In-Depth Analysis of Malaysia International Trade Pattern

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***Abstract*— 2015 wave a challenging year for Malaysia in terms of economic as well as international trade due to several factors inter alia plummeting of global crude oil prices, Ringgit depreciation and sluggish of Asian giant's trading momentum suchlike People's Republic of China [5]. Nevertheless, Malaysia trade still managed to push beyond the gauge projected by World Bank and International Monetary Funds (IMF) which recorded 5% growth than expected 4.7%. Despite exceeding the projection by 0.3%, the actual trade level recorded slightly dropped compared to 2014, therefore it is a vital need for Malaysia to restructure the movement of export and import to ensure consistent performance in the future.**

This study analyses top 60 Malaysia trading partners worldwide by taking into consideration the economic as well as financial determinants of trade. Rather than just a cliché linear regression, this study differs from others by segregating the top 60 partners into three level of segregation together with the prominent gravity model of trade to identify the superior and profitable trading partners' categories Malaysia should focus with. Lastly, the augmented gravity model of static panel analysis results shows mixed findings in which Malaysia trade with different segregation level provides different patterns and determinants of trade. This proves that instead of analysing trade as a whole, it is better to analyse it based on specific group segregation to obtain a clearer pattern of trade.

***Keywords*—** *International Trade, Gravity Model, H-O Theory, Linder's Theory, Trade Partner's Segregation, Static Panel Analysis*

1. Introduction

The fact that all developed and developing countries is an open economy as reported by International Chamber of Commerce (ICC) in 2015 proved how important international trade is. Being an open economy, it means that one country is actually interacting with another country in terms of business and even political matters. International trade is generally defined as the business activities going on between one country and the country beyond its border. Commonly, these activities are split into two – the export and the import.

Focusing on international trade, there is one particular model that is very prominent to the international traders. Borrowed and modified from Newton's law of universal gravitational by the pioneer [10], the Gravity Model of Trade explains the trading volume by using the economic size of trading countries and the distance between them. It is highlighted that the larger the distance between trading countries, the lesser the trade in terms of volume. The gravity model becomes a phenomenon in all over the world where researchers from multiple countries applied it to their own home country in the effort to prove the existence of this model. Apart from that, organization such as World Trade Organization (WTO) also conducted analysis on this model by pairing hundreds of countries worldwide. This model is undeniably a solid model to explain the volume of trade between one country and another country.

Malaysia, an open economy country located in the Southeast Asia, is one of the countries in which the researchers - both locally and internationally – direct their attention to explain the bilateral trade using the gravity model. First examined by [2], it explored the relationship between Malaysia and 80 trading partners as a whole without any segregation in the sample chosen. Even with positive results suggesting that Malaysian trade obeys the gravity theory in general, it is still generating conventional results that leave the future researchers with question suchlike "does Malaysian export more towards developed or developing countries" or even "what are the factors affecting Malaysia trade patterns". Further studies on Malaysian trade only focus on specific partnership such that Organization of Islamic Cooperation (OIC) and

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Association of Southeast Asia Nation (ASEAN). The needs to clarify the question drew the attention on Malaysian international trade activities by looking at different perspective such that income classification of trading partners as well as development level of trading partners.

2. Background of Malaysia International Trade

Realizing the importance of international trade towards open economy, it has become an essential attempt to understand the real trade phenomenon for Malaysia. The possibilities of getting the wrong fact by just assuming and randomly choosing trade partners are likely to happen, thus it needs to be totally fended off. Since the world economy started to turn sideways in 2015 with Ringgit losing its grip on exchange rate, small open economy like Malaysia who highly depends on export to generate income needs a good and clear illustration of which export destination works the best. To clarify the confusion and contradiction, a look on the overview of Malaysia international trade would be best as well as on the importance of export for an open economy.

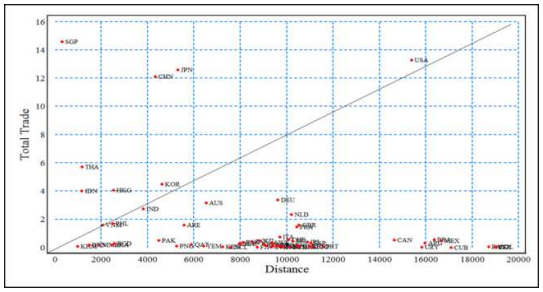

Figure 1. The Scatter Graph of Malaysia Total Trade based on Countries

Figure 1 depicts the total trade of Malaysia with 60 partners' worldwide measured in percentage of trade on the vertical axis and distance from Kuala Lumpur (capital of Malaysia) to capital of destination country at the horizontal axis measured in kilometers. The total trade percentage value is an average of 15 years starting from the year 2000 until 2014. The scatter diagram is labeled with the abbreviation of the country's name, showing that Singapore leads in the total trade at almost 15% but this is not a surprise since Singapore is geographically located the closest to Malaysia and is connected by 1 kilometer bridge crossing the ocean. Somehow, it seems to display the presence of gravity effect where distance affects total trade by increasing the total cost involving transportation. Still, looking at the top right corner of the scatter plot, USA stands at second place valuing a bit less than 14% from Malaysia total trade with the distance near to 16 000 kilometers away. This scenario obviously disobeys the gravity model of trade and raises a question of why it happens to be that way. Overall, Asian countries tend to be scattered on the left hand side of the graph whereas the further continents such as Europe, Africa and Oceania countries are likely to be scattered at the bottom part of the graph indicating less trade going on with Malaysia.

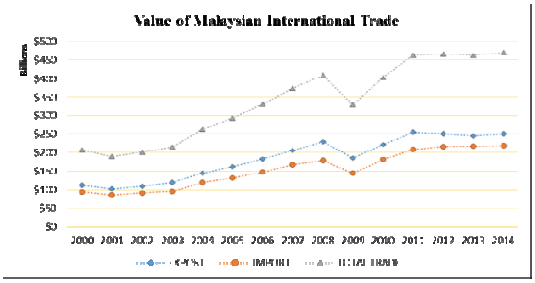

Figure 2. The Line Graph of Malaysia Export, Import and Total Trade from the Year 2000-2014

Figure 2 depicts the movement of Malaysian international trade activities starting from the year 2000 until 2014. Other than the major slump in 2009 which is believed to be due to the post effect of Global Financial Crisis in 2007-2008, the rest indicates a solid performance and a positive balance of payment throughout the new millennium. It can be seen clearly that total trade increased by more than one-fold from 2000 and 2014 and a steady increment from 2003 until 2008.

All in all, large portion of Malaysia GDP is contributed by the export revenue from numerous sectors within the economy. The reliance of Malaysia on international trade jeopardizes her to the fragile and unpredicted global economy. Thus, it is important for the government to allocate resources and focus on sectors which does not easily collapse when things going south. Yet, at the same time, the industry must be highly demanded internationally to ensure consistent growth in GDP from time to time.

3. The Gravity Model

It is diffused into economic theory of trade by [10] and [7] in an effort to study the effect of space and size towards trade. In the studies, [10] introduced that the total trade between two countries can be measured by their sizes (using GDP or GNP) and the distance between two economic centers of gravity (measures from their capital city). The following gravity equation is the first version as proposed by [10]:

$$T_{ijt} = \beta \frac{(M_i M_j)}{D_{ij}}, \ \ i \neq j \qquad (1)$$

On the left hand side of equation 1, *T* represents the total volume of trade between country i and country j for a time period of t. On the right hand side, β value is the simple constant value, the numerator is the size for country i and country j with a denominator of distance between country i and country j. Equation 1 can be translated into linear/natural logarithm where it carries the form of:

$$lnT_{ijt} = \beta + \beta_1 lnM_i + \beta_2 lnM_j - \beta_3 lnD_{ij} + \varepsilon \quad (2)$$

From equation 2, the terms logarithm is denoted by ln where multiplication becomes addition and division becomes subtraction with additional random error term at the end. This is the simplest and the most basic form of gravity model of international trade. Economists all over the world agreed that the economic size of country affects the total trade in a positive way where high income countries tend to have more refined and diversified product which means they are highly dependent on export and import activities [9]. Distance however, bears a negative sign due to the reason of it being a proxy to the transport cost.

For instance, in order to move products from country i to country j covering a certain kilometers of distance, it does involve transportation whether by air, sea or even land. Since transportation needs money and money means cost to the buyer, it signifies the existence of transportation cost in the distance. Considering that, cost can be divided into three involving physical shipping cost, time-related cost and cost of cultural unfamiliarity. Among these three, shipping cost is the most relevant cost in explaining the increase in price due to the, distance [4].

4. Estimation Procedure

For estimation purpose, STATA 11 software is chosen due to accuracy and capability of the software to deal with panel data apart from the built in diagnostic testing such as the Breusch Pagan Lagranger Multiplier (BP-LM) Test. Furthermore, there are few advantages of using panel data estimation such as it can capture relevant relationship between countries over time and can monitor unobservable individual effect [8].

In order to standardize and ensuring normal distribution, the data is transformed into natural logarithm form as presented by the abbreviation of *ln*. Then, stationarity test was conducted to ensure that the data are not following particular trend of movement to avoid unreasonable estimations. Levin-Lin-Chu (LLC) unit root test was chosen which carries a hypothesis of; (1) Ho: Panels contain unit roots and (2) Ha: Panels are stationary [3]. Overall, all the data is free from unit roots problem at level.

Next, the stationary data is segregated into three levels – Regional Level, Development Level and Income Level. Regional level is made up of five continents. The development level follows the United Nation Human Development Index (HDI) which covers gross domestic product, infrastructure advancement and industrial level. As for income level, it follows the income parameter determined by the World Bank. Overall, the list of countries sorted according to regional level is grouped below.

Table 1. The List of Countries According to Regional Level Segregation

Regional Level	**Countries**
Asia	Bangladesh, Brunei, Cambodia, China, Hong Kong, India, Indonesia, Japan, Myanmar, Pakistan, Philippines, Qatar, South Korea, Singapore, Sri Lanka, Thailand, Turkey, United Arab Emirates, Vietnam
The Americas	Argentina, Brazil, Canada, Colombia, Mexico, Panama, Peru, Uruguay, United States of America
Europe	Austria, Belgium, Czech Republic, Denmark, Finland,

	France, Germany, Ireland, Italy, Luxembourg, Netherland, Norway, Poland, Portugal, Russia, Slovakia, Spain, Sweden, Switzerland, United Kingdom
Oceania	Australia, Fiji, New Zealand, Papua New Guinea
Africa	Angola, Algeria, Benin, Egypt, Kenya, Nigeria, Togo, South Africa

5. Empirical Model

The regression models are made up of 7 independent variables for 60 partners with a combination of both economic and financial variables. The general form of regression model is as follows:

$$X_{ijt} = \alpha + \beta_1 GDP_{ijt} + \beta_2 GDPPC_{ijt} + \beta_3 POP_{ijt} + \beta_4 TRO_{it} + \beta_5 TRO_{jt} + \beta_6 RER_{ijt} + \beta_7 FCR_{jt} + \varepsilon_{ijt} \quad (3)$$

Model 3 is adapted from the basic gravity model from [10] with additional economic and financial variables to be tested within the equation. Referring to [11] and [6], income variables should not be put together in the same model as it will lead to collinearity problems. From model 3, the two income variable that is highly correlated with one another is the GDP and the GDP per capita differential. Thus, model 3 was split into two different regressions as provided below:

$$X_{ijt} = \alpha + \beta_1 GDP_{ijt} + \beta_2 POP_{ijt} + \beta_3 TRO_{it} + \beta_4 TRO_{jt} + \beta_5 RER_{ijt} + \beta_6 FCR_{jt} + \varepsilon_{ijt} \quad (4)$$

$$X_{ijt} = \alpha + \beta_1 GDPPC_{ijt} + \beta_2 POP_{ijt} + \beta_3 TRO_{it} + \beta_4 TRO_{jt} + \beta_5 RER_{ijt} + \beta_6 FCR_{jt} + \varepsilon_{ijt} \quad (5)$$

where α and β = coefficient to be estimated; GDP = Gross Domestic Product; POP = Population; TRO = Trade Openness; RER = Real Exchange Rate; FCR = Foreign Total Reserves; ε = error term; ijt = i (home country), j (partners country), t (time).

This is the first stage gravity model to be estimated by repeating the process with different group of data. After conducting first stage regression, the coefficients are then substituted into raw data to calculate the individuals' effect for each partner. The purpose is to conduct a second stage regression due to inability of panel estimation to deal with static data such as distance and trade agreements which do not change over time. Apart from that, the dummy variable of trade agreement is valued at one for existence of trade agreement and zero if otherwise.

$$IE_{ij} = \alpha + \beta_1 DIS_{ij} + \beta_2 RTA_{ij} + \varepsilon_{ijt} \quad (6)$$

where IE = Individuals Effect; DIS = Distance; RTA = Trade Agreement

6. Empirical Results

With reference to table 2, it describes the results of static panel analysis for regional level segregation. Out of 12 levels of segregation, only Oceania shows insignificance in GDP variable. This means that Malaysia trade with Oceania countries does not get affected by level of GDP of both home and destination countries. The rest of segregation categories show a variation level of significance at 99% and 95% confidence interval.

As for the theory of trade applicable to the case of Malaysia, the results depict somewhat interesting trend. Looking at regional level, out of five continents, only three continents provide significant results which are Asia, the Americas and Europe. Impressively, all of these three continents are actually supporting Linder's hypothesis. Linder's hypothesis highlights that one country tend to trade more with another country that share similarities in terms of economic performance and product preferences. This means that Malaysia tend to trade more with countries from these continents that share similarities with Malaysian taste over products.

Turning towards development and income level segregation, the pattern of trade is obviously indicating that Malaysia trade with rich countries, which is driven by Linder's hypothesis whereas Malaysia trade with low income and under developed countries is based on the Heckscher-Ohlin theory of trade with a delightful confident

level of 99%. The evidence proved to be the most advanced report there is on the theory of either Malaysia are following Linder's hypothesis or Heckscher-Ohlin theory of trade.

In terms of economic determinants of trade, the findings varied across different level of segregation. In general, total population of home and destination countries has higher significant level at 99% interval which indicates the concept of supply and demand factors. Apart from that, the openness of the home countries towards international trade also proved to be among the factors influencing Malaysia trade with others. Unfortunately, there is lack of significance in probability value to conclude that trade openness of destination country has an effect on total trade.

As for financial variables of real exchange rate between home and destination currency together with total foreign reserves of the country, the results tend to be more significant when it involves low income and under developed countries such as the African and some in Asia. Comparing real exchange rate and total foreign reserves, evidence shows that total foreign reserves affect more on total trade compared to the damage real exchange rate can do.

Looking at the dummy variable of trade agreement, this variable measures the relation of trade agreement of home country with destination country. It carries a value of one if there is any kind of trade agreement going on between the two countries and value of zero for vice versa. Regrettably and unexpectedly, only two segregation level – Oceania and Developing Countries – provide empirically proven evidence that Malaysia trade with these two groups of countries, and this is explainable with the existence of trade agreement. The rest of groups show insignificance in confident level even at 90% interval.

Finally, evidence from the distance variable seems to be unacceptable. This is due to the fact that only one group shows a significant level of 10% which is the Americas. Luckily, it possesses the expected negative coefficient which means that the further the distance between Malaysia and destination country, the lower will the total trade value be.

7. Conclusion and Recommendation

In this present paper, the study examines the specific effect of segregating trade partners according to three segregation levels in an effort to identify determinants of trade between Malaysia and top 60 trading partners. Overall, based on the partner's segregation groups, it can be concluded that Malaysia tend to trade more with Asian countries in terms of Regionalization. As for development level, Malaysia is focusing more on developed and developing countries with reference to the strength of the regression results. The finding is in parallel with a study by [6] in which evidence shows that developing country tend to trade more with developed countries. For the income level, Malaysia trade with the high income countries and upper middle income shows a better performance than lower middle income and low income.

As for the theory of trade applicable in Malaysia, rich countries tend to follow the Linder's hypothesis in which shared similarities are believed to be the major reasons of choosing trade partners. For poorer partners, Malaysia is actually obeying the Heckscher-Ohlin theory of trade where difference in factor endowment plays its role in choosing trade partners.

All in all, this study manages to achieve its main objectives of proving that different segregation levels tend to behave differently in terms of both economic and financial variables. This might be due to the concept of factor endowment theories of utilizing abundance resources at maximum to increase trade. Plus, Armington theory states that different countries are blessed with different resources which allow variety of products to be produced differently based on country of origin [1]. It is recommended that future researchers should look at the products differentiation suchlike industrial products or mining products which provide better profit for Malaysia national income. Eventually, it will be beneficial for both private and public sectors to improvise themselves to cater to both international and domestic demand.

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Table 2. Results for Static Fixed and Random Effects for Regional Segregation Level

Groups	**ASIA**		**THE AMERICAS**		**EUROPE**		**OCEANIA**		**AFRICA**	
Models	4	5	4	5	4	5	4	5	4	5
Constant	-27.70 *0.15*	2.70 *0.49*	-31.90*** *0.01*	-31.13* *0.06*	28.53 *0.44*	-29.24*** *0.01*	-31.13* *0.06*	-37.22** *0.02*	-233.03*** *0.01*	-308.60*** *0.01*
lnGDPijt	1.06*** *0.00*		1.81*** *0.01*		1.32*** *0.01*		0.10 *0.88*		1.13** *0.02*	
lnGDPPCijt		-0.01** *0.04*		0.10 *0.88*		-0.49*** *0.01*		-0.02 *0.56*		0.14 *0.60*
lnPOPijt	0.65 *0.51*	0.64*** *0.01*	0.02 *0.95*	2.06 *0.29*	-2.75 *0.17*	2.25*** *0.01*	2.06 *0.29*	2.80*** *0.01*	11.13*** *0.01*	17.00*** *0.01*
lnTROit	0.55 *0.12*	- 0.85*** *0.01*	0.56 *0.24*	-0.74 *0.42*	0.64 *0.25*	0.28 *0.25*	-0.74 *0.42*	-0.95* *0.09*	2.75** *0.03*	2.96**
lnTROjt	0.57*** *0.01*	0.64*** *0.01*	0.42 *0.24*	-0.56 *0.49*	0.10 *0.78*	0.51* *0.09*	-0.56 *0.49*	-0.47 *0.53*	-0.25 *0.36*	-0.41 *0.19*
lnRERijt	0.03 *0.23*	0.05* *0.08*	-0.06 *0.60*	0.41 *0.70*	0.86* *0.09*	0.06 *0.69*	0.41 *0.70*	0.64 *0.45*	-1.09* *0.07*	-1.36* *0.09*
lnFCRjt	0.13** *0.02*	0.36*** *0.01*	-0.11 *0.41*	0.85 *0.01*	0.05 *0.35*	0.04 *0.46*	0.85*** *0.01*	0.72** *0.02*	0.51*** *0.01*	0.48*** *0.01*
lnDISij	0.55 *0.27*	0.10 *0.78*	-15.07* *0.06*	-4.33 *0.20*	-3.92 *0.19*	-1.04 *0.69*	-4.33 *0.20*	-4.34 *0.19*	-30.72 *0.15*	-42.30 *0.14*
RTAij	1.96 *0.26*	1.55 *0.25*	1.73 *0.21*	3.95* *0.09*	(omitted)	(omitted)	3.95* *0.09*	3.95* *0.09*	8.20 *0.19*	11.57 *0.18*

*Notes: ***, ** and * are significance at 1%, 5% and 10% respectively.*

Table 3. Results for Static Fixed and Random Effects for Development Segregation Level and Without Segregation Level

Groups	**DVLP**		**DVLPG**		**UDVLP**		**No Segregation**
Models	4	5	4	3	4	5	3
Constant	-19.65*** *0.01*	-74.66*** *0.01*	-31.44*** *0.01*	-49.13 *0.18*	-148.71*** *0.01*	6.37 *0.51*	-88.09*** *0.01*
lnGDPijt	1.36*** *0.01*		1.21*** *0.01*		1.23*** *0.01*		1.37*** *0.01*
lnGDPPCijt		-0.51*** *0.01*		-0.01 *0.12*		1.48*** *0.01*	-0.01 *0.91*
lnPOPijt	-0.30 *0.53*	4.65*** *0.01*	0.89*** *0.01*	4.25** *0.02*	6.52** *0.03*	0.23 *0.55*	3.43*** *0.01*
lnTROit	1.01*** *0.01*	0.88** *0.02*	0.05 *0.88*	-1.87*** *0.01*	1.81 *0.11*	-1.21* *0.08*	1.50*** *0.01*
lnTROjt	0.38** *0.04*	0.64*** *0.01*	0.84*** *0.01*	0.89*** *0.01*	-0.15 *0.51*	-0.61*** *0.01*	0.02 *0.83*
lnRERijt	0.27** *0.02*	0.32* *0.09*	0.13 *0.15*	-0.64* *0.06*	-0.02 *0.59*	-0.02 *0.58*	0.05 *0.20*
lnFCRjt	0.08* *0.07*	0.03 *0.46*	-0.06 *0.45*	-0.06 *0.54*	0.42*** *0.01*	0.20* *0.06*	0.07* *0.09*
lnDISij	0.10 *0.71*	0.37 *0.50*	-0.55 *0.14*	-0.37 *0.68*	1.29 *0.59*	-0.04 *0.91*	0.04 *0.93*
RTAij	-0.52 *0.68*	-0.51 *0.83*	2.03** *0.02*	4.23** *0.04*	6.65 *0.12*	1.32* *0.09*	3.07** *0.02*

*Notes: ***, ** and * are significance at 1%, 5% and 10% respectively.*

Table 4. Results for Static Fixed and Random Effects for Income Segregation Level

Groups	**HI**		**UMI**		**LMI**		**LI**	
Models	4	5	4	5	4	5	4	5
Constant	-18.20 *0.38*	-66.22*** *0.01*	-300.40*** *0.01*	-300.37*** *0.01*	-25.96** *0.02*	-4.77 *0.60*	-88.77** *0.03*	-74.54* *0.06*
lnGDPijt	1.38*** *0.01*		1.29*** *0.01*		1.40*** *0.01*		1.63** *0.02*	
lnGDPPCijt		-0.05*** *0.01*		-0.01 *0.74*		1.03*** *0.01*		1.64*** *0.01*
lnPOPijt	-0.31 *0.79*	4.59*** *0.01*	14.58*** *0.01*	16.39*** *0.01*	0.27 *0.51*	0.95** *0.02*	3.32 *0.11*	4.14** *0.04*
lnTROit	0.94*** *0.01*	0.63* *0.07*	3.55*** *0.01*	2.33*** *0.01*	0.35 *0.61*	-0.65 *0.32*	0.93 *0.45*	0.76 *0.51*
lnTROjt	0.18 *0.38*	0.27 *0.24*	-0.06 *0.87*	-0.07 *0.86*	0.12 *0.56*	-0.16 *0.48*	-0.23 *0.54*	-0.21 *0.57*
lnRERijt	0.41** *0.02*	0.35* *0.08*	-0.66 *0.13*	-1.26*** *0.01*	0.02 *0.56*	0.04 *0.34*	-0.41 *0.18*	-0.48 *0.12*
lnFCRjt	0.05 *0.21*	0.03 *0.51*	0.03 *0.86*	0.40* *0.06*	0.07 *0.42*	0.11 *0.27*	0.27 *0.16*	0.30 *0.11*
lnDISij	0.15 *0.65*	0.54 *0.38*	-4.36 *0.45*	-4.22 *0.47*	-0.01 *0.97*	0.03 *0.94*	(N/A)	(N/A)
RTAij	0.22 *0.82*	0.48 *0.80*	16.70 *0.10*	15.88 *0.11*	1.39* *0.07*	1.64** *0.02*	(N/A)	(N/A)

*Notes: ***, ** and * are significance at 1%, 5% and 10% respectively.*