The Trade Development Among OIC Countries: Exploring Challenges, Opportunities, and the Impact of the Covid-19 Pandemic*

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Abstract

This paper investigates the factor determining the impact of trade development, challenges, and opportunities among various OIC countries. It examines the influence of socioeconomics as well as geopolitical and cultural factors using data from 2014 to 2022. The study focuses on a selected group of OIC countries from diverse regions, including South and Southeast Asia, South America, Europe, Africa, and Central Asia. The sample consists of 50 countries out of the total 57 OIC member nations. To address endogeneity issues related to institutional variables a two-step GMM model is employed. Additionally, a Covid-19 dummy variable is included in the model to account for the impact of the pandemic on trade. The results indicate that the Covid-19 dummy variable is significant in all models, highlighting its significant impact on trade. Furthermore, most of the variables examined in the study demonstrate significance across all models. Overall, this study provides valuable insights into the factors that influence trade in OIC countries and sheds light on the impact of the Covid-19 pandemic on trade.

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1. Introduction

The Organization of Islamic Cooperation (OIC) was established in 1969 with the objective of promoting economic cooperations among its 57 member countries. Over the years, various initiatives have been implemented to promote trade among OIC countries, including the establishment of Islamic Common Market, the OIC Trade Preferential System, and the OIC Investment Corporation. However, these efforts have encountered numerous challenges, primarily stemming from the diverse geopolitical and socioeconomic structures of member nations, resulting in varying levels of economic development and trade policies.

Despite representing one-fourth of the world's population, OIC member countries contribute only 15% to the global GDP. In 2019, the real GDP growth rate of OIC nations decreased from 3.9% in 2018 to 3.1%, well below the world average (SESRIC, 2019). Financial inclusion remains a concern, with OIC countries having 690 bank accounts per 1,000 adults compared to the global average of 770.3, and only 11.51 bank branches per 100,000 adults compared to the world average of 18.3. Overall, these statistics highlight the need to address the economic challenges faced by OIC member countries and explore ways to foster greater trade and economic cooperation among them. By understanding the factors influencing trade development and identifying the challenges and opportunities, policymakers can formulate effective strategies to enhance economic growth and integration within the OIC framework.

Indeed, the diverse economies within the OIC member countries present a range of opportunities and challenges. While some member countries possess abundant resources and a significant human capital base, others rely heavily on specific sectors such as oil production. This imbalance in resource distribution and export diversification can make these economies vulnerable to external market fluctuations. Countries like Saudi Arabia and the United Arab Emirates have built their economies on oil exports, which exposes them to volatility in global oil prices. On the other hand, countries like Turkey, Malaysia, and Indonesia have pursued economic development strategies beyond oil production and have diversified their export products (Ahad, Rahmatullah, Safiullah, Zmarai, & Naqibullah, 2020). However, these countries still face challenges in further expanding their export base and reducing their dependence on external markets. By acknowledging the economic vulnerability and limited export diversification, policymakers can focus on developing strategies to enhance economic resilience and foster sustainable economic growth. This can include initiatives to diversify export products, promote innovation and entrepreneurship, invest in human capital development, and strengthen regional economic cooperation within the OIC. Understanding the unique economic characteristics of member countries and addressing their specific challenges can contribute to the overall economic development and prosperity of the OIC as a whole.

The COVID-19 pandemic has indeed had a profound impact on global trade, with far-reaching consequences for economies around the world. The pandemic-induced disruptions in supply chains, trade flows, and investment have created unprecedented challenges for businesses and governments alike.

The decline in global economic growth and the reduction in demand for goods and services have been significant outcomes of the pandemic. The implementation of containment measures, such as lockdowns and travel restrictions, has resulted in the closure of borders and the imposition of trade barriers. These measures have further hindered international trade and economic activity. As a result, organizations, and institutions, including the World Trade Organization (WTO), have made alarming predictions about the decline in global trade. Projections indicate a substantial decrease ranging from 13% to 32% in global trade for the year 2020. These estimates highlight the magnitude of the challenges faced by economies worldwide (Allam, Bibri, & Sharpe, 2022; Yu *et al.*, 2021 and Vo & Tran, 2021).

The repercussions of the pandemic on trade have been felt across various sectors and industries, leading to job losses, reduced productivity, and financial strain. Governments and international bodies have been working to mitigate the negative impacts of the crisis through stimulus packages, policy interventions, and efforts to reopen borders and restore trade flows. The recovery of global trade from the effects of the pandemic remains a critical priority for fostering economic growth and stability. Collaboration and coordination among nations will be essential in navigating the challenges posed by the ongoing crisis and charting a path towards a resilient and sustainable global trading system.

Despite these challenges, some OIC member countries have been successful in developing their trade relations. Turkey has emerged as a significant player in the global economy, with exports totalling $171 billion in 2019 (Gürel & Kozluca, 2022). Similarly, Malaysia and Indonesia have seen substantial growth in their palm oil exports, with exports totalling $23.7 billion and $22.7 billion, respectively, in 2019 (Huang, 1997). However, several OIC member countries face significant barriers to trade development, including limited infrastructure, lack of export product diversification, and political instability. Yemen, Sudan, and Somalia, for instance, have experienced political unrest and conflict, leading to a decline in their economic growth and trade relations (Kendie, 1999).

Developing trade relations among OIC member countries has the potential to benefit their individual economies and promote economic integration among member countries. Intra-OIC trade could lead to enhanced productivity, greater specialization, and economies of scale, while reducing reliance on external markets. Furthermore, developing trade relations among OIC countries could promote mutual cooperation and economic development, contributing to GDP growth by fostering a more integrated and interconnected economic landscape

within the OIC region. When OIC member countries engage in trade with each other, they can take advantage of enhanced productivity, greater specialization, and economies of scale. Enhanced productivity can result from competition among member countries, leading to improvements in production processes and technology adoption. Greater specialization can arise from each country focusing on producing goods and services in which they have a comparative advantage, leading to more efficient allocation of resources (Porter, 2011). Economies of scale can arise when countries engage in larger production runs of goods, leading to lower costs per unit of output. Moreover, developing trade relations among OIC countries can promote mutual cooperation and economic development, which can have a significant positive impact on their individual economies and on the region as a whole. By engaging in trade with each other, OIC countries can build stronger economic ties and develop a sense of shared economic interest, leading to greater cooperation in other areas as well.

Despite the potential benefits, developing trade relations among OIC member countries presents various challenges. One significant challenge is the lack of a common regulatory framework governing intra-OIC trade, leading to regulatory fragmentation and a lack of harmonization of trade policies among member countries (Hassan, Sanchez, & Hussain, 2010 and Hassan *et al.* 2023). Additionally, limited infrastructure, bureaucratic procedures, and restrictive trade policies can constrain trade flows within the OIC region.

In summary, the COVID-19 pandemic has brought to the forefront the challenges and opportunities associated with trade development among OIC member countries. While several countries have successfully established robust trade relations, others face significant barriers in their trade development efforts. Enhancing trade relations among OIC countries has the potential to stimulate their economies and foster economic integration among member countries (Raimi & Mobolaji, 2008). To address these challenges, various strategies have been proposed to improve trade relations among OIC member countries include in-depth research which being done by many authors including Ariff *et al.* (2021), Ghouse *et al.* (2022), Hassan *et al.* (2023) among others. The current paper extends to work of Ghouse *et al.* (2022).

This study aims to analyse the challenges and opportunities encountered in trade development between OIC countries, investigate the factors that have contributed to successful trade relations within the OIC, and identify potential policies to improve trade relations among member countries. To accomplish these objectives, a mixed research technique, including data analysis via GMM model is employed. The novelty of this study lies in its comprehensive analysis of the current state of trade relations within the OIC and its exploration of potential solutions to challenges faced by these countries, particularly in the context of the COVID-19 pandemic.

2. Literature Review

The literature review section examines various studies that have explored the impact of trade on the member countries of the Organization of Islamic Cooperation (OIC). These studies employ different methodologies, including the gravity model, OLS regression model, Panel regression with fixed-effect and random-effect techniques, to analyse the relationships between various selected variables. The findings of these studies indicate that regional trade blocks can have a positive impact on economic growth among OIC member countries. Additionally, population size is identified as a significant factor influencing bilateral trade flows. The process of trade liberalization is found to have a positive long-term effect on the GDP per capita of member countries. Other factors that have been identified as influential in determining bilateral exports between Malaysia and OIC nations include the size effects, level of economic openness, inflation rates, and exchange rates. Moreover, the studies suggest that ASEAN membership has a positive influence on trade, and there has been a significant increase in the efficiency of OIC member countries' stock markets over the past decade.

To enhance intra-trade within the OIC, various efforts have been made, such as the establishment of Trade and Finance Support Schemes. Additionally, an OIC payment method for intra-trade transactions has been introduced through issuance of Trade-based Special Drawing Rights. Overall, these studies contribute to our understanding of the trade dynamics within the OIC and highlight the potential benefits and challenges associated with trade among member countries.

The study conducted by Hassan, *et al.* (2010), Ariff *et al.* (2021) and Hossain *et al.* (2005) analysed the impact of trade on the OIC member countries, specifically focusing on the role of regional trade blocks in economic growth. The researchers employed the gravity model to analyse the relationship between trade and various independent variables, including gross domestic product (GDP), per capita income, the distance between countries, and border. Their findings revealed that all the independent variables had a positive and significant impact on trade. Specifically, improvements in a member country's GDP were associated with increased trade with other block members. These results suggest that regional trade blocks can play a crucial role in facilitating economic growth among OIC member countries. However, it's important to note that the study did not specifically investigate the potential challenges or drawbacks associated with regional trade agreements. While the findings highlight the positive impact of regional trade blocks on trade and economic growth, further research would be needed to assess any potential limitations or obstacles that may arise from such agreements within the OIC context. Overall, the study contributes to our understanding of the relationship between trade and economic growth within the OIC and underscores the significance of regional trade blocks in fostering trade relations among member countries

In a study conducted by Osabuohien (2014), the impact of the global crisis

of 2007 to 2008 on the trade performance of some OIC members in Africa was investigated. The study highlighted that there has been little empirical work done in Africa, particularly in the OIC member countries, with regards to the performance of their trade. Using data from 1996 to 2008, the study employed the OLS regression model, as well as the Fixed Effect and Random Effect techniques to estimate relationships among variables. The findings revealed that trade performance and economic indicators related to global economic crises varied significantly across Africa. The crises had a significant impact on the trade share of OIC member countries in Africa. The study also included recommendations on how to enhance trade performance for African countries, particularly OIC members. The findings and recommendations of this study can be useful for policymakers and researchers who are interested in understanding the impact of global economic crises on trade performance in developing economies. However, the study did not explore the long-term effects of global economic crises on trade performance, which would be useful for policymakers.

In a study conducted by Nuroglu (2014), the author delved into the bilateral trade flows and factors affecting the growth of six major OIC economies. Using panel data from 1998 to 2005, the study applied the gravity model approach to analyse the data. The findings revealed that population size has a significant impact on a nation's trade flows, and the study takes a scientific approach to examining this phenomenon. The results showed that population has a positive effect on bilateral trade flows for exporting countries, while it has a negative effect on importing countries. While the study explored the impact of population size on a nation's trade flows, it did not consider other factors such as cultural differences or political instability that could also influence bilateral trade flows.

Ghani (2011) investigated the impact of trade liberalisation on the import and export, as well as the GDP of OIC member countries. The study employed two analytical techniques: the Balance of Payments (BOP) model and fixed-effects regression model, to estimate the export and import growth of other countries from 1975 to 2004. The results indicated that the trade liberalisation process had a positive effect on the GDP per capita of member countries in the long run. However, the ratio of imports, exports, and trade over GDP did not increase significantly after trade liberalisation, unlike the effect on GDP. However, the study did not examine the potential negative effects of trade liberalisation on certain sectors of the economy or the impact of trade liberalisation on income inequality.

In a study conducted by Zainal Abidin *et al.* (2014), the focus was on analysing how various economic factors affect bilateral exports between Malaysia and OIC members. The panel data utilized covers the period of 1997 to 2009, and the gravity model was applied for estimation purposes. The findings of this study suggest that factors such as size effects, the level of economic openness, inflation rates, and exchange rates play significant roles in determining Malaysia's exports

to OIC nations. Furthermore, the estimation of individual effects emphasizes the critical role that institutions and distance play in boosting exports between Malaysia and OIC members. Overall, this study sheds light on the importance of various economic factors in shaping bilateral trade flows between Malaysia and OIC members. While the study shed light on the importance of various economic factors in shaping bilateral trade flows, it did not investigate the impact of non-economic factors such as political instability or cultural differences on bilateral trade flows.

Wardani (2016) explores the impact of ASEAN membership on trade between Indonesia and Malaysia and other OIC member nations. The study focuses on the ASEAN Free Trade Area and uses the gravity model to analyse the data from 1997 to 2009. The main goal of the research is to determine whether ASEAN membership has a positive or negative effect on trade, and whether there are any significant differences between Indonesia and Malaysia. The study provides empirical evidence to shed light on the relationship between ASEAN membership and trade in the OIC region. While the study provides empirical evidence on the relationship between ASEAN membership and trade in the OIC region, it did not investigate the impact of ASEAN membership on non-OIC member countries.

Arshad, *et al.* (2016) conducted a study which investigate the weak-form efficiency of the stock markets of 11 OIC member countries using the MF-DFA approach. Despite the worldwide presence of OIC, there is a paucity of literature on their stock market efficiency. This study is particularly significant in the wake of the global financial crisis, which has highlighted the vulnerability of developing and emerging markets. The study aimed to assess the efficacy of these stock markets during various business cycles from 1998 to 2011. The findings of the study suggest that the efficiency of OIC member countries' stock markets has increased significantly over the past decade, which is indicative of their increased effectiveness. This is a crucial step towards enhancing the underdeveloped and illiquid stock markets of OIC member countries. While the study found that the efficiency of OIC member countries' stock markets has increased significantly over the past decade, it did not investigate the reasons behind the increased efficiency or potential challenges that could hinder further progress.

Nabi *et al.* (2015) investigated the efforts to enhance intra-trade within the OIC during the fifth OIC consultative team meeting. The team suggested the creation of Trade and Finance Support Schemes to accelerate OIC intra-trade. He proposed a potential trade financial assistance schema and defended the concept of establishing an OIC payment method for intra-trade transactions by issuing Trade-based Special Drawing Rights, modelled after the IMF's SDRs. The paper also discussed the role of trade in the Muslim world's golden age and its resurgence, as well as the origins and current status of the IMF's SDRs. While the study proposed a potential trade financial assistance schema and discussed the role of trade in

the Muslim world's golden age and its resurgence, it did not explore the potential challenges associated with the proposed Trade and Finance Support Schemes or the establishment of an OIC payment method for intra-trade transactions.

Alpay *et al.* (2011) provides an overview of the development and current framework of trade flows among some of the OIC member countries. The authors highlight that since the 1970s, the OIC member states have been working towards improving economic and commercial cooperation to strengthen their economic ties and coordinate their efforts more effectively. The paper notes that significant efforts have been made at numerous OIC forums to develop strategies for joint cooperative action to boost trade among the member countries. The authors also emphasize that increasing intra-OIC trade was one of the top priorities of the Ten-Year Programme of Action. To improve intra-OIC trade, the paper provides several suggestions. Overall, this study aims to provide an analytical overview of the development and current framework of trade flows among some of the OIC countries. However, the study did not investigate the potential challenges associated with the current framework or provide recommendations for improving trade flows among OIC member countries.

Ali and Raza (2017) investigate the role of trade agreements in promoting trade among OIC member countries. Using a gravity model, the study found that regional trade agreements had a positive impact on intra-OIC trade. The study highlights the need for the OIC to focus on creating a more enabling environment for trade through the removal of non-tariff barriers and the promotion of trade facilitation measures.

Al-Khouri and Zaki (2018) conducted a study on the trends and patterns of trade among OIC member countries from 2005 to 2015. The study revealed that intra-OIC trade experienced significant growth over the past decade, although it still made up a relatively small portion of the total trade of OIC member countries. The study also observed a shift in the composition of trade from primary commodities to manufactured goods, suggesting a potential move towards greater economic diversification among OIC member countries.

Yusuf *et al.* (2021) investigated the correlation between trade flows among OIC member countries and the quality of institutions, specifically in Malaysia and other African OIC member nations. The study employed fixed and random effect models and utilized panel data from 2000-2018. The study's results emphasize the critical role of institutional quality in stimulating economic growth and development and highlight the requirement for tailored policy interventions to tackle institutional shortcomings in OIC member countries.

The above literature review highlights several key findings regarding the impact of trade on OOIC member countries. First, it reveals that regional trade blocks have the potential to foster economic growth among member countries. This suggests that initiatives aimed at promoting regional integration and trade cooperation

can be beneficial for the economic development of OIC nations. Additionally, the literature suggests that population plays a significant role in bilateral trade flows among member countries. This implies that countries with larger populations may have greater trade opportunities and potential for economic exchange within the OIC. Furthermore, the review indicates that trade liberalization processes can have a positive long-term effect on the GDP per capita of member countries. This suggests that efforts to reduce trade barriers and promote free trade within the OIC can contribute to improved economic performance and living standards for their population.

It is important to acknowledge several research gaps in the existing literature. These gaps include the need to investigate the potential challenges or drawbacks associated with regional trade agreements within the OIC context. Exploring the long-term effects of global economic crises on trade performance, considering non-economic factors such as political instability or linguistic and cultural differences on bilateral trade flows, and examining the negative effects of trade liberalisation on specific sectors of the economy or income inequality and unequal distribution of wealth are also areas that require further research.

Policymakers can address these research gaps to enhance intra-trade within the OIC. This may involve the creation of Trade and Finance Support Schemes and the establishment of payment methods specifically designed to facilitate and promote intra-trade development within the OIC member countries. By addressing these research gaps and implementing targeted policies, policymakers can work towards strengthening trade relations, promoting economic growth, and fostering greater integration among OIC member countries.

3. Data Description and the Research Methodology

The data used in this study encompasses 50 OIC countries from diverse regions including Europe, South America, Central Asia, the Middle East, South and Southeast Asia, and Africa. The dataset covers a time period ranging from 2014 to 2022, providing a comprehensive snapshot of trade-related variables and economic indicators over several years. It is worth noting that data restrictions prevented the inclusion of seven countries from the total of 57 OIC member nations in the sample. Although these exclusions may limit the generalizability of the findings to the entire OIC membership, the selected sample of 50 countries still offers valuable insights into the trade dynamics and patterns within the OIC. To ensure the reliability and accuracy of the data, multiple sources have been utilized. The dataset is compiled from reputable sources such as the World Development Indicators (WDI), CIA Fact Book, International Monetary Fund (IMF), and distance information obtained from official websites. This diverse range of data sources enhances the robustness of the study and helps to capture a comprehensive view of the trade-related variables and economic factors under investigation. By utilizing this extensive dataset, the

study aims to provide a comprehensive analysis of the factors influencing trade development among OIC countries and to generate valuable insights into the dynamics of trade patterns, challenges, and opportunities within the OIC region.

Table 1. The sample selection framework details of region and countries

	Geographical Regions	Countries Name	Counts
1	South America and Europe	Albania, Guyana	2
2	Central Asian	Kyrgyz Republic, Afghanistan, Kazakhstan, Tajikistan, Turkmenistan Azerbaijan, Uzbekistan	7
3	Middle East	Iran Islamic Republic, Jordan, Iraq Bahrain, Kuwait, Oman, Lebanon, Qatar, Turkey, Saudi Arabia Palestine (West Bank & Gaza) United Arab Emirates	13
4	South and South Asian	Pakistan, Indonesia, Maldives Brunei, Bangladesh, Malaysia	6
5	Africa	Benin, Algeria, Burkina Faso, Togo Cameroon, Comoros, Cote d'Ivoire, Senegal, Djibouti, Morocco, Gabon Egypt, Gambia, Guinea, Mali, Mauritania, Niger, Sierra Leone Nigeria, Sudan, Uganda, Tunisia	22
	TOTAL		**50**

With the SDGs as a development goal also implemented by Muslim countries, including Indonesia, an in-depth study is required (Chapra, 2008). The classical and modern views of Maqāsid al-Sharīʻah are multi-dimensional, with an extensive scope that aims for better social welfare, as standards of living impact adherence to religious teachings and rituals of faith-based activities (Ullah & Kausar, 2017).

Based on Tariq Ramadahan's thought, there are three prerequisite criteria in determining maslahah: (1) haqiqiyyah, authentic and definitive, not speculative; (2) kulliyyah, general in nature, in the sense that it does not only accommodate the interests of a particular person or group; and (3) does not conflict with the text that is qatʻI (Ramadhan, 2008). If the 17 points of SDGs are understood in depth, then, using the theory of maslahah with its three prerequisites, the SDGs can be categorized as maslahah with global coverage.

When referring to the concept of Maqāsid al-Sharīʻah built by Ibn Qayyim, there is no doubt that the SDGs are part of Maqāsid al-Sharīʻah, as they do not conflict with Islamic law. Likewise with ash-Syatibi, as the SDGs include the interests of daruriyah and hajiyat, the SDGs are part of Maqāsid al-Sharīʻah. Additionally, based on research from BAZNAS' Center of Strategic Studies, there is relevance between Maqāsid al-Sharīʻah and SDGs: the SDGs are assessed as 53% related to dharuriyah aspects and 47% hajiah aspects. In general, all 17 SDGs align with the objectives of Maqāsid al-Sharīʻah (BAZNAS, 2017). Moreover, if examined further, the priority areas of the SDGs – poverty, hunger, health, and educatio – have a very significant

relationship with the main aspects of Maqāsid al-Sharīʿah.

Nurturing the soul is reflected in the prohibition of killing in Islam and in maintaining the ongoing life. If this principle is simplified in one word most relevant to represent it, then health is the main thing that determines human survival (Hasibuan, 2019). Life protection is directed at the realization of good health and general well-being; good health is related to physical health while well-being is related to psychological health (Firdaus, 2018).

Yusuf Qardawy argues that maintaining the existence of reason in Islam can be performed in several ways, such as obliging someone to seek knowledge. The presence of guidance to seek wisdom from birth to death provides fardhu kifayah law to continue to seek knowledge. Supporting the role of reason will give new knowledge so that it can bring confidence and reject prejudice, reject taqlid towards ancestors, great people, and ordinary people, and invite people to contemplate the creation of the heavens, the earth, and all things created by Allah (Qardhawi, 1997).

Heredity is an important aspect that needs to be maintained. In Islam, it is necessary for children to have a good life. One element s not to let children starve and become malnourished. The problem of hunger has become a shared responsibility of fellow Muslims, so it is inevitable that the goal of the SDGs to overcome hunger is part of the goal of Islam, namely in maintaining hifz al-nasl.

The obligation for everyone to work and undertake business is so that they are not poor and can meet their needs. On the other hand, every Muslim who has additional assets is obliged to help the poor and help others get out of poverty. These efforts are part of achieving prosperity (Indra, 2018).

Therefore, while no SDG priority points are described in the context of hifz al-din, essentially the four key points are also part of the maintenance of religion. Islam demands that everyone seeks knowledge so as not to be entangled in ignorance, pay attention to health so that they can worship perfectly, keep their families from starving, and work for the necessities of life to avoid poverty.

3.1. The model and Research Methodology

To analyses selected sample of 50 countries we have used the general functional form (1) and the regression model (2) detailed below,

$TRAOP = f(GDPG, FDI, INFL, REER, CO_2E, POP, INST, BOSHA, EXPO, LANG, DCOV)$

$TRAOP_{it} = \beta_0 + \beta 1 GDPG_{it} + \beta_2 FDI_{it} + \beta_3 INFL_{it} + \beta_4 REER_{it} + \beta_5 CO_2 E_{it} + \beta_6 POP_{it} + \beta_7 INST_{it} + \beta_8 BOSHA_{it} + \beta_9 EXPO_{it} + \beta_{10} LANG_{it} + \beta_{11} DCOV_{it} + u_{it}$

In equation (2), above 'i' stand for number of countries as cross-section (i= 1, 2,.....,N) where N=50 countries listed in Table 1 and 't' represent number of years or the time period over each country (t=1, 2,.....,n=T). The equation (2) is the

econometric equation of trade model, where β's are the coefficients of regression model. The variables considered in this model are: trade openness (TRAOP) which is the dependent variable whereas independent variables are: GDP growth (GDPG), foreign direct investment (FDI), inflation (INFL), real exchange rate (REER), corban emission *(CO_2E)* as proxy of environment, population (POP), institution (INST), border sharing (BOSHA), exports (EXPO), language dummy for a common language (LANG), and dummy to control the COVID effect (DCOV). To estimate this model, we employ GMM model detailed below.

3.1.1 Two Step System GMM Model

GMM is commonly used to address endogeneity problem in regression analysis. Endogeneity arises when one or more independent variables are associated with the error term in regression model. This can lead to biased and inconsistent coefficient estimates, as well as inefficient standard errors. GMM provides a way to estimate the coefficients in the presence of endogeneity by using internal or external instruments. While the internal or external instruments that are independent of error term and they are employed to develop moment conditions. These moment conditions are used to quantify the coefficients. The system GMM estimators are precisely aimed for dynamic panel data modeling.

Let's we have a regression equation:

$$Y = Z'\theta + \vartheta$$

Where the explanatory variables are uncorrelated with $E(\vartheta|I) = 0$. The θ is vector of regression coefficients. The Z' is a vector of k independent variables $Z' = (z_1, z_2, \ldots z_k)'$ and Y is a response variable. While W in $E(\vartheta|I) = 0$. is vector of j instruments $W = (w_1, w_2, \ldots w_j)$. According to the condition the j ≥ k.

The Generalized Method of Moments involves determining the magnitude of a positive semi-definite quadratic function through a generalized metric. To accomplish this, we can use G, the matrix that represents the quadratic function. From there, we can use the following equation:

$$\| E_N(W\vartheta) \| G = \| 1/NW'\hat{E} \| G = N(\frac{1}{2}/W'\hat{E})'G(\frac{1}{2}W'E) = \frac{1}{2}\hat{E}'WGW'\hat{E}$$

For the derivation of desired vector of coefficients β_Q, we need to minimize the $\beta_Q = \arg\min_{\hat{\beta}} \| I'\hat{E} \| Q$, and the β_Q is can be derived through $d/d(\hat{\beta}) \| I'\hat{E} \| Q = 0$. By following the chain rule of derivative this equation can be expended as:

To derive the desired vector of coefficients β_Q, we need to minimize the expression $\beta_Q = \arg\min_{\hat{\beta}} \| W'\hat{E} \| G$, and β_Q can be obtained by solving the equation $d/d(\hat{\beta}) \| W'\hat{E} \| G = 0$. This equation can be expanded using the chain rule of derivative.

$$\frac{d}{d(\hat{\beta}) \, \| \, W'\hat{E} \, \| \, G} = \frac{d}{d(\hat{E})} \, \| \, W'\hat{E} \, \| \, G \, \frac{d\hat{E}}{d(\beta)} = 0$$

The final equation can be drived as:

$$\beta_Q = \frac{Z'WGW'Y}{Z'WGW'Z} = (Z'WGW'Z)^{-1} Z'WGW'Y$$

So, the general model of dynamic panel models is:

$$y_{it} = \gamma y_{i,t-1} + z'_{it}\theta + \varepsilon_{it}$$

The equation can be written as:

$$\Delta y_{it} = (\gamma - 1)y_{i,t-1} + z'_{it}\theta + \varepsilon_{it}$$

4. Results and Discussion

The results in Figure 1 below shows the coefficients of the GMM model for Europe and South American regions, based on the results in Table 2. The Figure 1 shows that the lag value has the highest impact on the current value, followed by GDP growth and border sharing. COVID-19 has a significant but comparatively lower impact.
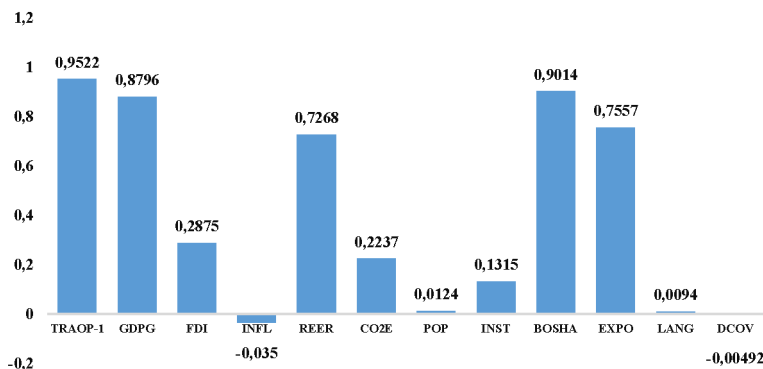

Figure 1. The coefficients of GMM model for Europe and South American region

The inflation and Covid-19 dummy both have negative impacts on trade openness . This is in-line with the existing literature. The results are summarised in Table 2 below followed by interpretation of these results.

Table 2. Results of GMM model for Europe and South American region countries

	Coefficient	Standard Error	t-value	P-value
TRAOP-1	0.9522**	0.4187	2.27418	0.0175
GDPG	0.8796***	0.0761	11.5585	0.0000
FDI	0.2875***	0.0355	8.09859	0.0000
INFL	-0.035**	0.0155	-2.2581	0.0348
REER	0.7268**	0.2715	2.67698	0.0351
CO2E	0.2237**	0.0913	2.45016	0.0423
POP	0.0124	0.6696	0.01852	0.7539
INST	0.1315**	0.0544	2.41728	0.0421
BOSHA	0.9014***	0.2453	3.67468	0.0000
EXPO	0.7557***	0.2359	3.20348	0.0000
LANG	0.0094**	0.0044	2.13636	0.0342
DCOV	-0.00492***	0.00105	-4.6857	0.0000
Diagnostics				
	Test Statistics		P-value	
Wald test	1645.46***		0.0000	
AR (2) test	0.5634		0.9558	
Hansen Test	2.0983		0.5429	

The ***, **, * are showing the significance at 1%, 5%, and 10% respectively.

The table 2 is based on the results of trade model of Europe and South American Region OIC countries. The results indicate that all the variables are significant except population. It means that the population which is a social indicator is not effecting trade in this region. The lag value of trade openness is significant, it indicates that it carries previous year effects. The economic indicators GDP growth and FDI are significant at 1% and 5% percent level of significance because the t-values are greater than the critical values. The results are supported by (Michail *et al*., 2021). Inflation (INFL) is also negatively significant but at 5% level of significance, it means that the inflation negatively impacts the international trade. This finding is matching with the findings of (Hanif, 2021; Okoyeuzu *et al*., 2022). The real exchange rate (REER, in term of US dollar) is also significant it indicates that if currency depreciated one unit it will reduce the trade, the results is supported by (Tarasenko, 2021). The environment variable CO2E is also significant and positive it shows the trade can be expended but at the cost of more CO2E. The institutions (INST) is significant but at 5%. It directs the strong institutions help in expending the trade (Zhuang *et al*., 2021). Border sharing is a demographic variable which is significant. The results show the border sharing is a cause of trade expansion (Hanif, 2021). Exports is the part of trade openness and the variable is significant and coefficient is positive it means increase in exports leads to increase in trade. These results are in line with the findings of Chaudhry *et al.* (2023) who reported that trade openness policy in all OIC income groups will benefit from openness through improved economic growth. Lower OIC income group countries exports

mostly primary goods, the prices of which are volatile and low on the international market. Moreover, the cultural variable language is also significant which is a dummy for common language (Hanif, 2021). We also introduce a dummy variable DCOV to control the impacts of Covid-19 which is significant and showing negative impact of Covid-19 on dependent variable.

The diagnostic tests indicate that the model is seems good fit because according to Wald test model is jointly significant. The AR (2) shows there is no issue of serial correlation while Hansen test indicates that internal instruments are weakly valid.
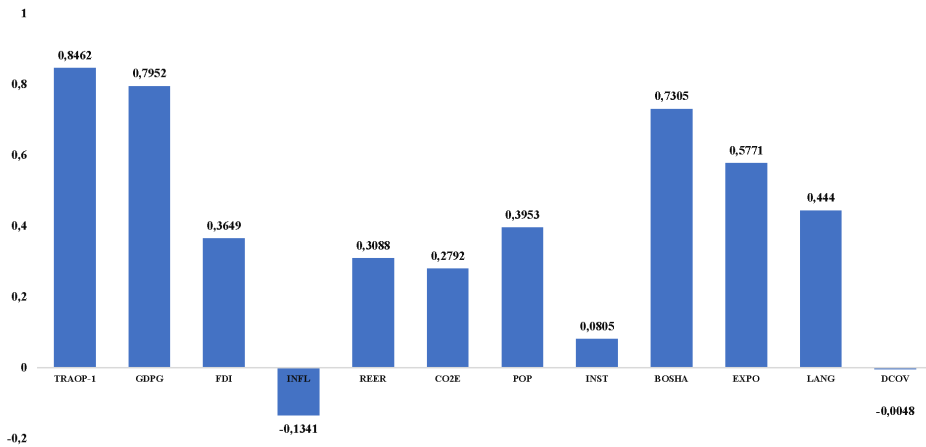

Figure 2. The coefficients of GMM model for Middle East region

Figure 2 displays the coefficients of the GMM model for Middle East region, based on the results in Table 3. The figure shows that the lag value has the highest impact on the current value, followed by GDP growth and border sharing which also have significant impacts. In addition, Covid-19 has a significant but less pronounced impact. Furthermore, both inflation and the Covid-19 dummy variable have negative impacts on trade openness. The detailed interpretation is provided below Table 3.

Table 3 presents the results of a trade model for Europe and South American Region OIC countries. The analysis reveals that all the variables, except population, are statistically significant in explaining trade patterns in this region. Lagged trade openness is found to have a significant impact, indicating that it carries previous year effects. GDP growth and FDI are significant at 1% and 5% level of significance respectively, and these findings are consistent with (Michail *et al.*, 2021). Inflation (INFL) is found to be negatively significant at the 5% level, implying that inflation has a negative impact on international trade, and this result is supported by (Hanif, 2021; Okoyeuzu *et al.*, 2022).

Table 3. Results of GMM model for Middle East Region Countries

	Coefficient	Standard Error	t-value	P-value
TRAOP-1	0.8462***	0.1755	4.8217	0.0000
GDPG	0.7952***	0.1014	7.8422	0.0000
FDI	0.3649**	0.1249	2.9215	0.0326
INFL	-0.1341**	0.0522	-2.5690	0.0399
REER	0.3088**	0.1186	2.6037	0.0491
CO2E	0.2792**	0.1073	2.6021	0.0165
POP	0.3953	0.6149	0.6429	0.8758
INST	0.0805**	0.0353	2.2805	0.0452
BOSHA	0.7305***	0.1258	5.8068	0.0000
EXPO	0.5771***	0.0867	6.6563	0.0000
LANG	0.4440***	0.1217	3.6483	0.0000
DCOV	-0.0048*	0.0026	-1.8462	0.0726
Diagnostics				
	Test Statistics		P-value	
Wald test	1645.46***		0.0000	
AR (2) test	0.5634		0.9558	
Hansen Test	2.0983		0.5429	

The ***, **, * are showing the significance at 1%, 5%, and 10% respectively

The real exchange rate (REER) is also significant and indicates that a depreciated currency will reduce trade, which is consistent with (Tarasenko, 2021). The environment variable CO2E is found to be positively significant, implying that trade can be expanded at the cost of more CO2E emissions. Institutions (INST) are also significant at the 5% level, indicating that strong institutions help in expanding trade (Zhuang *et al.,* 2021). Border sharing is a significant demographic variable, with results showing that it contributes to trade expansion (Hanif, 2021). Export, which is a part of trade openness, is also found to be significant with a positive coefficient, suggesting that an increase in exports leads to an increase in trade. The cultural variable, language, is significant as a dummy variable for common language (Hanif, 2021). A dummy variable, DCOV, is introduced to control the impacts of Covid-19, which is found to be significant and negatively impacting the dependent variable. The diagnostic tests indicate that the model is a good fit, as the Wald test shows that the model is jointly significant. There is no issue of serial correlation as evidenced by AR (2), and the Hansen test indicates weakly valid internal instruments.
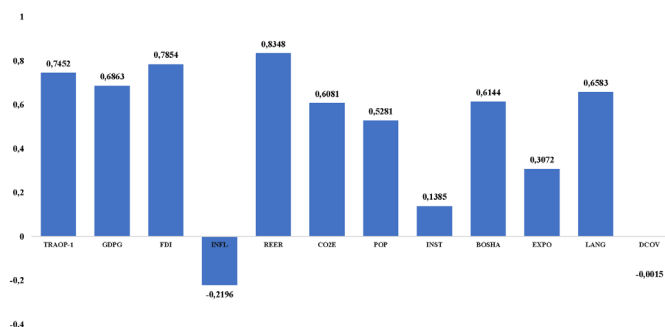

Figure 3. The coefficients of GMM model for Central Asia region

Figure 3 shows the coefficients of the GMM model for Central Asian region, based on the results presented in Table 4. It shows that the real exchange rate has the highest impact on the current value of trade openness, followed by lag value of trade openness and foreign direct investment, while Covid-19 has the least but still significant impact. Moreover, both inflation and the Covid-19 dummy have negative impacts on trade openness. The detailed interpretation can be found below Table 4.

Table 4. Results of GMM model for Central Asian region countries

	Coefficient	Standard Error	t-value	P-value
TRAOP-1	0.7452***	0.04672	15.9503	0.0000
GDPG	0.6863**	0.2445	2.80695	0.0463
FDI	0.7854***	0.2063	3.80708	0.0000
INFL	-0.2196**	0.0945	-2.3238	0.0231
REER	0.8348***	0.1878	4.44515	0.0000
CO2E	0.6081***	0.0744	8.17339	0.0000
POP	0.5281	0.6595	0.80076	0.7433
INST	0.1385*	0.0809	1.71199	0.0759
BOSHA	0.6144**	0.2455	2.50265	0.0342
EXPO	0.3072**	0.1443	2.1289	0.0358
LANG	0.6583*	0.3537	1.86118	0.0769
DCOV	-0.0015***	0.0004	-3.75	0.0000
Diagnostics				
	Test Statistics		P-value	
Wald test	1256.72***		0.0000	
AR (2) test	0.4764		0.1433	
Hansen Test	2.8792		0.5782	

The ***, **, * are showing the significance at 1%, 5%, and 10% respectively.

The table 4 is based on the results of trade model of Central Asian Region OIC countries. The results indicate that all the variables are significant except population. The lag value of trade openness is significant; it indicates that it carries previous year effects. The economic indicators GDP growth and FDI are also significant but they both have positive relationship with trade openness. These findings are supported by (Pan & Chong, 2023; Habibi *et al.*, 2022; Michail *et al.*, 2021). Inflation (INFL) negatively significantly effects the trade, this finding is similar with the findings of (Hufbauer *et al.*, 2022; Hanif, 2021; Okoyeuzu *et al.*, 2022). The real exchange rate is also significant it indicates that if currency depreciated one unit it will reduce the trade, the results is supported by (Tarasenko, 2021). The environment variable CO2E is also significant and positive it shows the trade can be expended but at the cost of more CO2E. The institutions (INST) is significant. It directs the strong institutions help in expending the trade (Zhuang *et al.*, 2021). Border sharing is a demographic variable which is significant. The results show the border sharing is a cause of trade expansion (Hanif, 2021). Exports is the part of trade openness and the variable is significant and coefficient is positive it means increase in exports leads to increase in trade. The cultural variable language is also significant which is a dummy for common language (Hanif, 2021). Dummy variable DCOV is introduced to control the impacts of Covid-19 which is significant and showing negative

impact of Covid-19 on dependent variable. The diagnostic tests indicate that the model is seems good fit because according to Wald test model is jointly significant. The AR (2) shows there is no issue of serial correlation while Hansen test indicates that internal instruments are weakly valid.
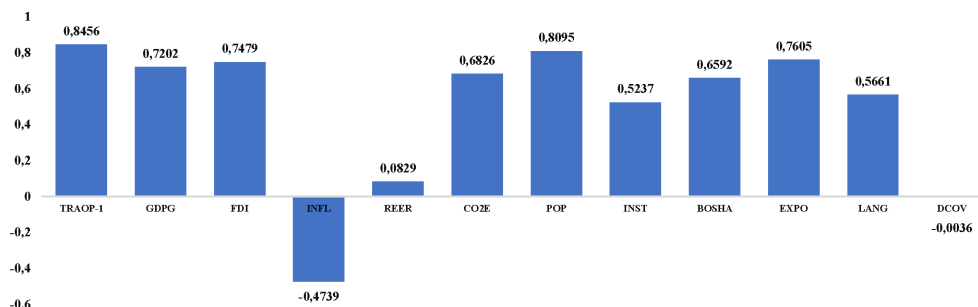

Figure 4. The coefficients of GMM model for South and South East Asian region

Figure 4 presentations the coefficients of the GMM model for South and South East region, which is based on the results shown in Table 5. The Figure 4 illustrates that the lag value of trade openness has the highest impact on the current value of trade openness, followed by GDP growth, population and foreign direct investment, while Covid-19 has the least but still significant impact. Furthermore, both inflation and the Covid-19 dummy variable have negative impacts on trade openness. The detailed results are provided in Table 5 below.

Table 5. Results of GMM model for South and South East Asian region countries

	Coefficient	Standard Error	t-value	P-value
TRAOP-1	0.8456***	0.03621	23.3527	0.0000
GDPG	0.7202***	0.076	9.47632	0.0000
FDI	0.7479***	0.2485	3.00966	0.0000
INFL	-0.4739***	0.167	-2.8377	0.0013
REER	0.0829*	0.0447	1.85459	0.0638
CO2E	0.6826**	0.236	2.89237	0.0155
POP	0.8095**	0.3049	2.65497	0.0225
INST	0.5237***	0.1162	4.50688	0.0000
BOSHA	0.6592**	0.2945	2.23837	0.0364
EXPO	0.7605**	0.2657	2.86225	0.0258
LANG	0.8661*	0.4569	1.8956	0.0654
DCOV	-0.0036**	0.0014	-2.5714	0.0167
Diagnostics				
	Test Statistics		P-value	
Wald test	927.65***		0.0000	
AR (2) test	0.9466		0.8403	
Hansen Test	1.6731		0.1574	

The ***, **, * are showing the significance at 1%, 5%, and 10% respectively.

The findings from the trade model of South and Southeast Asian Region OIC countries are presented in table 5, where all the variables are found to be significant. The lag value of trade openness shows a significant carryover effect

from the previous year. GDP growth and FDI are significant economic indicators, with a positive relationship with trade openness, which is consistent with prior research by Pan & Chong (2023), Z. Habibi *et al*. (2022), and Michail *et al*. (2021). Conversely, inflation (INFL) has a significant negative effect on trade, consistent with the findings of Hufbauer *et al*. (2022), Hanif (2021), and Okoyeuzu *et al*. (2022). The real exchange rate also has a significant negative effect on trade, which is supported by Tarasenko's (2021) research. The environment variable CO2E has a significant positive effect on trade, indicating that trade can expand at the cost of higher CO2E emissions. Institutions (INST) are found to be significant, suggesting that strong institutions can facilitate trade expansion (Zhuang *et al*., 2021). Border sharing is also a significant demographic variable that promotes trade expansion (Hanif, 2021). The cultural variable language, as a dummy for common language, is also significant (Hanif, 2021). Exports, as part of trade openness, have a positive coefficient, indicating that an increase in exports leads to an increase in trade. A dummy variable DCOV is introduced to control for the impacts of Covid-19, which has a significant negative impact on the dependent variable. The diagnostic tests suggest that the model is a good fit, as the Wald test shows that the model is jointly significant, the AR (2) indicates no serial correlation issues, and the Hansen test suggests that the internal instruments are weakly valid.
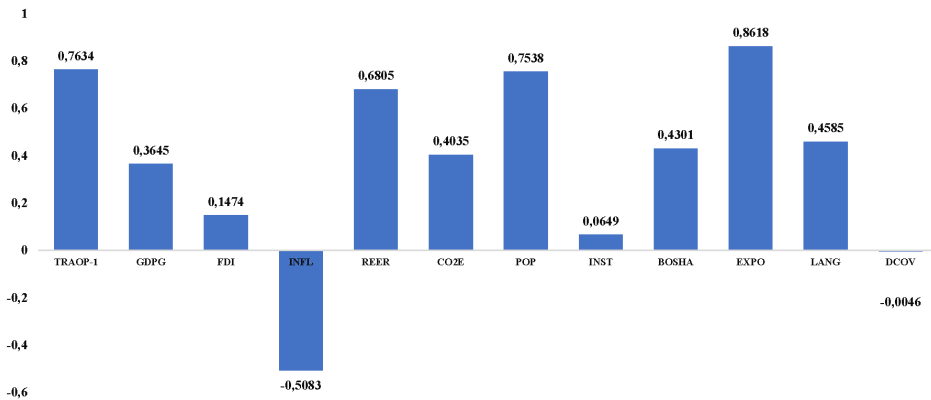

Figure 5. The coefficients of GMM model for African region

Figure 5 displays the coefficients of the GMM model for Europe and the South American region, based on the results presented in Table 6. It shows that the lag value has the highest impact on the current value of trade openness, followed by exports, border sharing, and GDP growth and border sharing, while Covid-19 has the least but still significant impact. Furthermore, both inflation and the Covid-19 dummy variable have negative effects on trade openness. The computed results are summarised in Table 6 below.

Table 6. Results of GMM model for Africa region countries

	Coefficient	Standard Error	t-value	P-value
TRAOP-1	0.7634***	0.1647	4.63509	0.0000
GDPG	0.3645***	0.1083	3.36565	0.0000
FDI	0.1474*	0.082	1.79756	0.0836
INFL	-0.5083***	0.0275	-18.484	0.0000
REER	0.6805**	0.3308	2.05713	0.0264
CO2E	0.4035***	0.0712	5.66713	0.0000
POP	0.7538***	0.1412	5.33853	0.0000
INST	0.0649	0.8881	0.07308	0.1436
BOSHA	0.4301**	0.1816	2.36839	0.0462
EXPO	0.8618***	0.159	5.42013	0.0000
LANG	0.4585	0.3994	1.14797	0.4721
DCOV	-0.0046**	0.0017	-2.7059	0.0362
Diagnostics				
	Test Statistics		P-value	
Wald test	365.48***		0.0000	
AR (2) test	0.9473		0.4964	
Hansen Test	1.4672		0.1116	

The ***, **, * are showing the significance at 1%, 5%, and 10% respectively.

Table 6 presents the results of the trade model for African Region OIC countries, which indicates that most of the variables are significant except for institutions and language. The lag value of trade openness is also significant, suggesting that it carries previous year effects. GDP growth and foreign direct investment (FDI) are positively related to trade openness, and their significance is consistent with previous research by Pan & Chong (2023), Z. Habibi *et al.* (2022), and Michail et al. (2021). Inflation (INFL) has a significant negative effect on trade, in line with the findings of Hufbauer *et al.* (2022), Hanif (2021), and Okoyeuzu *et al.* (2022). The real exchange rate is also significant, indicating that a currency depreciation of one unit reduces trade, as supported by Tarasenko (2021). The environmental variable CO2E is significant and positive, suggesting that trade can expand at the cost of increased CO2 emissions. Border sharing is a significant demographic variable, indicating that it facilitates trade expansion, as noted by Hanif (2021). Exports, as a part of trade openness, have a positive and significant coefficient, meaning that an increase in exports leads to an increase in trade. The introduction of the Covid-19 dummy variable (DCOV) shows a negative impact of the pandemic on the dependent variable, which is significant. Diagnostic tests suggest that the model is a good fit, as it is jointly significant according to the Wald test and has no issue of serial correlation based on AR (2), although internal instruments are weakly valid according to the Hansen test.

Figure 6 displays a comparison of coefficients across different regions of OIC countries. The Figure 6 is based on the results of Table 7. The highest impacts are related to the lag values of trade openness on its current value, and after that, GDP is the most influential variable for trade. Inflation and Covid-19 both have negative impacts on trade in all regions. All other variables have different positive impacts in the models.
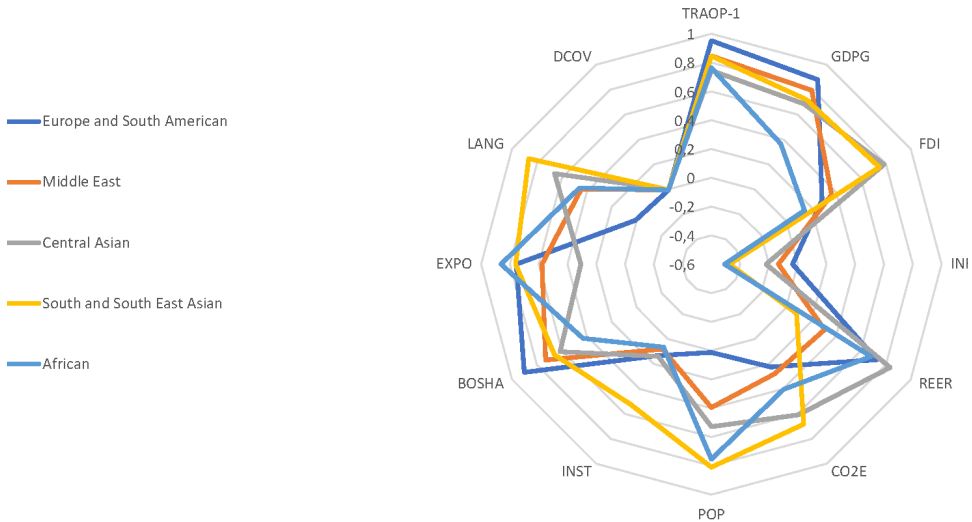
Figure 6. Radar chart for the comparison of coefficients of different model

Table 7. Comparison of impacts over the regions

	Europe and South American	Middle East	Central Asian	Southeast Asian	African
TRAOP-1	0.9522	0.8462	0.7452	0.8456	0.7634
GDPG	0.8796	0.7952	0.6863	0.7202	0.3645
FDI	0.2875	0.3649	0.7854	0.7479	0.1474
INFL	-0.035	-0.1341	-0.2196	-0.4739	-0.5083
REER	0.7268	0.3088	0.8348	0.0829	0.6805
CO2E	0.2237	0.2792	0.6081	0.6826	0.4035
POP	0.0124	0.3953	0.5281	0.8095	0.7538
INST	0.1315	0.0805	0.1385	0.5237	0.0649
BOSHA	0.9014	0.7305	0.6144	0.6592	0.4301
EXPO	0.7557	0.5771	0.3072	0.7605	0.8618
LANG	0.0094	0.444	0.6583	0.8661	0.4585
DCOV	-0.00492	-0.0048	-0.0015	-0.0036	-0.0046

5. Concluding remarks

1.   In conclusion, this study provides valuable insights into the factors that influence trade openness among OIC countries. The findings highlight the importance of economic, cultural, social, and geographical factors in shaping trade patterns within the OIC region. Some of the important findings of the paper are listed below. Economically, the study reveals that GDP growth and foreign direct investment are key drivers of trade openness. Countries with higher GDP growth and greater foreign investment tend to have more open and active trading relationships with other OIC members.

2.   Cultural factors, specifically a common language, are also found to be significant in promoting trade openness. Countries that share a common language have a higher propensity to engage in trade, indicating the importance of communication and linguistic compatibility in fostering economic cooperation.

3.   Social variables, such as population size and environmental factors, are identified as influential determinants of trade openness. Larger populations provide a larger consumer base and potential market for goods and services, while a conducive environment for trade, including stable institutions and infrastructure, promotes economic activity.

4.   The study also acknowledges the significant impact of the COVID-19 pandemic on trade variables. The inclusion of a dummy variable for the pandemic demonstrates its disruptive effects on trade among OIC countries, emphasizing the need for adaptive strategies and policies to mitigate the challenges posed by such global crises.

5.   Geographical factors, particularly border sharing and proximity, are found to play a significant role in trade among OIC countries. Shared borders and geographical proximity enhance accessibility and facilitate trade flows, underscoring the importance of geographical location in shaping trade relations.

Overall, this study contributes to a deeper understanding of the factors influencing trade openness within the OIC. The findings provide a foundation for policymakers and stakeholders to develop strategies and policies that promote trade, economic cooperation, and integration among OIC member countries, ultimately fostering sustainable economic growth and development in the region.

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