THE DETERMINANTS OF EXPORTS BETWEEN MALAYSIA AND THE OIC MEMBER COUNTRIES: A GRAVITY MODEL APPROACH

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1. Introduction

The impact of exports on economic growth has attracted considerable interest from the researchers. The numerous studies have been conducted and found meaningful results between exports and economic growth. Although there is consent among researchers regarding the impact of exports on economic growth but researchers does not show similar consensus during the confirmation of causality among exports and economic growth. The results of causality among exports and economic growth are complex whether exports causing economic growth or economic growth causing exports.

The traditional models of exports prove that exports cause increase in production in the economy. In an open economy, transformation of knowledge and technology is may be due to exports, and there is a shift in resources toward the sectors that draw upon the abundant factors and the value of total production increases. An increase in total output, following a movement from autarky to free trade, can be also found in some models of economies of scale with monopolistic competition Krugman (1979). The neoclassical model presented by Harrod (1939)and Domar (1946) where capital is main factor of production, exports shows positive effect on economic growth in developing country. The Adam Smith (1776), Ricardo (1817) and Solow (1956) admit the importance of exports, and explain that exports can bring an economy at higher level of income since it permits a better allocation of resources. The new growth theories presented by Romer (1986) and more support the contribution of exports in the economic growth. The Grossman and Helpman (1991) explain that, within the new growth theories framework

exports boost economic growth through following channels: exports expand the supply of raw material and capital equipment, which can enlarge the productivity in the economy. Exports permit developing countries access to improved technology of developed countries in the form of embodied capital goods. Furthermore, exports allow intensification of capacity utilization that increases products produced and consumed (Hamori and Razafimahefa, 2003).

1.1 Malaysian Exports

International trade plays an important role in the development process in Malaysia particularly in transforming the economy from a low income to upper-middle income category. For many decades the United States of America, The European Union (EU) and Japan were Malaysia's major trading partners. However, after the 2008/09 world economic and financial crises, this trend has changed where Malaysia's major exporting and importing nations have tilted more towards other new markets and non-traditional countries such as China (MITI, 2010). Under the New Economic Model (NEM), the Malaysian government has embarked on a new strategy to shift its trade dependency on the traditional markets and exploring new markets for exports and imports. One of the markets being targeted is the Middle Eastern countries. Trade relationship between Malaysia and the OIC countries becoming more relevant especially after the 2008/09 world economic and financial crisis. Therefore it is vital to study and analyze the on-going Malaysia-OIC trade relationship in this context.

Export is backbone of Malaysian economy since independence. As far as Malaysia's exports is concerned it observed rapid expansion during initial years of 1990s, as it

increased from USD 89.66 billion in 1997 to USD 188.74 billion in 2012 (210.54 percent increase in 16 years) due to better exports & tariff reforms. During the year 1997 to 2012 total exports 2257.32 billion USD and on average 141.08 billion USD was recorded.

1.2 Malaysian Exports with OIC countries

Since the establishment of the Organization of Islamic Cooperation (OIC) in 1969, there have been many initiatives among member countries in promoting economic and trade cooperation under the OIC framework (Suayb, 2009). Although the raison d'être of its formation was political, the need to cooperate on the economic arena among them has gain its momentum in the 1974, beginning at the second Islamic Summit Conference, and subsequently with the adoption of the General Agreement for Economic, Technical, and Commercial Co-operation among the member states of the OIC.

The implementation of the Trade Preferential System among OIC member countries (TPS-OIC) as a means of establishing the Islamic Common Market (ICM), the establishment of the Islamic Development Bank (IDB), the existence of seminars and forums such as the World Islamic Economic Forum (WIFE), and the resolutions of the Makkah summit in 2005, which is to increase intra-OIC trade to 20 per cent by the year 2015 are some examples of programmes, polices, and initiatives done that are specifically meant to promote, enhance, and strengthen their relationship economically. But despite all these, it is still being argued that as a whole, the OIC countries are still trade more with the rest of the world than among themselves (Hassan, 1998). This is in

line with the recent empirical facts available. In 2006 for instance, the share of intra-OIC trade has dropped to 14.3 per cent from 14.8 per cent in the previous year (Carsicm, 2008). In 2007, Malaysia's total trade with the OIC member countries accounted only 8.37 per cent of its total global trade (IMF and Dinar Standard, 2008).

Considering that the OIC countries have more than 60 per cent of vital resources and with 1.6 billion of the world's population, this general picture of the state of OIC trade performance can be deemed as weak. Furthermore, in light of the present on-going world economic and financial crises, there is an urgent need for Malaysia to diversify its export destinations away from its traditional trading partners, and one of these destinations is the OIC region. Although there are many factors responsible for the weaknesses of this trade relation, the leaders and the people of the OIC countries believe that there are many fields and opportunities for growth of mutual trade relations. It is therefore crucial to examine and analyze the on-going Malaysia-OIC Export relation in this context. The focus of this research is to examine Malaysia's export relationship with the OIC member countries. In recent years, it is in the interest of the Malaysian government to expand its export market to the Middle Eastern countries (Abu-Hussin, 2010). This can be seen in the economic blueprint of the New Economic Model (NEM) which was launched in March 2010, where a new strategy would be adopted to shift its trade dependency on the traditional markets and exploring new markets especially for exports. In the post- September 11 terrorist attack that hit the U.S and in light with the on-going global economic and financial crises, a study of the Malaysia-OIC export linkages has become more relevant than ever.

1.3 Malaysian Exports with TPP countries

Major Malaysian exports partners are from TPP members countries. In 1997 total Malaysian exports 89.66 billion USD (47.06 percent) with TPP member countries and 47.46 billion USD (52.93 percent) with non-TPP country were recorded. The highest Malaysian exports volume 188.74 billion USD was recorded in 2012. Similarly, highest export volume with TPP countries 95.37 billion (50.53 percent) was also recorded in 2012. From the total exports of 2257.32 billion, exports with TPP countries 1050.38 billion (46.53 percent) and with non-TPP countries 1206.94 billion (53.46 percent) was recorded during the time period of 1997 to 2012.

Table1.1. Malaysia Exports with TPP and non-TPP countries

Year	Malaysia Total Exports (billions USD)	Malaysia Exports with TPP countries (billions USD)	Percentage From total	Malaysia Exports with TPP countries (billions USD)	Percentage From total
1997	89.66	42.19	47.06	47.46	52.93
1998	94.58	37.86	40.02	56.72	59.97
1999	95.04	44.27	46.58	50.77	53.41
2000	107.56	56.00	52.06	51.56	47.93
2001	124.84	48.88	39.15	75.96	60.84
2002	116.31	49.86	42.86	66.45	57.13
2003	122.62	53.60	43.71	69.01	56.28
2004	128.92	63.17	48.99	65.75	51.00
2005	149.62	71.33	47.67	78.29	52.32
2006	162.05	78.59	48.49	83.45	51.50
2007	172.87	81.08	46.90	91.78	53.09
2008	179.39	89.86	50.09	89.53	49.90
2009	182.22	65.68	36.04	116.53	63.95
2010	162.39	81.59	50.24	80.80	49.75
2011	180.45	90.99	50.42	89.45	49.57
2012	188.74	95.37	50.58	93.37	49.46

Note: data for this table has been taken from IFS CD-ROM data base 2013 and it is authors self calculated.

It can observe that Malaysia is exporting almost 50 percent to 11-TPP member countries. The detail of Malaysian total exports, exports with TPP member countries and with non-TPP countries during the year 1997 to 2012 are presented in Table1.

The purpose of this study is to examine the impact of macroeconomic factors i.e. GDP, CPI, TRGDP and ER on exports between Malaysia, OIC and TPP member's countries using a panel data from 1997 – 2012. The results of this study will reveal whether all variables have impact on exports between Malaysia, OIC and TPP member's countries, therefore appropriate policies can be implemented by the government of Malaysia.

2. Review of Literature

In the literature numerous studies witness the productivity and supply-side effects of exports on domestic output. Increase in domestic output cause increase in capital formation and total factor productivity (TFP) hence economic growth (Krueger 1978). Similarly, Bhagwati (1978) explore that exports support industries which have economics of scale that develop the productivity and efficiency in the long run. Tyler (1981) explores the effect of exports on economic growth in middle income and OPEC member's countries. The study found that exports cause enhancement in technology which leads to increase in absorptive capacity and in cause economic growth.

Similarly, Nishimizu and Robinson (1984) investigates that expansion in exports encourage the growth of TFP by increasing competitiveness and economies of scale while expansion in imports discourage the growth of TFP. Theoretical literature on economic growth also support the concept of exports may have positive effect on

economic growth in long run. There are several studies (Grossman and Helpman, 1990; Rivera-Batiz and Romer, 1991; Barro and Sala-i-Martin, 1997) explores that export may cause economic growth by transforming technology by importing high-tech import items and from the spill over effects of foreign direct investment. Sachs and Warner (1995) documented that the increase in trade motivates government to initiate a restructuring program to face the competition in open market. Meanwhile, Redding (1999) point out that trade is hurdle in economic growth through relative disadvantage in the growth of productivity in specialized sectors of an economy.

2.1 Malaysian Exports with TPP and OIC Member's Countries

The encouragement of exports between Malaysia, TPP and OIC countries has long been well thought-out as the fundamental for collaboration and economic integration. As with studies of TPP and OIC international exports capacity, empirical studies on TPP and OIC countries' international trade as a group also inadequate. However, Ekholm *et al* (1996), Bendjilali (1997), Al Atrash & Yousef (2000), Makdisi *et al* (2001) Amin *et al* (2005) Nugent & Miniesy (2006) and Abu-Hussin (2010) have pay attention on the Middle East and North African (MENA) region, which embrace the immensity of OIC members. Moreover, Hassan (2001) and Yunus & Ismail (2009) focused on South Asian Association for Regional Cooperation (SAARC).

The proposed studies on TPP and OIC countries illustrate that exports dimensions for countries in these regions are small, and categorize the small intensity of trade related services, a lack of trade related information, the subsistence of tariff and non-tariff obstacle, and vacant of trade structures as barriers to regional cooperation and trade.

These countries' unbalanced and contracted exports bases also offer slight encouragement to prospective regional partners in term of ascertain long-term economic associations.

Additionally, these OIC members' countries reliance on non-OIC members' countries for imports and exports. Ekholn *et al* (1996) use cross-sectional data for 11- developing countries and 13- industrial countries and argue that impending for trade growth inside the MENA regions, even with the more peaceful countries, and the European Union (EU) is small. Bendjilali (1997) explore the situation of intra-trade between OIC member countries by using gravity model. The results of the study shows that trade of OIC countries positively exaggerated by the size of their economies, the degree of IDB trade financing and their mutual involvement in regional integration schemes. While trade of OIC countries negatively affected by communication and transportation costs as proxy for the distance factor which constitutes a significant barrier to trade among OIC countries.

Al Atrash & Yousef (2000) used Tobit procedure to explore the effects of trade among members of Arab Maghreb Union (AMU) and the members of Gulf Cooperation Council (GCC). The results show that effects are negative, which is patently unusual from estimates for other free trade agreements (FTA). Utilizing cross-country regressions, Makdisi *et al* (2005) demonstrate that trade openness has a positive and significant impact on growth for many countries, the effect has been smaller.

Amin *et al* (2005) also explore the scope of economic integration between five members of the Arab States (LAS) and include five of their major partners; the results show that the LAS economic alliance has not been effectual in cause trade growth, representing a collapse of its members to instate integrative procedures. Meanwhile, Hassan (2001) examines the role of exports towards development in SAARC countries. He argue that SAARC countries need trade rectification to boost trade among them because the size of trade between SAARC countries is small as compare to trade with non-SAARC countries.

Yunus and Ismail (2009) investigate Malaysia- OIC trade using gravity model approach from the period 1980-2006. The empirical results of this study claim that GDP of Malaysia and OIC countries, exchange rate, foreign direct investment (FDI) and distance are the major determinants of exports in Malaysia. In such circumstances, Greenaway et al. (2002) use panel data and shows that with the cause of trade, economic growth increase up to certain level after that it is decline. So, there is j-curve relationship between trade and economic growth. Furthermore, Brunner (2003) considers the model of Frankel and Romer's (1999) and found that due to certain problem effect of trade on economic growth is not robust.

On the other hand, Dowrick and Golley (2004) explores that improve in productivity and increase in investment contributes in economic growth but contribution of investment is relatively less as compare to improving productivity. Furthermore, Barro (2003) explore the determinants of economic growth and found that trade is one of the determinants of economic growth. The study of Yanikkaya (2003) utilizes annual time series data of 120

countries to investigate the impact of international trade on economic growth. By using two indicators volume of trade and trade restriction on foreign exchange on bilateral payments results conclude that both indicators boost economic growth in long run and short run.

Similarly, Karras (2003) argue that exports improves total factor of productivity and boost economic growth in 105 countries. Further study explains that 1 percent increase in exports cause economic growth increase in between 0.30 percent to 0.35 percent. In addition, Bhattacharya (2011) explore the relationship between FDI, economic growth and volume of merchandize trade. The study explains that FDI have dynamic effects to boost the economic growth, through promote the adoption of modern technology in production sector and encourage the knowledge and training. The transforming knowledge, training and skills into labour cause support the economic growth in case of India. The increase trade leads labor productivity; Alcalà and Ciccone (2004) shows that 1 percent increase in trade cause increase in labor productivity by 1.55 percent hence economic growth.

Same researcher discusses the impact of distance equator and quality of institution. Rassekh (2007) considers Frankel and Romer (1999) growth model and utilizes 150 countries data to investigate the relationship between exports and economic growth. The study argue that less developed countries get more benefits from exports as compared to developed countries due to distance from equator and quality of institutions. Similarly, in literature liberalization indicators presented by Wacziarg and Welch (2003) also

discusses. The study of Kneller et al. (2008) argue that country with efficient human capital, less trade taxes and excess supply of raw material for industries can get more benefits from the exports. In addition, Chang and Ying (2008) explore the air freight contribution to boost economic growth in Africa. The results are claim that decrease the cost of air freight, improvement in cargo services has positive and significant effect on economic growth.

Moreover, Kim and Lin (2009) apply instrument-variable threshold regression method on time series data of 61 countries to confirm the contribution of trade in economic growth. The results of the study witness that the relationship exists between trade and economic growth and found a threshold point is USD780 to USD820 per capita. Furthermore, if per capita is less than USD 780 to USD820 than trade is hurt economic growth. In addition, Dufrenote et al. (2010) explains the determinants of economic growth by using quintile regression procedure and found that government balance, inflation, population growth, investment and term of trade are the main determinants of economic growth. Their finding indicates that less develop countries are obtaining more benefits of international trade as compared to developed economies.

Furthermore, Chansomphou and Ichihashi (2011) studies South East Asian countries before and after financial crises to explore the impact of international trade on economic growth. The results of structural break cointegration procedure proposed by Carrion-i-Silvestre and Sano (2006) are indicates that financial crises hurt Malaysian, Indonesian and Pilipino economy whereas Thai economy perform well before and after economic

crises in South East Asia. Further results argue that international trade positively affects the output of Malaysian economy and Indonesian economy but effect is smaller in Thai economy, and international trade hasten economic growth in the Pilipino economy before the crisis and after that economic growth is inversely impacted by trade. Moreover, Kim et al. (2011) investigates international trade and economic growth nexuses in less developed countries (LDCs) and developed countries by utilizes threshold regression procedure. The results are shows that in developed countries international trade contributes in growth productivity, capitalization, financial development and economic growth while effect is negative in LDCs.

2.2 Gravity Model, TPP and OIC countries

The gravity model was first applied to international trade studies by Tinbergen (1962) and Poyhonen (1963) to analyze the patterns of bilateral trade flows among the European countries. However, the origins of the application of the gravity model analysis to the field and sub-field of social sciences can be dated as far back as in the 1930's from various fields such as Astronomy, Sociology, and Regional Economics (e.g: Reilly, 1931; Stewart, 1948; Zipf, 1946). Ghani (2007) studied the effects of OIC membership towards the volume of trade. Employing the standard gravity model, he discovered that OIC member countries are susceptible to conflict and their institutional quality is, on average, is relatively low compared to non-OIC countries. Meanwhile, Raimi and Mobolaji (2008) explored the possibility of 'faith-based integration' under the OIC umbrella. Their study and its results can be seen as a strong case for enhancing intra-OIC trade.

Bendjilali (1997) examined major determinants of intra-OIC trade relationship using gravity model and found that trade is correlated positively with the size of their economies and negatively related by transportation cost as a proxy for distance. Al Atrash and Yousef (2000) suggested that intra-Arab trade and Arab trade with the rest of the world are lower than what the gravity equation would be predicted. The results suggested that there is considerable scope for regional integration. Hassan (1998) pointed out that the volume of intra-regional trade is very low and the dependence on the industrialized countries is considerable. The study suggested the removal of tariff and non-tariff barriers under the OIC block countries that can lead to some profitable intra-regional trade channels. Furthermore, study pointed out that it is crucial to make the preferential trade agreements more effective among the OIC member countries by increasing private sector participation rather than through preferential trading arrangement. The study also recommended that the OIC member countries should strengthen the backward and forward linkages in production and investment to reap the economies of scale.

In addition, Khalifah (1993) analyzed the structure of intra-Muslim countries trade and discovered that the trade contributions of the high income Muslim countries are greater than the lower and upper middle income countries. She argued that any form of trade integration among the Muslim countries must incorporate countries especially from the Middle East. In her analysis, she highlighted the political complexities on that region and uniting them is not an easy task. Ab Rahman and Abu-Hussin (2009) analyzed Malaysia's trade relations with the Gulf Cooperation Council (GCC) countries which consist of the United Arab Emirates (UAE), Bahrain, Saudi Arabia, Oman, Qatar, and

Kuwait. Using trade intensity index, they showed that Malaysia's trade with the individual GCC country and with GCC as a group were very low during the 1990 – 2007 period of study. They provided suggestions on how to improve Malaysia-GCC trade relations in the future such as to expedite the Free Trade Agreement (FTA) initiative, and focusing on niche areas which they have comparative advantage at such as Halal Food services, Islamic Banking and Finance services, tourism sector, Bio-fuel industries, constructions, education sector, and petrochemical industries.

However, Evelyn *et al*. (2011) find that based on their Gravity Model estimation, culture and religion are insignificant in enhancing bilateral trade between Malaysia and the GCC countries. Ismail (2008) examined the pattern of trade between Malaysia and eighty trading partners, where twenty of which are OIC members. In his research, he found that Malaysia trade with countries which have similar in terms of size but different in terms of factor endowment. Abu-Hussin (2010) explored the trade relationship between Malaysia and the Gulf Cooperation Council (GCC) countries. By employing the revealed comparative advantage (RCA) and the trade intensity index, he discovered that the trade linkages are still insignificant relative to Malaysia's traditional trading partners.

3. Data Description and Empirical Methodology

There are quite a number of studies that estimate export equations for Malaysia, TPP and OIC. However, since there have been many economic changes in the world generally, and in OIC, in particular, a re-examination, using the latest data available, and employing the current econometric techniques, is essential. Therefore, the purpose of

this section is to develop the following model of exports in which all the methodological issues concerning the exports equation estimation will be taken into consideration. This study applies different model with Malaysia and TPP countries, Malaysia and OIC countries with different techniques.

3.1 Data Source

The data sources of Malaysian, TPP and OIC countries exports and other macroeconomic variables are reported in the following sections.

3.1.1 Data Source of OIC countries

The data used are annual and span for the period of 1997 – 2009. Data on Gross Domestic Product (*GDP*), *GDP* per capita, foreign direct investments (FDIs), real exchange rates, total exports, total imports are obtained from the *World Development Indicators (WDI)* database of the World Bank and also from the *International Financial Statistics (IFS)*, *CD-ROM* database and website of International Monetary Fund (*IMF*). Data on Malaysia's exports (country *i* export) to all other countries (country *j's*), Malaysia's imports (country *i* imports) from all other countries (country *j's*) are obtained from the *Direction of trade statistics*, *CD-ROM* database and website of International Monetary Fund (*IMF*). Data on the distance (in kilometer) between Kuala Lumpur (capital of Malaysia) and other capital cities of country *j* are obtained from an Indonesian website: www.indo.com/distance. The data on Consumer Price Index (*CPI*) of all the Muslim countries are collected from the *World Development Indicators (WDI)* database of the World Bank and the Center of Advanced Research & Studies of the

Islamic Common Market website: www.carsicm.ir. For the measurement of the level of institutional quality, that is measured by the corruption index is obtained from the Corruption Perceptions Index (CPI) from Transparency International (TI) and retrieved from TI database at www.transparency.org/cpi.

3.1.2 Data Source of TPP countries

The annual time series data set for 12-TPP countries from the year 1997-2012 is collected from different sources. Data of real GDP, CPI, TRGDP and ER for country i (Malaysia) and country j (TPP countries) taken from World Development Indicator (WDI) database of World Bank. While, data on Exports from country *i* to country *j* obtained from the Direction of Trade Statistic, CD-ROM database and website of International Monetary Fund (IMF). Data on the variable GDP, TRGDP and EXPORT are calculated in millions of USD.

3.2 Estimation Method

The main objective of this study is to explore the long-run and short-run relationship of export and other macroeconomic variables of Malaysia TPP and OIC-countries. The different methodologies have been used to estimates exports between Malaysia, TPP and OIC countries. First, to explore long run relationship between exports of Malaysia and OIC countries, Fully Modify OLS (FMOLS) have utilized. Second, to examine the relationship between Malaysia and OIC countries exports by applying gravity model. Third, to investigates the relationship between Malaysia and TPP countries exports by using FMOLS.

3.2.1 Malaysia – OIC countries and FMOLS approach

To test relationship between exports and other macroeconomic variables, six steps were performed. First, test of stationarity and order of integration among all variables. The study used panel unit root test proposed by Maddala & Wu (1999), Levin, Lin & Chu (2002) and Im, Pesaran & Shin (2003) to determine the stationarity and order of integration. Second, with the assumption that all variables are in same order of integration; either stationary at level I (0) or stationary at first difference I(1), Kao panel cointegration proposed by Kao (1999) has been applied to confirm the residual based cointegration among all variables. These tests involve procedures that are designed to detect the presence of a unit root in the residuals of (cointegrating) regressions among the levels of panel data. Third, fully modify ordinary least square (FMOLS) proposed by Pedroni (2000) has been applied to explore the long run relationship between Malaysian export and other variables. Fourth, to confirm that the long run results are not spurious study will applied unit root tests of the residuals of FMOLS model without trend and intercept formation. Fifth, panel error correction model (panel ECM) used to find out short run relationship between all the variables.

3.2.1.1 Panel Unit Root Test

In the previous literature the unit root tests for the individual time series data (Phillips and Perron (PP) test and Augmented Dickey Fuller test (ADF), and others) are suffering with several problems. One of the main problems is to have low power against the alternative of stationarity of the series, especially if the sample size is small. Panel unit root test have several advantages, it is provide large no of point data, increase the value

of degree of freedom and reduce multicollinearity between the two regressors. Moreover, panel unit root test provide us more powerful test statistics asymptotically follow a normal distribution. In this study, Im, Pesaran & Shin (2003) known as IPS test, Levin, Lin & Chu (2002) known as LLC test and Maddala & Wu (1999) known as MW are used. The IPS test is based on the following model:

$$\Delta X_{it} = \alpha_i + \beta_i X_{i,t-1} + \sum_{k=1}^{n_i} \rho_{ij} \Delta X_{i,t-j} + \varepsilon_{it} \qquad i = 1,\ldots..,N, \quad t = 1,\ldots\ldots,T \tag{2}$$

where Δ is the first difference, X_{it} is the series for Malaysia in the current penal in the time period t, n_i is the no of lags and ε_{it} is the distributed random variables.

3.2.1.2 Panel Cointegration Approach

The two non-stationary series with the some linear combination said to be cointegrated. In the second step study will applied panel cointegration test proposed by Kao (1999) for the null hypothesis of no cointegration in homogenous and heterogeneous panels. Assumed all variables are I(1), study apply panel cointegration using Kao' (1999) tests. The panel cointegration can be demonstrate as following

$$X_{it} = \alpha_i + Y_{it}\beta + \omega_{it} \tag{3}$$

where $i = 1,\ldots..,N$, $t = 1,\ldots..,T$, ε_i = individual constant term, β = slop parameter, ω_i = stationary distribution, X_{it} and Y_{it} = integrated process of order I(1) for all $_i$. Kao (1999) derives two (DF and ADF) types of panel cointegration tests. Both tests can be calculated from:

$$\varpi_{it} = \rho\varpi_{it-1} + V_{it} \tag{4}$$

and

$$\varpi_{it} = \rho\varpi_{it-1} + \sum_{j=1}^{\rho} \phi_j \Delta\varpi_{it-j} + V_{it} \quad (5)$$

where ϖ_{it-1} obtained from Equation (2). For null hypothesis $H_O : \rho = 1$ and alternative hypothesis $H_1 : \rho \angle 1$ is used. Kao (1999) propose four DF-type statistics. The first two DF statistics are based on assuming strict exogenity of the regressors with respect to the error in the equation, while the remaining allow for endogeneity.

3.2.1.3 Fully Modify OLS (FMOLS)

After the strong ground of long-run relationship among all variables FMOLS proposed by Pedroni (2000) were applied to show country wise relationship among all variables. The panel FMOLS have numerous advantages. It allows serial correlation (SE), existence of endogeneity (EE) and cross sectional heterogeneity. Moreover, it will propose both within dimension and between dimensions. Let Equation (2), can obtain the between-dimension Equation (5)

$$\varpi_{GFM} = N^{-1} \sum_{i-1}^{N} \left[\sum_{t=1}^{T} (X_{it} - X'_i)^2 \right]^{-1} \left[\sum_{t=1}^{T} (X_{it} - X'_i) Y'_{it} - Tr'_i \right] \quad (6)$$

where $\varpi_{GFM} = N^{-1} \sum_{i=1}^{N} \varpi_{FM\,i}$. ϖ_{FMi} is the FMOLS estimator for individual variable.

3.2.1.4 Panel Error Correction Model (Panel ECM)

Furthermore, a panel ECM was applied to analyze the short-run relationship among variables. A panel ECM model is specified as follows;

$$\Delta \ln Export_{it} = \mu_i + \sum_{j=1}^{11} \delta_j D_{jit} + \sum_{j=1}^{p} \varphi_{1j} \Delta \ln GDP_{it-j} + \sum_{j=0}^{p} \phi_{2j} \Delta \ln GDP_{jt-j} + \sum_{j-1}^{p} \phi_{3j} \Delta \ln CPI_{it-j}$$
$$+ \sum_{j-0}^{p} \phi_{4j} \Delta \ln CPI_{jt-j} + \sum_{j-0}^{p} \phi_{5j} \Delta \ln ER_{it-j} + \sum_{j-0}^{p} \phi_{6j} \Delta \ln ER_{jt-j} + \sum_{j-0}^{p} \phi_{7j} \Delta \ln TRGDP_{it-j} \quad \textbf{(7)}$$
$$+ \sum_{j-0}^{p} \phi_{8j} \Delta \ln TRGDP_{jt-j} + \lambda \varepsilon_{it-1}$$

3.2.2 Malaysia – OIC countries Gravity Model Approach

The gravity model of world trade originates from the law of gravity in Physics called the Newton's law of universal gravitation. This law is discovered by English physicist, Sir Isaac Newton in his famous work, *Philosophiae Naturalis Principia Mathematica* in 1687. This law basically states that the attractive force between two bodies is directly related to their size and inversely related to the distance between them. The gravity model applied in this study is based on the gravity model used by Sharma and Chua (2000) and Rahman (2003, 2009). However, the gravity model used in this study depart from Sharma and Chua (2000) and Rahman (2003, 2009) where it incorporate political economic factors, that is, institutions, to analyze determinants of Malaysia-OIC export. Employing panel data analysis using a gravity model approach, the years estimated is in the period of 1997 to 2009. One of the econometric advantages in using panel data is that it allows individual heterogeneity which is not an available characteristic if time

series or cross sectional data is used (Baltagi, 2005). Using panel data would also provide more informative data, more variability, less collinearity among the variables, more degrees of freedom, and more efficiency. Furthermore, it allows the assumptions stated in the cross sectional analysis to be relaxed and tested (Maddala, 2001).

The gravity model for Malaysia-OIC export is as follows:-

$$\ln(Export_{ijt}) = \tau_0 + \varphi_1 \ln(GDP_{it}) + \varphi_2 \ln(GDP_{jt}) + \varphi_3 \ln(PCGDP_{it}) + \varphi_4 \ln(PCGDP_{jt}) + \varphi_5 \ln(DIST_{ijt}) + \varphi_6 \ln(PCGDPD_{ijt}) + \varphi_7 \ln(ER_{ijt}) + \varphi_8 \ln(INF_{it}) + \varphi_9 \ln(INF_{jt}) + \varphi_{10} \ln(TR/GDP_{it}) + \varphi_{11} \ln(TR/GDP_{jt}) + \varphi_{12} \ln(INS_{it}) + \varphi_{13} \ln(INS_{jt}) + U_{ijt}$$

Where Exportijt = Country *i* (Malaysia) exports to country *j* (in million USDs), DISTij = Distance between county *i* capital to country *j* capital (in kilometers), INSit = Corruption perceptions index of country *i*, INSjt = Corruption perceptions index of country *j*, GDPi = Gross Domestic Product of country *i*, GDPj= Gross Domestic Product of country *j*, PCGDPi = Per capita GDP of country *i*, PCGDPj = Per capita GDP of country *j*, PCGDPDijt = Per capita GDP differential between country *i* and *j*, ERijt = The real effective exchange rate index (2005=100). The real exchange rate in this study is defined as the relative price of foreign goods in terms of domestic goods (Stockman, 1987), INFit = Inflation rate for country *i*, INFjt = Inflation rate for country *j*, TR/GDPit = Trade/GDP ratio of country *i*, TR/GDPjt = Trade/GDP ratio of country *j*, Uijt = error term, *t* = time period; τ, φs = parameters.

3.2.3 Malaysia- TPP countries FMOLS Approach

The main objective of this section is to explore the long-run and short-run relationship of export and other macroeconomic variables of Malaysia and TPP-countries. To test relationship between exports and other macroeconomic variables mainly FMOLS were applied. But six different steps were performed to complete the procedure of this model. First, test of stationarity and order of integration among all variables. The study used panel unit root test proposed by Maddala& Wu (1999), Levin, Lin & Chu (2002) and Im, Pesaran& Shin (2003) to determine the stationarity and order of integration. Second, with the assumption that all the variables are in same order of integration stationary at level I (0) or stationary at first difference I(1) Kao panel cointegration proposed by Kao (1999) has been applied to confirm the residual based cointegration among all variables. These tests involve procedures that are designed to detect the presence of a unit root in the residuals of (cointegrating) regressions among the levels of panel data. Third, fully modify ordinary least square (FMOLS) proposed by Pedroni (2000) has been applied to explore the long run relationship between Malaysian export and other variables. Fourth, to confirm that the long run results are not spurious study will applied unit root tests of the residuals of FMOLS model without trend and intercept formation. Fifth, panel error correction model (penal ECM) used to find out short run relationship between all the variables. Finally, after confirm long-run and short-run relationship panel Granger causality will applied to access the direction of causality among all variables.

3.2.3.1 Panel Unit Root Test

In the previous literature the unit root tests for the individual time series data (Phillips and Perron (PP) test and Augmented Dickey Fuller test (ADF), and others) are suffering with several problems. One of the main problems is to have low power against the alternative of stationarity of the series, especially if the sample size is small. Panel unit root test have several advantages, it is provide large no of point data, increase the value of degree of freedom and reduce multicollinearity between the two regressors. Moreover, panel unit root test provide us more powerful test statistics asymptotically follow a normal distribution. In this study, Im, Pesaran & Shin (2003) known as IPS test, Levin, Lin & Chu (2002) known as LLC test and Maddala & Wu (1999) known as MW are used. The IPS test is based on the following model:

$$\Delta X_{it} = \alpha_i + \beta_i X_{i,t-1} + \sum_{k=1}^{n_i} \rho_{ij} \Delta X_{i,t-j} + \varepsilon_{i_t} \; i = 1,\ldots..,N, \quad t = 1,\ldots\ldots, T \tag{2}$$

where Δ is the first difference, X_{it} is the series for Malaysia in the current penal in the time period t, n_i is the no of lags and ε_{it} is the distributed random variables.

3.2.3.2 Panel Cointegration Approach

The two non-stationary series with the some linear combination said to be cointegrated. In the second step study will applied panel cointegration test proposed by Kao (1999) for the null hypothesis of no cointegration in homogenous and heterogeneous panels. Assumed all variables are I(1), study apply panel cointegration using Kao' (1999) tests. The panel cointegration can be demonstrate as following

$$X_{it} = \alpha_i + Y_{it}\beta + \omega_{it} \tag{3}$$

where i = 1,…..,N, t=1,…..,T, ε_i= individual constant term, β = slop parameter, ω_i = stationary distribution, X_{it} and Y_{it}= integrated process of order I(1) for all$_i$. Kao (1999) derives two (DF and ADF) types of panel cointegration tests. Both tests can be calculated from:

$$\varpi_{it} = \rho\varpi_{it-1} + V_{it} \tag{4}$$

$$\varpi_{it} = \rho\varpi_{it-1} + \sum_{j=1}^{\rho} \phi_j \Delta\varpi_{it-j} + V_{it} \tag{5}$$

where ϖ_{it-1} obtained from Equation (2). For null hypothesis $H_O : \rho = 1$ and alternative hypothesis $H_1 : \rho \angle 1$ is used. Kao (1999) propose four DF-type statistics. The first two DF statistics are based on assuming strict exogenity of the regressors with respect to the error in the equation, while the remaining allow for endogeneity.

3.2.3.3 Fully modify ordinary least square (FMOLS)

The strong evidence allows us to apply FMOLS to confirm the long run relationship among proposed variables. The panel FMOLS have numerous advantages. It allows serial correlation (SE), existence of endogeneity (EE) and cross sectional heterogeneity. Moreover, it will propose both within dimension and between dimensions. Let Equation (2), can obtain the between-dimension Equation (6)

$$\varpi_{GFM} = N^{-1}\sum_{i-1}^{N} \left[\sum_{t=1}^{T}(X_{it} - X'_i)^2\right]^{-1}\left[\sum_{t=1}^{T}(X_{it} - X'_i)Y'_{it} - Tr'_i\right] \tag{6}$$

where $\varpi_{GFM} = N^{-1}\sum_{i=1}^{N} \varpi_{FM\,i}.\varpi_{FMi}$ is the FMOLS estimator for individual variable.

3.2.3.4 Panel Error Correction Model (Panel ECM)

Furthermore, study applied panel ECM to explore the short-run relationship among the proposed variables. The study specify panel ECM as follows

$$\begin{aligned}\Delta \ln Export_{it} &= \mu_i + \sum_{j=1}^{11} \delta_j D_{jit} + \sum_{j=1}^{p} \varphi_{1j} \Delta \ln GDP_{it-j} + \sum_{j=0}^{p} \phi_{2j} \Delta \ln GDP_{jt-j} + \sum_{j-1}^{p} \phi_{3j} \Delta \ln CPI_{it-j} \\ &+ \sum_{j-0}^{p} \phi_{4j} \Delta \ln CPI_{jt-j} + \sum_{j-0}^{p} \phi_{5j} \Delta \ln ER_{it-j} + \sum_{j-0}^{p} \phi_{6j} \Delta \ln ER_{jt-j} + \sum_{j-0}^{p} \phi_{7j} \Delta \ln TRGDP_{it-j} \\ &+ \sum_{j-0}^{p} \phi_{8j} \Delta \ln TRGDP_{jt-j} + \lambda \varepsilon_{it-1}\end{aligned} \tag{7}$$

3.2.3.5 Panel Causality

In the next step study investigate the direction of causality between variables in panel model. According to Engle and Granger (1987) if there are two non-stationary variables are cointegrated, VAR in first difference not be specified. If there is found long-run equilibrium relationship among all variables then study can test Granger Causality with the specified model. The Granger Causality test is based on the following regressions:

Export Causality

$$\begin{aligned}\Delta Export_{it} &= C_{1i} + \sum_{p} \varphi_{11ip} \Delta \ln GDP_{it-p} + \sum_{p} \varphi_{12ip} \Delta GDP_{jt-p} + \sum_{p} \varphi_{13ip} \Delta CPI_{it-p} + \sum_{p} \varphi_{14ip} \Delta CPI_{jt-p} \\ &+ \sum_{p} \varphi_{15ip} \Delta ER_{it-p} + \sum_{p} \varphi_{16ip} \Delta ER_{jt-p} + \sum_{p} \varphi_{17j} \Delta TRGDP_{it-p} + \sum_{p} \varphi_{18j} \Delta TRGDP_{jt-p} + \mu_{1i} ECT_{it-1} + \varepsilon_{1t}\end{aligned} \tag{8}$$

GDP_i Causality

$$\Delta GDP_{it} = C_{2i} + \sum_p \phi_{21ip} \Delta \ln EXPORT_{it-p} + \sum_p \phi_{22ip} \Delta GDP_{jt-p} + \sum_p \phi_{23ip} \Delta CPI_{it-p} + \sum_p \phi_{24ip} \Delta CPI_{jt-p}$$
$$+ \sum_p \phi_{25ip} \Delta ER_{it-p} + \sum_p \phi_{26ip} \Delta ER_{jt-p} + \sum_p \phi_{27j} \Delta TRGDP_{it-p} + \sum_p \phi_{28j} \Delta TRGDP_{jt-p} + \mu_{2i} ECT_{it-1} + \varepsilon_{2t} \quad (9)$$

GDP_j Causality

$$\Delta GDP_{jt} = C_{3i} + \sum_p \phi_{31ip} \Delta \ln EXPORT_{it-p} + \sum_p \phi_{32ip} \Delta GDP_{it-p} + \sum_p \phi_{33ip} \Delta CPI_{it-p} + \sum_p \phi_{34ip} \Delta CPI_{jt-p}$$
$$+ \sum_p \phi_{35ip} \Delta ER_{it-p} + \sum_p \phi_{36ip} \Delta ER_{jt-p} + \sum_p \phi_{37j} \Delta TRGDP_{it-p} + \sum_p \phi_{38j} \Delta TRGDP_{jt-p} + \mu_{3i} ECT_{it-1} + \varepsilon_{3t} \quad (10)$$

CPI_i Causality

$$\Delta CPI_{it} = C_{4i} + \sum_p 41_{ip} \Delta \ln EXPORT_{it-p} + \sum_p \phi_{42ip} \Delta GDP_{it-p} + \sum_p \phi_{43ip} \Delta GDP_{jt-p} + \sum_p \phi_{44ip} \Delta CPI_{jt-p}$$
$$+ \sum_p \phi_{45ip} \Delta ER_{it-p} + \sum_p \phi_{46ip} \Delta ER_{jt-p} + \sum_p \phi_{47j} \Delta TRGDP_{it-p} + \sum_p \phi_{48j} \Delta TRGDP_{jt-p} + \mu_{4i} ECT_{it-1} + \varepsilon_{4t} \quad (11)$$

CPI_j Causality

$$\Delta CPI_{jt} = C_{5i} + \sum_p \phi_{51ip} \Delta \ln EXPORT_{it-p} + \sum_p \phi_{52ip} \Delta GDP_{it-p} + \sum_p \phi_{53ip} \Delta GDP_{jt-p} + \sum_p \phi_{54ip} \Delta CPI_{it-p}$$
$$+ \sum_p \phi_{55ip} \Delta ER_{it-p} + \sum_p \phi_{56ip} \Delta ER_{jt-p} + \sum_p \phi_{57j} \Delta TRGDP_{it-p} + \sum_p \phi_{58j} \Delta TRGDP_{jt-p} + \mu_{5i} ECT_{it-1} + \varepsilon_{5t} \quad (12)$$

ER_i Causality

$$\Delta ER_{it} = C_{6i} + \sum_p \phi_{61ip} \Delta \ln EXPORT_{it-p} + \sum_p \phi_{62ip} \Delta GDP_{it-p} + \sum_p \phi_{63ip} \Delta GDP_{jt-p} + \sum_p \phi_{64ip} \Delta CPI_{it-p}$$
$$+ \sum_p \phi_{65ip} \Delta CPI_{jt-p} + \sum_p \phi_{66ip} \Delta ER_{jt-p} + \sum_p \phi_{67j} \Delta TRGDP_{it-p} + \sum_p \phi_{68j} \Delta TRGDP_{jt-p} + \mu_{6i} ECT_{it-1} + \varepsilon_{6t} \quad (13)$$

ER_j Causality

$$\Delta ER_{jt} = C_{7i} + \sum_p \phi_{71ip} \Delta \ln EXPORT_{it-p} + \sum_p \phi_{72ip} \Delta GDP_{it-p} + \sum_p \phi_{73ip} \Delta GDP_{jt-p} + \sum_p \phi_{74ip} \Delta CPI_{it-p}$$
$$+ \sum_p \phi_{75ip} \Delta CPI_{jt-p} + \sum_p \phi_{76ip} \Delta ER_{it-p} + \sum_p \phi_{77ip} \Delta TRGDP_{it-p} + \sum_p \phi_{78ip} \Delta TRGDP_{jt-p} + \mu_{7i} ECT_{it-1} + \varepsilon_{7t} \quad (14)$$

$TRGDP_i$Causality

$$\Delta TRGDP_{it} = C_{8i} + \sum_p \phi_{81ip} \Delta \ln EXPORT_{it-p} + \sum_p \phi_{82ip} \Delta GDP_{it-p} + \sum_p \phi_{83ip} \Delta GDP_{jt-p} + \sum_p \phi_{84ip} \Delta CPI_{it-p}$$
$$+ \sum_p \phi_{85ip} \Delta CPI_{jt-p} + \sum_p \phi_{86} ip \Delta ER_{it-p} + \sum_p \phi_{87j} \Delta ER_{jt-p} + \sum_p \phi_{88j} \Delta TRGDP_{jt-p} + \mu_{8i} ECT_{it-1} + \varepsilon_{8t} \quad (15)$$

$TRGDP_j$Causality

$$\Delta TRGDP_{jt} = C_{9i} + \sum_p \phi_{91ip} \Delta \ln EXPORT_{it-p} + \sum_p \phi_{92ip} \Delta GDP_{it-p} + \sum_p \phi_{93ip} \Delta GDP_{jt-p} + \sum_p \phi_{94ip} \Delta CPI_{it-p}$$
$$+ \sum_p \phi_{95ip} \Delta CPI_{jt-p} + \sum_p \phi_{96} ip \Delta ER_{it-p} + \sum_p \phi_{97j} \Delta ER_{jt-p} + \sum_p \phi_{98j} \Delta TRGDP_{it-p} + \mu_{9i} ECT_{it-1} + \varepsilon_{9t} \quad (16)$$

All variables are previously defined but Δ =first difference, ECT = error correction term, p = lag length, ECT_{it} = long-run model estimated residuals from Equation (2), $\mu_{i,j} ECT_{it}$ = long-run equilibrium.

4. Empirical Results

4.1 Malaysia – OIC Results based on FMOLS

4.1.1 Unit root test results

The test proposed by Levin, Lin & Chu (2002) and Im, Pesaran & Shin (2003) are used to test the panel unit root of each variable (CPI_{it}, CPI_{jt}, ER_{it}, ER_{jt}, $EXPORT_{it}$, GDP_{it}, GDP_{jt}, $TRGDP_{it}$, $TRGDP_{jt}$), The results of panel unit root test are reported in Table 4.1.

Results are divided into four panels, panel A consists of results from the Levin, Lin & Chu (2002), panel B consists of the results from Im, Pesaran & Shin (2003), Panel C consists of the results from ADF Fisher Chi Square and panel D consist of the results from Phillips-Perron (1988) Chi Square. The results suggest that all variables are non-stationary at level and become stationary after first difference and significant at 5 percent critical value.

The results of panel unit root based on decision of majority. In case of CPI_i , the LLC test shows that it is stationary at level while rest of three tests prove it is non-stationary at level and stationary after first difference. In case of ER_i, the IPS and ADF tests show that it is stationary at level. While the LLC and PP tests prove it non-stationary at level and become stationary after first difference. The results of $TRGDP_j$ of LLC test shows that it is stationary at level but rest of three tests prove it is non-stationary at level and become stationary after first difference. Furthermore, all four tests of Unit root of CPI_j, ER_j, EXPORT, GDP_i, GDP_j, $TRGDP_i$ shows that they are non-stationary at level and become stationary after first difference. Finally, these results show that most of the variables are stationary at first difference I(1) hence conventional estimation methods of panel data are not applicable here. This study will construct the panel data model method which is robust to first difference I(1) stationary variables.

Table4.1. Unit Root Test Results

Panel A: Levin, Lin & Chu Test	**Level**	**First Difference**	**Panel B: im, Pesaran & Shin W-Test**	**Level**	**First Difference**
$LNCPI_{it}$	0.0002*		$LNCPI_{it}$	1.000	0.000*
$LNCPI_{jt}$	0.9989	0.000*	$LNCPI_{jt}$	1.000	0.000*
$LNER_{it}$	1.000	1.000*	$LNER_{it}$	0.0001*	
LNERjt	0.0828	0.000*	LNERjt	0.7291	0.000*
$LNEXPORT_{it}$	1.000	0.000*	$LNEXPORT_{it}$	1.000	0.000*
$LNGDP_{it}$	1.000	0.000*	$LNGDP_{it}$	1.000	0.000*
$LNGDP_{jt}$	0.4058	0.000*	$LNGDP_{jt}$	1.000	0.000*
$LNTRGDP_{it}$	1.000	0.000*	$LNTRGDP_{it}$	1.000	0.000*
$LNTRGDP_{jt}$	0.003*		$LNTRGDP_{jt}$	0.3725	0.000*
Panel C: ADF Fisher Chi Square			**Panel D: PP Fisher Chi Square**		
$LNCPI_{it}$	1.000	0.000*	$LNCPI_{it}$	1.000	0.000*
$LNCPI_{jt}$	0.9998	0.000*	$LNCPI_{jt}$	0.1247	0.000*
$LNER_{it}$	0.0277*		$LNER_{it}$	1.000	0.000*
LNERjt	0.6248	0.000*	LNERjt	0.7344	0.000*
$LNEXPORT_{it}$	1.000	0.000*	$LNEXPORT_{it}$	1.000	0.000*
$LNGDP_{it}$	1.000	0.000*	$LNGDP_{it}$	1.000	0.000*
$LNGDP_{jt}$	1.000	0.000*	$LNGDP_{jt}$	1.000	0.000*
$LNTRGDP_{it}$	1.000	0.000*	$LNTRGDP_{it}$	1.000	0.000*
$LNTRGDP_{jt}$	1.000	0.000*	$LNTRGDP_{jt}$	1.000	0.000*

*denoted significant at 1 percent critical value

4.1.2 Panel Cointegration Test Results

Based on the panel unit root test results, we conclude that all series are integrated with the same order of I(1), we then proceed for the cointegration test. The second step explores the long-run equilibrium relationship among export and other macroeconomic variables. Results of Kao's cointegration are reported in Table 4.2. The results show that export and other proposed variables are cointegrated within the panel of 55-OIC countries.

Table4.2. Results of Kao's Residual Cointegration

Test	*t*-Statistic	P-Value
ADF	-5.766596	0.0000

Hence according to the P value, there is cointegration among the selected set of variables using the Kao residual method.

4.1.3 FMOLS Results

Based on the previous results it is confirmed that all variables; export, GDP_i, GDP_j, $PCGDP_i$, CPI_i, CPI_j, ER_i, ER_j, $TRGDP_i$, $TRGDP_j$ are cointegrated. We then proceed to analyze whether there exist a long run relationship between variables using a panel cointegration technique. The results of FMOLS are reported in Table 4.3.

Table 4.3: FMOLS Test

Variables	Coefficient	Std. Error	*t*-Value	*P*-Value
$LNGDP_i$	19.48493	6.647995	-2.930948	0.0039*
$LNGDP_j$	1.451818	2.395304	0.606110	0.5453
$LNTRGDP_i$	9.378233	3.113720	3.011907	0.0030*
LNTRGDP*j*	0.290620	0.809078	0.359199	0.7199
$LNCPI_i$	12.19262	7.918930	1.539681	0.1256
$LNCPI_j$	3.054546	1.860290	1.641973	0.1026
$LNER_i$	13.28256	2.662923	4.987962	0.0000*
$LNER_j$	-0.529118	0.976545	-0.541827	0.5887

*denote significant at 5 percent

These results show that out of all the variables included in the model, GDPi, TRGDPi and ERi has significant effect on exports.

4.1.4 FMOLS Residual Test

According to the unit root test of the residuals of FMOLS model (without trend and intercept), it is confirmed that the long run results are not spurious. The results are reported in Table4.5.

Table 4.5: Results of FMOLS Residual

Test	LEVEL		FIRST DIFFERENCE	
	t-statistics	p-values	t-statistic	p-value
Levin, Lin & Chu Test	-6.56350	0000	-12.0948	0000
ADF Fisher Chi Square	96.9407	0000	162.228	0000
PP Fisher Chi Square	95.9899	0000	183.159	0000

4.1.5 Panel ECM Model

A panel ECM is then applied to examine the short-run relationships among all variables. Results of panel ECM are reported in Table 4.6.

Table 4.6: Panel ECM (dependent variable ΔLNEXPORT)

Variables	Coef	Std. Err	*t*-Value	*P*-Value
$\Delta LNGDP_i$	4.832153	3.473523	1.391139	0.1660
$\Delta LNGDP_j$	0.204775	1.722519	0.118881	0.9055
$\Delta LNTRGDP_i$	7.108162	1.760562	4.037439	0.0001*
$\Delta LNTRGDP_j$	0.337664	0.590847	0.571492	0.5684
$\Delta LNCPI_i$	-5.71345	5.485602	-1.041535	0.2991
$\Delta LNCPI_j$	0.924390	1.316117	0.702362	0.4834
$\Delta LNER_i$	12.51135	1.908178	6.556703	0.0000*
$\Delta LNER_j$	-0.23278	0.732809	-0.317654	0.7511
ECM(-1)	-0.441938	0.057155	-7.732232	0.0000*
C	0.264826	0.203579	1.300852	0.1950

According to the short run results, it is anticipated that there is convergence in the long run equilibrium which is depicted by table 5. If there is 1 percent disequilibrium then exports will respond 0.44 percent each time period to restore the equilibrium. Hence it

takes 2.27 time periods to restore the equilibrium. From the short run variables it is observed that there are ER and TRGDP positively causing exports in short run.

4.2 Malaysia- OIC Gravity Model Results

For the panel analysis, unbalanced data are to be used for the model, the Hausman test is to be employed to determine whether FE model or RE model is more appropriate to be employed. It is important to note the problems of estimating the FE model for Malaysia's exports. According to Rahman (2003), "we cannot directly estimate variables that do not change over time because inherent transformation wipes out such variables" (p. 17), and as such the dummy and distance variables need to be dropped. This problem can be solved by running a second stage regression with taking into account the individual effects as the dependent variable whereas the dummy and distance as independent variables. The equation to be estimated for the second stage regression thus as follows:

$$IE_{ij} = \alpha_0 + \beta_1 \ln(Distance_{ij}) + INS_{it} + \mu_{ij} \quad \textbf{(2)}$$

Where *IEij* is the individual effects and *Distanceij* denotes to distance and the *INSjt* is the quality of institutions measured in this study by using the corruption perception index of country *j*. Equation 1 is to be estimated and Table 4.7 shows the results for Fixed Effects Model, Random Effects Model, and Pooled Model.

Tabble4.7: Estimation Results for Exports Model

Variables	Fixed Effects Model	Random Effects Model	Pooled Model
$LN(GDP)_i$	39.638** (2.30)	38.223* (1.90)	39.943 (1.31)

$LN(GDP)_j$	4.563** (2.46)	5.5796** (2.68)	6.076* (1.93)
$LN(PCGDP)_i$	1.4678 (1.28)	0.275*** (4.01)	0.174*** (4.14)
$LN(PCGDP)_j$	-3.977 (-1.44)	-5.882* (-1.75)	-6.948 (-1.36)
LN(ER)	-2.448** (-2.01)	-0.4001*** (-4.42)	-0.344*** (-6.69)
$LN(INF)_i$	-1.287*** (-3.56)	-0.279 (-0.77)	0.3299 (0.61)
$LN(INF)_j$	0.01 (0.22)	0.059 (0.99)	0.011 (0.12)
$LN(TR/GDP)_i$	-0.021 (-0.33)	0.081 (1.55)	0.2297*** (3.89)
$LN(TR/GDP)_j$	0.658*** (9.61)	0.557*** (12.29)	0.754*** (18.09)
LN(Distance)		-0.702** (-2.00)	-0.356* (-1.76)
INS_j		0.095 (0.50)	-0.3203* (-1.75)
R-Squared	0.669	0.901	0.9198
F-test	5.00		
Hausman test	0.000		

Notes: *, **, *** are denoted to 1%, 5% and 10% level of significance

Since the Hausman test suggests that the Fixed Effects Model is more appropriate in explaining the Malaysia-OIC export model, the discussion and the interpretation of the results will only deal with the Fixed Effects Model. After conducting multicollinearity and other specification tests, the results are shown in Table 4.8.

Table4.8: Results of Exports Model

Variables	Fixed Effects Model	P-Values	Standard Error
Constant	11.623*** 6.23)	0.000	1.865
$LN(GDP)_j$	0.149*** (3.53)	0.000	0.042
$LN(PCGDP)_j$	-0.243*** (-4.43)	0.000	0.055

LN(ER)	-1.028*** (-2.71)	0.007	0.379
$LN(INF)_i$	-0.211** (-2.30)	0.021	0.092
$LN(INF)_j$	0.172*** (2.97)	0.003	0.058
$LN(TR/GDP)_i$	0.8899*** (24.65)	0.000	0.036

Notes: *, **, *** are denoted to 1%, 5% and 10% level of significance

Table 4.8 indicates the results. In Malaysia-OIC export gravity model, the coefficient of country's *j GDP* has a positive sign and found to be highly significant at 1 per cent level. The positive sign is consistent with theoretical explanation. With 1 per cent increase in country *j's GDP*, exports of Malaysia would increase by 0.15 per cent. It is thus empirically proven that Malaysia's export is determined by the size of the economy. As for the other variable, the negative sign of the per capita *GDP* of country *j* implies that the effect of economies of scale is more dominant than the absorption effect of country *j* as a result of increasing in country *j's GDP* per capita. To put it simply, due to the increase in *GDP* per capita of country *j*, more goods are produced in country *j* and the tendency to import goods from Malaysia is reduced. The sign of the coefficient is clearly corroborates with theoretical expectation and highly significant at 1 per cent level. All else being equal, it is estimated that Malaysia's exports to country *j* decreases by 0.24 per cent as country *j's* per capita *GDP* increases by 1 per cent. For exchange rate, the negative coefficient suggests that an appreciation of the real exchange rate would discourage Malaysia's exports to country *j*. It is estimated that an appreciation of the real exchange rate by 1 per cent would reduced Malaysia's exports to country *j* by 1.03 per

cent. This coefficient is highly significant at 1 per cent level and the negative sign concurs with the hypothesis.

Meanwhile, Malaysia's inflation variable has an expected sign and statistically significant at 5 per cent level. It is estimated that a 1 per cent increase in Malaysia's inflation rate will reduce Malaysia's exports to country *j* by 0.21 per cent. This is clearly in line with the theoretical prediction as high inflation in one's country will have a negative impact on export activities. As for the country's *j* inflation variable, it is highly significant at 1 per cent level and possessed the expected sign. It seems that Malaysia's exports to OIC member countries will increase by 0.17 per cent when the inflation rate increases by 1 per cent in the country*j*. While for the trade *GDP* ratio, the coefficient value is 0.8898956. It is very significant at 1 per cent level and possessed an expected positive sign. This indicates empirically that Malaysia's exports to country *j* can be amplified by promoting pro-liberal and freer trade policies for Malaysian economy. The estimation suggests that Malaysia's exports to country *j* would increase by 0.89 per cent with the 1 per cent increase in Malaysia's trade-GDP ratio. Attempt to promote free trade, such as abolishing quotas, rationalizing subsidies, reducing trade taxes, among others, need to be put in place to boost Malaysia's export to the OIC countries. Table 4.9 shows the second stage regression results of the Malaysia-OIC export Gravity Model.

Table4.9: Second Stage Regression for Malaysia- OIC Export Model

Explanatory Variables	Coefficient (t-statistics)

Constant	-99.25 (-2.27)
LN (Distance)	10.73 (2.26)**
INS j	9.497 (1.94)*

Notes: *, **, *** are denoted to 1%, 5% and 10% level of significance

Based on Table 4.9, the sign of the dummy variable of *INSj* is concurred with expectation, where it possessed a positive sign and is significant at 10 per cent level. The Gravity Model of Malaysia-OIC export suggests that Malaysia's exports to OIC will increase by 9.5 per cent if 1 unit of improvements occurred in the Corruption Perception Index of country *j*. For the distance variable, it is found to be significant at 5 per cent level and possessed the wrong sign, thus it is contradiction with the logic of the gravity model.

4.3 Results of Malaysia- TPP countries Exports

4.3.1 Panel Unit Root Test

To test the panel unit root of each variable (CPI_{it}, CPI_{jt}, ER_{it}, ER_{jt}, $EXPORT_{it}$, GDP_{it}, GDP_{jt}, $TRGDP_{it}$, $TRGDP_{jt}$), the test proposed by Maddala& Wu (1999), Levin, Lin & Chu (2002) and Im, Pesaran& Shin (2003) have been applied. The results of panel unit root test reported in Table10. Results are divided into four panels, panel A consists of results from the Levin, Lin & Chu (2002), panel B consists of the results from Im, Pesaran& Shin (2003), Panel C consists of the results from ADF Fisher Chi Square and panel D consist of the results from Phillips-Perron (1988) Chi Square. In panel unit root test results are based on majority

Table4.10. Unit root test results

Panel A: Levin, Lin & Chu Test	Level	First Difference	Panel B: im, Pesaran& Shin W-Test	Level	First Difference
LNCPIit	0.0576	0.000*	LNCPIit	0.9983	0.000*
LNCPIjt	0.9684	0.000*	LNCPIjt	1.000	0.000*
LNERit	1.000	1.000	LNERit	0.0503	0.000*
LNERjt	0.8927	0.000*	LNERjt	0.8950	0.000*
LNEXPORTit	0.9999	0.000*	LNEXPORTit	1.000	0.000*
LNGDPit	0.9981	0.000*	LNGDPit	1.000	0.000*
LNGDPjt	0.0184*		LNGDPjt	0.9753	0.000*
LNTRGDPit	0.9993	0.000*	LNTRGDPit	0.9998	0.000*
LNTRGDPjt	0.1535	0.000*	LNTRGDPjt	0.8287	0.000*
Panel C: ADF Fisher Chi Square	Level	First Difference	Panel D: PP Fisher Chi Square	Level	First Difference
LNCPIit	1.000	0.000*	LNCPIit	1.000	0.000*
LNCPIjt	1.000	0.000*	LNCPIjt	0.9261	0.000*
LNERit	0.1748	0.000*	LNERit	0.000*	
LNERjt	0.9185	0.000*	LNERjt	0.9397	0.000*
LNEXPORTit	0.9994	0.000*	LNEXPORTit	1.000	0.000*
LNGDPit	1.000	0.000*	LNGDPit	1.000	0.000*
LNGDPjt	0.5952	0.000*	LNGDPjt	0.0109*	
LNTRGDPit	1.000	0.000*	LNTRGDPit	1.000	0.000*
LNTRGDPjt	0.8672	0.000*	LNTRGDPjt	0.8204	0.000*

*denoted significant at 1 percent critical value.

According to all four test variables CPI_{it}, CPI_{jt}, ER_{jt}, $EXPORT_{it}$, GDP_{it}, $TRGDP_{it}$, $TRGDP_{jt}$ are non-stationary at level and become stationary at first difference. While according to LLC and PP test GDP_{jt} is stationary at level but other two tests IPS and ADF prove it non-stationary at level and stationary at first difference. In this case it is accepted the decision of IPS and ADF as per rule. Furthermore, according to PP test ER_{it} is stationary at level but rest of three tests prove it non-stationary at level and stationary at first difference. Finally, these results shows that most of the variables are stationary at first difference I(1) hence conventional estimation methods of panel data are not applicable here. This study will construct the panel data model method which is robust to First difference I(1) stationary variables.

4.3.2 Panel Cointegration Test Results

As panel unit root test results are concluded that series are integrated with the same order I (1) study proceed to test Cointegration. Thus the second step explores the long-run equilibrium relationship among export and other macroeconomic variables. Results of Kao's Cointegration are reported in Table 4.11. The results are stated that Export and other proposed variables are cointegrated within the panel of 12-TPP countries.

Table4.11. Results of Kao's Residual Cointegration

Test	*t*-Statistic	P-Value
ADF	-6.34367	0.0000

Hence according to the P value, there is Cointegration among the selected set of variables using the Kao residual method.

4.3.4 FMOLS Results

As it is prove that there isCointegration among nine variables Export, GDPi, GDPj, PCGDPi, CPIi, CPIj, ERi, ERj, TRGDPi, TRGDPjstudy further can explore the long-run relationship by Cointegration vector using panel Cointegration techniques. The results of FMOLS are reported in Table 4.12.

Table4.12. FMOLS Test

Variables	Coefficient	Std. Error	*t*-Value	*P*-Value
$LNGDP_i$	1034.220	12491.64	0.082793	0.9342
$LNGDP_j$	19409.22	5031.264	3.857723	0.0002*
$LNTRGDP_i$	-2533.775	10486.69	-0.230622	0.8181
$LNTRGDP_j$	14386.66	4197.542	3.427401	0.0009*
$LNCPI_i$	6725.632	4189.256	1.605448	0.1119
$LNCPI_j$	143.1625	11344.13	0.012620	0.9900
$LNER_i$	-19100.81	4935.385	-3.870176	0.0002*
$LNER_j$	6185.669	32906.71	0.187976	0.8513

*denote significant at 5 percent

These results show that out of all the variables included in the model, GDPj, TRGDPj and ERi has significant effect on the exports.

4.3.4 ECM Residual Test

After perform FMOLS it is important to confirm the stationary of the model. If the model show non-stationary than it cause spurious regression. The results of ECM residual test are reported in Table4.13.

Table4.13. Results of ECM Residual

Test	LEVEL		FIRST DIFFERENCE	
	t-statistics	p-values	t-statistic	p-value
Levin, Lin & Chu Test	-5.66934	0000	-8.69470	0000
ADF Fisher Chi Square	52.7398	0000	84.6384	0000
PP Fisher Chi Square	52.7705	0000	98.6815	0000

According to the unit root test of the residuals of FMOLS model without trend and intercept formation, it can be confirmed that the long run results are not spurious.

4.3.5 Panel ECM Model

After confirmed the long-run relationship panel ECM were applied to explore the short-run relationships among all variables. Results of panel ECM are reported in Table4.14.

Table4.14. Results of Panel ECM (dependent variable ΔLNEXPORT)

Variables	Coefficient	Std. Error	*t*-Value	*P*-Value
$\Delta LNGDP_i$	3337.553	30825.97	0.108271	0.9140
$\Delta LNGDP_j$	5422.133	776.0105	6.987190	0.0000*
$\Delta LNTRGDP_i$	7984.238	25313.50	0.315414	0.7532
$\Delta LNTRGDP_j$	8724.970	1439.374	6.061642	0.0000*
$\Delta LNCPI_i$	18917.59	79632.86	0.237560	0.8128
$\Delta LNCPI_j$	-10174.19	14194.78	-0.716756	0.4754
$\Delta LNER_i$	1311.870	29019.46	0.045207	0.9640
$\Delta LNER_j$	13908.80	7103.291	1.958078	0.0534

ECM(-1)	0.524339	0.397569	1.318865	0.0406*
C	-414788.3	508470.9	-0.815756	0.4168

*denote significant at 5 percent.

According to the short run results, it is anticipated that that there is convergence in the long run equilibrium which is depicted by table 4.14. If there is 1percent disequilibrium then exports will respond 0.52 percent each time period to restore the equilibrium. Hence it takes 1.92 time periods to restore the equilibrium. From the short run variables it is observed that there are GDP and CPI positively causing exports in short run.

4.3.6 Panel Granger Causality Tests

Granger Causality test were applied to confirmed the direction of causality of all variables. The results of Granger Causality are tabulated in Table4.15.

Table4.15. Results of Granger Causality

Direction of Causality	p-value	Lags	Decision	Outcome
ER_j>EXPORT	0.6064	2	Does not reject null	ER_j does not cause Export
EXPORT>ER_j	0.8698	2	Does not reject null	Export does not cause ER_j
ER_i>EXPORT	0.3087	2	Does not reject null	ER_i does not cause Export
EXPORT>ER_i	0.0959	2	Does not reject null	Export does not cause ER_i
CPI_i>EXPORT	0.0029*	2	Reject null	CPI_i does cause Export
EXPORT>CPI_i	0.7627	2	Does not reject null	Export does not cause CPI_i
CPI_j>EXPORT	0.1503	2	Does not reject null	CPI_j does not cause Export
EXPORT>CPI_j	0.5998	2	Does not reject null	Export does not cause CPI_j
GDP_i>EXPORT	0.7099	2	Does not reject null	GDP_i does not cause Export
EXPORT>GDP_i	0.4036	2	Does not reject null	Export does not cause GDP_i
GDP_j>EXPORT	0.2686	2	Does not reject null	GDP_j does not cause Export
EXPORT>GDP_j	0.0001*	2	Reject null	Export does cause GDP_j
$TRGDP_i$>EXPORT	0.0566	2	Does not reject null	$TRGDP_i$ does not cause Export
EXPORT>$TRGDP_i$	0.0028*	2	Reject null	Export does cause $TRGDP_i$

$TRGDP_j$>EXPORT	0.0715	2	Does not reject null	$TRGDP_j$does not cause Export
EXPORT>$TRGDP_j$	0.2519	2	Does not reject null	Export does not cause $TRGDP_j$

*denoted significant at 5% critical value.

Using the granger causality test it is confirm that only CPI, GDP and TRGDP are significantly causing exports.

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