



Analysis of Trade Pattern between Malaysia and the OIC Member Countries: Gravity Model

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Abstract

This study examines trade relations between Malaysia and the Organization of Islamic Cooperation (OIC) member countries for the period of 1997 to 2009. Applying the Trade Gravity Model (TGM) through panel data, the study isolates factors that determine Malaysia-OIC trade. The gravity estimates indicate the importance of size effects, level of development, FDI inflows, and the quality of institutions in determining Malaysia-OIC trade flows. Distance, on the other hand, is found to be insignificant in explaining Malaysia's trade with OIC. Based on these findings, some important policy implications are to be investigated in leading to the development of a strong trade relationship between Malaysia and the OIC countries particularly on Malaysia's role in achieving the Mecca declaration target of 25 percent on intra-OIC trade by the year 2015.

Keywords: *International Trade, Gravity Model, Panel Data, Malaysia's Trade*

1. INTRODUCTION

International trade has always been playing a crucial role in the process of growth and development in Malaysia, especially in transforming the economy from a low income to upper-middle income category. Traditionally, Malaysia's major trading partners were the United States of America, The European Union (EU), and Japan. But this trend has been shifted somewhat primarily due to the 2008/09 world economic and financial crises. In 2009 for example, Malaysia's major exporting and importing nations have tilted more towards other new markets and non-traditional countries such as China (MITI, 2010). In response to the crises, the Malaysian government, under the New Economic Model (NEM), has embarked on a new strategy to shift its trade dependency on the traditional markets and exploring new markets for exports and imports. Under NEM, one of the markets being targeted is the Middle Eastern countries.

The prospects and opportunities in forging a closer and deeper regional economic co-operation under OIC, particularly with the rich Arab countries are yet to



be fully tapped especially through the means of trade (Khadijah, 2004). Furthermore, the 2008/09 world economic and financial crisis and in the aftermath of the September 11 terrorist attack have made the trade relationship between Malaysia and the OIC countries becoming more relevant than ever especially in the sphere of economic cooperation. It is therefore crucial to examine and analyze the on-going Malaysia-OIC trade relationship in this context.

2. MALAYSIA-OIC: AN OVERVIEW OF TRADE RELATIONSHIP

Over the recent years, Malaysia-OIC trade relationship is relatively small compared with Malaysia's trade with the rest of the world although it has shown an increasing pattern. In 2007 for example, 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). The detail can be seen in Figure 1.

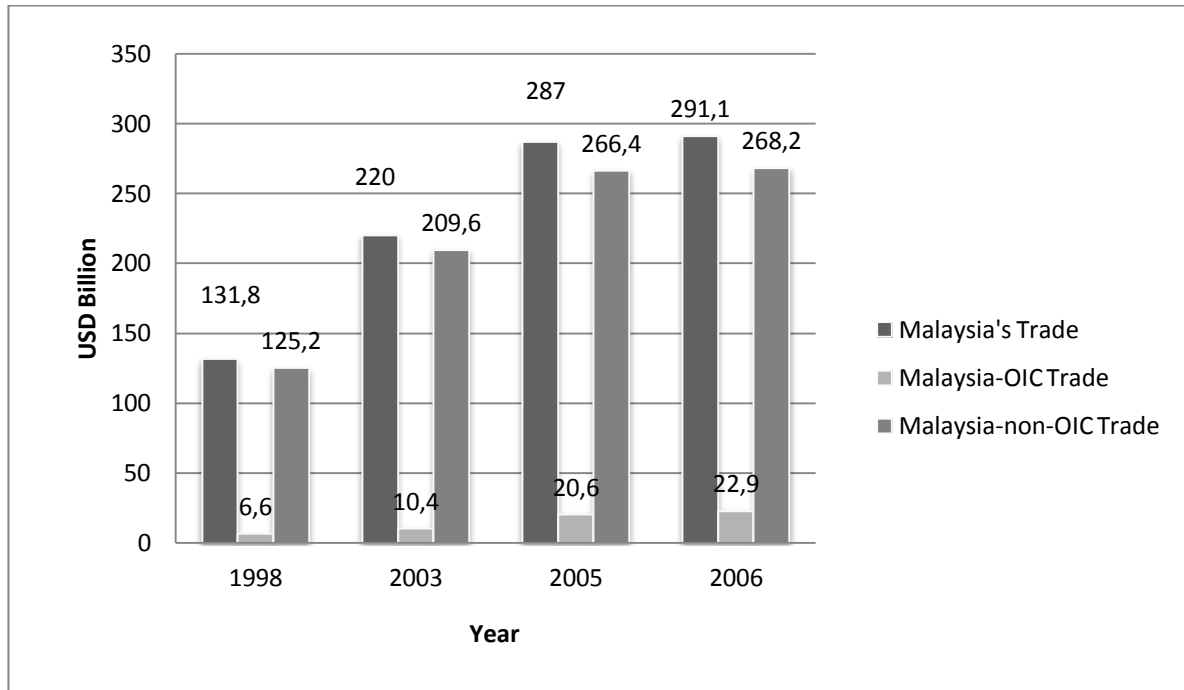
Overall, Malaysia's trade with the OIC member countries for the years 1998, 2003, 2005, and 2006 are USD6.6 billion, USD10.4 billion, USD20.6 billion, and USD22.9 billion respectively. On the other hand, Malaysia's trade with non-OIC countries amounted at USD125.2 billion, USD209.6 billion, USD266.4 billion, and USD268.2 billion respectively for the years 1998, 2003, 2005, and 2006. Considering that the OIC countries have more than 60 per cent of vital resources and with 1.3 billion or one-sixth of the world's population, this general picture of the state of OIC trade performance can be deemed as weak. 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.

Malaysia's major trading partner in the OIC region, on the other hand, can be seen in Table 1.

Table 1 indicates that among Malaysia's major trading partners in the OIC are Indonesia, Saudi Arabia, U.A.E., Pakistan, Turkey, and Brunei. Overall, the trade performance in terms of value between Malaysia and the OIC member countries has shown an increasing trend. Malaysia's trade with Indonesia for example has increased substantially from USD2,688.96 million in 1997 to USD11,478.91 million in 2009. This sharp increase in trade volume between these two countries from 1997 to 2009 is due to factors such as common language, cultural affinity, historical backgrounds, and similar borders.



Figure 1 : Malaysia-OIC Trade for the Year 1998, 2003, 2005, and 2006



Source: <http://www.carsicm.ir/icmroot/public/Statistics/OIC-View.htm>. Retrieved on 29 September 2010.

Table 1 : The OIC Member Countries Trade with Malaysia, Selected Years and Countries (USD in Million)

Year/ Country	1997	1999	2001	2003	2006	2009
Indonesia	2688.96	2987.91	3804.49	5068.16	9025.81	11478.91
Saudi Arabia	659.39	588.07	977.73	991.84	2860.09	1920.25
U.A.E.	765.96	836.95	997.29	1415.32	3238.67	4590.91
Pakistan	665.3	569.52	443.15	715.95	902.22	1782.24
Turkey	461.25	332.96	409.91	361.63	702.62	590.52
Brunei	297.8	224.88	278.01	349.46	421.09	510.33
Iran	139.11	137.08	327.48	428.37	1022.6	1010.00
Qatar	36.81	32.27	77.12	53.43	266.12	881.00
Bangladesh	196.54	140.74	186.62	335.37	445.03	830.62
Egypt	229.78	323.21	219.77	477.92	390.94	844.87
Jordan	168.71	104.26	91.48	108.91	208.48	175.28
Yemen	56.52	86.73	346.07	316.74	314.47	277.52

Source: Direction of Trade Statistics, International Monetary Fund.
Retrieved on 9 April 2011 at <http://www.imfstatistics.org/dot>

3. LITERATURE REVIEW

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. The model is based on the analogy of Newton's law of gravity



which states that the bilateral trade flows between two countries is proportional to its Gross Domestic Product (GDP) as a proxy of size and diminishes with distance, other things being equal (Krugman & Obstfeld, 2009).

Later, the model has been augmented to take into account other factors in explaining trade flows among countries. Frankel *et al.* (1995) for instance, added dummy variables in the model for common border and language. Other researchers have included non-economic variables, such as political and institutional variables into the extended gravity model. Such studies are conducted by Summary (1989), Dollar and Kraay (2002), Levchenko (2004), and Anderson and Marcoullier (2002). They found positive relationship between bilateral trade flows and the political and institutional qualities.

Endoh (1999) employed population variable in the model, which has a negative effects on trade flows. Frankel *et al.* (1995) and Elliott and Ikemoto (2004) introduced per capita income as a proxy to the level of development in explaining international trade. Filippini and Molini (2003) pointed out that there are two aspect worth mentioning when using gravity model, that is, the concepts of distance and mass ought to be reinterpreted according to the social and economic phenomenon under scrutiny and the multiplicative formulation of the law was generally kept even if an additive one might have seemed to be as good as the other.

Asmak 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. By using a qualitative method of semi-structured interviews, Abu-Hussin (2010) has arrived into the same conclusion that religious affinity does not help in terms promoting business relations of Malaysia-GCC countries. He also 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. Through these analyses, he discovered that the trade linkages are still insignificant relative to Malaysia's traditional trading



partners. Ismail (2008), on the other hand, examined the pattern of trade between Malaysia and 80 trading partners, where 20 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.

Balassa (1961) showed that as the economic integration increases, trade barriers or forms of protectionism, such as tariffs, non-tariff restrictions, import quotas, government regulations, etc., would decrease. Studies specifically addressed on the issue of the establishment of the Islamic Common Market (ICM) as a long term goal for OIC are still scarce (Amin and Hamid, 2009). But there are some studies which supported the establishment of the ICM. Shalaby (1988), Anjum (1996), Ariff (1998), Ahmad and Ugurel (1998), Dabour (2004), and Amin and Hamid (2009) are among them.

Hassan (2002) proposed that the establishment of the Islamic Common Market (ICM) is a step in the right direction and the way forward for the OIC member countries to enhance their trade relationship in the long term. Amin and Hamid (2009) showed that the OIC is now heading in the right direction as far as the establishment of the ICM is concerned. But they warned that the major impediment for the materialization of the ICM was a lack of political commitment among the member countries.

4. METHODOLOGY AND DATA

4.1 The Gravity Model

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. Mathematically, it can be expressed as:

$$F = G \frac{M_i M_j}{D^2} \quad (1)$$

where F denotes the gravitational force between two objects i and j , and G is the gravitational constant. In this equation, the gravitational force is directly proportional to the masses of the objects (M_i and M_j) and inversely proportional to the square of the distance D^2 between the point masses. Contextualizing it to the flow of international trade, the equation becomes as follows:



$$Trade_{ij} = \frac{Pop_i Pop_j}{D_{ij}} \quad (2)$$

where $Trade_{ij}$ is the value of bilateral trade between country i and country j , Pop_i and Pop_j are country i 's and country j 's population respectively, where in this case, mass is associated with country's population. D_{ij} is the distance between country i and country j . Thus, it states that the volume of trade are measured by trade, exports, or imports between any two countries is proportional, other things being equal, to the population of the two countries, and diminish with the distance between them.

To facilitate the econometric estimation, the model in equation (2) is transformed into a log form to obtain a linear relationship of the model as:

$$\ln(Trade_{ij}) = \alpha + \beta \ln(Pop_i * Pop_j) - \gamma \ln(D_{ij}) \quad (3)$$

where α , β , and γ are coefficients to be estimated. Equation (3) says that there are three reasons that determine the volume of trade between two countries; the size of their populations and the distance between them, where the size of the population is expected to have a positive effect on trade and the distance is negative.

4.2 Model Specification

The gravity model applied in this study is based on the gravity model used by Sharma and Chua (2000) and Rahman (2003, 2009). Employing panel data analysis using a gravity model, the years estimated is in the period of 1997 – 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 trade is as follows:

$$\begin{aligned} \ln(Trade_{ijt}) = & \alpha_0 + \beta_1 \ln(GDP_{it} * GDP_{jt}) + \beta_2 \ln(PCGDP_{it} * PCGDP_{jt}) \\ & + \beta_3 \ln(DIST_{ij}) + \beta_4 \ln(PCGDPD_{ijt}) + \beta_5 \ln(FDI_{ijt}) + \beta_6 \ln\left(\frac{TR_{it}}{GDP_{it}}\right) + \beta_7 \ln\left(\frac{TR_{jt}}{GDP_{jt}}\right) \\ & + \beta_8 \ln(INS_{it}) + \beta_9 (INS_{jt}) + \varepsilon_{ijt} \end{aligned} \quad (4)$$

where: $Trade_{ijt}$ = Total trade (exports + imports) between Malaysia (country i) and country j (in million USDs); GDP_i (GDP_j) = Gross Domestic Product (constant term)



of country i (j); $PCGDP_i$ ($PCGDP_j$) = Per capita *GDP* of country i (j); $PCGDPD_{ijt}$ = Per capita *GDP* differential between country i and j ; TR/GDP_{it} = Trade/*GDP* ratio of country i ; FDI_{ijt} = Foreign direct investment inflows between country i and j ; and ϵ_{ijt} = error term; t = time period; α , β = parameters, $DIST_{ij}$ = Distance between country i capital to country j capital (in kilometers), INS_{it} = Corruption perceptions index of country i , and INS_{jt} = Corruption perceptions index of country j .

4.3 Data and Source of Data

All observations are based on annual data. The data used are in real terms. 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.

5. EMPIRICAL RESULTS

For the panel analysis, unbalanced data is to be used for the model and thus, the Hausman test is to be employed to determine whether the fixed effects (*FE*) model or random effects (*RE*) model is more appropriate. It is important to note the problems of estimating the *FE* model for Malaysia's trade. 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:



$$IE_{ij} = \alpha_0 + \beta_1 \ln(\text{Distance}_{ij}) + INS_{jt} + \mu_{ij} \quad (5)$$

where IE_{ij} is the individual effects and Distance_{ij} denotes to distance and the INS_{jt} is the quality of institutions measured in this study by using the corruption perception index of country j . Having checked the goodness of fit of the model, the estimation results for the Malaysia-OIC trade model for the equation (4) is presented in Table 2.

Since the Hausman test suggests that the FE Model is more appropriate in explaining the Malaysia-OIC trade model, the discussion and interpretation of the results will only deal with the FE model. In the FE model of Malaysia-OIC trade, the coefficient of GDP is positive and statistically significant at 5 per cent level. It is as expected and corroborated with the theoretical prediction.

Table 2 : First-order Auto Regressive Disturbances

<i>ln(Trade)</i>	<i>Parameter Estimates</i>	<i>P-Values</i>	<i>Standard Error</i>
Constant	-1.51*** (-93.37)	0.000	0.016
$\ln(GDP_{i(j)})$	0.002** (1.99)	0.047	0.001
$\ln(PCGDP_{i(j)})$	0.376*** (32.58)	0.000	0.0115
$\ln(PCGDPD_{ij})$	0.0135*** (4.77)	0.000	0.0028
$\ln(TR/GDP)_i$	1.004*** (683.34)	0.000	0.0015
$\ln(FDI)$	0.0014** (2.55)	0.011	0.0006
R-squared	0.865		
F-test	12.21		

Notes: * = significant level at 10%
** = significant level at 5%
*** = significant level at 1%
t-statistics are noted in parentheses.

In running the second stage regression for the dummy and distance variables, equation (5) is to be regressed and the results are shown in Table 3.



Table 3: Second Stage Regression for Malaysia-OIC Trade Model

<i>Explanatory Variables</i>	<i>Coefficient (t-statistics)</i>
Constant	0.3796 (0.11)
$\ln(\text{Distance})$	-0.066 (-0.18)
INS_j	1.166 (1.84) *

Notes: * = significant level at 10%
** = significant level at 5%
*** = significant level at 1%

This finding basically implies that Malaysia tends to engage in trade activities with larger economies among the OIC countries. It is estimated that Malaysia's bilateral trade with country j will increase by 0.002 per cent when Malaysia's GDP and country j 's GDP increase by 1 per cent. On the other hand, the coefficient of GDP per capita of Malaysia and country j is also highly significant at 1 per cent level. The coefficient value is 0.376. This brings about that Malaysia's bilateral trade with country j will increase by 0.38 per cent as the GDP per capita of Malaysia and country j increases by 1 per cent. It suggests that Malaysia tends to trade more with OIC countries of high level of development.

These findings entail a positive correlation between economic growth and trade. As growth increases, the ability of a government to spend especially on infrastructures and education would increase. This can be seen as an act of capacity building initiatives which eventually would facilitate and enhance trade activities between countries. The positive sign of the $PCGDP$ differential coefficient indicates that the H-O effect dominates the Linder effect in Malaysia's trade with OIC countries. The coefficient is highly significant at 1 per cent level. The explanation to this would be that Malaysia's major trading partners in the OIC are countries which have relatively similar levels of per capita income, which is in contradict with the H-O hypothesis and more towards the argument on the Linder hypothesis.

The trade/ GDP ratio represents a proxy for the level of openness of the country. The coefficient is significant at 1 per cent level and has a positive sign as expected. This finding demonstrates the significance of free trade policy and the pursuit of trade liberalization in enhancing Malaysia-OIC trade. It is estimated that as 1 per cent increase in the openness of trade of Malaysia, Malaysia's trade to country j would increase by 1.004 per cent. This result is crucial especially for policy makers in Malaysia in their attempt to increase trade relations between Malaysia and OIC countries. As for the FDI , the variable is significant at 5 per cent level and has the



expected positive sign. The data for *FDI* inflows have been powered by two in an attempt to cancel out the negative sign appears on some of the data. The result for *FDI* confirms the hypothesis that Foreign Direct Investment (*FDI*) and trade are positively correlated and complementary. Malaysia's trade with country *j* increases by 0.001 per cent as the *FDI* inflow to Malaysia increases by 1 per cent. Policies to attract *FDI* coming in are needed in an attempt to increase Malaysia-OIC trade and intra-OIC trade as a whole.

For the second stage regression results, the sign of the dummy variable of *INS_j* is positive and thus confirmed with expectation and significant at 10 per cent level. It is interesting to compare this result with the analysis of trade patterns. Based on the analysis of trade patterns, Malaysia's major trading partner among the OIC member countries in the year of 1997, 1999, 2001, 2003, 2006, and 2009, among others, are Saudi Arabia and Pakistan. This shows the untapped and unexplored trade potentials for Malaysia and the OIC member countries. A gravity model finding suggests that a 1 unit improvement in the Corruption Perception Index of country *j* will increase Malaysia's bilateral trade by 1.166 per cent. For the distance variable, it is found to be insignificant in explaining Malaysia's trade with the OIC individual countries.

6. CONCLUDING REMARKS

This paper aims at investigating empirically on bilateral trade relations between Malaysia and the OIC member countries. Estimation of the Malaysia-OIC gravity model of trade revealed that, among others, the importance of size effects, level of development, and the *FDI* inflows in determining Malaysia-OIC trade. Distance is not significant in explaining Malaysia's trade with the OIC countries whereas a better quality of institutions is proven to be crucial in enhancing Malaysia-OIC trade relationship.

These findings and results are important especially for policy makers in crafting policies to improve Malaysia-OIC trade relationship in the future. In line with the empirical findings, it is crucial for Malaysian government to focus on accelerating the effort to establish the Islamic Common Market (ICM), liberalizing the economy further, improving the strategic sectors such as the Islamic Banking and Finance, and intensifying endeavors in curbing corrupt practices.

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