

## Malaysia-OIC Trade: Static and Dynamic Gravity Model Approaches

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This paper examines the impact of the Organization of Islamic Conference (OIC) membership on Malaysian exports. We use the static and dynamic gravity model approaches to analyse the relationship using annual data from 1980 to 2010. The empirical results reveal that the GDP of OIC member countries, FDI of Malaysia, local population size, exchange rate, price ratios, distance and border are the main determinants of Malaysian exports. The evidence also suggests that there is also considerable room for improvement trade between Malaysia and OIC membership countries.

### 1. Introduction

One of the Organization of Islamic Conference (OIC)<sup>3</sup> objectives and principles as has been outlined in the OIC Charter is to strengthen intra-bloc economic and trade cooperation. The ultimate goal of this objective is to create Islamic Common Market. In 2005, OIC developed its ten-

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<sup>3</sup> The OIC was first established 42 years ago. It was founded in Rabat, Morocco on 25 September 1969 following the incident of criminal arson perpetrated on 21 August 1969 by Zionist element against Mosque al-Aqsa (OIC, 2008). The First Islamic Conference of Ministers of Foreign Affairs held in Jeddah on March 1970 to set up a permanent general secretariat. They chose Jeddah as the HQ but permanent HQ will be in Jerusalem. The OIC adopted the Charter of the Organization two and half years after the Rabat Summit. The aim of the charter is to strengthen solidarity and cooperation among Islamic states in the political, economic, cultural, scientific and social fields. In order to achieve this ultimate aim the OIC constructed main bodies, secondary organs, institutions and specialized committees (OIC, 2008).

year action plan to re-coordinate collective actions of its members in various fields including economy. The action plan also outlined the negotiations of implementing preferential tariff scheme among member countries which were the initial steps to more integrated trade arrangements.

Therefore, this paper is aimed to conduct an empirical research to assess the effect of OIC membership on Malaysia exports. This study is a response to the call for doing research and development on Muslim countries to measure the effectiveness of OIC in promoting trade among member countries where the number of researches in this area is limited. In addition, as one of founding member of OIC, Malaysia has indeed involved in many economic cooperation and trade negotiations. This study will examine the importance of the negotiations within the OIC and the effects to the Malaysian exports. To empirically analyse the effect, we employ the static and dynamic gravity models. In addition to the static approach which is widely used, the dynamic approach is able to capture the persistence effect of trade or export activities.

Furthermore, all OIC member countries are developing countries. Even more, 23 (including Palestine) of them are categorized under least developed low income countries<sup>4</sup>. These least-developed countries constitute more than half of the total OIC population. Therefore, collective actions should be taken cooperatively by well-developed member countries to help those least-well developed members through trade negotiations because the trade is able to treat for the balanced development among members. This willingness to help will show the spirit of Muslim brotherhood. This study helps to understand the impact of economic characteristics of other members to Malaysian exports that may provide room for improvement in trade relationships.

This study finds that the common determinants of gravity model, which are the GDP of OIC member countries, FDI of Malaysia, local population size, exchange rate, price ratios, distance, and border, are the main determinants of Malaysian exports. The export variable also shows its dynamic behaviour as its lagged dependent variable is significant. The OIC membership is otherwise insignificant. However, the sign is

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<sup>4</sup> See [http://www.un.org/esa/policy/devplan/profile/ldc\\_list.pdf](http://www.un.org/esa/policy/devplan/profile/ldc_list.pdf) (online: 15 October 2011).

positive. These findings are crucial as they show the important determinants of Malaysian export demand from the OIC member countries and the impact of OIC membership to the export.

The remainder of the paper is organized as follows. The next section illustrates Malaysian exports to the OIC. Section 3 discusses previous literatures on the gravity model and trade agreements. Section 4 describes the methodology of the study which comprises of static and dynamic gravity models. Section 5 describes data sources, variable definition and expected signs. Section 6 discusses the econometric methods and their empirical results. Last, Section 7 concludes the paper.

## **2. Trade: Malaysia and the OIC**

The organization that promotes multilateral trade is the World Trade Organization (WTO) that was established after the collapse of GATT (General Agreement for Tariff and Trade). As 10 May 2012, WTO has 155 countries in its membership. Its main function is to smooth the trade activities through liberalizing the trade. Its spirit is the most favoured nation (MFN) integrated with non-discriminatory respect to all members. However, to achieve a freer free trade it will take a long of time as unanimity of all members must prevail in prior to the free trade practices. However, under GATT's Article 24, it is allowed for a group of countries to form regional trade arrangements so long the arrangements do not violate WTO rules. The approach of regionalism<sup>5</sup> divides the economists into two groups (Clarete *et al.* 2003). The opponents argue that the process of regionalism is like putting another distortion into the world trading system. This will cause trading system to be like a spaghetti bowl i.e. complex trading rules.

However, other economists believe that in order to establish a pure multilateral trade without distortions is the first best solution but it is something impossible to happen in this complicated world order. They argue that putting another distortion does not mean complicating world trade pattern. It is based on the Second Best Theory. Based on this argument, this paper justifies that the trade cooperation among OIC

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<sup>5</sup> Regionalism is an action of forming regional trade areas whether the parties involved in free trade agreements (FTAs) or Preferential Trade Agreements (PTAs).

member countries is considered as multilateral trade activities rather than regional trade activities.

In recent two decades, the volume of trade among OIC member countries has been increasing rapidly. Both exports and imports of the OIC member countries increased rapidly in recent years after an interruption in 2001. It was due to the global economic slowdown in the early 2000s accompanied by fluctuations in oil prices. Currently, the world economy was again interrupted by the sub-prime crisis. This sub-prime crisis that occurred in developed countries such as the United States, the United Kingdom, Spain, Italy, Greece and Iceland, caused the reduction in the demand on products imported from the OIC. In 2008, the OIC exports were USD1.808 trillion, but in 2009, the exports dropped to USD1.206 trillion.

More than half of the total exports of the OIC belong to the group of Fuel Exporting Countries (FECs), and this share has been steadily increasing in recent years. Their share in total imports, at the same time, has also been on the rise to the detriment of the group of Middle-Developed Countries (MDCs), whose share accounted for almost two-thirds of the total imports in 2000. Malaysia is one of the MDCs. Although the share is rising largely due to higher oil and other commodity prices, it also highlights the fact that OIC countries, with the exception of Malaysia, Turkey and Indonesia, have not notably diversified away from primary commodities to a broader export basket.

In the case of Malaysia, Malaysia exported products at amount of USD5 billion to OIC countries in 2001. The amount increased five folds in 2010. Major export destinations among others are Indonesia, United Arab Emirates (UAE), Pakistan, Egypt, Bangladesh and Pakistan, which are mostly among D8<sup>6</sup> member countries (Table 1). Major export products includes HS15 (animal, vegetable fat and oils, cleavage product, etc), HS85 (electrical, electronic equipment), HS27 (mineral fuels, oils, distillation products, etc), HS84 (machinery, nuclear reactors, boilers, etc), HS71 (pearls, precious stones, metals, coins, etc), and

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<sup>6</sup> D8 is known for Development 8 of eight major developing Muslim countries. The organization comprises of Malaysia, Indonesia, Turkey, Iran, Bangladesh, Pakistan, Egypt and Nigeria.

HS39 (plastics and articles thereof)<sup>7</sup>. Table 2 shows the figures in details. Overall, the Malaysian exports to the OIC increases from year to year for those major commodities. Besides, Malaysia's exports of halal products and services were also expected to increase significantly in the coming years due to the growing demand from the member countries of OIC specifically from high income Arab countries. Due to that, Malaysia gave a special focus on halal industry as a part of its strategic thrusts and policy measures under the Third Industrial Master Plan (2006 – 2020) (MITI 2006).

### 3. Previous Studies

The Gravity model that will be used in the analysis part of this research has been used by many previous researchers like Frankel *et al.* (1995), Rajapakse and Arunatilake (1997), Hassan (2001) and others. The gravity model was introduced by Tinbergen (1960). Its widely use is due to its robustness and its ability to analyse various trade issues (van Bergeijk and Brakman, 2010).

In contrast, Frankel *et al.* (1995) examine the PTA in American continent. They argue that the bilateral trade is unable to be explained only by natural variables such as national income, geographical size, and common language and border. However, other literatures show the importance of such variables which are the core components of the gravity model. Previous studies such as Martinez-Zarzoso *et al.* (2009) and Head *et al.* (2010) have significant results for the variables as well as other older studies such as Rajapakse and Arunatilake (1997) and Hassan (2001).

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<sup>7</sup> Based on HS4 codes.

**Table 1 Malaysian exports 2001 – 2010 (Based on HS4 USD '000)**

| <i>Importers</i> | 2001    | 2002    | 2003    | 2004    | 2005     | 2006     | 2007     | 2008     | 2009     | 2010     |
|------------------|---------|---------|---------|---------|----------|----------|----------|----------|----------|----------|
| OIC, total       | 5001135 | 5723040 | 7210778 | 9197179 | 10095737 | 11840906 | 15345928 | 20273301 | 16987969 | 20811711 |
| onesia           | 1563104 | 1790370 | 2127983 | 3062935 | 3312085  | 4069163  | 5148242  | 6215029  | 4913274  | 5628912  |
| UAE              | 833467  | 858864  | 1114717 | 1555261 | 1847642  | 2266554  | 2947093  | 3758678  | 2850239  | 3791790  |
| Pakistan         | 399268  | 525090  | 667728  | 702293  | 747908   | 842598   | 1255059  | 1718703  | 1632818  | 2336545  |
| Egypt            | 209917  | 295533  | 454633  | 365146  | 459609   | 342127   | 476732   | 715844   | 809573   | 1400951  |
| Bangladesh       | 171328  | 225886  | 320184  | 364606  | 409399   | 422460   | 407931   | 684905   | 803495   | 1259325  |
| Saudi Arabia     | 341232  | 383234  | 407574  | 482824  | 474281   | 530333   | 717195   | 1053051  | 813092   | 893914   |
| Iran             | 178343  | 229082  | 327911  | 345836  | 358638   | 440847   | 617949   | 733442   | 682143   | 848926   |
| Turkey           | 366926  | 211167  | 318273  | 399055  | 534583   | 640264   | 902111   | 815521   | 475448   | 656991   |
| Benin            | 3184    | 3638    | 21820   | 11845   | 26420    | 98495    | 210513   | 396293   | 298597   | 477472   |
| Brunei           | 272935  | 300303  | 317055  | 318126  | 359821   | 345836   | 402437   | 447869   | 443430   | 449850   |
| Togo             | 4777    | 16238   | 35213   | 58480   | 50396    | 71954    | 93984    | 135700   | 107185   | 268288   |
| Jordan           | 66451   | 62740   | 79082   | 343349  | 113757   | 149895   | 89921    | 549150   | 149902   | 260087   |
| Oman             | 96735   | 49545   | 52359   | 71109   | 81034    | 99835    | 151358   | 229826   | 173010   | 180366   |
| Kuwait           | 63288   | 70972   | 89446   | 108047  | 122205   | 159890   | 167923   | 375991   | 163018   | 180345   |
| Djibouti         | 4582    | 5021    | 12732   | 13336   | 21812    | 32980    | 79147    | 140467   | 146632   | 180303   |
| Syria            | 50649   | 66502   | 154266  | 149121  | 164226   | 156077   | 166107   | 173391   | 174345   | 176718   |
| Yemen            | 50818   | 76544   | 104474  | 111114  | 119080   | 261954   | 220496   | 334317   | 204809   | 167643   |

Source: Trade Map, International Trade Centre ([www.trademap.org](http://www.trademap.org)).

**Table 2 Malaysian products of export to OIC member countries, 2001 – 2010 (Based on HS4 USD '000)**

|  | 2001    | 2002    | 2003    | 2004    | 2005     | 2006     | 2007     | 2008     | 2009     | 2010     |
|--|---------|---------|---------|---------|----------|----------|----------|----------|----------|----------|
| All products   | 5001135 | 5723040 | 7210778 | 9197179 | 10095737 | 11840906 | 15345928 | 20273301 | 16987969 | 20811711 |
| Animal,vegetable<br>fats and oils,<br>cleavage products,<br>etc (HS15) | 826239  | 1247389 | 1871017 | 1913704 | 1684839  | 1770528  | 2667020  | 4707568  | 3370433  | 5298797  |
| Electrical,<br>electronic<br>equipment (HS85)                          | 712685  | 763183  | 877323  | 1135749 | 1219803  | 1383168  | 1586221  | 2107334  | 1837337  | 2563177  |
| Mineral fuels, oils,<br>distillation<br>products, etc.<br>(HS27)       | 380432  | 329041  | 480275  | 662437  | 885345   | 1525331  | 1713865  | 2112611  | 1862637  | 1800277  |
| Machinery, nuclear<br>reactors, boilers,<br>etc. (HS84)                | 466182  | 544472  | 630906  | 878433  | 980194   | 1141086  | 1470820  | 1598578  | 1454631  | 1533770  |
| Pearls, precious<br>stones, metals,<br>coins, etc. (HS71)              | 288094  | 218233  | 267141  | 534304  | 723483   | 778782   | 1031985  | 1078868  | 1054151  | 1175948  |
| Plastics and articles<br>thereof (HS39)                                | 157300  | 175377  | 254208  | 345962  | 434163   | 486802   | 647406   | 883193   | 751053   | 1016623  |

Source: Trade Map, International Trade Centre ([www.trademap.org](http://www.trademap.org)).

Rajapakse and Arunatilake (1997) and Hassan (2001) investigate the South Asian Association for Regional Cooperation (SAARC). They find that the SAARC needed trade reformation to enhance trade among them (Rajapakse and Arunatilake, 1997) because volume of trade between each other is small compared to trade with others (Hassan, 2001). This situation happened due to (1) production of similar products, (2) small scale of production, and (3) political confrontation among country members (Rajapakse and Arunatilake, 1997). Hassan (2001) concludes that the main factor contributed to this situation is the low level of industrialization in most country members. Therefore, he argues that the SAARC would gain intra-bloc increase if all country members gave much focus on industries.

In term of trade arrangements, Ceglowski (2000) and Okubo (2004) demonstrate that implementation of PTA will decrease effects of common border variable. Clarete *et al.* (2003) argue that different PTA gave different intra-bloc trade effect. They also find that there are PTAs that give effect contrary to the theory. Martinez-Zarzoso *et al.* (2009), on contrary, find that regionalism (PTA and other types of regionalism) has positive impact on both intra- and extra-bloc trade where the impact is larger for developed nations than developing ones. A study by Ghani (2007) on OIC membership impact of trade shows the negative relationship between OIC membership and trade. This finding implies that OIC reduces trade. In addition, all previous studies mentioned here, except one, are based on static gravity model specification. This model ignores the persistence effect of trade such that last year trade arrangements affect current trade. Therefore, following Martinez-Zarzoso *et al.* (2009), we consider the lagged dependent variable of export in the model specification.

#### **4. Methodology**

This research will adopt the gravity model to examine the impact of OIC membership on Malaysian exports. The literatures show that this model is widely used in order to examine the flows of trade. The model explained the volume of trade flows in terms of the ratio of the product of the gross domestic product (GDP) of countries  $i$  and  $j$  to the distance between them multiplied by a parameter  $A$ .



$$\text{Trade}_{ij} = A \frac{(GDP_i \cdot GDP_j)}{\text{Distance}}$$

By taking the logarithm we get the following:

$$\ln(\text{Trade}_{ij}) = A + \beta_1 \ln(GDP_i \cdot GDP_j) - \beta_2 \ln(\text{Distance}_{ij}) + \varepsilon_{ij}$$

Taking into account other important determinants, the static gravity model is rewritten as follows:

$$\begin{aligned} \ln X_{mjt} = & \alpha_0 + \alpha_t + \alpha_j + \beta_1 \ln GDP_{mt} + \beta_2 \ln GDP_{jt} + \beta_3 \ln ENDOW_t + \beta_4 \ln FDI_{mt} + \beta_5 \ln FDI_{jt} \\ & + \beta_6 \ln POP_{mt} + \beta_7 \ln POP_{jt} + \beta_8 \ln EX_{jmt} + \beta_9 \ln P_{jmt} + \beta_{10} \ln DISTANCE_{mj} \\ & + \beta_{11} BORDER_{mj} + \beta_{12} OIC_j + \varepsilon_{jt} \end{aligned}$$

where  $\alpha_0$  is constant;  $\alpha_t$  is year-specific effect but common to all countries;  $\alpha_j$  is country-specific effect which is common to all years;  $\varepsilon_{jt}$  error term in log assumed to normally distributed;  $\beta_k$  are estimated parameters, for all  $k = 1, 2, \dots, 12$ ;  $GDP$  is Gross Domestic Product (GDP);  $ENDOW$  is absolute difference between  $GDP_{mt}$  and  $GDP_{jt}$ ;  $FDI$  is inward flows of foreign direct investment (FDI);  $POP$  is number of population,  $EX$  is average-of-period exchange rate of national currencies per a ringgit;  $P$  is the relative average consumer price of foreign price to Malaysian price;  $DISTANCE$  is distance between exporting and importing countries;  $BORDER$  is dummy for common border; and  $OIC$  is dummy for OIC membership.

All variables are in log form except for dummies. If the coefficient on OIC dummy is positive and significant, then the trading activities between Malaysia and OIC members are judged to expand. Given the log linear specification of the gravity model regression equation, the impact of trade between Malaysia and OIC member countries can be computed in percentage terms as  $100 \times [\exp(\beta_{12}) - 1.00]$ . The dependent variable is the total export of merchandise. The subscript  $m$  indicates the exporting country. In this model, Malaysia is the exporting country, and the subscript  $j$  indicates the Malaysia trading partners.

Martinez-Zarzoso *et al.* (2009) argue that businesses among trading countries are not set up in a one day or year, but have been developed in many years where the distribution channels and service networks have involved sunk costs. In addition, customers in partner countries may already have accustomed to certain products produced in exporting countries. Another reason for the existence of persistence effects is the presence of long-term supplying contract between the exporters and importers. This has led that, exports are high. In that case, we consider the lagged dependent variable as another determinant in the gravity model. This new model is called the dynamic gravity model:

$$\begin{aligned} \ln X_{mjt} = & \alpha_0 + \alpha_t + \alpha_j + \phi X_{mjt-1} + \beta_1 \ln GDP_{mt} + \beta_2 \ln GDP_{jt} + \beta_3 \ln ENDOW_t + \beta_4 \ln FDI_{mt} \\ & + \beta_5 \ln FDI_{jt} + \beta_6 \ln POP_{mt} + \beta_7 \ln POP_{jt} + \beta_8 \ln EX_{jmt} + \beta_9 \ln P_{jmt} \\ & + \beta_{10} \ln DISTANCE_{mj} + \beta_{11} BORDER_{mj} + \beta_{12} OIC_j + \varepsilon_{jt} \end{aligned}$$

## 5. Data

The data set consists of a panel of observations for a group of 127 Malaysian trading partners and the sample period is covering from 1980-2010. Within these sample countries, there are 31 OIC member countries<sup>8</sup>. Some OIC member countries are excluded from the sample in order to avoid outliers in the dataset because they are categorized as least developing OIC countries as the trade occurred might not indicate the real demand in their domestic markets. Iraq, Palestine and Kyrgyz are not included due to data inconsistency and unavailability.

The Malaysian exports dataset to these trading partners are obtained from Direction of Trade Statistics (DOTS), International Monetary Fund (IMF). Annual GDP and population are obtained from World Economic Outlook Database, IMF's website. FDI dataset are gathered from World Investment Report. Exchange rate and price index datasets are collected from International Financial Statistics, IMF. Distance is taken from Jon

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<sup>8</sup> These countries are Albania, Algeria, Azerbaijan, Bahrain, Brunei, Cameroon, Cote D'Ivoire, Egypt, Gabon, Guyana, Indonesia, Iran, Jordan, Kazakhstan, Kuwait, Lebanon, Libya, Morocco, Nigeria, Oman, Pakistan, Qatar, Saudi Arabia, Suriname, Syria, Tajikistan, Tunisia, Turkey, Turkmenistan, UAE, and Uzbekistan.

Haveman's and CEPII's websites. The OIC membership information is taken from OIC's website.<sup>9</sup>

Export, GDP, FDI and exchange rates are in nominal terms. These nominal terms are used instead of real terms because the terms can show current demand on goods. This has been argued by Jakab *et al.* (2001) and Sapir (2001). The coefficients of Malaysian GDP are assumed to be positive to indicate the economy with larger size trades more. On the other hand, the GDP of partners indicates the demand for foreign goods as discussed in international trade text books. The difference of GDP between the exporter and the trading partners indicate the relative effect of endowment on export. The effect of endowment is expected to be negative which demonstrates that one country prefers trading with those which are as rich as it is.

FDI is expected to be positively affects the export to show that FDI drives trade activities. The positive sign also represents that FDI promotes export-orientation activities. Population is an indicator of market size. The sign of its coefficients can either be positive to show the economies of scale where the economies with large population exports more; or negative to indicate the absorption capacity where 'demand creates its own supply' applies because the large population absorb the supply of goods domestically. On the other hand, the coefficients of exchange rate are assumed to be negative where the depreciation of ringgit makes the price of export to be cheaper and increase the demand on its goods. On contrary, for the importing countries, the depreciation of their currencies means the import is more expensive which thus reduces the demand on import.

To control for changes in price between exporter and importer countries, we use average price index. We take ratios of foreign price (importers' price indices) to Malaysian price. If the price increases in Malaysian domestic market, holding foreign prices constant, the price of its exports will also increase. This increase reduces demands from foreign consumers. In contrast, if the price of foreign countries increases relatively higher than Malaysia's, it makes Malaysian goods relatively

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<sup>9</sup> [http://www.oic-oci.org/member\\_states.asp](http://www.oic-oci.org/member_states.asp) (15 October 2011).

cheaper. Thus, it increases demand on Malaysian goods. Therefore, we expect the price ratios to affect exports negatively.

The distance between the exporter and its trading partners is measured in kilometres. The variable is used as a proxy of transportation costs. The farther is the distance the more the cost to export goods. On the other hand, the closer is the distance the more to trade. This is measured by a dummy variable of value one if Malaysia, as the exporting country shares a common border with its trading partners and zero, otherwise. Finally, another dummy is used to measure the effect of OIC membership on Malaysian exports. The dummy takes value of one if importing countries are OIC member countries, or zero otherwise. This dummy is assumed to be positive as being an OIC member it will encourage trading between members of country.

## 6. Empirical results

The static gravity model is estimated using ordinary least squares (OLS), generalized least squares (GLS) and panel corrected standard error (PCSE) OLS. The ordinary OLS estimates are usually biased as it assumes constant variance across time and countries. As alternatives, the model is again estimated using GLS and PCSE. However, the GLS estimates and their associated standard errors are calculated using inverse of ratio of variance matrix to number of time periods,  $\hat{\Sigma}_{i,j} = \frac{\hat{\epsilon}_i' \hat{\epsilon}_j}{T}$  and  $\Omega = \Sigma_{m \times m} \otimes I_{T_i \times T_i}$ , as estimator's weight<sup>10</sup>. Beck and Katz (1995) show that the variance matrix is of rank at most  $\min(T, m)$ . Therefore, in order to obtain valid GLS results  $T$  must be at least as large as  $m$  (number of panels). Beck and Katz (1995) suggest using OLS estimates with asymptotic standard errors that are corrected for correlation between the panels i.e. PCSE. The PCSE allows the panel to be balanced or unbalanced as it does not need similar requirement as  $T$  must be at least as large as  $m$  as GLS needs.

Furthermore, the inclusion of lagged dependent variable in the dynamic gravity model causes least squares estimates to be biased and inconsistent. This is due to serial correlation between the error term and

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<sup>10</sup> where  $i$  and  $j$  are panels;  $I$  is an identity matrix;  $m$  is the number of panel.

the lagged export or among the determinants. This happens since the determinants (including the errors except the lagged export) are correlated with export, the dependent variable. Hence, the inclusion of its lag as independent variable triggers the correlation between the determinants. Therefore, we propose using instrumental variable estimation to handle the situation. The estimator takes into account that the instruments adopted must be highly correlated with the lag but strictly uncorrelated with the error term. The unobserved effects are assumed random and i.i.d across panels so that we can use two-stage least squares random effect GLS transformation<sup>11</sup>.

Table 3 shows the results of OLS, GLS and PCSE estimations. The results reveal that there is similarity in the coefficient parameters, significance and sign among these three estimators except the errors. The errors show that OLS produces upward standard error biases. Time trend is not significant which indicates the time specific effects are unimportant because the time specifics affect the countries in the data similarly. On the other hand, the country specific effects are significant for the PCSE estimation. This indicates the country's specific characteristics are important in affecting Malaysian trade flows. The specific characteristics include legal, tradition, historical, language differences and so on, to name a few. To understand the characteristics, further institutional research is needed to be done, as part of future research.

The results also demonstrate that GDP of Malaysia has positive sign such that it Malaysian exports positively. However, the coefficient is insignificant. On the other hand, the partners' GDP is significant. This result is as expected the theory that the exports are determined by the foreign GDP as a measure of foreign demands, which has been widely discussed in many international trade textbooks. Also, the differences between GDP, or endowment is insignificant. The result implies that endowment does not affect export where Malaysia does not prefer those who are as rich as it is as major export destinations. Malaysian inward

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<sup>11</sup> We prefer IV to GMM (generalized method of moments) due to two reasons. First, GMM involves too many instruments that may reduce degree of freedom. Second, GMM eliminates the unobserved effects using first differencing techniques which can cause time-invariant variable to be excluded due to multicollinearity.

FDI does not affect export, rejecting the hypothesis that inward FDI increases exports i.e. export-orientation FDI. However, the foreign countries' FDI has positive impact on Malaysian exports. This is a reasonable relationship because Malaysia exports more intermediate products such as vegetable oils, semi-conductors and other raw materials (Table 2).

**Table 3 Estimation results of static gravity model**

|                     | <i>OLS</i>        | <i>GLS</i>        | <i>PCSE</i>       |
|---------------------|-------------------|-------------------|-------------------|
| $\alpha_0$          | 169.936*(95.065)  | 169.936*(94.801)  | 169.936*(96.113)  |
| $\alpha_t$          | -0.078(0.050)     | -0.078(0.050)     | -0.078(0.051)     |
| $\alpha_j$          | 0.001(0.001)      | 0.001(0.001)      | 0.001*(0.001)     |
| $\ln GDP_{mt}$      | 0.177(0.259)      | 0.177(0.258)      | 0.177(0.261)      |
| $\ln GDP_{jt}$      | 0.976*** (0.028)  | 0.976*** (0.028)  | 0.976*** (0.029)  |
| $\ln ENDOW_t$       | 0.006(0.024)      | 0.006(0.024)      | 0.006(0.020)      |
| $\ln FDI_{mt}$      | 0.024(0.052)      | 0.024(0.052)      | 0.024(0.052)      |
| $\ln FDI_{jt}$      | 0.107*** (0.019)  | 0.107*** (0.019)  | 0.107*** (0.018)  |
| $\ln POP_{mt}$      | 3.591** (1.662)   | 3.591** (1.657)   | 3.591** (1.683)   |
| $\ln POP_{jt}$      | -0.033(0.023)     | -0.033(0.023)     | -0.033(0.021)     |
| $\ln EX_{jmt}$      | -0.132*** (0.026) | -0.132*** (0.026) | -0.132*** (0.025) |
| $\ln P_{jmt}$       | 1.113*** (0.141)  | 1.113*** (0.141)  | 1.113*** (0.142)  |
| $\ln DISTANCE_{mj}$ | -1.635*** (0.059) | -1.635*** (0.059) | -1.635*** (0.054) |
| $BORDER_{mj}$       | 0.345* (0.182)    | 0.345* (0.181)    | 0.345*** (0.133)  |
| $OIC_j$             | 0.078(0.068)      | 0.078(0.068)      | 0.078(0.069)      |
| <i>R-squared</i>    | 0.813             |                   | 0.813             |

Note: Standard errors are in parentheses. For panel-corrected standard errors (PCSE) model, the errors are hetero-corrected standard errors. \*\*\* and \*\* indicate 1% and 5% levels of significance.

The number of Malaysian population affects exports positively. The significance of the coefficient shows the positive effect of the economies of scale on trade. The size of population measures the market size of an economy. Hence, the larger the size of Malaysian population the more

exports go abroad. The exchange rate also affects exports significantly. The sign shown is negative as expected. The result shows that if the ringgit depreciates the ratios become smaller, *ceteris paribus*, which indicates that the depreciation of ringgit affects Malaysian exports positively. Conversely, this also indicates that the appreciation of the importers' currencies affects Malaysian exports positively since Malaysian exports become relatively cheaper. The price ratios are also significant and positively signed. A relatively higher increase in foreign domestic prices as compared to Malaysian domestic price will increase Malaysia goods competitiveness. The demand on its products will also increase.

Distance is measured in kilometres. It represents the cost of commuting goods from a place to another. The result shows a negative sign that trading with farther countries will incur more costs as compared to trading with close countries. The border dummy justifies this argument that trading with neighbour is the cheapest way.

In order to capture the effect of OIC membership, the OIC dummy is positive but statistically insignificant determinant of Malaysian exports. This result contradicts previous finding by Ghani (2007) that OIC membership empirically reduce trade. However, Ghani (2007) used the bilateral trade data, which in his study he finds that the OIC member countries, in average, tend to trade less among members. His empirical finding undermines the spirit of OIC Charter. In contrast, using more restrictive approach as the data reduced to Malaysian exports only, we find that the OIC membership affects Malaysian export. Though the coefficient is insignificant, the sign gives considerable rooms for trade improvement between Malaysia and the OIC.

**Table 4 Estimation results of dynamic gravity model**

|                     | <i>Panel IV (two-stage least squares random-effects)</i> |
|---------------------|--|
| $\alpha_0$          | 87.319(93.302)   |
| $\alpha_t$          | -0.051(0.050)  |
| $\alpha_j$          | 0.000(0.000)   |
| $\ln X_{mjt-1}$     | 0.914*** (0.012)   |
| $\ln GDP_{mt}$      | 0.050(0.361)   |
| $\ln GDP_{jt}$      | 0.062*** (0.019)   |
| $\ln ENDOW_t$       | -0.004(0.012)  |
| $\ln FDI_{mt}$      | 0.246*** (0.053)   |
| $\ln FDI_{jt}$      | 0.012(0.010)   |
| $\ln POP_{mt}$      | 5.598** (2.211)  |
| $\ln POP_{jt}$      | 0.015(0.012)   |
| $\ln EX_{jmt}$      | -0.010(0.014)  |
| $\ln P_{jmt}$       | 0.086(0.076)   |
| $\ln DISTANCE_{mj}$ | -0.143*** (0.036)  |
| $BORDER_{mj}$       | -0.030 (0.094)   |
| $OIC_j$             | 0.001(0.035)   |

Note: Standard errors are in parentheses. \*\*\* and \*\* indicate 1% and 5% levels of significance. Time dummies of year 1987 – 2007 are included in the estimation. The instrumented variable is  $\ln X_{mjt-1}$ . The remaining independent variables at levels are used as instruments including second lag of export variable and time dummies.

The dynamic model's results produce quite interesting results. Using instrumental variables (IV) technique, endogeneity problem due to the lagged dependent variable is handled with the application of a set of instruments.<sup>12</sup> Also, the IV method is able to overcome weakly exogenous independent variables, in which the latter problem was raised by Jafari *et al.* (2011) in their study. As shown in Table 4, the lagged

<sup>12</sup> The IV method is preferred to a generalized method of moments (GMM) because it can prevent the too-many instruments problem.



export is positively signed and highly significant. As argued above, last year exports affect current exports. This persistence effects also suggest the existence of export hysteresis. Other variables namely Malaysian GDP, Malaysian population, Malaysian FDI and distance are also significant and have a sign as expected. On contrary, the exchange rate, price ratios and border dummy are insignificant but have expected signs. Lastly, the OIC dummy is still insignificant but positively signed. Overall, the results are consistent with static model's results. Ghani (2007) in his article argues that OIC membership supposed to be positive theoretically, even though it might be insignificant. In this paper, we successfully find out his argument empirically to be true.

## **7. Conclusion**

This study examines the impact of OIC membership on Malaysian exports for the period 1980 – 2010 using the gravity model. To investigate the issue, we employ static and dynamic gravity models. From a basic gravity equation, empirical models are developed. This study identifies mix of results between the static and dynamic gravity models. Overall, the empirical results show that the GDP of OIC member countries, FDI of Malaysia, local population size, exchange rate, price ratios, distance and border are the main determinants of Malaysian exports. The empirical results also show that there is also considerable room for improvement trade between Malaysia and OIC membership countries.

The empirical finding suggest that in order to encourage trade among OIC members, Muslim countries should actively promote and integrate markets and reduce tariff and non-tariff barriers' promote free trade agreements (FTA) among member countries while working towards an Islamic Common Market. They should actively work on trade matching of buyers and sellers by working closely with relevant trade bodies, government and non-governmental organizations, commercial and financial institutions. Lastly, they should also promote out-sourcing of goods and services from Muslim countries while not compromising on quality.

For future researches, the use of disaggregate data may be useful to further the study on the impact of OIC trade relationship from a

perspective of particular goods. In addition, this study covers 31 years of data period. In this long period of data, certain OIC member countries were not stable due to war. Besides, many OIC member countries are oil-exporting countries which may divert their trades into developed countries. Therefore, dummy variables can be used to represent the effects.

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