni 2006, p.3). N refers to the number of nations that i buy from including it, and n_i to the number of varieties exported from one country i. σ is the elasticity of substitution between varieties from different countries ($\sigma > 1$)

Step 3:Accounting for trade costs

A crucial element in all gravity equations is the presence of trade costs. These are easily introduced. If t_{ij} indicates bilateral trade costs, the price in market j:

$p_{ij} = p_i t_{ij}$

Where p_i is the mill price of a variety in country i (note the absence of an index for varieties; varieties are defined symmetrically). After transportation the price in market j becomes p_{ij}

Step 4: Aggregating all goods

The gravity equation describes total trade between two countries; this implies that we have to aggregate across varieties

$$T_{ij} = n_i s_{ij} E_j = n_i \left(p_i t_{ij}\right)^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}}$$

Where the second equality follows from combining equations step 2 and step 3 in the bilateral trade equation.

Step 5:Budget constraint

Using general equilibrium in the exporting nation in order to eliminate the nominalprice because there is seldom data on the number of varieties n_i and producer prices $p_i$available.

$$Y_i = \sum_j T_{ij} = n_i p_i{}^{1-\sigma} \sum_j \left(t_{ij}^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}} \right)$$

Total output $Y_i$is all sales to all destinations. The above is rewritten as follows:

$n_i p_i{}^{1-\sigma} = \frac{Y_i}{\Pi_i^{1-\sigma}}$Where$\Pi_i = \left(\sum_j \left(t_{ij}^{1-\sigma} \frac{E_j}{p_j^{1-\sigma}} \right) \right)^{\frac{1}{1-\sigma}}$

Step 6: Gravity equation

Substituting step 5 into step 4 gives:

$$T_{ij} = Y_i E_j \left(\frac{\tau_{ij}}{\Pi_i P_j} \right)^{1-\sigma}$$

The above equation is nothing but the Anderson and van Wincoop (2003) equation.When proxying both the exporter's production of traded goods and the importer's expenditure on traded goods with their respective GDPs we get:

$$T_{ij} = GDP_i GDP_j \left(\frac{\tau_{ij}}{\Pi_i P_j} \right)^{1-\sigma}$$

Thus, gravity equation for international trade, based on sound micro economic foundations is derived. Taking the logarithm on both sides:

$$\ln T_{ij} = \ln GDP_i + \ln GDP_j + (1-\sigma) \ln \left(\frac{\tau_{ij}}{\Pi_i P_j} \right)$$

Table 8.1: Summary Statistic

Variable	Obs	Mean	Std. Dev.	ı	Max
_total*	3,234	60,384,544.70	241,761,186.34	00	5,300.00
current *	3,234	467,643,601,190.48	1,419,040,778,432.28	00	,990,000.00
ap	3,234	8,433.73	4,015.22	54	18,265.81
_crude*	3,234	18,095,946.08	148,371,050.05	00	4,500.00
_refined*	3,234	42,299,277.01	157,235,305.29	00	3,600.00
_Production*	3,234	2,101,285,714.29	2,774,363,597.12	00	13,100.00
convrt	3,234	0.52	0.31	00	1.86

nillion

ce : Author´s calculation

Table 8.2: OLS with FTA Dummy united

IABLES	OLS
uit_cur	0.215
	(0.381)
lp_current_missing	1.190***
	(6.43e-08)
p_convrt	-0.839***
	(0.00624)
st	-0.258
	(0.263)
ummy	-0.282
	(0.140)
tant	-107.4
	(0.124)
rvations	2,563
ıared	0.761

st se in parentheses *** p<0.01, ** p<0.05, * p<0.1

ce : Author´s calculation

Table 8.3:Modified Wald test for groupwise heteroskedasticityin fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (150) = 49316.03

Prob>chi2 = 0.0000