

PRIMARY RESEARCH

Intra OIC-Region Trade: Application of Gravity Model

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Abstract.

Purpose: This study analyses the international trade among members of the Organisation of Islamic Cooperation (OIC) and documents the significant contributing factors.

Methodology: Our sample includes 49 OIC-members (located from Southeast Asia to South America). The extended gravity model of international trade is applied to identify the determinants of intra-OIC region trade on the recent five years data (2014-18), at the time research conducted. Exports are used as proxy for the international trade between a pair of trading partners.

Findings: Evidence supports the application of the basic gravity model in explaining trade variations within the OIC region. GDP contributes positively while distancing negatively. Common language contributes positively to trade flows. Shared borders and Inflation (importer and exporter) turned insignificant. Trade volume among OIC member countries is less than potential.

Recommendations: OIC economies need to focus on growth through the production of value-added commodities-leading to an increase in international trade. Furthermore, surplus capital within the region may be shifted to economies with scarce capital.

Significance: To the best of author's knowledge, this is the only effort to present a comprehensive analysis of international trade within the OIC-region through the application of the gravity model in recent years.

KAUJIE Classification: U0, U3

JEL Classification: F10, F14

INTRODUCTION

The Organization of Islamic Cooperation (OIC) is the second-largest inter-governmental organisation after the United Nations, with membership of 57 states, spread over four continents [Asia, Europe, Africa, and South America] (OIC, 2015). OIC is an association of Muslim majority countries. Islam promotes a different civilisation (monotheism) and specifies basic principles of *ḥarām* and *ḥalāl* as far foods, dresses, earning means, dealings,

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festivals and culture, etc. are concerned (Al-Qaradawi, 1960), leading to commonalities among member communities of OIC. Hence, trading various commodities among Muslim communities is much more comfortable than trade with non-Muslims. There are specific traditionally Muslim societies, although boundaries of the Islamic religion are not bound to race, region or ethnicity. At present, in the South and Southeast Asian region, there are six Muslim majority countries: in Central Asia seven countries, in Middle East (the centre of Muslim civilisation) 14 countries, in Europe two countries, in Africa 27 countries, and South America two OIC members. Geographically, the OIC region occupies the central place in the global map alongside the important marine trade route from Southeast Asia to Western Africa. OIC-region consists of 31.02 million KM^2 land area (21% of the global habitable area (WorldData, 2018) and houses close to 1.8 billion people (24% of the global population). The share of OIC countries in international trade is 9.21% and in global GDP 8.43% [in 2016]. OIC region (49 sample countries) has completed the trade of US\$ 17.8 trillion during the last five years, [cumulative] (2014-18) (PRC, 2017; Worldbank, 2018; SESRIC, 2018).

Islamic religion has given due attention to trade and commerce related aspects of humanity. According to Qur'ān "O you who believe! Eat not up your property among yourselves unjustly except it be a trade amongst you, by mutual consent" [4 : 29]. Islam also encourages Muslims to get engaged in trade as profession¹ and Prophet Muhammad (PBUH) awards a higher rank in Jannah to an honest trader "The truthful, trustworthy merchant is with the Prophets, the truthful, and the martyrs" (*Jami at-Tirmidhi*, 1209). However, another *ḥadīth* announces bad-ending for a wicked trader 'O people of trade!' and they replied to the Messenger of Allah turning their necks and their gazes towards him, and he said: Indeed the merchants will be resurrected on the Day of judgement with the wicked, except the one who has *taqwā* of Allah, who behaves charitably and is truthful' (Jami' at-Tirmidhi 1210)². Islam lays down the principles of *ḥalāl* and *ḥarām* (al-Qaradawi, 1960), equally applicable to trade and commerce. Islam commands for fairness and forbade from deceit. There are specific trading rules given by Sharī'ah (Hanif , 2020).

In addition to the economic prosperity of residents, trading across the national borders have multiple other advantages, including promotion of commonalities and reduction of differences, economic and political alliances, broader interaction of citizens, etc. Over the period, various international trade theories justifying trade across the borders have been developed, including, e.g. Mercantilism, the Absolute advantage, the Comparative advantage, Factor proportion, and Product life cycle. International trade contributes to resource-exploitation for a better quality of life across trading communities. However, the potential benefits are reduced to an extent in the presence of many barriers to international trade (including transportation and tariffs). Advances in information and communication technologies have helped in increasing the volume of international trade significantly. World merchandise exports have reached to US\$ 19.67 trillion, while commercial services closed at US\$ 5.63 trillion, by the end of 2018 (annual). However, gains from international trade are not uniform for all nations. In fact, the

¹"Engage in trade, for nine tenths of sustenance is found therein" (Takhrijul Ihya of 'Allamah 'Iraqi, *ḥadīth*: 1588 & Sharhul Ihya, Vol.5 p.416) as doi: <https://hadithanswers.com/the-benefit-of-trade/>

²<https://sunnah.com/tirmidhi/14>

lion's share is occupied by top 10 countries with more than 50% share; and least developed countries' share in global trade is less than 1%, for the year 2018 (WTO, 2019, pp. 5-9). There is another aspect of international trade: the persistent deficit in trade balance (more imports than exports). Countries with persistent trade deficits [leading to the adverse balance of payment, in the absence of attractive investment opportunities for foreigners] have to face the consequences in the form of foreign loans and grants-leading to service of the masters, against their national interest.

What determines the exports of a country is an interesting question. In recent years application of gravity model is very popular in understanding the factors contributing to international trade [see inter alia (Esfahani & Rasoulinezhad, 2017; Host et al., 2019; Jabalameli & Rasoulinezhad, 2018; Martinez-Zarzoso & Nowak-Lehmann, 2003; Rahman & Ara, 2010; Rasoulinezhad, 2017; Visser, 2019)]. In case of intra-OIC region trade, not much evidence is available as compared to the size of the community; however, certain appreciable efforts do exist [for example, (Abidin et al., 2014; Amin & Hamid, 2009; Gundogdu, 2009; Hanif, 2018; Sorhun, 2013)]. To the best of our knowledge, none of the studies has been conducted to document the explanatory of trade variations within the OIC region in recent years through gravity applications, except (Gundogdu, 2009) with a data set from 1995-2007; hence, a gap in the literature exists as far latest evidence is concerned, which this study is expected to fill. I intend to document determinants of trade through the application of traditional gravity model [with few extensions] within broader OIC intra-region trade. Gravity model carries theoretical justification as well as empirical evidence in the area of international trade (Yotov et al., 2016). OIC region is mostly underdeveloped and lacks in research and scientific developments, so in general, a broader trading interaction of Muslim communities is beyond the region. For the year 2018, OIC region merchandise international trade remained close to US\$ 3.8 trillion, of which close to 16.5% is intra-OIC trade (Worldbank, 2018; SESRIC, 2018)]. OIC agreed on ten years action plan in 2005 with a target of 20% intra-OIC trade by 2015; however, the target is missed by 3%.

In the next section, a selected literature review is presented, followed by a brief description of OIC trade. The methodology is then presented, followed by analysis and results. The last section concludes the study.

REVIEW OF STUDIES (OIC-REGION)

Gravity model carries theoretical justification as well as empirical evidence in the area of international trade. Gravity model application has been extended to multiple sectors in addition to international trade, including migration, commuting, international portfolio selection, foreign direct investment and greenfield investments (Head & Mayer, 2015). There are hundreds of studies in the context of gravity and international trade. A cursory look at the search for related literature in a credible database (like SCOPUS) produces articles in hundreds on a yearly basis. Few selected studies are reviewed hereunder. The selection of the studies is based upon the volume and importance of markets covered in the studies. Khayat (2019) study trade patterns between six GCC countries (KSA, Kuwait, Bahrain, Qatar, UAE, and Oman) and six developed countries (USA, Japan, Russia, Germany, Spain,

and Italy) for 2001-12, through the application of primary gravity model. Findings reveal the significance of GDP, population, and distance as determinants of international trade. Findings on similarity in trade integrations between BRICS (Brazil, Russia, India, China, and South Africa) and UN defined regional groups including Africa, Asia/Pacific, East Europe, Latin America, and Western Europe, are documented by (Rasoulinezhad & Jabalameli, 2018) using panel gravity model for 2001-15. Results suggest more of dissimilarity in the trading patterns of BRICS. In case of China and India, distance has a weaker negative effect. In another study (Rasoulinezhad & Wei, 2017) analysis trade patterns between China and 13 OPEC nations (Angola, Algeria, Ecuador, Indonesia, Iraq, Iran, Kuwait, Libya, Nigeria, Qatar, Saudi Arabi, UAE, and Venezuela) for a period 1998-2014 through Panel gravity model. Results confirm the significance of gravity variables, including GDP and distance in long run bilateral trade flows. Khorana and Martinez-Zarzoso (2018) study trade flows for intra-common wealth countries and beyond for a period 1996-2013 through the application of extended gravity model by including governance indicators. Findings reveal significant role of gravity variables including GDP and distance, in addition to other variables in trade flows within common wealth countries and beyond. The contribution of regional trade agreements in 130 countries for a period 1962-96 is documented by (Carrere, 2006) using the gravity model. Findings suggest an ex-post increase in trade flows between member countries. Studies describing international trade issues of the OIC region [intra-region, specifically] are in scarce, as compared to the size of the community; however, a review of the following important studies is presented. Trade potential in five OIC countries (Malaysia, Pakistan, Turkey, Jordan, and United Arab Emirates) is documented by (Amin & Hamid, 2009) through revealed comparative advantage indices, and identified multiple products, potential candidates in intra-trade. In another study, (Gundogdu, 2009) searches the determinants of OIC intra-trade; and documents that increase in intra-OIC trade and with rest of the world is partly attributed to a reduction in trade barriers and tariff. However, there is a need to improve trade facilitation within the OIC region by reducing red-tapism, financial constraints, and improvement in infrastructure. Alpay et al. (2011) present a comprehensive analysis on international trade of OIC region based on data up to 2009 and recommend specific measures including a reduction in tariffs, harmonising laws with World Trade Organisation (WTO), the establishment of special economic zones, infrastructure development, and encouraging participation of private sector. The impact of trade cost on OIC region trade is documented by (Bagci, 2014); and it concludes that trade cost causes to exports from the OIC region significantly. As per results, a 1% reduction in trade cost leads to an increase in exports close to 4% from the OIC region and vice versa. The author suggests specific measures for policy institutions within the OIC region, including the reduction in tariff and non-tariff barriers, facilitation to entrepreneurship, improvements in logistics, and development of a common currency.

The economic crisis impact on trade performance of 25 OIC region countries from the African continent is documented by (Osabuohien & Efobi, 2014), and concluded that the global crisis had affected trade performance in selected countries adversely. International trade of the sample countries shows dependence on economic performance and an association

with Foreign Direct Investment (FDI) inflows. The authors suggest that more focus should be given to finished products and enhancement in inter-regional trade. There are two essential conditions for success in economic cooperation of the OIC region, including the determination to cooperate and translation of emblem of OIC-cooperate with one another for virtue and heedfulness-into firm belief and commitment (Zeinelabdin, 1990). Trade and investment are correlated, intimately, and capital surplus countries may find fruitful in investing in capital deficit countries due to low correlation among OIC stock markets (Hassan, 2003). The creation of Muslim Economic Block (MEB) for the OIC region may help in competing with ever-rising economic unions (Raimi & Mobolaji, 2008). However, Ihsanoglu (2009) documents multiple reasons contributing to impeding the OIC action plan, including organisational, technical, financial, political, and complex structures of the OIC countries.

Certain other studies have focused on a single country versus OIC trade dynamics. For example, Sorhun (2013) estimates the potential of turkey in trading with the OIC region, while Abidin et al. (2014) search for determinants of Malaysian exports to the OIC region, and Abidin et al. (2015) document the integration of macroeconomic variables and trade for Malaysia and OIC countries. Finally, Yogatama and Hastiadi (2016) look into the role of democracy and governance in enhancing Indonesian exports to the OIC region, and Hanif (2018) presents an analysis of Pakistani trade with the OIC region.

These studies highlight the issues and reasons of less than potential trade within the OIC region and suggest multiple measures for improvement, including optimal utilisation of capital (from surplus countries to deficit countries), cooperation among members through preferential trading rights, reduction in trading costs and development of logistic structures, reduction in trade barriers (tariffs and non-tariffs), etc. None of the studies has relied on the traditional gravity model, in recent times, to identify determinants of intra-OIC region trade, except Gundogdu (2009) for a sample period 1995-2007. Hence latest evidence on intra-OIC determinants of trade is missing in the literature, and this study is expected to fill the gap. Gravity model carries theoretical justification as well as empirical evidence in the area of international trade (Yotov et al., 2016).

DESCRIPTION OF OIC-REGION

The Organization of Islamic Cooperation (OIC) is the second-largest inter-governmental organisation after the United Nations, which has a membership of 57 states, spread over four continents. It covers 24% of the global population and occupies 21% of the global habitable land area. Selected descriptive statistics of OIC-region are presented in table-1. The analysis covers 49 (out of 57) countries based on the availability of data during the sample period. I have divided, objectively, the OIC region into five economic zones based on geographic location. The first zone covers six countries in South and Southeast Asia (S&SA), the second zone consists of seven Central Asian (CA) countries, the third zone covers Middle Eastern (ME) Muslim majority countries [12 countries], the fourth zone consists of Muslim majority countries [22] in Africa, finally, the last zone accounts for Muslim majority countries in Europe and South America (E&SA) [2].

TABLE 1
Selected Indicators of OIC Region (2014-2018)

Regions	Countries	Area <i>KM</i> ² (000)	Population Million	Population per <i>KM</i> ²	GDP US\$ B	Intel. Trade US\$ B	BOT US\$ B
South & Southeast Asia	Indonesia, Brunei, Malaysia, Bangladesh, Maldives and Pakistan	3047	674	221	28,022	4490	-71.6
Central Asia	Afghanistan, Tajikistan, Azerbaijan, Kyrgyz Republic, Kazakhstan, Turkmenistan and Uzbekistan	4,661	120	26	5,249	857	62.8
Middle East	Bahrain, Iran Islamic Rep, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Turkey, United Arab Emirates and West Bank and Gaza	5498	281	51	38,745	9946	990.6
Africa	Algeria, Benin, Burkina Faso, Cameroon, Comoros, Cote d'Ivoire, Djibouti, Egypt, Gabon, Gambia, Guinea, Mali, Mauritania, Morocco, Niger, Nigeria, Senegal, Sierra Leone, Sudan, Tunisia, Togo and Uganda	12,395	646	52	19,657	2488	-401.5
Europe & South America	Albania, Guyana	224	4	18	206	54	-16.4
OIC-Region*	49 Selected Countries	25,825	1,725	67	91,879	17836	563.9

Constructed by Author; Data sources World Bank (2018); SESRIC (2018)

* we have to exclude eight countries (Chad, Guinea Bissau, Libya, Mozambique, Syria, Somalia, Suriname and Yemen) due to no availability of complete data for the selected period.

This analysis is limited to OIC membership; hence, other Muslim communities are not included. There are some significant Muslim communities elsewhere (e.g. India, China, Russia, Europe, and North America, etc.). S&SA and African Zones perform poorly in GDP as well as international trade considering the size of the community, resulting in a deficit in the trade balance. These regions have an able working population but are scarce in capital. OIC may design a system of transferring capital from surplus countries to the deficit to achieve optimal capital utilisation and growth. There is enormous dispersion in population per *KM*² within broader OIC region. Some countries are overpopulated (e.g., Bahrain and Bangladesh) and some other countries are underpopulated (e.g. Kazakhstan). OIC has the option to adopt dual nationality agreements and long-term residency schemes within the member states for optimal utilisation of human resources.

Overall trade picture: During 2014-18, international trade of OIC region has remained US\$ 17.8 trillion, comprising of US\$ 9.2 trillion exports and US\$ 8.6 trillion imports. As depicted in figure-1, OIC region international trade has shown a sharp decline in 2015 and 2016; however, it recovered in 2017 and 2018, although still not reached to the level of 2014. Significant reduction in trade was taken place in 2015 (19%), Year on Year (YoY) basis. Average exports are 51.4%, and imports are 48.6%. Annual figures for exports and imports remained very much close to the average, as depicted in the figure (also, the standard deviation is less than 3%). In the year 2015 and 2016, exports [49%] were less than imports [51%]. OIC region has depicted an overall surplus (amounting to \$564 billion) in trade balance during the review period. However, in 2015 and 2016, financial years remained tight for the region with a small negative trade balance (-\$60 and -\$32 billion, respectively).

The decline in trade needs to be addressed by the policymakers. OIC occupies 21% of global habitable land area, with a population of 24% of total humanity; however, GDP contribution (8.4%) and share in international trade (11%), during the review period, is significantly lesser than the size of the community (PRC, 2017; Worldbank, 2018). Although, OIC region has achieved growth in GDP more than global GDP growth as well as positive annual growth in international trade-a slight improvement in global share during the period under review-yet the contribution is far lesser than potential and size of the community. A significant number of societies in the OIC-region are lower-middle-income economies, producing primary goods. I argue for the development of science and technology institutions within the OIC region to achieve inventions, innovations and high-tech production. The measure would help in increasing the share of global GDP and international trade-essential for progress and prosperity in the socio-economic lives of the residents.

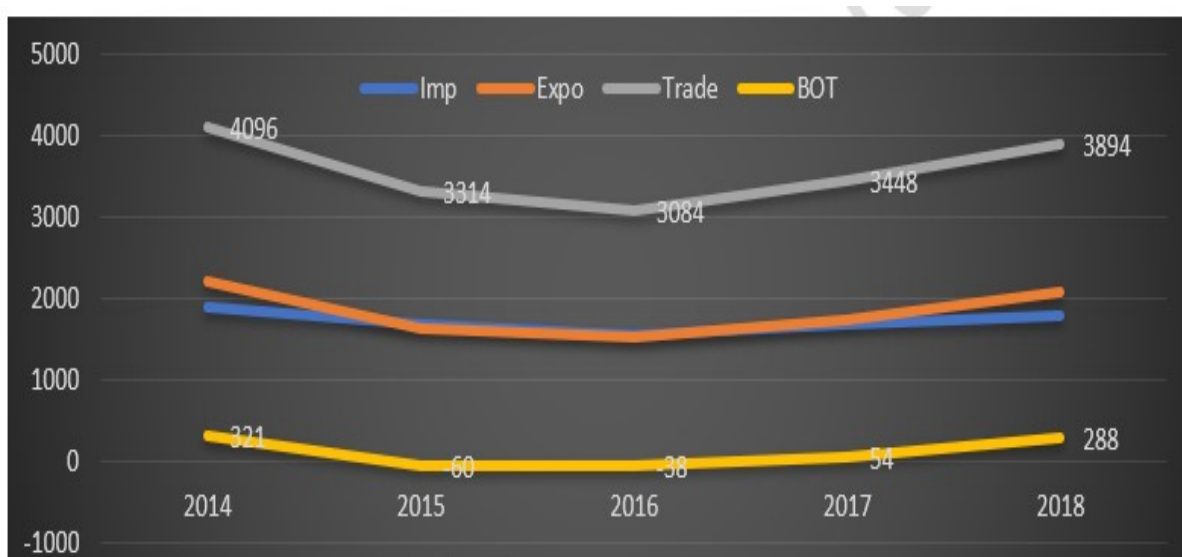


FIGURE 1. Trends in Trade, Exports, Imports and BoT US\$ Billions in OIC-region (2014-18)

Surplus (Deficit): OIC-region has remained in surplus in international trade during the study period (2014-18). Collectively, the OIC region has gained a surplus amounting to US\$ 564

billion for the last five years (2014-18). However, certain members have shown deficits in trade. Five years surplus (deficit) in the balance of trade is presented in figure-2. According to the results, top ten countries with surplus in balance of trade [US\$ Billions], during the study period are Saudi Arabia [493], United Arab Emirates [281], Qatar [257], Iran [195], Kuwait [158], Malaysia [123], Kazakhstan [112], Nigeria [111], Iraq [76], and Oman [60]. The Gulf area (with petroleum resources) dominates the list in addition to Malaysia, Nigeria and Kazakhstan. Bottom ten countries, leading in deficit in international trade [US\$ Billions] for review period [2014-18] include Turkey [336], Egypt [224], Pakistan [144], Morocco [100], Lebanon [80], Bangladesh [72], Jordon [68], Algeria [54], Afghanistan [43], Tunisia and Uzbekistan [36]. Hence, countries with natural resources (particularly petroleum-related) are in surplus, while industry-based and/or agricultural countries are in deficit [except Malaysia]. Most of the deficit countries are either agricultural or intermediate level industry-based, producing primary goods-with lesser price and stiff competition in the global market. I argue for increased spending in the area of science and technology to develop the capacity; as well as investment from capital surplus countries to capital deficit countries.

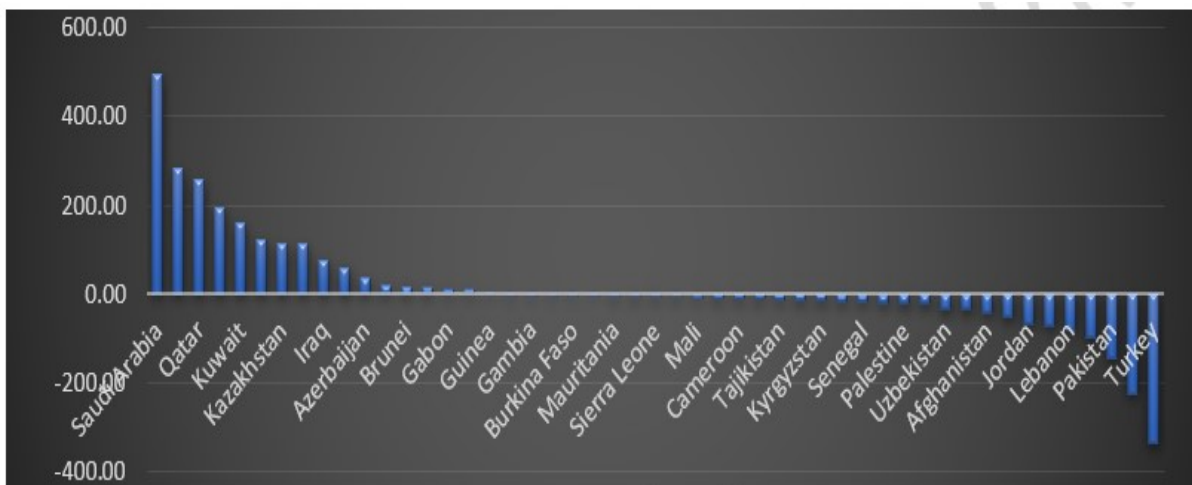


FIGURE 2. Country-wise Surplus (deficit) US\$ Billions in OIC-region (2014-18)

Intra-OIC region trade: Average intra-OIC trade of merchandise for the period under review is 16.8% [with maximum 17.5% and least 16.4%] of merchandise traded. Annual percentages are not far from average, as depicted in figure-3. Besides, the standard deviation of the sample is less than 1%. Trade within the OIC region is significantly less than the potential. OIC set a target to increase intra-OIC region trade to 20% of the region’s international trade, from 14.5% (in 2004), within the next decade (by 2015). Although an improvement in intra-OIC trade is found, however, the target is missed by almost 3% [intra-OIC trade is static close to 17% during the review period]. Multiple reasons, including organisational, technical, financial, political, and complex structures of the OIC countries contribute to impeding the OIC action plan (Ihsanoglu, 2009).

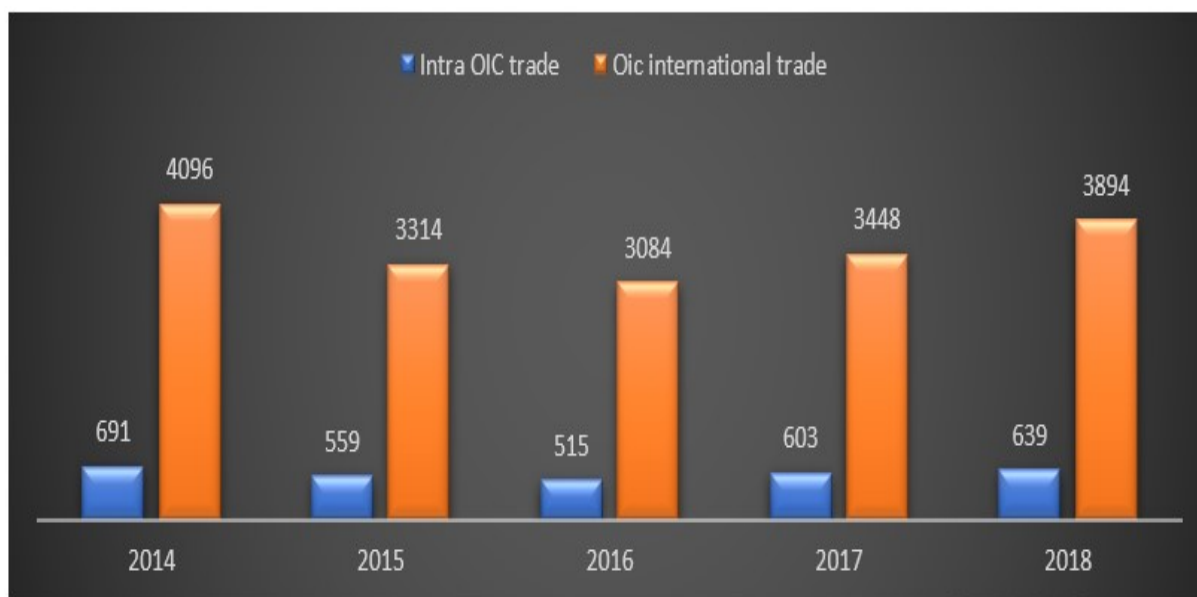


FIGURE 3. A Comparison of OIC Region International Trade, and Intra OIC Trade (Merchandise), US\$ Billions (2014-18)

Certain efforts from the OIC Platform to increase the intra-region trade are worth mentioning. The measures include export financing scheme (1987), Islamic Corporation for the insurance of investment and export credit (1996), a framework agreement on preferential trade system (1990), Islamic solidarity fund for development (2007) [includes poverty reduction and skill development], and a special program for the development of Africa (2008). OIC region consists of multiple climatic zones-resulting in different resources and production capacities. For example, the Arabian region needs agricultural and agro-based products; South and South East Asia, as well as Africa, have the potential to meet the demand. Trade among the communities increases interaction and bring them closer. Besides, an increase in trade leads to a higher level of growth and development, resulting in prosperity (Alpay et al., 2011). It is pertinent for OIC countries to increase trade ties with each other so that differences may get reduced and identification of commonalities may be increased.

METHODOLOGY

The sample includes 49 countries for testing of the gravity model, (table-1). OIC has a membership of 57 countries; however, I have to exclude eight countries (Chad, Guinea Bissau, Libya, Mozambique, Syria, Somalia, Suriname, and Yemen) due to no availability of complete data for the selected period. The sample period is from 2014 to 2018. This study is based on close to 11,760 observation years, for 49 countries. Data is extracted from multiple sources (Table-2). I used exports as a proxy of trade between the trading pairs. I preferred GDP per capita over total GDP to cater for the population as well. Distance is represented by the distance between capital cities of trading pair (Nguyen, 2019). Inflation is proxied by the Consumer Price Index (CPI).

TABLE 2
Data Sources

Variables	Data Sources	Worldwide Web-link
GDP	World Bank	https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD
Population	World Bank	https://data.worldbank.org/indicator/SP.POP.TOTL
Common-language	CIA-Fact Book	https://www.cia.gov/library/publications/the-world-factbook/fields/402.html
CPI inflation	World Bank*	https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG
Distance		https://www.distancefromto.net/city-capital
Exports	IMF	https://data.imf.org/regular.aspx?key=61726508
Shared-border	CIA-Fact Book	https://www.cia.gov/library/publications/the-world-factbook/fields/281.html

*Any missing value is taken from Trading Economics <https://tradingeconomics.com/country-list/inflation-rate>

Gravity model in trade is based on newton’s law of universal gravitation depicted by the following equation:

$$F = G \frac{m_1 m_2}{r^2} \tag{1}$$

where F is the gravitational force acting between two objects, m_1 and m_2 are the masses of the objects, r is the distance between the centres of their masses, and G is the gravitational constant. Application of gravity model in economics inspired by newton’s law demonstrates that trade between two countries depends upon the size of the economy (GDP) and cost of trade (distance). Where the size of the economies is expected to contribute to international trade positively while the cost of trade negatively. Distance represents transportation cost of trade and GDPs proxy size of the economy (Gundogdu, 2009). The standard economic gravity model is written in the following form:

$$Trade_{1,2} = G \frac{Size_1 Size_2}{Distance_2} \tag{2}$$

Alternatively,

$$T_{ij} = b_0 b_1(y_i) b_2(y_j) b_3(d_{i,j})$$

Converting the model from multiplicative to additive form

$$\ln T_{ij} = b_0 + b_1(\ln y_i) + b_2(\ln y_j) + b_3(\ln d_{ij}) + u_{ij} \tag{3}$$

T_{ij} is the volume of trade between country i and j ; b_0 is constant; b_1 b_2 b_3 represent the beta coefficient of variables; y_i is GDP of country i and y_j is GDP of country j ; d_{ij} is distance between country i and j ; while \ln is natural log; and u_{ij} is the error term.

However, literature has identified multiple other important variables contributing to international trade, including trade agreements, shared borders, common language, common currency, etc. In this study, I have taken care of those variables; hence our model for testing is as under:

$$\ln X_{it} = b_0 + b_1(\ln gdp_{it}) + b_2(\ln gdp_{jt}) + b_3(\ln dis_{ij}) + b_4(bord_{ij}) + b_5(lang_{ij}) + b_6(inf_{it}) + b_7(inf_{jt}) + u_{ij} \tag{4}$$

Where x denotes export; b beta coefficients; gdp is gross domestic product per capita; dis distance between capital cities; bor is a common border; $lang$ is common language; inf is inflation; u_{ij} is error term; ln is natural log; t represents sample period; ij denotes pair of countries exporter and importer, respectively; border and language are dummy variables assuming values of either 1 or zero.

Literature suggests preference for usage of panel data with fixed effects. To account for multilateral resistance terms, I used period fixed effects; and to account for the endogeneity of trade policy variables, I applied cross-section fixed effects, in the panel data (Yotov et al., 2016). I expect a positive contribution of all variables in international trade, except distance and inflation in exporter's economy. Data checked for multicollinearity between independent variables (correlation); and unit root through ADF. The stationarity of time series is required to avoid spurious regression results (Asteriou & Hall, 2007, p. 231). Both tests are cleared as per the requirement of estimation of the regression model [table-4 & 5]. Analysis is conducted through application of Eviews-11.

ANALYSIS & RESULTS

Descriptive statistics are presented in table-3. During the review period, the highest intra-OIC region trade between two countries is close to US\$21 billion, while the minimum is zero, with an average of US\$126 million. The sample is diverse as far as intra-region trade is concerned. Such diversification exists in other variables too. The average distance between the trading couple is 5,174 Kilo Meter (KM), with a maximum of 15,128 and a minimum of just 127 KM. Maximum Gross Domestic Product-Per Capita (GDP-PC) for a country is US\$126,598 and minimum US\$951, with an average of (all) US\$17,418. Inflation ranges from -3.7% to a maximum of 63% with an average of 4.6%, during the review period. Such diversifications do exist in total population and GDP, as well. OIC countries are more diverse than similar on account of population, GDP, inflation, etc.

TABLE 3
Descriptive Statistics-OIC Region [2014-18]

Description	Exports \$ M	Distance KM	GDP-PC \$	INF %	Population M	GDP (\$ M)
Mean	126	5,174	17,418	4.6	33.8	375,017
Median	0.17	4,785	7,620	2.7	11.3	83,207
Maximum	20,768	15,128	126,598	63	267.6	3,494,762
Minimum	0	127	951	-3.7	0.41	2,027
Std. Dev	703	3,185	24,745	6.9	55.4	622,873

Correlation between selected series is reported in Table 4. As per results, Exports [dependent variable] show negative association with distance and inflation in exporting economy; while positive association of exports is depicted with GDP (exporter and importer) as well as with inflation in importing economy. From independent variables, none of the pairs depicts a significant correlation. Distance depicts negative correlations with all the series. Inflation

depicts negative correlations with respective GDPs in domestic countries but positive with partner countries GDPs.

TABLE 4
Correlation

	LExport	LGDP_PC-Exp	LGDP_PC_Imp	LDistance	Inf_Exp
LExport	1				
LGDP_PC_Exp	0.28	1			
LGDP_PC_Imp	0.158	-0.02	1		
LDistance	-0.348	-0.091	-0.093	1	
Inf_Exp	-0.003	-0.033	0.004	-0.058	1
Inf_Imp	0.041	0.005	-0.032	-0.061	-0.005

All series converted to log values except for inflation as inflation data is in decimals.

Stationarity checking is an essential requirement for estimation of regression model. Results of unit root testing are reported in table-5. I applied group unit root testing methods (Augmented Dickey-Fuller and Philips-Perron tests). Results of groups, as well as, individual series support the stationarity of variables, used in regression model.

TABLE 5
Unit Root Testing

Variables	ADF		PP		Results
	Statistics	Probability*	Statistics	Probability*	
Panel-A. Group Testing					
Fisher Chi-square	838.024	0.000	292.184	0.000	Stationary
Choi Z-stat	-27.864	0.000	-14.349	0.000	Stationary
Panel-b. Individual Series					
LDisatnce		0.000		0.000	Stationary
LExports		0.000		0.000	Stationary
LGDP PC Exp		0.000		0.000	Stationary
LGDP PC Imp		0.000		0.000	Stationary
Inflation Exp		0.000		0.000	Stationary
Inflation Imp		0.000		0.000	Stationary

All series converted to log values except for inflation as inflation data is in decimals.

* Probabilities for Fisher tests are computed using an asymptotic Chi-Square distribution; All other tests assume asymptotic normality

Regression results are reported in Table-6. Four regression models are tested with different assumptions. Column-II reports Panel Least Square (PLS) results without any effects. Column-III reports PLS results with cross-section fixed effects. Column-IV depicts PLS results with period fixed effects. Finally, column-V displays PLS results with combined cross-section and period fixed effects.

TABLE 6
Regression Results-OIC Region (2014-18)

I	II	III	IV	V
Variables	No Effects	Cross-Section FE	Period FE	C-S & Period FE
	Beta Coefficient. (P Value)	B. Coefficient (P Value)	B. Coefficient (P Value)	B. Coefficient (P Value)
LGDP-Exporter	**3.25 (0.00)	*6.18 (0.03)	**3.24 (0.00)	*6.36 (0.03)
LGDP-Importer	**1.07 (0.01)	*0.81 (0.01)	**1.07 (0.00)	*0.81 (0.00)
LDistance	** -2.16 (0.00)	** -2.90 (0.00)	** -2.17 (0.00)	** -2.92 (0.00)
Language	*2.85 (0.01)	*2.91 (0.03)	*2.91 (0.01)	*3.00 (0.03)
Border	2.48 (0.12)	-0.21 (0.91)	2.35 (0.15)	-0.40 (0.82)
Inflation-Exporter	71.17 (0.06)	-10.76 (0.95)	70.51 (0.07)	-13.30 (0.93)
Inflation-Importer	6.83 (0.25)	3.43 (0.56)	6.91 (0.25)	3.55 (0.58)
Constant	-16.82 (0.053)	-33.28 (0.27)	-16.60 (0.06)	-34.76 (0.25)
R Square	0.575	0.567	0.413	0.575
Adj. R Square	0.447	0.442	0.391	0.440
D-W Stat	1.96	2.63	1.94	2.62
F Statistics	23.70 (0.00)	4.51 (0.00)	15.25 (0.00)	4.25 (0.00)

** , * Significant at 1% and 5%, respectively; Dependent Variable: Log Exports; Method: Panel Least Squares; Cross-sections included: 49; Cross-section fixed (dummy variables); Period fixed (dummy variables)

Marginal differences in beta coefficient values, adjusted R Square, F statistics, and Durbin-Watson emerge under different tests. However, there is no difference in results as far significant variables are concerned. Focusing on results in column-V with cross-section and period fixed effects as recommended in the literature (Yotov et al., 2016), the overall fitness of the model is acceptable based on F significance probability (0.00) [F significance Prob. is 0.00 under all models]. Durbin-Watson (DW) Stat is within the acceptable range (2.62) as it is much higher than R Square and far from the extremes (of 0.00-4.00) [DW ranges from 1.94-2.63 for all models]. Also, there is no indication of spurious regression and serial correlation (Asteriou & Hall, 2007, pp. 293, 143). Adjusted R Square is 44% [ranges from 39% to 45% for all models], leaving 56% variations in intra-OIC trade unexplained. However, the basic gravity equation applies to intra-OIC trade during the review period. As expected, signs of GDP per capita beta coefficients are positive (significant at 5% level);

[ranging from 0.00 to 0.03 for all models and both GDP variables], and for distance negative (significant at 1% level) [significance level is 0.00 for all models]. Likewise, dummy for common language is positive (significant at 5% level) [ranges from 0.01 to 0.03 for all models]. Other selected variables, including shared borders and inflation (exporter, importer), are not significant. Signs of inflation beta coefficients are in line with theory [except in case of exporters for two models, i.e. No effects and period effects] but not significant, although coefficient values are high/large. Intercept is also not significant. The gravity model, taking into account cross-section and period fixed effects, explains intra-OIC trade to an extent, similar to international trade in other markets (Khayat, 2019; Khorana & Martinez-Zarzoso, 2018; Rasoulinezhad & Wei, 2017). The findings are in line with results documented by (Gundogdu, 2009) for OIC region.

The gravity model explains trade in the intra-OIC region. GDP and common language contribute positively in trade across the borders. As expected, distance plays a negative role, which can be addressed by reducing the cost of transit. OIC needs to focus on reduction of trade costs and inflation [although inflation is insignificant, but I suggest based on theory and larger coefficient values] in exporting economies; increase in GDP growth, promotion of preferential trade agreements and common language to enhance the trade level among members. OIC region has the potential to promote Arabic language within the broader area and Muslim countries. Basics of the Arabic language are learned by Muslims to understand the message of Islam; however, promoting Arabic as a business language needs further efforts. Furthermore, OIC countries need to promote preferential trading agreements as well as soft borders and business-friendly policies, including visa facilitation.

CONCLUSION & RECOMMENDATIONS

This study is conducted to identify the determinants of intra-OIC region trade through the application of an extended gravity model of international trade for the recent five years [(2014-18) at the time research conducted]. Our sample includes 49 OIC members (out of 57) due to the availability of complete data for the review period. I document that OIC-region's contribution to global GDP and international trade is significantly lesser than the size of the community. Also, intra-OIC trade is less than potential. OIC members failed to achieve the target of 20% intra-OIC trade by 2015. The Gravity model confirms the significance of GDP as well as distance in international trade within the broader OIC region. Additionally, common-language promotes trade between the countries. Although, overall international trade of the OIC region is in surplus, during the review period, however, it is not the same for all. There are countries with the surplus in BoT as well as countries with the deficit in BoT. A mechanism needs to be designed to divert funds from surplus countries to deficit countries. Specifically, I recommend investment from the GCC region to South and Southeast Asia and Africa. OIC nations need to focus on growth in economies through the production of high-tech goods. Information and Communication Technologies (ICT) is a must for connectivity, across the region. Member countries need to agree on connectivity roots and develop transportation infrastructure across the region including marine, road and

air transportation. Free Tariff and trade agreement within the OIC community is expected to enhance collective prosperity. Concessions and privileges on imports from primary goods manufacturing zones-South & South East Asian, Central Asian and African zones-to Middle Eastern zone will help in uplifting the economic status of those regions. Two economic zones (S&SEA and Africa) need special attention of OIC community, as close to 3/4th of OIC-community resides in these areas. Economic cooperation bodies (ECO, D-8, etc.) need to be strengthened to play an active role in boosting economic activities and the sharing of expertise. GCC can be a role model for cooperation among Muslims in various parts, including Far East Asia, South Asia, Central Asia, the Middle East, and Africa. Finally, fewer restrictions on movements and dual nationality agreements will help in mobility of intellectual as well as financial capital within broader OIC region. Traditional Islamic law of citizenship recognizes Muslims as natural citizens of Dar ul Islam/Muslim country (Akgunduz, 2009). Future research agenda includes incorporation of governance indicators in studying trade flows within OIC region and trade flows beyond the region.

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