Majors: (FIN)

No. (FIN26)

"Digitizing Trade Procedures and Trade Gains in the OIC Countries"

By:

Hajra Bibi ***01-321221-009***

Supervisor:

Dr. Amjad Masood

Department of Business Studies

Bahria University Islamabad

Spring-2024

Acknowledgment

All praises to Allah, the Merciful, the Powerful, and the Magnificent, who has granted us the knowledge, expertise, and skills to explore the wonders of His creation with great diligence. May countless blessings be upon our Holy Prophet (S.A.W). First and foremost, I would like to express my deepest gratitude to my supervisor, Dr. Amjad Masood for their unwavering support, guidance, and encouragement throughout my research. His expertise and insightful feedback have been invaluable in shaping this thesis.

Secondly, I would like to extend my heartfelt thanks to my family and friends for their unwavering love and encouragement. My family has always believed in me and supported my academic pursuits. My friends provided me with much-needed motivation and stress relief during challenging times.

To everyone who has contributed in this research in any way I am truly grateful. This accomplishment would not have been possible without your support and encouragement. May Allah bless them all greatly Ameen.

Abstract

The objective of the current study is to examine the impact of digital trade facilitation on the bilateral trade flows of OIC countries. The existing literature has suggested that the Oic countries are yet to achieve their full potential in regard to digitization of trade procedures. There mean values of digital trade facilitation are below as compared to the world average. Hence to empirically analyze the impact of full implementation of digital trade facilitation measures on OIC countries we have applied structured gravity model of trade using Poisson pseudo maximum likelihood estimator. The analysis is based on the UN Global Survey on Digital and Sustainable Trade Facilitation survey which is conducted biennially since 2017. The findings show a considerable impact of digitization on the bilateral trade flows of the OIC countries. The analysis is not only limited to the aggregate trade. In addition to analyzing aggregate trade, we examined trade in the manufacturing, mining and energy, and agriculture sectors. The proposed research model follows the latest developments in gravity trade model and includes both international and intra-national trade flows for empirical analysis. It is evident from the findings that paperless trade and cross boarder digitization significantly improve the bilateral trade flows in the OIC bloc. The implementation of digital trade facilitation measures results in an increased aggregate trade, including both manufactured and agricultural goods. The countries that heavily rely on the exports of mining products could benefit by the implementation of digital TF measures and diversify their trade portfolio. The research offers valuable insights for policy makers and reinforces the importance of implementation of digitization into trade procedures.

Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1.Background the study

Rapid technical breakthroughs are transforming the worldwide landscape of international trade. In this era of technological advancements, the global economy and digitalization in trade are expanding quickly. The economies are taking a revolutionary shift towards digitization. IT and its knowledge have become a crucial part of recent times. World economies are aiming to achieve cost reductions by incorporating IT in their operations that results in optimization and enhanced efficiency. Developed countries with established digital economies are enjoying high GDP volumes as well as GDP per capita (Ahmedov, I. 2020). According to UN Global Survey countries are giving a trial to developing technologies and using them to facilitate trade across borders more effectively. For instance, certain Customs agencies are exploring the potential use of cutting-edge technologies, such as artificial intelligence and big data analytics, to speed up clearance procedures and enhance risk management. Some have made blockchain technology available so that products can be tracked more effectively and transparently through the whole supply chain. COVID-19 has expedited ongoing efforts to digitize trade procedures, which have greatly improved the effectiveness of border controls and trade administration procedures for Customs and other pertinent agencies. With the further advancements in technology there will be more sophisticated AI tools to enhance international trade. The involvement of ICT technology into trade has reaped great benefits to the nations. The incorporation of digital solutions and ICT technology to streamline and automate trade procedures is known as digital trade facilitation. UN Global Survey on Digital and Sustainable Trade Facilitation has classified digital trade facilitation into two categories: Paperless trade and cross border trade facilitation. Paperless trade refers to use of electronic systems and formats rather than conventional paper-based documentation systems, to accelerate the trade and minimize the associated costs. Cross-border paperless trade refers to the steps taking place to promote the electronic exchange of trade-related data and documents as well as cross-border mutual recognition.

OIC countries contribute a major part towards global trade and hence the digitalization of trade procedures in these countries will result in increased trade gains, economic growth and regional integration. Currently the implementation of digital procedures in the OIC bloc in not up to the

mark as per the findings of Global survey on digital and sustainable trade. Figure 1 compares the relative coverage of measures related to digital trade facilitation. We plot the mean value of TF coverage of the OIC countries along with mean values for OECD and the world for refernce. It is clear from the figure that the performacne of the OIC countries is lower than global avergae for almost all measures. The gap is larger for DTF measures including 'Electronic issuence of certificate of origin', 'Electronic application for custom refunds', and 'Recognised custom authority'. Moreover, the facilitation coverage for 'electronic exchnage of SPS certificate' and 'Electronic exchnage of certificate of origin' is particularly meager. Note that TF coverage is scaled as: 0 = no implementation, 1= pilot stage, 2 = partial implementation, and 3 = full implementation.

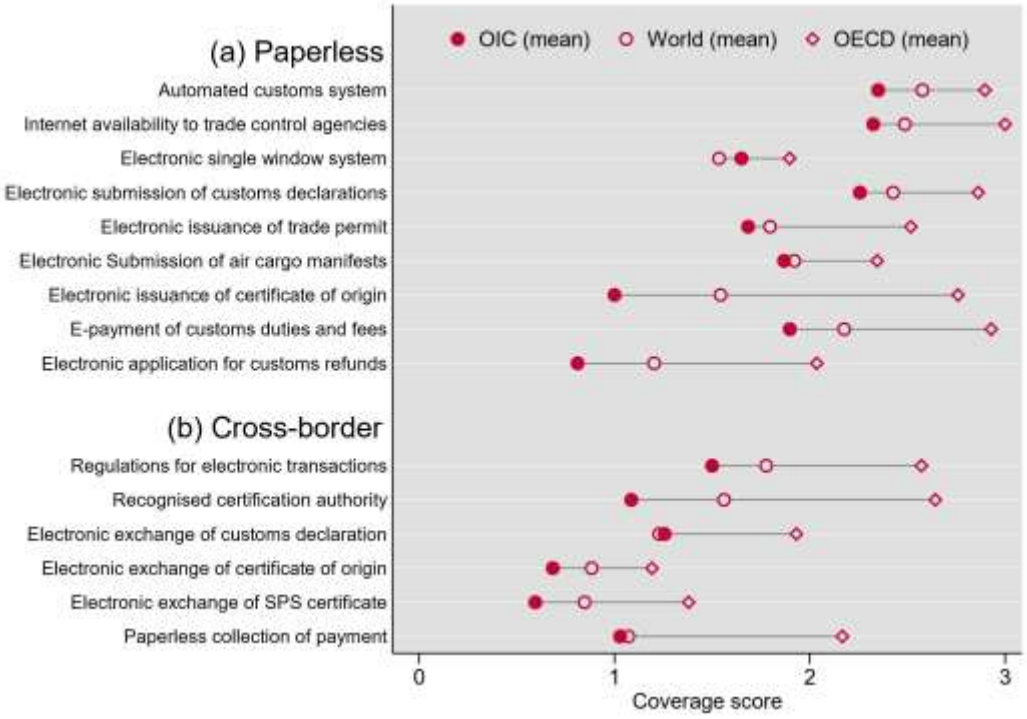

Figure 1: Comparison of digital trade facilitation

Figure 2 portrays standing of the OIC countries in terms of TF coverage and relative change over time period 2015 to 2021. As clear from the chart, there is a wide diversity in the TF measured implemented by each country. While countries like Indonesia, Malaysia, and Turkey are among the better performers, digital TF implementation in Iraq, Afghanistan, and Gabon is the lowest. The improvement in the TF coverage over time is also heterogenous across countries.

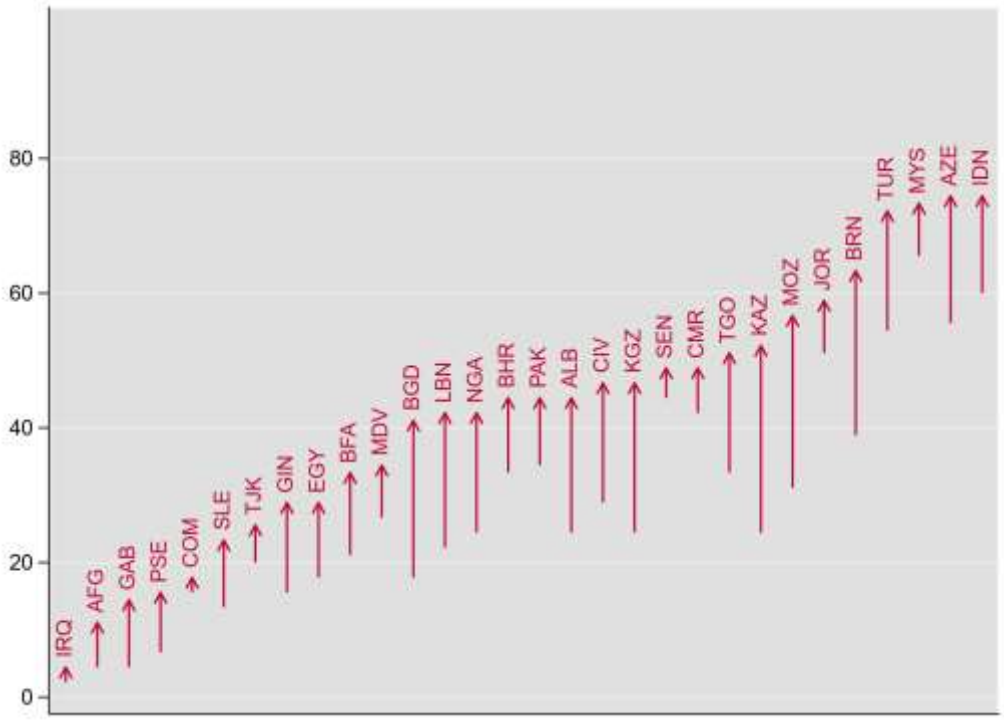

Figure 2: Change in digital trade facilitation between 2015-2021

It is evidenced from the above-mentioned figures that OIC countries are yet to achieve their full potential in terms of digital trade facilitation. Some Previous studies have been done on OIC sector that analyze the impact of digital technologies on the economic growth. The study conducted by Ali et al., (2024) emphasizes that the use of internet, mobile and broadband subscription has a positive impact on the economic growth. In another study the relationship between ICT and trade has been analyzed and the results suggest that there is a positive and significant relationship between ICT technology and trade. The ICT components examined, consisted of broadband, cellular phones, fixed telephones and internet usage. The results summarized that these technologies significantly improved trade in the OIC countries (Yogatama, A. R. 2017).

Dahlman et al. (2016) argues that digitalization is a key factor in promoting economic growth through expanding labor and capital productivity, enabling access to internation markets and through reduction of transaction costs. All of these previous studies have used ICT technologies such as usage of phone and internet and other digital infrastructure related components to analyze the impact of digitization. In this current study we have used the more rigorous and detailed way

to measure digitization i.e. through UN Global Survey on Digital and Sustainable Trade Facilitation. The World Trade Organization (WTO) and other international bodies have underscored the significance of trade facilitation in boosting trade flows, fostering economic growth, and promoting development. As per the findings of WTO 2015 and 2021 reports full implementation of the trade facilitation agreement could drop trade costs by 14.3% on average and also resulting in an increase of up to US$ 1 trillion per year in global trade, with the significant gains visible for the poorest countries. Trade costs for the African region would be reduced by an average of 16.5%. Reductions would average 16.8% and 15.7% in landlocked and coastal Africa, respectively. The positive effect of trade facilitation measures on bilateral trade flows is evidenced in empirical literature; for instance, Portugal-Perez and Wilson (2012), Abendin, Pingfang, and Nkukpornu (2022) and Jayasooriya (2021). However, these studies formulated the trade facilitation measure based on the information and communication technologies (ICT), and other factors related to hard and soft infrastructure.

1.2. Research Gap

Existing literature on trade digitization mainly focuses on developed countries and regions with advanced digital infrastructure, leaving a significant gap in understanding the impact on developing countries, especially in the Organization of Islamic Cooperation (OIC) countries. Previous researches have analyzed the impact of digital trade facilitation/ trade digitization on the bilateral trade flows of developed economies however when it comes to specific geographical or socio-economical regions, the research is quite limited and there is a need to explore these dimensions as well. This study focuses on filling this gap.

Moreover, there is substantial amount of literature present that analyses the impact of trade facilitation on bilateral trade flows, however those models mainly focus on international trade and exclude the intra-national trade. The latest developments in gravity estimation model as suggested by Yotov (2022) recommend the inclusion of intra-national trade for a more comprehensive analysis. This study aims to fill this gap and incorporates the intra-national trade into the gravity estimations along with international trade flows.

1.3. Problem Statement

The Organization of Islamic Cooperation (OIC) plays a crucial role in global trade. However, despite their geographically favorable locations and abundant natural resources, many OIC

countries face significant obstacles that hinder the success of their trade activities. One of the major challenges is the poor implementation of trade facilitation policies, which has prevented these countries from maximizing their capacity to support international trade. In contrast, developed countries have successfully incorporated digital systems into their trade processes, significantly boosting their trade gains. This highlights a substantial gap in trade digitization between OIC countries and the rest of the world. Various factors contribute to this shortfall, necessitating a thorough examination of the barriers and hurdles impeding digitization.

Existing literature has primarily focused on the impact of digitization in terms of infrastructural improvements and the incorporation of ICT technology into trade. However, there is a lack of studies that quantify the impact of digitization using digital trade facilitation measures. The poor implementation of these measures in the OIC bloc, compared to other OECD countries, prevents the region from reaching its full potential in international trade.

Addressing these challenges and implementing effective digital trade facilitation measures is essential for the OIC countries to enhance their trade capabilities and fully participate in the global digital economy. By bridging this gap, we can provide evidence-based strategies to policy makers and governments that will assist them in the implementation of digital technologies in bilateral trade hence resulting in overall trade gains.

1.4. Scope of the study

The scope of this study focuses on the impact of digital trade facilitation on bilateral trade between Organization of Islamic Cooperation (OIC) countries in the years 2017, 2019, and 2021. Analysis will use structural gravity modeling with Poisson pseudo maximum likelihood role to quantify the commercial benefits of digitization and paperless cross-border trade. The review will draw on data from the UN's biennial Global Survey on Digital and Sustainable Trade Facilitation since 2017. In particular, it will examine the current state of trade digitization across the OIC bloc, identifying areas for development effective and suggests policy.

This approach will define the specific objectives, target population, variables, methods and limitations of the study, ensuring a focused and manageable research project that provides valuable insights into relationships between trade digitization and bilateral trade flows in the OIC countries.

1.5. Research questions

This study focuses on the following research questions:

1. What specific trade benefits have been realized in OIC countries as a result of digitization and paperless cross-border trade?
2. What are the major factors behind poor implementation of digital trade facilitation measures in the OIC segment?
3. What policy recommendations can be given to improve digital trade and facilitate bilateral trade in OIC countries?
4. How the full implementation of digital trade facilitation can affect the OIC countries' economic development and growth?

1.6. Research Objectives

The research objectives of this study are:

1. To estimate the impact of digital trade facilitation on bilateral trade across 39 OIC member countries
2. To examine the impact of digital trade facilitation on trade in the manufacturing, mining and energy, agricultural sectors in OIC countries.
3. Identifying the factors contributing towards the suboptimal implementation of digital procedures in the OIC bloc.
4. To enhance the empirical analysis by using a structural gravity model that incorporates both international and intra-national trade flows.

1.7. Significance of the Study

The importance of this study lies in its contribution to improving the understanding of the impact of digital marketing initiatives on international trade performance, especially in Organization of Islamic Cooperation (OIC) member states. This study addresses a methodological gap that has been identified in previous research and includes the intra-national trade along with international trade in the gravity estimation. Moreover, the scope of this study extends further by analyzing the sector specific impact of digitization on the trade flows. Through the implementation of industry-specific analysis, the research offers detailed insights into the disparate impacts of digital trade facilitation on manufacturing, mining and energy, and agriculture. These insights are of particular importance for stakeholders and policymakers looking to implement targeted initiatives. The

research focuses on the OIC member countries, recognizing the unique socio-economic and geopolitical context of this group. This regional focus provides tailored insights that can inform policy decisions specific to OIC nations, contributing to the economic development and trade strategies of these countries. Results demonstrating the beneficial and statistically significant effects of digital trade facilitation on overall performance offer information to help policymakers create effective strategies. The study adds to the academic literature on international trade by incorporating the latest developments in gravity model. It also provides empirical evidence and insights that can stimulate further research in the evolving field of digital entrepreneurship. In summary, the significance of this study is to examine the impact of digital trade facilitation on bilateral trade flows, providing valuable insights for policy makers, researchers and stakeholders make informed decisions and contribute to sustainable international trade policies.

1.8. Summary

This chapter outlines the importance of digitization of trade and how the advancement of digital procedures in the OIC bloc can reap benefits to the world and enhance international trade. The chapter has highlighted the research gap, significance, scope and practical implication etc. The upcoming chapter is focused on a detailed look at existing literature. Third chapter is based upon methodology that states the method and sources of data collection. Data is compiled biennially since 2017 around the globe under the UN Global Survey on Digital and Sustainable Trade Facilitation. The survey is comprised of several indicators of digital trade facilitation grouped into two components: paperless trade and cross-border trade facilitation. A recent study (De Castro, Kornher, et al., 2022) applies data from the UN trade facilitation survey to examine the effect of digitization on agricultural trade. However, the model specification lacks inclusion of intra-national trade which is recommend in latest development in gravity estimation (e.g., Yotov, 2022).

We have estimated the effect of digital trade facilitation on bilateral trade of 39 OIC member countries for the years 2017, 2019, and 2021. In addition to aggregate trade, we analyzed trade of manufacturing, mining and energy, and agriculture sectors. For empirical analysis, we applied structural gravity using Poisson pseudo maximum likelihood with high dimensional fixed effects estimation. Following the latest development in the gravity trade literature, our model includes both international and intra-national trade flows. The fourth chapter Findings show that digital trade facilitation has a positive and statistically significant effect on trade. The trade promoting

role of digitization is more pronounced for the exports of mining and energy, while the effect is relatively smaller for the exports of agricultural products.

Chapter 2

Literature Review

2.1. Introduction

The digitalization of trade is fast changing the dynamics of global trade. Hence, the OIC countries are faced with challenges and opportunities. The OIC comprises 57 member states from different regions, such as Africa, Asia and the Middle East. This means that the OIC constitutes a considerable part of the world economy. However, implementing digital technologies in trade processes has been different in the member countries. Based on the recent data, OIC countries are responsible for approximately a fifth of the global trade and they face serious challenges in utilizing the full potential of digitization (Annual Report, 2022). Research indicates that implementation of digital trade facilitation can result in significant efficiency gains and cost reductions. For example, the World Trade Organization (WTO) (2023) estimates that digitalization could lower the trade costs by up to 17. 5% for developed and 22% for developing countries. Nevertheless, the degree to which OIC countries have adopted digital trade facilitation measures is not the same, as some have made considerable progress while others have not. On the contrary, some nations are lagging behind because of the infrastructure and institutional inefficiencies. This paper investigates the influence of trade digitalization on the bilateral trade flows among the OIC countries. This review seeks to gain a better understanding of the role of digitalization in the OIC trade dynamics by critically analyzing the existing literature and the identification of the key trends and challenges.

2.2. Historical Perspectives of Trade Digitization in the OIC Countries

The OIC member states have encountered the digitalization of trade and have launched different digitization projects for the better trade. These include covering customs procedures, documents, payments, and development of digital infrastructures. The Islamic Development Bank (IDB) reports some OIC member states like the United Arab Emirates (UAE) and Malaysia have taken the digital trade facilitation measures such as electronic single windows and online customs portals (IDB, 2018).

Digitalization has immensely reshaped the landscape of international trade, making it more intertwined and interdependent. Reducing trade barriers has emerged as an important objective as

nations strive to optimize trade's benefits, and Digital Trade facilitation (TF) falls under one of the strategies to achieve this goal. Trade facilitation encompasses the set of policies aiming at reducing trade cost and time through the simplification, modernization and harmonization of export and import processes. A vast array of activities aimed at enhancing the effectiveness of trade procedures fall under the scope of trade facilitation. The focus on trade facilitation gained momentum in the 1990s with the advent of global supply chains and the digital revolution, which highlighted the inefficiencies in traditional trade procedures (Grainger, A. 2007). The WTO's Trade Facilitation Agreement (TFA), which came into force in 2017, marked a significant milestone in this regard. The TFA aims to expedite the movement, release, and clearance of goods, thereby reducing the cost and time of trading internationally.

The evolution of trade digitalization policies in the OIC member states began in the early 2000s with the development of the strategic frameworks and action plans aimed at digital trade facilitation. For instance, the "Ten-Year Program of Action" agreed upon during the third extraordinary session of the Islamic Summit held in Makkah in December 2005 served as a foundation for developing the digital trade initiatives between the member states (Worldfolio, 2013). The above is e-commerce platforms and electronic documentation systems adoption that promotes this by doing away with trade barriers and improving competitiveness.

The OIC countries are making some progress, but they still have many problems with digitalizing trade projects. These hindrances give rise to the problems of weak digital infrastructure, low technological capacity, regulatory barriers and institutional constraints. In addition, the disparity in technological readiness and socioeconomic conditions among the member states is the main impediment to the total digitization of trade across the OIC bloc. However, this has not stopped the OIC countries from achieving milestones in trade digitization. According to the World Bank Group’s report, digital trade facilitation measures have proved to be very effective in speeding up customs clearance, reducing transaction costs and increasing the degree of trade transparency (The World Bank, n. d). Additionally, OIC member countries and international organizations have come up with great strides through sharing of information and training in the digital trade practices. The digitalization level of trade in OIC member states is still far from the maximum which is testified by the fact that the problems of trade digitization are still addressed.

2.3. Impact of Trade Digitization on Bilateral Trade Flows in the OIC Countries

A large number of empirical studies have already been carried out to obtain the relationship between trade digitalization and trade flows among OIC countries. The effect of digital trade facilitation measures was analyzed by Duval, Utoktham and Kravchenko (2018). The findings of the study revealed that the full implementation of digital trade facilitation alongside WTO TFA measures resulted in reduction of trade costs by 26% in Asia and Pacific. Among others, Majeed and Ayub (2018) showed the connection between e-commerce acceptance and economic performance for OIC countries. The research revealed that e-commerce and bilateral trade were a positive association that positively affected each other. Jayasooriya (2021) has also explored the digital connection's influence on the trade integration among the Islamic countries. In an analysis of the study, the gravitational model revealed that the digital infrastructure and the connectivity greatly augmented bilateral flows of the OIC bloc. This proof shows that digital trade facilitation is the actual instrument of economic integration and trade growth among the associated nations.

The study on digital trade in the OIC countries' economies has used several approaches to demonstrate the link between digital trade facilitation and the bilateral trade. The most widely used methods for analyzing trade patterns and getting the effects of digitalization on trade outcomes are panel data analysis, the gravity models, and econometric methods. These techniques assist in separating the impact of digital trade promotion from other influencing factors as well as in directly observing the impact on the bilateral trade. In this regard, they will be the main supplier of knowledge on the trade performance-digital trade facilitation causality.

The analysis results of the AES (Autonomous Export Systems) simulations show that the digitalization of trade between the OIC countries increases the bilateral trade between these countries. Established scholars often say that there is a positive connection among e-commerce adoption, digital connection, and trade integration (González and Ferencz, 2018). The states investing in digital infrastructure and using the good digital trade facilitation policies would usually be more trade-intensive. It is most possible that they will have the economic integration at the level of the OIC bloc. Secondly to this, the report suggests the solution is overcoming of the deficits in infrastructure, peace policy, and institutional problems. The policymakers in OIC states can base their efforts on these studies that will allow them to create the strategy that will favorably

affect the development of the digital trade facilitation. Consequently, the economy as a whole will fulfill this task rather than digital trade alone.

2.4. Factors Influencing Trade Digitization in the OIC Countries

The impact of digitalization of the trade in the organizing countries of the Islamic Cooperation Organization (OIC) has many elements, every factor governing whether digital trade facilitation techniques are acquisitioned. The mentioned factors include institutional frameworks, technological infrastructure, legal and regulatory frameworks, socio-economic conditions, and cultural and organizational dynamics.

Institutional Factors

Institutional frameworks are the biggest determinants of the OIC countries' digitization of trade. Governance structures and institutional arrangements are almost the same as the coordination and the success of digital trade facilitation. Engstrom (2020) holds the view that digital trade must have government agencies or departments that will be the custodians of the initiatives. The countries which have developed institutional frameworks including the United Arab Emirates and Saudi Arabia have improved trade process and efficiency by good coordination and governance mechanisms (Modugu and Dempere, 2021).

Technological Infrastructure and Readiness for Trade Digitization

The two dimensions of the speed and scale of trade digitization in the OIC countries are certainly the technological infrastructure and the preparedness of these regional countries (Ali et al., 2024). Digital components, like broadband access, electronic payments, and the digital systems, are the key elements that allow digital trade. According to Fahleviet et al. (2024), those countries with the most advanced level of technologies, namely Malaysia and Turkey have taken the lead in the process of global trade. This is because the digital infrastructure of these nations has allowed them to introduce the digital trade facilitation measures that in turn has led to the increased trade efficiency and competitiveness.

Legal and Regulatory Frameworks

Legal and regulatory environment is the primary determinant of the extent of trade digitalization in the OIC member countries. The regulatory mechanisms that are understandable and transparent

are the most crucial for the businesses and stakeholders that are engaged in digital trade activities (Ahmed, 2019). Dahabiyeh and Constantinides (2022) study that the comprehensive regulation of electronic transactions, digital signatures and data protection is essential to make the digital trade practices possible. The countries that have already set up legal and regulatory frameworks, like Bahrain and Qatar, have created a platform for digital trade. Therefore, trust and security in digital transactions are the outcome of the aforementioned process.

Socio-economic Factors

The main indicators of the preparedness and ability for digital trade in OIC countries are social-economic factors, including income, education, and digital technology access, (Mawardi et al., 2024). Chetty and his team (2018) determined that countries with a higher income and education level have greater digital literacy and readiness for digital trade. Nevertheless, the socio-economic development of the member states can be an obstacle for the whole digital trade initiatives adopted. Imran (2023) has proved that the socio-economic inequalities should be tackled and the digital literacy programs should be financed in order to make the trade digitization efforts inclusive and equitable.

Cultural and Organizational Factors

Cultural attitudes towards technology and organizations' readiness for change are the factors that affect the trade digitization processes in OIC countries. According to Hanna (2020), the nations that promote innovation and entrepreneurship are more open to the digital trade practices. Besides, digital champions in organizations and government agencies can be a key factor in trade digitization initiatives. Asif, Yang, and Hashim (2024) stress the significance of overcoming the cultural and organizational barriers to trade digitization and creating an environment that is favorable to innovation and digital transformation.

2.5. Trends in Trade Digitization among OIC Countries

There was a noticeable increase in trade digitization initiatives among OIC countries, as a result of technological progress and the realization of the advantages of digital trade facilitation during these years. Member states began to concentrate on introducing particular measures to simplify and improve the cross-border trade processes.

A major trend during this time was the general use of electronic customs systems and online trade portals. Countries like Saudi Arabia, Indonesia, and Nigeria spent a lot of money on digital infrastructure to modernize customs procedures, automate documents processes, and facilitate electronic payments (Raimondi, 2023). These projects were aimed at decreasing the amount of paperwork, shortening the processing times and improving the whole trade efficiency. Moreover, a remarkable development in setting up the entire legal and regulatory structures to promote digital trade between 2015 and 2021 was observed. The OIC governments have passed the laws to tackle the problems such as electronic signatures, data protection, and cybersecurity which in turn create a supporting environment for digital trade practices to flourish (Demertzi et al., 2023). Clear regulatory framework and transparent processes were the major factors that drew confidence among investors and traders which in turn increased the participation of the digital trading platforms.

The development of the digital infrastructure encompassing broadband connectivity and digital payment systems, was another important factor attributing to the digitalization trends in trade in these years (Matthess and Kunkel, 2020). Countries including Turkey, Egypt, and Bangladesh devoted a lot of their resources to developing the digital infrastructure that enables online trade services to be provided. The infrastructure development provided further growth opportunities and also made the business platforms more accessible to companies of any capacity.

2.6. Case Studies of Trade Digitization Initiatives

Through the period of 2015 to 2021, many OIC countries from the region initiated the large-scale trade digitization projects which were under their own strategy and achieved the different results.

Trade Digitization in Saudia Arabia

The e-customs system of Saudi Arabia (SECS) was developed as a mark of the digitalization of the economy of the country. The findings of the Saudi Customs Authority report indicate that SECS was a tool that helped to reduce the time required for customs procedures, simplified the customs procedures, and increased the trading efficiency (Arab News PK, 2024). This program has been designed in order to digitalized the trade processes and therefore, to smooth-out the internal trade operations.

Trade Digitization in Indonesia

Indonesia electronic trade program was a strategy of developing e-trade and electronic payment systems. The Ministry of Trade of Indonesia, Republic, affirms that these initiatives were developed to facilitate trade and to enable the traders to access digital platforms (Ramli, 2019). The government of Indonesia set a goal to enhance trade participation and impact economic growth through the use of digital technologies. Those activities especially contributed to the growth of SMEs, which enjoyed the opportunities of using digital platforms and going global.

Trade Digitization in Nigeria

Nigeria has developed the Nigeria Single Window Trade Portal with a view to easing the trading procedures and to remove the bureaucratic bottlenecks for the traders. Ogunlesi (2023) found that the portal in addition to transparency, reduced corruption, and improved trade efficiency. The digitalization of the trade processes was aimed at increasing the trade volumes, attracting more foreign capital, and encouraging the economic growth of the country.

The results of such trade digitalization projects are the raise of bilateral flows of trade, economic growth and regional integration. The abolishment of the trade barriers and the raising of the transparency level from the other countries will provide them with more foreign investment and larger trading relationships. In accordance with the research, the digitization of trade measures of OIC member countries were found to be correlated to the rise in trade volumes. In addition, the geographical location of the country influenced by the development of digital trading increased the competitiveness of the OIC countries in the world markets and reduced their dependence on the traditional routes of trade.

Despite the fact that the literature has extensively covered trade digitization among OIC countries, there are some areas that still need to be addressed. One of the areas is the investigation of the different impacts of trade digitization on the various sectors and industries in OIC countries. Although some studies have focused on the overall trade flows, there is almost no research on the effect of digitalization on sectors like agriculture, manufacturing, and services. Besides, there is a necessity for further research into the socio-economic consequences of trade digitization, such as its impact on the income distribution, employment patterns, and social inclusion in OIC countries. The knowledge of how digitization affects these socioeconomic factors is vital for the making of

the inclusive policies that will be beneficial to all the segments of the society. Future research directions should also be comparative analyses of OIC countries' trade digitization strategies and outcomes, taking into account their different institutional, regulatory, and technological contexts. By filling these gaps, researchers can improve the understanding of the complex effects of the trade digitization. Thus, they can support the evidence-based policymaking that will lead to the inclusive and sustainable economic development of the OIC bloc.

2.7. Theoretical Framework

The theoretical framework of the gravity trade model is based on the idea that economic size and distance between two groups have an effect on their bilateral trade flows. This model was first introduced by Walter Isard in 1954, and this model predicts the trade flows based on these key factors. The basic form of the model is represented by the equation:

$$F_{ij} = G.\frac{M_i M_j}{D_{ij}}$$

In this equation, Fij denotes the trade flow between two countries (i and j), G is the constant and D stands represents the distance between two countries. M represents the economic sizes of the countries bring measured. This model has been widely used by the economists to analyze the determinants of bilateral trade flows, including factors like common borders, languages, legal systems, currencies, colonial legacies, and the effectiveness of trade agreements and organizations such as NAFTA and the WTO.

The gravity model has also been applied to a variety of other bilateral flow issues beyond trade, including migration, tourism, remittances, and FDI Economists such as James Anderson and Jeffrey Bergstrand developed economic models based on the gravity model to measure the benefits of trade liberalization and the impact of border barriers on trade. This theoretical framework combines economic theory with empirical research, providing insights into the patterns and determinants of international trade flows.

In order to analyze how digital trade facilitation measures influence the bilateral trade flows, we have incorporated digital trade facilitation measures of UN global survey as independent variable and exports act as dependent variable. All of the other variables show below are control variables. The theoretical framework can be presented in a diagram as:

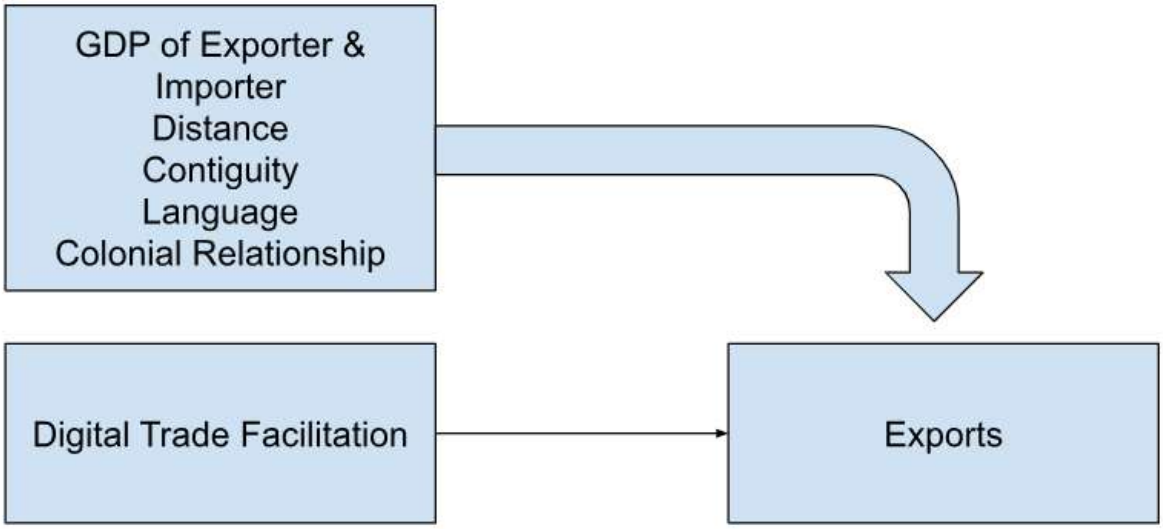

Fig 1.3 Proposed Research Model

GDP of Importer & Exporter

The Gross Domestic Product (GDP) of an importer and exporter refers to the entire cost of products and services produced in the domestic limitations.

In the gravity model of international trade, the relationship between imports, exports, and trade facilitation to GDP is important. The gravity model shows that trade between two countries is proportional to their size, measured by their GDP, and inversely proportional to the geographic distance between them. According to the gravity model, larger countries import and export more due to their economies larger. Furthermore, trade facilitation effects bilateral trade through a gravity model, where trade facilitation variables affect the volume of interstate trade hence have a gravitational effect in the lower-order model.

Distance

The gravity model of trade states that bilateral trade flows between two countries are positively related to their economic sizes (typically measured by GDP) and inversely related to the geographical distance between them.

The distance variable in the gravity model represents the physical or geographical distance between the trading partners. This distance is typically measured as the great-circle distance between the capital cities or economic centers of the two countries.

The gravity model suggests that the greater the distance between two countries, the higher the trade costs (such as transportation and communication costs) and the lower the bilateral trade flows between them. This is because distance acts as a proxy for various trade frictions, such as transportation costs, information costs, and cultural differences. Importantly, the distance coefficient in gravity model regressions has been found to be relatively stable over time, despite technological progress that has reduced average trading costs. This suggests that distance measures the relative unit transportation cost between short and long distances, rather than the absolute level of average transportation cost. Furthermore, the impact of distance on trade flows has been found to vary depending on the level of economic development. For developed countries, the negative impact of distance on trade has decreased over time, while for developing countries, the negative impact has increased. This indicates that the importance of distance as a trade barrier depends on the specific characteristics of the trading partners.

In summary, the gravity model shows that distance is a key determinant of bilateral trade flows, with trade being inversely related to the geographical distance between countries. The distance coefficient captures various trade frictions, and its magnitude and evolution over time depend on the characteristics of the trading partners.

Colony

The colonial relationship, within the context of the gravity model of trade, refers to the historical ties between a colonizing country and its colonies, where the colonizer often exerted control over the trade policies of the colonies. This relationship influenced trade patterns and export volumes between the colonizer and the colonized territories. In the gravity model of trade, the colonial relationship can impact exports in several ways: Colonies were often specialized in producing specific export commodities dictated by the colonizer's economic interests. This specialization influenced the composition of exports from colonies to the colonizing country. The colonial relationship often provided preferential market access for colonial exports to the colonizer, leading to higher export volumes from the colonies to the metropole. The establishment of transportation networks and trade routes by the colonizer facilitated the export of goods from the colonies to the

colonizing country, enhancing trade flows. The colonial relationship fostered cultural and linguistic ties between the colonizer and the colonies, which could have influenced trade patterns and export volumes. Moreover, colonies were often economically dependent on the colonizer for trade, leading to a significant portion of their exports being directed towards the metropole.

Language

Language, within the context of the gravity model of trade, plays a significant role in shaping export patterns between countries. The gravity model has been frequently used to estimate the impact of common language on bilateral trade, as countries sharing a common language are more likely to engage in trade due to reduced communication barriers and enhanced cultural understanding. Linguistic proximity between trading partners can influence the volume and direction of trade flows, with language acting as a facilitator for communication and enhancing trade relationships between countries. Research has shown that language can act as a driver of trade by influencing migration patterns and boosting trade volumes between countries, with the effect of linguistic proximity on trade flows being significant and shaping the economic interactions between nations. The relationship between language and exports is intertwined with migration patterns, as countries that share a common language may experience higher levels of migration, which in turn can impact trade relationships between nations.

Chapter 3

Research Methodology

3.1. Introduction

This research methodology chapter describes the systematic process undertaken to collect, analyze, and interpret data for the study. It serves as a guide, outlining the selected techniques and providing evidence for their appropriateness in addressing the research objectives. This chapter details the research philosophy, research approach, sample size, sampling technique, econometric approach and data sources for this study.

3.2. Research Philosophy

A research philosophy refers to the beliefs, assumptions, and principles that underpin the researcher's approach to study. It includes the researcher's basic ideas about how to gather, analyze and use knowledge, facts, and information about a phenomenon Research philosophy guides the entire research process, including research design, data collection methods and data including the data analysis methods used in the study It includes the overall research process which continues to draw conclusions. There are several research philosophies i.e. positivism, interpretivism, pragmatism and realism. Positivism is associated with quantitative methods of the research. This philosophy believes that there is an objective reality that can be analyzed scientifically. Positivists base their theories on the empirical data and they use scientific methods such as hypothesis testing and statistical analysis to study social phenomena. Interpretivism is associated with qualitative methods of research. This philosophy does not believe in objective reality and emphasizes that reality is based upon the personal perceptions and cultural norms. The methods of this research involve participant observations, interviews and ethnographic studies to gain insights into human behavior and social interactions. Pragmatism integrates elements of both positivism and interpretivism, emphasizing practicality and the use of methods that are most effective in addressing specific research questions. Philosophy of realism refers to an approach that asserts the existence of entities beyond human perception or interpretation. It expresses the idea that there is an objective reality that exists irrespective of what is observed or perceived.

The present research is based upon the philosophy of positivism. This is entirely justifiable as the study believes on objective reality and adopts a quantitative approach to analyze the relationship between its dependent and independent variables.

3.3. Research Approach

The concept of research method refers to the systematic and methodological process of collecting, analyzing, and interpreting data to solve a research problem This type of research includes methods and techniques for investigating a particular phenomenon or issue. There are two main research approaches being used: quantitative research and qualitative research. Quantitative research involves the collection and analysis of statistical data to explain, predict, or control the variables of interest. It focuses on the measurement of variables, the testing of causal relationships, and the presentation of numerical data using statistical methods. Quantitative data are objective, empirical, and statistically measured, and are often used to test hypotheses, identify patterns, and make predictions. On the other hand, qualitative research focuses on understanding human behavior, experiences and perceptions through non-statistical methods of data collection such as interviews, observations and case studies. It attempts to delve into ideas and experiences, offering rich and comprehensive insights into the realities of life. Qualitative data are descriptive and not quantitative, collected through methods such as interviews, focus groups, and ethnographies. This research method is used to understand subjective experiences, attitudes and behaviors, with the aim of providing detailed explanations and revealing new insights and understandings.

In the context of present study, the research approach being used is quantitative as it deals with the numerical data to identify the impact of digital trade facilitation measures (digitization) on the bilateral trade flows of the OIC countries.

3.4. Population and Sample size

There are 57 member countries in the Organization of Islamic Cooperation (OIC). Out of these 57 countries our sample size consists of 39 OIC countries. These countries are selected because of the availability of trade data. The data is selected biennially for the years 2017, 2019 and 2021 for our empirical analysis.

3.5. Sampling Technique

Sampling techniques are methods used to select a subset of individuals or observations from a larger population to conclude characteristics about the entire population. The choice of sampling

techniques is important in research and statistics because they allow for the collection and analysis of data without needing to study the whole population thus saving time and resources. Sampling techniques are broadly classified into two categories; probability and non-probability sampling. Probability sampling is further divided into four types. Simple random sampling allows an equal chance for each member of the population to be selected. Systematic sampling is where samples are selected after regular intervals after a random start. Stratifies sampling is about classifying the whole population into groups or strata and then randomly choosing from each stratum to ensure that each subgroup is represented into the sample. At last, there is cluster sampling where whole population is divided into clusters and then clusters are randomly selected for research purposes. All individuals are studies into chosen clusters.

The second category that is non probability sampling does not involve random selection hence every individual does not have a chance of selection. This is also further classified into four types. First is convenience sampling where individuals are selected based upon the ease of access or the ones that are readily available. Second is judgmental sampling where the sample is chosen based upoin the judgement of researcher. The researcher choses those individuals that he thinks would be most beneficial to the study. Third type is quota sampling in which population is divided based on certain quota making sure that certain characteristics are represented in the sample. At last, there is snowball sampling technique where population is hard to reach and existing research subjects refer to the individuals that meet the research criteria.

In the present study, we have used convenient sampling and we have selected 39 OIC countries for our research purpose. The selection is based upon the availability of data. Out of 57 OIC countries, the trade data was only available for these 39 selected countries. (See annex for list of the selected countries)

3.6. Data sources

For empirical estimation trade data is extracted from International Trade and Production Database for Estimation (ITPD-E) because of its inclusion of both international and intra-national trade flows (Borchert, Larch, Shikher, and Yotov (2021) and Borchert, Larch, Shikher, and Yotov (2022)). Mario Larch's regional trade agreements database is referred to gain information related to EIAs. The remaining data for other variables is retrieved from e-Center for Prospective Studies

and International Information (CEPII); for reference, see Mayer, Gopinath, Helpman, Rogoff, et al. (2014)

3.7. Empirical estimation approach

Analogical to the Newtonian gravitation law, gravity trade model is origin-destination flow model which estimate bilateral trade flows encompassing factors related to exporting country, importing country, and the bilateral factors between the trading partners. We stepwise construct our gravity trade model starting with a general form presented below.

$$X_{ij} = \frac{1}{Y} \frac{Y_i E_j}{\left[\tau_{ij}/\left(\Pi_i P_j\right)\right]^{\sigma-1}} \quad (1)$$

In the equation, Xij is the bilateral exports between countries i and j; Y is the world's aggregate production; Yi is domestic production of country i; and Ej is expenditure of country j; whereas τij represents the bilateral trade costs between the country pair i and j, these costs are associated with several geographic and trade policy variables, such as tariffs, bilateral distance, and presence of regional trade agreements. Anderson and Van Wincoop (2003) coined Πi as outward multilateral resistance and Pj as the inward multilateral resistance. Outward multilateral resistance means the resistance faced by the exports from i to j relative to other export destinations. Similarly, the inward multilateral resistance denotes the resistance faced by country j importing from i relative to other source countries.

Inclusion of time dimension and log-transformation of the above equation yields the following most commonly used empirical equation of the gravity trade model.

$$\ln X_{ijt} = \ln E_{jt} + \ln Y_{it} - \ln Y_t + (1-\sigma) \ln \tau_{ijt} - (1-\sigma) \ln \Pi_{it} + (1-\sigma) \ln P_{jt} + \varepsilon_{ijt} \quad (2)$$

However, there are some challenges in the empirical estimation of this model: estimation of the multilateral resistance terms, dealing with the zero trade flows, and existence of heteroscedasticity of trade data. First, the theoretical constructs Πit and Pjt are are not directly observable. Based on the developments such as s Head, Mayer, and Ries (2010); Novy (2013); Olivero and Yotov (2012), the current structural gravity equation including exporter-time fixed effects and importer-time fixed effects. However, the exporter-time (and importer-time) fixed effects absorb country-specific time-variant variables such as GDP, exchange rate, and other national policies.

Latest development in gravity model includes Heid, Larch, and Yotov (2021) which offer a novel way to model country-specific policy variable i.e., as an interaction with a dummy variable for international trade. Following the same strategy Beverelli, Keck, Larch, and Yotov (2018) estimated the effect of institutional quality on bilateral trade. These models, however, require inclusion of intra-national flows (where i=j) in additional to international trade (where i≠j). Yotov (2022) has greatly emphasized the inclusion of intranational in the state of the art gravity model approach.

$$X_{ijt} = \exp[\alpha_{it} + \beta_{jt} + \gamma_1 INTL_{ij} + \gamma_2(INTL_{ij} \times DTF_{it}) + \delta_1 lnDistance_{ij} + \delta_2 RTA_{ijt} + \delta_3 Colony_{ij} + \delta_4 Language_{ij} + \delta_5 Contiguity_{ij}] \times \varepsilon_{ijt} \quad (3)$$

$$X_{ijt} = \exp[\alpha_{it} + \beta_{jt} + \gamma_1 INTL_{ij} + \gamma_2(INTL_{ij} \times DTFpl_{it}) + \gamma_3(INTL_{ij} \times DTFcb_{it}) + \delta_1 lnDistance_{ij} + \delta_2 RTA_{ijt} + \delta_3 Colony_{ij} + \delta_4 Language_{ij} + \delta_5 Contiguity_{ij}] \times \varepsilon_{ijt} \quad (4)$$

The dependent variable is exports of an origin i to a destination j during year t. Note that the variable is taken in levels which allows inclusion of the cases of zero exports between the country-pairs. The main variable of interest, DTFit is the index of digital trade facilitation which enters into the equation as an interaction with the border dummy, INTLij. This allows to estimate the effect of language commonality with respect to international trade flows compared to intra-national trade. In equation (4), we split the digital trade facilitation into its two components: $DTFpl_{it}$ denotes digital facilitation through paperless trade measures; and $DTFcb_{it}$ for the cross-border digital facilitation.

On the right-hand side, first two terms capture exporter-time fixed effects and importer-time fixed effects, respectively. The bilateral distance in logarithmic form between country-pairs is denoted by lnDistanceij. The variable RTAijt denotes the existence of an economic integration agreement such as a free trade agreement between the country-pair. Next, three bilateral time-invariant variables Colonyij, Contiguityij, and Languageij are dummy variables to record colonial relationships, shared border and language commonality between trading countries respectively.

Pertaining to computation, Poison pseudo maximum likelihood (PPML) is preferred estimator compared to ordinary least square (Silva & Tenreyro, 2006, 2011); and its recent version Poisson

pseudo maximum likelihood with high-dimensional fixed effects (Correia, Guimarães, & Zylkin, 2020) offers solution the non-existence problem (Silva & Tenreyro, 2022).

Trade facilitation measures are taken from the UN Global Survey on Digital and Sustainable Trade Facilitation. Various measures of digital trade facilitation have been divided into two main groups: paperless trade, and cross-border paperless trade facilitation. The degree of implementation of these measures in the survey is denoted as: no implementation (0); pilot implementation (1); partial implementation (2); and full implementation (3). In this study we have formulated our measure of trade facilitation as: $(\sum_{i}^{m} Q_i /3m) \times 100$ where Q_i is the score for ith measure, and m is the total number of measures in the category.

Chapter 4

Results and Findings

4.1. Descriptive Analysis

Table 1 presents descriptive statistics. Trade values are measured in billion US$, including both international trade and intranational trade flows. The indicated by the tables, occurrence of zero trade flows are included. Trade facilitation can be as low as 0% for instance for Iraq. Bilateral distance between country pairs is in kilometers (log-transformed). Other variables are binary in nature. For instance, Contiguity is equal to 1 if country pair share border. Similarly, language and colonial relationships between trading partners are entered as binary dummies. RTA denote membership to a custom union or existence of free trade area between the country pair.

Table 1: Descriptive Statistics

Variable	Units	Mean	Std. dev.	Min	Max
Trade (total)	Billion US$	496.39	5542.49	0.00	356881.80
Trade (mining)	Billion US$	87.03	1322.13	0.00	79142.29
Trade (manufacturing)	Billion US$	345.87	3660.03	0.00	232782.80
Trade (agriculture)	Billion US$	63.48	1545.81	0.00	105788.50
DTF	Percentage	42.76	23.47	0.00	91.11
DTFpl	Percentage	53.06	26.15	0.00	100.00
DTFcb	Percentage	27.30	22.84	0.00	94.44
lnDistance	KM (log)	8.66	0.77	1.61	9.88
RTA	0/1	0.11	0.31	0	1
Contiguity	0/1	0.02	0.13	0	1
Language	0/1	0.08	0.27	0	1
Colony	0/1	0.01	0.09	0	1

Note: Total observation N= 14810.

Trade (total) has a mean of 496.39 billion US$ and a standard deviation of 5542.49 billion US$. This indicates a very high variability in total trade values. Trade (mining) has a mean of 87.03 billion US$ and a standard deviation of 1322.13 billion US$. Again, a high variability in mining trade. Trade (manufacturing) has a mean of 345.87 billion US$ and a standard deviation of 3660.03

billion US$. High variability in manufacturing trade. Trade (agriculture) has a mean of 63.48 billion US$ and a standard deviation of 1545.81 billion US$. High variability in agriculture trade. DTF has a mean of 42.76% and a standard deviation of 23.47%. Moderate variability in DTF scores. DTFpl has a mean of 53.06% and a standard deviation of 26.15%. Moderate variability in DTFpl scores.

DTFcb has a mean of 27.30% and a standard deviation of 22.84%. Moderate variability in DTFcb scores. lnDistance (log of distance) has a mean of 8.66 km and a standard deviation of 0.77 km. Low variability in logged distance values. The binary variables RTA (Regional Trade Agreement), Contiguity, Language, and Colony have means close to 0 and standard deviations around 0.1-0.3, indicating low variability as most values are 0. In summary, the trade variables show high variability around their means, the DTF variables show moderate variability, lnDistance shows low variability, and the binary variables show low variability. The standard deviation provides a standardized measure of dispersion for each variable.

4.2. Correlation Analysis

Table 2 represents the correlation between the variables:

Table 2: Correlation Analysis

	trdtot	trdagr	trdmae	dgt	dgtpl	dgtcb	cntg	lndistw	lang	col
trdtot	1.00									
trdagr	0.62	1.00								
trdmae	0.83	0.35	1.00							
dgt	0.00	-0.05	-0.03	1.00						
dgtpl	0.00	-0.05	-0.03	0.97	1.00					
dgtcb	0.02	-0.03	-0.01	0.91	0.78	1.00				
cntg	0.03	0.00	0.01	-0.01	-0.01	-0.01	1.00			
lndistw	-0.14	-0.11	-0.11	0.09	0.11	0.05	-0.30	1.00		
lang	0.01	-0.01	-0.01	-0.05	-0.06	-0.03	0.10	-0.14	1.00	
col	0.01	0.00	0.00	0.03	0.02	0.04	0.09	-0.04	0.17	1.00

The correlation table shows relationships among various trade and geographic variables. Total trade (trdtot) is strongly correlated with trade in agricultural goods (trdagr, 0.62) and manufactured goods (trdmae, 0.83). Geographical distance-related variables (dgt, dgtpl, dgtcb) have high inter-correlations (0.91 to 0.97) but low correlations with trade variables. Sharing a border (cntg) and a common language (lang) show minimal correlation with trade variables but a slight positive correlation with each other (0.10). Historical colonial relationships (col) have low correlations across all variables, with the highest being with common language (0.17).

4.2. Regression Analysis

In Table 3 regression estimates are represented for the effect of digital trade facilitation on aggregate exports. Looking at the control variables, signs of all coefficients are as expected. For instance, bilateral trade decrease with the increasing geographic distance between the trading partners. On the other hand, country pairs with common language, colonial relationships, or having shared borders (contiguity) trade more. Lastly, compared to domestic sales, international trade face friction due to border procedures, as shown by the coefficient of INTL.

Concerning the digital TF measures, we find positive and statistically significant effect on total trade of the OIC countries. More precisely, a 1 percent change in the TF measure results in 0.036 percent change in the trade. In other words, implementing all TF measure, that is a 100 percent improvement in the TF coverage would result in a 3.6 percent increase in bilateral trade. When distinguishing between paperless and cross border paperless TF measure, the trade facilitation role of the latter is evidenced.

Table 3: Effect of digital trade facilitation (Aggregate trade)

	Total Trade	
	(2)	(1)
DTF	0.036***	
	(0.008)	
DTFpl		0.003
		(0.007)
DTFcb		0.043***
		(0.008)
lnDistance	-0.481***	-0.524***
	(0.065)	(0.063)
RTA	0.379***	0.396***
	(0.107)	(0.103)
Colony	0.586***	0.646***
	(0.164)	(0.168)
Language	0.345***	0.218*
	(0.121)	(0.124)
Contiguity	0.265*	0.223
	(0.141)	(0.137)
INTL	-5.082***	-4.654***
	(0.571)	(0.556)
α_{it}, β_{jt}	Yes	Yes
N	14,810	14,810

Notes: The value of dependent variable, trade, is expressed in millions of United States dollars. Exporter-time and importer-time fixed effects are included but not reported for brevity. Robust standard errors in parentheses are clustered over country pairs. Statistical significance is indicated as *** p<0.01, ** p>0.05, * p>0.1.

As most of the OIC nations are heavily dependent of exports of mining sectors e.g., fuels and other minerals. We analyzed the effect of digital TF measures separately for trade in mining sectors and

other goods. The estimates are presented in Table 3. First thing to notice is that the DTF effect is almost comparable for both mining and non-mining trade. Second, the effect of both paperless, and cross-border DTF measure is positive and statistically significant for the non-mining trade. Additionally, the effect of control variables is as theoretical expectation.

The findings of Table 4 imply that digitizing trade procedures to reduce time and cost of trading process would help exports more. In this way, this is particularly important for countries with high export concentration for fewer goods.

Table 4: Effect of digital trade facilitation (Mining and Non-mining trade)

	Mining		Non-Mining	
	(1)	(2)	(3)	(4)
DTF	0.056***		0.050***	
	(0.013)		(0.008)	
DTFpl		0.049***		0.016***
		(0.018)		(0.005)
DTFcb		0.003		0.040***
		(0.020)		(0.009)
lnDistance	-0.446***	-0.424***	-0.525***	-0.554***
	(0.109)	(0.108)	(0.066)	(0.063)
RTA	1.308***	1.331***	0.459***	0.466***
	(0.185)	(0.188)	(0.097)	(0.094)
Colony	0.561	0.547	0.528***	0.564***
	(0.426)	(0.427)	(0.163)	(0.165)
Language	-0.034	0.022	0.496***	0.407***
	(0.251)	(0.250)	(0.125)	(0.123)
Contiguity	-0.027	-0.024	0.369**	0.341**
	(0.305)	(0.309)	(0.144)	(0.140)
INTL	-8.514***	-8.982***	-5.718***	-5.334***

	(0.863)	(1.024)	(0.487)	(0.439)
α_{it}, β_{jt}	Yes	Yes	Yes	Yes
N	14,810	14,810	14,810	14,810

Notes: The value of dependent variable, trade, is expressed in millions of United States dollars. Exporter-time and importer-time fixed effects are included but not reported for brevity. Robust standard errors in parentheses are clustered over country pairs. Statistical significance indicated as *** p<0.01, ** p>0.05, * p>0.1.

To dig further into this scenario, we plot export diversification of the OIC countries against the share of mining sector in their total exports, Figure 3. Note that the data on export diversification is taken from United Nations Conference on Trade and Development while the share of mining is calculated based on the trade data from the ITPDE database. As shown by the figure, some countries including Turkey, Indonesia, Pakistan, and Malaysia have relatively diversified exports. On the other hand, countries such as Iraq, Azerbaijan, and Yamen, among others, are highly dependent on exports of fuel and other mining products. TF measure for these countries can promote exports of non-mining goods, thus help diversify their exports.

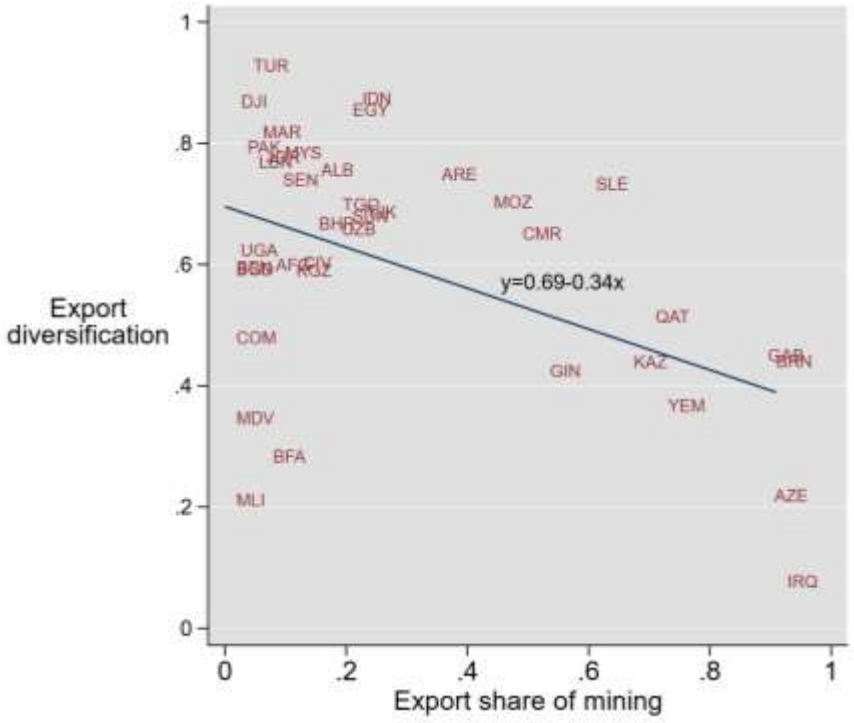

Figure 4: Dependence on mining sector and export diversification

Going further, we segregate the non-mining trade in the manufacturing and agriculture sectors, in Table 5. Apart from the TF measure, the effect of distance and border effect are stronger for agricultural trade which can be attributed to the perishable nature of products such as fruits and vegetables. Pertaining to the TF measure, the estimates show positive and statistically significant trade effect for both manufacturing and agricultural exports, however, the effect is more pronounced for the former. While paperless TF measures are found to encourage manufacturing trade, the effect of cross-border TF measures is seen for both of the sectors.

Table 5: Effect of digital trade facilitation (Manufacturing and agricultural trade)

	Manufacturing		Agriculture	
	(1)	(2)	(3)	(4)
DTF	0.047***		0.022***	
	(0.009)		(0.005)	
DTFpl		0.024***		0.006
		(0.009)		(0.005)
DTFcb		0.024**		0.022***
		(0.012)		(0.007)
lnDistance	-0.544***	-0.550***	-0.676***	-0.700***
	(0.077)	(0.074)	(0.098)	(0.099)
RTA	0.454***	0.456***	0.321**	0.319**
	(0.108)	(0.107)	(0.141)	(0.140)
Colony	0.717***	0.723***	0.252	0.273
	(0.183)	(0.184)	(0.288)	(0.280)
Language	0.407***	0.387***	0.225	0.180
	(0.151)	(0.144)	(0.164)	(0.163)
Contiguity	0.422***	0.416***	0.321	0.305
	(0.153)	(0.151)	(0.198)	(0.193)
INTL	-4.992***	-4.895***	-5.683***	-5.514***
	(0.573)	(0.563)	(0.467)	(0.466)
α_{it}, β_{jt}	Yes	Yes	Yes	Yes
N	14,810	14,810	14,810	14,810

Notes: The value of dependent variable, trade, is expressed in millions of United States dollars. Exporter-time and importer-time fixed effects are included but not reported for brevity. Robust standard errors in parentheses are clustered over country pairs. Statistical significance is indicated as *** p<0.01, ** p>0.05, * p>0.1.

Chapter 5

Discussion and Conclusion

5.1. Discussion

The present study investigates the effect of digital trade facilitation (DTF) on bilateral trade flows among OIC countries for the years 2017, 2019, and 2021. By employing a structural gravity model with a Poisson pseudo maximum likelihood estimator, we were able to quantify the impact of digital TF measures on aggregate exports. The findings reveal substantial trade gains attributable to digitization and cross-border paperless trade facilitation measures. Specifically, the results show that a 1 percent improvement in digital TF measures leads to a 0.036 percent increase in total trade, implying that a full implementation of these measures could boost bilateral trade by 3.6 percent. The analysis also distinguishes between the effects of paperless and cross-border paperless TF measures, highlighting a more pronounced facilitative role of the latter. This positive influence is particularly evident in non-mining trade and exhibits sectoral variations, with manufacturing trade benefiting more significantly than agricultural trade.

The positive relationship between digital TF measures and trade flows underscores the critical role of digitization in enhancing trade efficiency and reducing transaction costs. The significant coefficients of digital TF measures affirm the hypothesis that digitizing trade processes can streamline operations, reduce delays, and lower the costs associated with international trade. This is particularly important for OIC countries, where traditional trade processes often face significant bureaucratic hurdles and inefficiencies.

The differentiated impacts of paperless and cross-border paperless TF measures suggest that while digitization within countries is beneficial, the elimination of cross-border procedural bottlenecks is even more crucial. Cross-border paperless trade facilitation addresses the complexities and delays at the border, which are often significant impediments to international trade. By facilitating smoother, quicker, and more transparent border processes, these measures enhance the overall trade environment, making it easier for countries to engage in bilateral trade.

Our findings align well with existing literature that emphasizes the role of trade facilitation in promoting international trade. For instance, Wilson et al. (2005) found that trade facilitation measures significantly increase trade flows in Asian countries by reducing transaction costs and

improving efficiency. Similarly, our results corroborate the conclusions of Freund and Rocha (2011), who highlighted the importance of efficient border management in Africa. The substantial positive effects of digital TF measures in our study mirror these findings, suggesting that efficient and transparent trade processes are universally beneficial.

However, our results diverge from some studies that have found negligible effects of digital measures in less developed contexts. For example, Busse et al. (2012) reported that digital trade facilitation had limited impact in Sub-Saharan Africa due to inadequate digital infrastructure and lower levels of institutional readiness. In contrast, the significant benefits observed in our study indicate that OIC countries might possess better digital infrastructure or have made more concerted efforts towards digitization, thus reaping greater benefits from these measures. This suggests a potential pathway for other developing regions to follow, emphasizing the importance of investing in digital infrastructure and enhancing institutional capacities to fully leverage the benefits of digital trade facilitation.

5.2. Conclusion

In conclusion, the study highlights the significant positive impact of digital trade facilitation on bilateral trade flows among OIC countries using a gravity trade model. The gravity model, a staple in international trade analysis, posits that trade flows between two countries are directly proportional to their economic sizes (often measured by GDP) and inversely proportional to the distance between them. By incorporating TF measures into this model, the study sheds light on how simplifying and improving customs procedures can significantly boost trade activities. The findings advocate for increased investment in digital infrastructure and cross-border paperless trade measures to enhance trade efficiency and economic diversification.

The findings from the study highlight that the implementation of digital TF measures leads to a notable increase in the overall trade of goods, encompassing both manufactured and agricultural products. These measures include efforts to streamline, standardize, and digitize customs procedures, which collectively play a pivotal role in promoting the active participation of nations in the global trade network. Such improvements facilitate the integration of these countries into global value chains, where components of products are produced in different countries before being assembled into final goods.

One of the key mechanisms driving this expansion of trade is the reduction in time and cost associated with cross-border transactions. Simplified customs procedures mean that goods can move more quickly and with fewer bureaucratic hurdles, reducing delays that can be costly for exporters and importers alike. This efficiency gain is crucial, as it makes products from these countries more competitive in the global market by lowering the costs associated with trading. Additionally, enhanced transparency in trading processes, brought about by standardized and digitized customs procedures, helps to build trust among trading partners. Trust is a critical component in international trade, as it reduces the perceived risk of trading and encourages more business transactions.

The study underscores the relative importance of these mechanisms and suggests that they warrant further exploration. Understanding the specific contributions of time and cost reductions versus transparency improvements can help policymakers design more effective TF measures tailored to the unique needs of their countries.

Furthermore, the article notes that policy measures aimed at strengthening electronic infrastructure, with a particular focus on minimizing human interaction, will be crucial in mitigating the disruptive effects of future pandemics on trade flows. The COVID-19 pandemic highlighted the vulnerabilities of traditional trade systems that rely heavily on human presence and manual processes. By investing in electronic infrastructure, countries can ensure that their trade operations are more resilient to such disruptions, maintaining smoother trade flows even during crises.

The article also emphasizes the specific benefits of TF measures for countries in the Organization of Islamic Cooperation (OIC), many of which are heavily dependent on exports from the mining sector, such as fuels and other minerals. For these countries, TF measures can promote the export of non-mining goods, thus helping to diversify their export portfolios. Diversification is critical for economic stability, as it reduces dependence on a single sector and spreads risk across multiple industries. By improving customs procedures and reducing trade barriers, these countries can open up new opportunities for exporting manufactured goods and agricultural products, fostering economic growth and resilience.

In conclusion, this study provides compelling empirical evidence that trade facilitation measures significantly enhance the trade performance of OECD countries and offers valuable insights into

the mechanisms driving this improvement. By focusing on reducing trade costs, improving transparency, and strengthening electronic infrastructure, countries can better integrate into global trade networks and diversify their economies, making them more resilient to future challenges.

5.3. Practical implications

The findings from this study have several important implications for policymakers and stakeholders in OIC countries. Theoretically, they validate the structural gravity model as an effective tool for understanding trade flows and the significant role of digital infrastructure in trade facilitation. This contributes to the broader literature on trade economics by providing empirical evidence on the impact of digital trade facilitation measures.

Practically, the results advocate for increased investment in digital trade facilitation initiatives. Policymakers should prioritize the implementation of both paperless and cross-border paperless trade measures to enhance trade efficiency and competitiveness. The significant positive impact on non-mining trade highlights an opportunity for economic diversification. For countries heavily reliant on mining exports, promoting digital TF measures can facilitate the trade of non-mining goods, thereby diversifying their export base. This diversification is crucial for economic resilience and sustainable development, reducing dependency on volatile commodity markets and fostering broader economic growth.

The sectoral analysis reveals that while both manufacturing and agricultural sectors benefit from digital TF measures, the impact is more pronounced for manufacturing trade. This suggests that countries such as Yemen and Iran aiming to boost their manufacturing exports should focus on implementing comprehensive digital trade facilitation strategies. For the agricultural sector, addressing the challenges posed by geographic distance and border procedures is essential due to the perishable nature of agricultural products. Streamlining these processes can significantly enhance the competitiveness of agricultural exports.

5.4. Limitations

Despite the robust findings, this study has several limitations that need to be acknowledged. First, the analysis is based on the UN Global Survey on Digital and Sustainable Trade Facilitation. The survey's biennial nature also means that some changes in trade facilitation practices might not be immediately reflected in the data.

Second, the study focuses exclusively on OIC countries, which may limit the generalizability of the results to other regions. The unique economic, political, and social contexts of OIC countries might influence the effectiveness of digital trade facilitation measures differently compared to other regions.

Third, while the fixed-effects model used in this study controls for unobserved heterogeneity, it might not capture all dynamic aspects of trade facilitation and economic conditions over time. Future studies could employ dynamic panel models to address this limitation and provide a more nuanced understanding of the temporal effects of digital TF measures.

5.5. Future Research Directions

Future research should aim to address these limitations by incorporating more granular data and exploring the dynamic effects of digital TF measures over a longer period. Longitudinal studies can provide deeper insights into the long-term impacts of these measures and the time it takes for their benefits to materialize fully. Additionally, investigating the specific components of digital trade facilitation that drive the most significant trade gains could provide more actionable insights for policymakers.

Comparative studies across different regions or income groups could enhance the understanding of contextual factors influencing the effectiveness of digital TF measures. For instance, examining the role of digital trade facilitation in fostering trade in other developing regions, such as Sub-Saharan Africa or Latin America, could offer valuable lessons and best practices.

Further research could also explore the role of digital trade facilitation in fostering sustainable trade practices and environmental outcomes. As digital measures streamline trade processes and reduce the need for physical documentation, they can potentially lower the environmental footprint of trade activities. Investigating these aspects can contribute to the broader agenda of sustainable development and trade.

References

Aassouli, D. and Ahmed, H., 2023. Supporting SMEs financial resilience during crises: A framework to evaluate the effectiveness of financial literacy programs targeting SMEs. Malaysian Journal of Economic Studies, 60(1), pp.105-121.

Abendin, S., Pingfang, D., & Nkukpornu, E. (2022). Bilateral trade in west Africa: Does digitalization matter? The International Trade Journal, 1–25.

Ahmed, U., 2019. The Importance of cross-border regulatory cooperation in an era of digital trade. World Trade Review, 18(S1), pp.S99-S120.

Ali, M., Anwar, U., Khattak, M. A., & Islam, M. U. (2024). Digitalization and Economies of OIC Countries. Bulletin of Monetary Economics and Banking, 27, 155-170.

Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. American Economic Review, 93(1), 170–192.

Annual Report on Investment Climate and Opportunities in OIC Countries. (2022). Available at: https://www.isdb.org/sites/default/files/media/documents/2022-12/Final%20OIC%20Investment%20report%202022-digit-2%20%281%29.pdf.

Asif, M., Yang, L. and Hashim, M., 2024. The role of digital transformation, corporate culture, and leadership in enhancing corporate sustainable performance in the manufacturing sector of China. Sustainability, 16(7), p.2651.

Auboin, M., Koopman, R. and Xu, A., 2021. Trade and innovation policies: Coexistence and spillovers. Journal of Policy Modeling, 43(4), pp.844-872.

Beverelli, C., Keck, A., Larch, M., & Yotov, Y. V. (2018). Institutions, trade and development: A quantitative analysis.

Borchert, I., Larch, M., Shikher, S., & Yotov, Y. V. (2021). The international trade and production database for estimation (ITPD-E). International Economics, 166, 140–166.

Borchert, I., Larch, M., Shikher, S., & Yotov, Y. V. (2022). The international trade and production database for estimation-release 2.

Chetty, K., Qigui, L., Gcora, N., Josie, J., Wenwei, L. and Fang, C., 2018. Bridging the digital divide: measuring digital literacy. Economics, 12(1), p.20180023.

Correia, S., Guimarães, P., & Zylkin, T. (2020). Fast Poisson estimation with high-dimensional fixed effects. The Stata Journal, 20(1), 95–115.

Dahabiyeh, L. and Constantinides, P., 2022. Legitimating digital technologies in industry exchange fields: the case of digital signatures. Information and Organization, 32(1), p.100392.

Dahlman, C., Mealy, S., & Wermelinger, M. (2016). Harnessing the Digital Economy for Developing Countries. Paris: OECD. http://www.oecd-ilibrary. org/docserver/download/4adffb24-en.pd

De Castro, A. B. R., Kornher, L., et al. (2022). The effect of trade and customs digitalization on agri-food trade: A gravity approach. In 2022 Annual Meeting, July 31-August 2, Anaheim, California.

Demertzi, V., Demertzis, S. and Demertzis, K., 2023. An overview of cyber threats, attacks and countermeasures on the primary domains of smart cities. Applied Sciences, 13(2), p.790.

Duval, Y., Utoktham, C. and Kravchenko, A (2018)."Impact of implementation of digital trade facilitation on trade costs", ARTNeT Working Paper Series, No. 174, January 2018, Bangkok, ESCAP.

Engstrom, D.F., Ho, D.E., Sharkey, C.M. and Cuéllar, M.F., 2020. Government by algorithm: Artificial intelligence in federal administrative agencies. NYU School of Law, Public Law Research Paper, (20-54).

ESCAP. (n.d.). Digitalization for Sustainable Trade Facilitation in OIC Asian Countries. [online] Available at: https://www.unescap.org/events/2024/digitalization-sustainable-trade-facilitation-oic-asian-countries [Accessed 15 May 2024].

Fahlevi, M., Asdullah, M.A., Raza, F.A., Watto, W.A., Aljuaid, M. and Aziz, A.L., 2024. The influence of information and communication technology on trade in developing countries and partners. Cogent Business & Management, 11(1), p.2320814.

González, J.L. and Ferencz, J., 2018. Digital trade and market openness.

Grainger, A. (2007, June). Trade facilitation: A review. In a conference on Global supply chain security at Imperial College, London.

Hanna, N., 2018. A role for the state in the digital age. Journal of Innovation and Entrepreneurship, 7(1), p.5.

Hanna, N.K., 2020. Assessing the digital economy: aims, frameworks, pilots, results, and lessons. Journal of Innovation and Entrepreneurship, 9(1), p.16.

Hassan Khayat, S., 2019. A gravity model analysis for trade between the GCC and developed countries. Cogent Economics & Finance, 7(1), p.1703440.

Head, K., Mayer, T., & Ries, J. (2010). The erosion of colonial trade linkages after independence. Journal of international Economics, 81(1), 1–14.

Heid, B., Larch, M., & Yotov, Y. V. (2021). Estimating the effects of non-discriminatory trade policies within structural gravity models. Canadian Journal of Economics/Revue canadienne d'économique, 54(1), 376–409.

Imran, A., 2023. Why addressing digital inequality should be a priority. The Electronic Journal of Information Systems in Developing Countries, 89(3), p.e12255.

ISLAMIC DEVELOPMENT BANK. (2018). Available at: https://www.isdb.org/sites/default/files/media/documents/2018-12/IsDB-Annual%20Report-1423H.pdf.

Jayasooriya, S. (2021). ADBI Working Paper Series Bayesian gravity model for digitalization on bilateral trade integration in Asia. Asian Development Bank Institute. [online] Available at: https://www.adb.org/sites/default/files/publication/689146/adbi-wp1232.pdf.

Jayasooriya, S. (2021). Bayesian gravity model for digitalization on bilateral trade integration in asia.

Kasi, P.M.B., Shaharuddin, N.A.B. and Kechil, M.F.B.A., 2019. Opportunities of Islamic Trade Finance in OIC Countries. In Contemporary Management and Science Issues in the Halal Industry: Proceedings of the International Malaysia Halal Conference (IMHALAL) (pp. 395-410). Springer Singapore.

Majeed, M.T. and Ayub, T., 2018. Information and communication technology (ICT) and economic growth nexus: A comparative global analysis. Pakistan Journal of Commerce and Social Sciences (PJCSS), 12(2), pp.443-476.

Matthess, M. and Kunkel, S., 2020. Structural change and digitalization in developing countries: Conceptually linking the two transformations. Technology in society, 63, p.101428.

Mawardi, I., Al Mustofa, M.U., Widiastuti, T. and Ghozali, M., 2024. The Influence of Institutional Quality, Economic Freedom, and Technological Development on Islamic Financial Development in OIC Countries. Journal of Open Innovation: Technology, Market, and Complexity, p.100279.

Mayer, T., Gopinath, G., Helpman, E., Rogoff, K., et al. (2014). Gravity quations: Toolkit, cookbook, workhorse. Handbook of International Economics, 4, 1–14.

Mhlanga, D., 2021. Artificial intelligence in the industry 4.0, and its impact on poverty, innovation, infrastructure development, and the sustainable development goals: Lessons from emerging economies?. Sustainability, 13(11), p.5788.

Modugu, K.P. and Dempere, J., 2021. Globalization and foreign direct investment in the GCC countries: A recipe for post COVID-19 recovery. Modugu, Kennedy P. and Dempere, Juan M.(2021).“Globalization and Foreign Direct Investment in the GCC Countries: A Recipe for Post COVID-19 Recovery” Journal of Asian Finance, Economics, and Business, 8(9), pp.11-22.

Novy, D. (2013). Gravity redux: measuring international trade costs with panel data. Economic Inquiry, 51(1), 101–121.

Ogunlesi, C.D.C., 2023. Implementation of maritime single window: selected case studies.

Olivero, M. P., & Yotov, Y. V. (2012). Dynamic gravity: endogenous country size and asset accumulation. Canadian Journal of Economics/Revue canadienne d’économique, 45(1), 64–92.

Portugal-Perez, A., & Wilson, J. S. (2012). Export performance and trade facilitation reform: Hard and soft infrastructure. World Development, 40(7), 1295–1307.

Raimondi, B., 2023. Cross-Border ecommerce in selected asian and african countries: attractiveness for italian digital export companies.

Ramli, K., 2019. Indonesia's preparation for the digital economy and e-commerce: Infrastructure, regulatory, and policy development. In Developing the Digital Economy in ASEAN (pp. 139-157). Routledge.

Ruvoletto, R., 2023. Digitalization and Internationalization: An Analysis of the Impact of Digital Technologies on Export Management Practices.

Silva, J. S., & Tenreyro, S. (2006). The log of gravity. The Review of Economics and statistics, 88(4), 641–658.

Silva, J. S., & Tenreyro, S. (2011). Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator. Economics Letters, 112(2), 220–222.

Silva, J. S., & Tenreyro, S. (2022). The log of gravity at 15. Portuguese Economic Journal,1–15.

Sugandini, D., Purwoko, P., Pambudi, A., Resmi, S., Reniati, R., Muafi, M. and Adhyka Kusumawati, R., 2018. The role of uncertainty, perceived ease of use, and perceived usefulness towards the technology adoption. International Journal of Civil Engineering and Technology (IJCIET), 9(4), pp.660-669.

The World Bank (n.d.). Connectivity, Logistics & Trade Facilitation. [online] World Bank. Available at: https://www.worldbank.org/en/topic/trade-facilitation-and-logistics.

Worldfolio, T. (2013). The voice of the Muslim world. [online] Theworldfolio. Available at: https://www.theworldfolio.com/news/the-voice-of-muslim-/2374/ [Accessed 14 May 2024].

WTO (2023). Digital Trade for Development. [online] Available at: https://www.wto.org/english/res_e/booksp_e/dtd2023_e.pdf.

Yogatama, A. R. (2017). The Role of Information and Communication Technology (ICT) on the Organization of Islamic Cooperation (OIC) countries' trade development. A New Paradigm in Trade Governance Strengthen Global Competitiveness.

Yotov, Y. V. (2022). On the role of domestic trade flows for estimating the gravity model of trade. Contemporary Economic Policy

Appendix

List of the 39 OIC member countries included in the regression analysis:

1. Afghanistan
2. Albania
3. Azerbaijan
4. Bahrain
5. Bangladesh
6. Benin
7. Brunei Darussalam
8. Burkina Faso
9. Cameroon
10. Comoros
11. Djibouti
12. Egypt
13. Gabon
14. Guinea
15. Indonesia
16. Iraq
17. Ivory Coast
18. Jordan
19. Kazakhstan
20. Kyrgyzstan
21. Lebanon
22. Malaysia
23. Maldives
24. Mali
25. Morocco
26. Mozambique
27. Pakistan

28. Palestine
29. Qatar
30. Senegal
31. Sierra Leone
32. Sudan
33. Tajikistan
34. Togo
35. Turkey
36. Uganda
37. United Arab Emirates
38. Uzbekistan
39. Yemen

Thesis.docx

ORIGINALITY REPORT

15%	10%	9%	6%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Amjad Masood, Inmaculada Martínez-Zarzoso. "Trade Effects of Trade Facilitation Revisited", Economics Letters, 2023 Publication	2%
2	fui.edu.pk Internet Source	1%
3	Y. Duval, T. Wang, C. Utoktham, A. Kravchenko. "Next-generation Trade Facilitation for Asian Integration: Cross-border Paperless Trade", Journal of Asian Economic Integration, 2019 Publication	1%
4	www.wto.org Internet Source	1%
5	Submitted to University of Queensland Student Paper	<1%
6	purehost.bath.ac.uk Internet Source	<1%
7	etd.aau.edu.et Internet Source	<1%