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# The Determinants of Exports between Malaysia and the OIC Member Countries: A Gravity Model Approach

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## Abstract

This paper investigates the impact of economic factors on bilateral exports between Malaysia and the OIC member countries. Using the panel estimation for gravity model, the data covers the period of 1997 to 2009. The gravity estimates imply the importance of size effects, level of openness of the economy, inflation rates, and the exchange rates as determinants of Malaysia's exports to OIC countries. The estimation of individual effects shows the significance of distance and institutions in enhancing Malaysia-OIC exports.

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

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## 1. Introduction

Since the establishment of the Organization of Islamic Cooperation (OIC)<sup>†</sup> 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

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<sup>†</sup> Formerly known as the Organization of the Islamic Conference, the OIC is an inter-governmental organization consists of 57 member countries and 13 observer status countries.

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, policies, 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.

## **2. Research Background**

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.

## **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. 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. He 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, he 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. He also recommended that the OIC member countries should strengthen the backward and forward linkages in production and investment to reap the economies of scale.

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.

#### 4. Methodology

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:-

$$\begin{aligned} \ln(\text{Export}_{ijt}) = & \tau_0 + \varphi_1 \ln(\text{GDP}_{it}) + \varphi_2 \ln(\text{GDP}_{jt}) + \varphi_3 \ln(\text{PCGDP}_{it}) \\ & + \varphi_4 \ln(\text{PCGDP}_{jt}) + \varphi_5 \ln(\text{DIST}_{ijt}) + \varphi_6 \ln(\text{PCGDPD}_{ijt}) \\ & + \varphi_7 \ln(\text{ER}_{ijt}) + \varphi_8 \ln(\text{INF}_{it}) + \varphi_9 \ln(\text{INF}_{jt}) + \\ & \varphi_{10} \ln(\text{TR}/\text{GDP}_{it}) + \varphi_{11} \ln(\text{TR}/\text{GDP}_{jt}) + \\ & \varphi_{12} \ln(\text{INS}_{it}) + \varphi_{13} \ln(\text{INS}_{jt}) + U_{ijt} \end{aligned} \tag{1}$$

Where  $\text{Export}_{ijt}$  = Country  $i$  (Malaysia) exports to country  $j$  (in million USDs),  $\text{DIST}_{ij}$  = Distance between county  $i$  capital to country  $j$  capital (in kilometers),  $\text{INS}_{it}$  = Corruption perceptions index of country  $i$ ,  $\text{INS}_{jt}$  = Corruption perceptions index of country  $j$ ,  $\text{GDP}_i$  = Gross Domestic Product of country  $i$ ,  $\text{GDP}_j$  = Gross Domestic Product of country  $j$ ,  $\text{PCGDP}_i$  = Per capita GDP of country  $i$ ,  $\text{PCGDP}_j$  = Per capita GDP of country  $j$ ,  $\text{PCGDPD}_{ijt}$  = Per capita GDP differential between country  $i$  and  $j$ ,  $\text{ER}_{ijt}$  = 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),  $\text{INF}_{it}$  = Inflation rate for country  $i$ ,  $\text{INF}_{jt}$  = Inflation rate for country  $j$ ,  $\text{TR}/\text{GDP}_{it}$  = Trade/GDP ratio of country  $i$ ,  $\text{TR}/\text{GDP}_{jt}$  = Trade/GDP ratio of country  $j$ ,  $U_{ijt}$  = error term,  $t$  = time period;  $\tau, \varphi_s$  = parameters.

## 5. Sources of Data

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](http://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](http://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](http://www.transparency.org/cpi).

## 6. Empirical 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:

$$IE_{ij} = \alpha_0 + \beta_1 \ln(\text{Distance}_{ij}) + INS_{jt} + \mu_{ij} \quad (2)$$

Where  $IE_{ij}$  is the individual effects and  $\text{Distance}_{ij}$  denotes to distance and the  $INS_{jt}$  is the quality of institutions measured in this study by using the corruption perception index of country  $j$ . Equation 1 is to be estimated and Table 1 shows the results for Fixed Effects Model, Random Effects Model, and Pooled Model.

Table 1. Estimation Results for Export Model

Variables	Fixed Effects Model	Random Effects Model	Pooled Model
Constant	39.638** (2.30)	38.223* (1.90)	39.943 (1.31)
LN(GDP) <sub>i</sub>	4.563** (2.46)	5.5796** (2.68)	6.076* (1.93)
LN(GDP) <sub>j</sub>	1.4678 (1.28)	0.275*** (4.01)	0.174*** (4.14)
LN(PCGDP) <sub>i</sub>	-3.977 (-1.44)	-5.882* (-1.75)	-6.948 (-1.36)
LN(PCGDP) <sub>j</sub>	-2.448** (-2.01)	-0.4001*** (-4.42)	-0.344*** (-6.69)
LN(ER)	-1.287*** (-3.56)	-0.279 (-0.77)	0.3299 (0.61)
LN(INF) <sub>i</sub>	0.01 (0.22)	0.059 (0.99)	0.011 (0.12)
LN(INF) <sub>j</sub>	-0.021 (-0.33)	0.081 (1.55)	0.2297*** (3.89)
LN(TR/GDP) <sub>i</sub>	0.658*** (9.61)	0.557*** (12.29)	0.754*** (18.09)
LN(Distance)		-0.702** (-2.00)	-0.356* (-1.76)
INS <sub>j</sub>		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: \* = significant level at 10%, \*\* = significant level at 5%, \*\*\* = significant level at 1%, t-statistics are noted in parentheses.

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 2.

Table 2. Results of Export Model (GLS)

Variables	Fixed Effects Model	P-Values	Standard Error
Constant	11.623*** (6.23)	0.000	1.865
LN( <i>GDP</i> ) <sub><i>j</i></sub>	0.149*** (3.53)	0.000	0.042
LN( <i>PCGDP</i> ) <sub><i>j</i></sub>	-0.243*** (-4.43)	0.000	0.055
LN( <i>ER</i> )	-1.028*** (-2.71)	0.007	0.379
LN( <i>INF</i> ) <sub><i>i</i></sub>	-0.211** (-2.30)	0.021	0.092
LN( <i>INF</i> ) <sub><i>j</i></sub>	0.172*** (2.97)	0.003	0.058
LN( <i>TR/GDP</i> ) <sub><i>i</i></sub>	0.8899*** (24.65)	0.000	0.036

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

Table 2 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 3 shows the second stage regression results of the Malaysia-OIC export Gravity Model.

Table 3. 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 <sub><math>j</math></sub>	9.497 (1.94) *

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

Based on Table 3, the sign of the dummy variable of  $INS_j$  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.

## 7. Conclusion

This paper is intended to examine Malaysia's exports with the OIC member countries. For exports flows between Malaysia and the OIC countries, an analysis of the gravity model demonstrated that the major determinants are the size of the economies, level of openness of the economy, inflation and the exchange rates. Several policy implications can be drawn from the results of the gravity model. For one, it is vital for Malaysian policy makers to play an important role to exploit the vast market of the OIC region, such as focusing on the African region, accelerating the effort to establish the Islamic Common Market (ICM),

liberalizing the economy further, and intensifying endeavours in curbing corrupt practices.

## References

- Abu-Hussin, M. F. (2010). *Exploring International Trade between Malaysia and GCC Countries: Empirical Analysis on Trends, Developments and Challenges*. Unpublished Doctoral Thesis, Durham University: United Kingdom.
- Al Atrash, H., & Yousef, T. (2000). Intra-Arab Trade: is it too Little?. *IMF Working Paper*, 00/10, International Monetary Fund (IMF).
- Asmak, A. R., & Abu-Hussin, M. F. (2009). GCC Economic Integration Challenge and Opportunity for Malaysian Economy. *Journal of International Social Research*, 2(9): 43-55.
- Baltagi, B. H. (2005). *Econometric Analysis of Panel Data* (3rd ed.). New York: John Wiley & Sons.
- Bendjilali, B. (1997). An intra-trade Econometric model for OIC member Countries: A Cross Country Analysis. *IRTI Research Papers*, No. 55.
- Evelyn S., Ahmad, Z., & Thirunakarasu, S. (2011). Leveraging Trade Opportunities with Non-Traditional Partners: The Malaysia-GCC Perspective. *International Conference on International Trade and Investment: Globalisation at Crossroads – Implications for the Developing World*, Le Meridien Hotel, Mauritius, 20-21 December.
- Ghani, G. M. (2007). Does OIC Membership Reduce Trade? *Journal of Economic Cooperation*, 28(4): 39-62.
- Hassan, M. K. (1998). An Empirical Investigation of Economic Cooperation Among the OIC Member Countries. *Economic Research Forum*.
- Ismail, N. (2008). Explaining Malaysian Bilateral Trade Using the Gravity Model. *The Empirical Economic Letters*, 7(8): 811-818.
- Khalifah, N. A. (1993). The Structure of Intra-Muslim Countries Trade. *Malaysian Economic Journal*, 27: 57-84.
- Maddala, G. S. (2001). *Introduction to Econometrics* (3rd ed.). New York: John Wiley & Sons.
- Poyhonen, P. (1963). A Tentative Model for the Volume of Trade Between Countries. *Welwirtschaftliches Archiv*, 90: 93-99.
- Rahman, M. M. (2003). A Panel Data Analysis of Bangladesh's Trade: The Gravity Model Approach. Unpublished Doctoral Dissertation, University of Sydney: Australia.
- Rahman, M. M. (2009). Australia's Global Trade Potential: Evidence from the Gravity Model Analysis. *Oxford Business & Economics Conference*, 24 – 26 Jun, Oxford University: United Kingdom.
- Raimi, L. & Mobolaji, H. I. (2008). Imperative of Economic Integration Among Muslim Countries: Lessons From European Globalisation. *Humanomics*, 24 (2): 130-144.
- Reilly, W. J. (1931). *The Law of Retail Gravitation*. New York: Pillsbury Publishers.
- Sharma, S. C., & Chua, S. Y. (2000). ASEAN: Economic Integration and Intra-Regional Trade. *Applied Economics Letters*, 7(3): 165-169.
- Stewart, J. Q. (1948). Demographic Gravitation: Evidence and Application. *Sociometry*, 11(1): 31-58.
- Tinbergen, J. (1962). Shaping the World Economy: Suggestions for an International Economic Policy. *Journal of Farm Economics*, 46(1): 271-283.
- Zipf, G.K. (1946). The  $\frac{P_1 P_2}{D}$  Hypothesis: On the Intercity Movement of Persons. *American Sociological Review*, 11(6): 677-686.