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Abstract

The Authorized Economic Operator (AEO) program comprises of comprehensive trade facilitation and security improvement measures that also serve the overarching objective of institutional development. The aim of the current paper is to analyze the impact of AEO program adoption on trade of the members of the Organization of Islamic Countries (OIC) for the period of 2000-2017 by using descriptive analysis, convergence analysis and gravity model. Gravity analysis spans the period of 2000-2017 for 132 countries of which 57 are the OIC Member States. Both the traditional and the structural gravity analyses show that AEO adoption by OIC member states has no impact on the bilateral trade of these countries. Our analysis suggests that there is a high level of convergence in terms of AEO implementation among the OIC Member States. However, there are a number of serious challenges both in the design and the implementation of the programs. This de jure-de facto differentiation stands as one of the main reasons in regards to the effectiveness of the AEO programs.

Keywords: Authorized Economic Operator, trade facilitation, Organization of Islamic Countries, structural gravity, survey.

JEL Classifications: F14, F13, O53, O57.

1. Introduction

In the last three decades, the world has witnessed a whirlwind of technological progress in information and communication technologies, globalization of the supply chains and an ever-increasing number of stakeholders in international trade. Meanwhile, the resulting new ways of doing business came under increasing threats and risks that require more resources, knowledge, experience, skills and technology than a private company can alone possess (Campos et al, 2017). As a result, along with these companies, Customs Authorities started to search for ways to improve their processes and technologies to develop and sustain quicker, smoother and safer movement of goods across borders.

Trade facilitation has come up as the answer to the problem of increasing levels of uncertainty in global supply chains. The principal objective of any trade facilitation measure is to increase the flow of goods, services and people across countries without abandoning the security of these flows or the ability of governments to collect border taxes (Moïsé, 2013).

There is a broad literature on the impact of trade facilitation on trade flows. Most of the existing studies analyze the impact on trade of increased efficiency in Customs procedures for both rich and poor countries by using gravity or computable general equilibrium models. The majority of the findings suggest that gains from trade would be higher in developing countries than in developed countries, in relative terms, due to less efficiency of Customs administrations of less developed countries. (e.g. Hummels, 2001; Kim et al., 2004; Clarke, 2005; Francois and Manchin, 2006; Nordas et al., 2006; Djankov et al., 2010; Hoekman and Nicita, 2008; Kim et al., 2013).

The objective of the current paper is to analyze the impact of a specific trade facilitation measure, namely AEO program adoption, on trade of the members of the Organization of Islamic Countries (OIC) for the period of 2000-2017 by using a structural gravity model.

The AEO design was first introduced by the World Customs Organization (WCO) SAFE Framework in 2005 and built on the Customs-to-Business partnership model. Accordingly, to guarantee the common objectives of trade facilitation and supply chain security, traders *voluntarily* apply for AEO certificate by meeting a broad range of criteria and cooperate with Customs Authorities. In return, these firms are granted various benefits in their dealings with the Customs Authorities, such as faster clearance of goods and fewer physical inspections such as use of green lane, prior notification if selected for control, incomplete/simplified declarations, reduced guarantees, local clearance, preferential treatment in customs related transactions.

The success of an AEO program, consequently, depends on the nature of the relationship between Customs and the AEO certificate holder which should be based on the principles of mutual transparency, impartiality and accountability. In other words, the AEO program has the distinct feature of enhancing the institutional structure of both the Customs and the company, which goes above and beyond the purpose of trade facilitation. This makes AEO adoption a more comprehensive trade facilitation and security improvement measure that also serves the overarching objective of institutional development. Therefore, it bears more importance for the developing countries as a tool to build institutional capacity.

Around the world, 77 countries have already initiated an AEO program and 17 countries are in the stage of developing their programs (WCO, 2018). Many of the operational AEO programs in the world are in developed countries, whereas less developed countries face difficulties both before and after the adoption of the program. The recognition of the AEO status by other Customs Authorities is possible through the use of mutual recognition agreements (MRAs). In other words, with MRAs, both Customs Authorities agree to provide substantial, comparable and reciprocal benefits/facilitation to the mutually recognized AEOs. There exist 61 MRAs around the World and 39 are being negotiated (WCO, 2018).

The studies analyzing the effects of an AEO program on trade have been very limited. There are a few descriptive studies that discuss the characteristics of the AEO program such as application procedures, benefits and mutual recognition agreements between Customs that utilize an AEO program (e.g. Aigner, 2010; APEC, 2016; Butter, Liu and Tan, 2012; Urcioli and Ekwall, 2015). C de Sa Porta and Marini (2017) analyze the impact of trade facilitation programs including AEO for 75 countries using the gravity approach. They find a positive and significant effect for AEO program to foster trade. Martincus (2016) studies the impact of Mexico's AEO Program, the NEEC, on firms' trade flows. He finds that the NEEC has a positive contribution to the AEO firms' trade, through lower rates of physical inspections and thereby shorter times in Customs for shipments. However, he does not provide an analysis for the impact of the AEO program at the country-level.

The contribution of our paper to this literature is to provide an extensive analysis of the impact of AEO programs on trade flows for the set of the OIC Member States, which are mainly composed of low income developing countries. To the best of our knowledge, this is the first paper that analyzes the country level trade facilitation effect of AEO program adoption for a set of countries that particularly need to build institutional capacity to achieve their long-term development goals.

The OIC is an alliance initiated in 1969 and has 57 members mainly located in Western Asia and Western Africa. While the Member States comprise the one-fourth of the world population, their share in world trade amounts only to 9 percent. Although many of the rich, oil-exporters of the world belong to this group of countries, low and lower-middle income countries constitute 63 percent of the OIC. Therefore, development is an important issue for the alliance and enhancing trade is a viable tool to achieve this objective.

The institutional shortcomings in these countries indicated by the low levels of indicators such as democracy and control of corruption and increasing conflict in the region are the main barriers to trade for most of the OIC countries. Therefore, the AEO program stands as a natural candidate for the OIC countries to improve safety and security at the Customs while facilitating trade. However, the main drawback is that it is a voluntary program and it is costly to implement both for Customs and for the companies.

By 2018, 12 OIC Member States have initiated an AEO program, namely, Azerbaijan, Brunei Darussalam, Egypt, Indonesia, Jordan, Malaysia, Morocco, Oman, Saudi Arabia, Tunisia, Turkey and Uganda.

In this paper, gravity estimations are conducted for the period of 2000-2017 for 132 countries of which 57 are the OIC Member States. Both the traditional and the

structural gravity analyses show that AEO adoption by OIC Member States has no impact on the bilateral trade of these countries. In other words, neither the OIC AEO programs nor MRAs signed by these countries have an impact on the bilateral trade of the 57 OIC Member States with each other and the rest of the world when exporter-time, importer-time and directional country pair fixed effects are included in the analysis.

The outline of the paper is as follows: Section 2 introduces the AEO programs in the OIC Member States. Section 3 presents the empirical strategy followed by a detailed discussion of the data used in this paper in Section 4. Results of the gravity estimations are presented and explained in Section 5. Finally, Section 6 concludes and offers a brief discussion.

2. AEO Programs in the OIC Member States

The OIC is an alliance initiated in 1969 and has 57 members mainly located in Western Asia and Western Africa. All Member States comprise 24 percent of the world population. However, the collective GDP of the OIC Member States amounts only to 8.3 percent of the World GDP in current dollars in 2016. Moreover, the shares of exports and imports of the OIC countries in the World are limited to around 9.5 percent and 9 percent in 2016, respectively.

Although the OIC covers a group of countries with diverse income, the number of lowincome countries in the OIC is 20^4 and lower-middle income countries is 16^5 . While the number of upper-middle income countries is 14^6 , only 7^7 members of the OIC are high income countries.

High income countries in the OIC are the major oil exporters in the world. However, the share of exports of the OIC in the world exports is still only 9 percent suggesting that goods and services exports other than oil are very limited in the OIC countries.

Concerning the high number of countries with low income and lower-middle income, it is apparent that development is an important issue for the alliance. Therefore, enhancing trade is a viable tool for this aim. Although there are various trade facilitation tools that may be used within the alliance, adoption of an AEO program appears to be an appropriate choice as institutional improvement is the backbone of this program.

According to WCO (2018), among the OIC Member States, 12 countries out of 57 have initiated authorized economic operator programs. The names and launch years of these AEO Programs are presented in the Appendix Table A1.

Jordan is the first country in the alliance that introduced the AEO program, named as the Golden List. Considering that the SAFE Framework was introduced in 2005, the initiation of the AEO program in the same year made Jordan a leading country both in the OIC and in the World. Morocco has followed Jordan and initiated the AEO program in 2006. There was a pause in AEO adoption of the OIC Member States until 2010.

⁴ Afghanistan, Benin, Burkina Faso, Chad, Comoros, Gambia, Guinea, Guinea-Bissau, Mali, Mozambique, Niger, Senegal, Sierra Leone, Somalia, Sudan, Syrian Arab Republic, Tajikistan, Togo, Uganda and Yemen.

⁵ Bangladesh, Cameroon, Côte d'Ivoire, Djibouti, Egypt, Indonesia, Iran, Iraq, Kyrgyz Republic, Mauritania, Morocco, Nigeria, Pakistan, Tunisia, Uzbekistan, West Bank and Gaza.

⁶ Albania, Algeria, Azerbaijan, Gabon, Guyana, Jordan, Kazakhstan, Lebanon, Libya, Malaysia, Maldives, Suriname, Turkey, Turkmenistan.

⁷ Bahrain, Brunei Darussalam, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

Malaysia and Tunisia started their AEO programs in 2010 that would be dubbed as the second wave in the AEO program adoption among the OIC countries. Starting from 2013 there has been a steady increase in AEO program initiations. In 2013, Azerbaijan, Turkey and Uganda; in 2014, Egypt; in 2015, Indonesia launched their AEO programs. Brunei Darussalam, Oman and Saudi Arabia are the countries with the most recent AEO programs.

The number of operators in the OIC countries' AEO programs as of 2018 is presented in Figure 1. The variation is significantly large between the countries. The size, income, trade volume, number of transactions, design of the AEO program, MRAs and political status are some of the determinants of the number of AEO operators in a country. Morocco is the leading country among the OIC with 439 AEO companies registered. By launching the AEO program in 2006, Morocco has also the first mover advantage. Turkey is the second country having the highest number of AEO status holders. Note that some countries initiated the program as late as 2017. AEO program in Egypt has also more than 100 enrollments by the companies. Despite the early initiation of the AEO program, the enrollment is lower in Jordan. Although Azerbaijan has an active AEO program since 2010, there are only 2 companies registered, which needs special attention.





Source: Authors' compilation using WCO (2018) data and survey responses. Brunei Darussalam has also an active AEO program. However, there is no information in WCO (2018). Also, the survey has not filled out by them.

AEO programs are distributed almost evenly among different income groups among the OIC Member States. However, the number of countries without an AEO program is the highest in low income countries (Figure 2). Moreover, compared to lower-middle income countries, the likelihood of adopting an AEO program is lower in upper-middle income countries.



Figure 2. Number of AEO Programs in the OIC Member States: Income Category

Source: Authors' compilation using WCO (2018) data.

Being involved in a Mutual Recognition Agreement is important for an AEO Program both from the Customs' and the traders' perspective. An MRA is a time-consuming endeavor as it requires the AEO programs of both parties to be well-functioning as well as a strong mutual will to establish a partnership on both sides. Among the OIC countries, Malaysia is leading in signing MRAs (Table 1). Egypt, Jordan, Morocco and Tunisia have signed the Agadir Agreement, which is a regional MRA. Turkey and Jordan have two separate MRAs. However, in the OIC Member States, the countries which have established an AEO program very recently do not have any MRAs yet.

Table 1. Concluded MRAs of the OIC Member States

Date	Countries
June 2008	Jordan-USA
June 2014	Korea-Turkey
April 2016	Tunisia, Egypt, Jordan, Morocco (Agadir Agreement)
March 2016	Hong Kong, China and Malaysia
July 2017	Korea, UAE
October 2017	Korea, Malaysia
June 2014	Malaysia-Japan

Source: Authors' compilation using WCO (2018) data.

3. Empirical Strategy

Due to its widespread acceptance in the literature and its ability to deliver a tractable framework for trade policy analysis in a multi-country environment (Arkolakis et al., 2012 and references therein), a gravity framework is employed in this paper to estimate the impact of authorized economic operator programs on bilateral trade flows.

The following is a brief discussion of the structural gravity model and is largely borrowed from Yotov et al. (2016):

$$X_{ij} = \frac{Y_i E_j}{Y} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma} \quad \forall i, j;$$
(1)

where

$$\Pi_i^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} \frac{E_j}{Y} \qquad \forall i;$$
(2)

$$P_j^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{\Pi_i}\right)^{1-\sigma} \frac{Y_i}{Y} \qquad \forall j.$$
(3)

Let X_{ij} denote expenditure in country *j* on goods from source country *i*. E_j signifies the expenditure on goods and services in country *j* originated from all countries. Y_i and *Y* denote the sales of goods and services at destination prices from country *i* to all countries and world output at those prices, respectively. Next, t_{ij} denotes the bilateral trade costs between countries *i* and *j*. The trade elasticity of substitution across different varieties is represented by σ . Π_i and P_j are price indices of exporting and importing countries, respectively. These price indices, which are called as outward and inward multilateral resistance by Anderson and van Wincoop (2003), include trade costs with all other partners and can be interpreted as average trade costs.

The traditional gravity estimates are obtained after the log-linearization of equation (1) –assuming it holds in each time period *t*- with an additive error term $\varepsilon_{ij,t}$:

$$lnX_{ij,t} = lnE_{j,t} + lnY_{i,t} - lnY_t + (1-\sigma)lnt_{ij,t} - (1-\sigma)lnP_{j,t} - (1-\sigma)ln\Pi_{i,t} + \varepsilon_{ij,t}$$
(4)

Due to the fact that multilateral resistance terms are unobservable, until recently an overwhelming majority of the trade literature has used the following specification with standard gravity variables:

$$lnX_{ij,t} = \beta_0 + \beta_1 \ln DIST_{ij} + \beta_2 CNTG_{ij} + \beta_3 LANG_{ij} + \beta_4 CLNY_{ij} + \beta_5 lnE_{j,t} + \beta_6 lnY_{i,t} + \varepsilon_{ij,t}$$
(5)

In line with the standards in the literature, $lnX_{ij,t}$ denotes the logarithm of nominal bilateral international trade flows from exporter *i* to importer *j* at time *t*. β_0 is the constant term interpreted as the world output. Trade costs are represented by $\ln DIST_{ij}$, the logarithm of bilateral distance between trading partners *i* and *j*, $CNTG_{ij}$, an indicator

variable to show the presence of borders between trading partners i and j, $LANG_{ij}$, an indicator variable for the existence of common official language between trading partners i and j and $CLNY_{ij}$, an indicator variable to capture the presence of colonial ties between trading partners i and j. The variables $lnE_{j,t}$ and $lnY_{i,t}$ are the logarithms of the importer expenditure and exporter output, respectively.

However, the heavily used specification in equation (5) suffers from many biases and inconsistencies due to ignorance of multilateral resistance terms and zero trade flows, heteroscedasticity of trade data, insufficient treatment of bilateral trade costs, endogeneity of trade policy, mistreatment of non-discriminatory trade policy and adjustment to trade policy changes. In this paper, as explained in detail in Yotov et al. (2016), to overcome these challenges we use the following theoretically-consistent structural gravity estimating equation:

$$X_{ij,t} = exp\left[\pi_{i,t} + \chi_{j,t} + \gamma GRAV_{ij} + \eta_1 AEO_{j,t} \times INTL_{ij} + \eta_2 MRA_{ij,t}\right] \times \varepsilon_{ij,t}$$
(6)

In equation (6) the variable $X_{ij,t}$ is the nominal trade flows. In order to be general in our treatment, we set up the estimating equation under the assumption of a panel data setting. One of the most important differences of equation (6) from equation (5) is that it includes not only international trade flows $(X_{ij,t}, i \neq j)$ but also intranational flows $(X_{ii,t})$ as suggested by Heid et al. (2017). Therefore, we will be able to identify the impact of adoption of an AEO program by an importer country (a non-discriminatory trade facilitation measure towards exporting countries) on bilateral trade flows even in the existence of importer-year fixed effects.

Equation (6) is in exponential form following Santos Silva and Tenreyro (2006) to estimate the gravity model with the Poisson Pseudo Maximum Likelihood (PPML) estimator. Due to the large degree of heteroscedasticity in trade flows, estimating a loglinearized version of (6) leads to inconsistent parameter estimates as shown in Santos Silva and Tenreyro (2006). Therefore, the use of PPML as an alternative overcomes the challenges of the standard OLS estimator. Furthermore, due to the multiplicative form of the estimating equation in (6), PPML enables the researchers to make use of the information embedded in the zero trade flows.

*GRAV*_{*ij*} is a vector of co-variates which includes all standard time-invariant gravity variables in equation (5). We also experiment by replacing *GRAV*_{*ij*} with a full set of pair fixed effects, μ_{ij} . The term μ_{ij} encompasses the set of country-pair fixed effects (i) to absorb all time-invariant gravity covariates from equation (5) and any other unobservable time-invariant bilateral determinants of trade costs and (ii) to absorb most of the linkages between the endogenous trade policy variables and the remainder error term $\varepsilon_{ij,t}$. Furthermore, whether the error term $\varepsilon_{ij,t}$ in equation (6) is introduced as additive or multiplicative does not affect the PPML estimator (Santos Silva and Tenreyro, 2006).

The term $\pi_{i,t}$ denotes the set of time-varying exporting-country dummies, which account for observable and unobservable exporter-specific factors that may influence bilateral trade as well as the outward multilateral resistances and countries' output shares. The term $\chi_{j,t}$ involves the set of time-varying importing-country dummy

variables that control for observable and unobservable importer-specific characteristics that may influence trade as well as the inward multilateral resistances and total expenditure in the importing country.

The expression $AEO_{j,t} \times INTL_{ij}$ is the interaction of $AEO_{j,t}$ and $INTL_{ij}$. The term $AEO_{j,t}$ is a vector of dummies if the importing country has an operational authorized economic operator program in year t, while $INTL_{ij}$ is a dummy variable taking the value of one for international trade between countries *i* and *j*, and zero otherwise. Note that, this interaction term results in a new bilateral term that enables us to identify the effects of this non-discriminatory trade policy measure, even in the presence of importer-time fixed effects. Finally, the term $MRA_{ij,t}$ represents the vector of mutual recognition agreements of OIC Member States.

Next, we introduce a more detailed specification that covers distinct features of the AEO program adopted by the importer country:

$$X_{ij,t} = exp[\pi_{i,t} + \chi_{j,t} + \gamma GRAV_{ij} + \eta_1 \Omega_{j,t} \times INTL_{ij} + \eta_2 MRA_{ij,t}] \times \varepsilon_{ij,t}$$
(7)

where the term $\Omega_{j,t} = \{Type_{j,t}, Benefits_{j,t}, Converge_{j,t}\}$.

 $Type_{j,t}$ is a vector of dummies that counts the number of operator types covered by the AEO program in country j at time t. These operators are importers, exporters, transporters, customs brokers, warehouses, manufacturers, port terminals, QIZs and it is important to have as many as possible in the AEO program to cover the entire supply chain.

Benefits_{*j*,*t*} is a vector of dummies that counts the number of benefits offered in the AEO program in country *j* at time *t*. These benefits are green lane, incomplete/simplified declarations, off-working hours' transactions, reduced guarantees, local clearance, priority treatment, withholding tax exemption, preclearance and deferred payment of duties.

Finally, $Converge_{j,t}$ is a variable that identifies the degree at which the AEO program of the importing country j at time t possesses a pre-defined set of AEO criteria. Calculation of convergence will be explained in detail in the next section.

4. Data

4.1. Gravity Data

The data used in the structural gravity analysis of the current paper cover the period of 2000-2017. Since the first AEO program among the OIC Member States was adopted in 2005 by Jordan, we start in 2000 to have a reasonable number of years before that. Our data set includes 132 countries of which 57 are OIC Member States⁸.

⁸ Due to lack of data on many micro states and a variety of Sub-Sharan African states, only 132 of current 229 states of the World are included in the dataset. A list of these countries is provided in the Appendix Table A2.

Our data are composed of four main elements: (i) International trade flows; (ii) intranational trade flows, (iii) presence of AEO programs and MRAs, and (iv) gravity variables.

The international trade flows are obtained from the 2017 update of the Direction of Trade Statistics (DOTS) provided by the IMF. The DOTS database publishes bilateral trade flows for 229 countries. Our justification for using the IMF DOTS is twofold: (i) The current version of the IMF DOTS uses many data sources including the UN COMTRADE database to have the most extensive coverage. (ii) A new methodology⁹ is used to estimate the missing observations, which is the case for many of the OIC Member States.

Only the export and imports of 57 OIC Member States with each other and with the remaining 75 countries in the dataset are considered to identify the impact of OIC AEO programs and MRAs on bilateral trade of these countries.

The intra-national trade flows are ideally constructed as the difference between the gross value of domestic production and the gross value of total exports. In this paper, we obtain the intra-national trade flows as the difference between GDP and total exports. We recognize the inconsistency between the measure of GDP as value added and the measure of total exports as gross value. However, it is not possible for us to use gross values for both, due to the unavailability of cross-country gross-production data (from the UNIDO's Industrial Statistics Database) for many of the OIC Member States.

The OIC AEO programs and MRAs data come from the WCO (2018). The former is a time-varying non-discriminatory policy measure and takes the value of one if the importing country has an AEO program and zero otherwise. The latter is a country-pair variable that varies in time and takes the value of 1 if two countries have a mutual recognition agreement and zero otherwise.

The gravity variables are either constructed or obtained from different sources. For the panel data analysis, bilateral fixed effects are used to absorb all time-invariant bilateral determinants of trade. However, due to the impossibility of using directional bilateral fixed effects in our cross-section regressions, we have to rely on a standard set of standard gravity variables. The data on bilateral distance, common language, contiguity, and colonial ties are taken from CEPII's Distances Database (Mayer and Zignago, 2011). The current GDP data to proxy for exporting country output and importing country expenditure are obtained from WDI.

4.2. AEO Survey Data and Convergence

In order to obtain more detailed information about the inner-workings of the AEO programs and to collect the data needed for equation (7), we conducted a survey among the OIC Member States with functioning AEO programs.

Among these states, 8 out of 12 countries (Egypt, Indonesia, Jordan, Morocco, Oman, Tunisia, Turkey and Uganda) have responded to the survey¹⁰.

⁹ Marini et al. (2018) explain the mew methodology used in the preparation of the 2017 update of IMF DOTS.

 $^{^{10}}$ The survey questionnaire which is adopted from APEC (2016) and the responses are available upon request.

Table 2 presents a general overview of the survey respondents in terms of their size, trade openness and trade intensity at their border check points as these three may have been important in the AEO adoption.

	GDP (in billions of USD)	Trade Openness	Average Trade Intensity at Border Checkpoints (in billions of USD)
Egypt	237	32%	-
Indonesia	1,011	30%	-
Jordan	40.5	62%	2.3
Morocco	111	53%	1.2
Oman	71.9	76%	2.1
Tunisia	39.9	85%	1.3
Turkey	841	42%	1.9
Uganda	26.4	30%	0.4

Table 2.	General	Overview	of Survey	Respondents,	2017
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Source: Authors' compilation using survey data and WDI.

Table 2 shows that there is a great degree of variability in terms of economic size (proxied by *GDP*), trade openness (proxied by *[Exports+Imports]/GDP*) and trade intensity at the borders (proxied by *[Exports+Imports]/#Border Checkpoints*) across the group of the OIC members that adopted AEO programs. Economic size ranges between \$26.4 million to \$1 billion while trade openness ranges from 30 percent to 85 percent. With the exception of Uganda, AEO holders in the OIC have average trade intensities ranging across \$1.2 million to \$2.3 million.

Identification of Themes and Variables

Together with survey design and distribution, as in APEC (2016), a qualitative comparator matrix is created using 7 major themes and 15 variables for operational AEO programs:

- 1. General information on the AEO program
 - a. Sectors of AEOs
 - b. Types of operators
- 2. Application, verification, and authorization
 - a. Application, verification, and authorization procedures
 - b. Self-assessment procedures
- 3. Security and compliance requirements
 - a. Compliance requirements
 - b. Physical security requirements
- 4. Post-authorization
 - a. Post-authorization audit
 - b. Suspension, revocation and cancellation procedures
- 5. Customs organizational structure for AEO programs
 - a. Customs organizational structure for AEO programs

- b. Training provided to Customs officers
- 6. Partnership between Customs Authority and the private sector
 - a. Partnership initiatives
 - b. Benefits of AEOs
 - c. MRAs
 - d. SMEs
- 7. Accessibility of information on Customs Authority's website about the AEO program
 - a. Electronic promotion of the AEO program

These 15 variables are supported by 92 questions that are defined as sub-variables.

Comparator Matrix

After the design and the deployment of the survey described above, the survey responses are analyzed by using the comparator matrix, the data of which are available upon request.

The convergence analysis involves the construction of a comparator matrix, which is a simple tool to compare different approaches to the AEO concept within the OIC Member States.

First, AEO programs are compared based on the survey responses through a determination of whether each feature is identified by the respondent country as being present in their program. If the feature is present, one point is assigned in the respective cell of the matrix. If not, no points are assigned. This procedure is repeated for each AEO program within the OIC.

Next, a "convergence percentage" is calculated for each sub-variable. This calculation is undertaken by dividing the total number of AEO programs with that particular subvariable i by the total number of OIC Member States with AEO programs:

$$Convergence \% = \frac{\# of AEO \ programs \ with \ subvariable \ i \ present}{total \ \# of \ AEO \ program \Box}$$
(8)

Then, a "total convergence percentage by country" is calculated by summing identified sub-variables each AEO program has, and comparing the percentage against the maximum possible score (where a country has all sub-variables).

$$Total Convergence \% by country = \frac{Convergence \%}{total \# of subvariables under a country}$$
(9)

Country-level convergence indicates what percentage of all sub-variables is present in a particular AEO program. If a country possesses all the sub-variables, then its score would be 100 percent. This can be considered as a vertical reading of the comparator matrix. Equation (9) is indeed the basis for $Converge_{j,t}$ to be used in the estimation of equation (7).

Table 3 shows the results of country-level convergence analysis for 8 OIC survey respondents. The OIC AEO programs on average show a 75 percent convergence.

Accordingly, Morocco and Jordan exhibit 83 and 81 percent total convergence, respectively. These countries are followed by Egypt and Turkey (76 percent), Uganda (74 percent), Indonesia (72 percent) and Tunisia (70 percent). The lowest amount of convergence is observed in Oman (66 percent).

	AEO Launch	#AEOs as of 2018	Convergence
Egypt	2014	119	76%
Indonesia	2015	80	72%
Jordan	2005	88	81%
Morocco	2006	439	83%
Oman	2017	17	67%
Tunisia	2010	35	70%
Turkey	2013	332	76%
Uganda	2013	51	74%
OIC			75%

Table 3. Country Level Convergence

Source: Authors' compilation using survey data.

This result can be explained by two factors: (i) The age of the program-The correlation coefficient between the launch year of the AEO program and the country-convergence percentage is -0.778 indicating that as the AEO program matures, it embodies a more diverse set of characteristics. (ii) The number of AEO companies-The correlation coefficient between the number of AEO status holders and the country-convergence percentage is 0.710 signifying the fact that a higher number of AEO companies is translated into higher convergence probably through demands of these companies to be more involved in international supply chains coupled with an increasing need for further advancements in the program for security purposes.

5. Results

We begin our gravity estimations in a panel setting where standard gravity variables and bilateral fixed effects are used as in equation (6). Table 4 reports the results.

Column (1) of Table 4 reports the results of the PPML regression from a panel of 132 trading partners of the OIC countries from 2000 to 2017. Here, $\ln Y$ and $\ln E$ in equation (5) are dropped out due to the inclusion of exporter-time and importer-time fixed effects in accordance with the requirements of gravity theory in terms of the need for proper control of multilateral resistance terms. The estimates of the standard gravity variables are in line with a voluminous gravity literature that is extensively surveyed by Head and Mayer (2014). The important result here is that the parameter *AEO* x *INTL* is positive but not statistically significant. MRAs exert a positive and significant influence on bilateral trade of OIC Member States, showing that mutual recognition of AEO holders across MRA partners has a significant trade facilitation effect.

As trade policy tools the AEO program adoption or MRAs are potentially endogenous due to the fact that these policy measures are not randomly assigned across countries and affected by the level of bilateral trade. Owing to the difficulty of finding instrumental variables that satisfy the essential exclusion restrictions at the country level, we follow Baier and Bergstrand (2007) and include directional country pair fixed effects to control for endogeneity in the regressions from this point on.

Column (2) reports the results with pair fixed effects along with exporter-time and importer-time fixed effects. Naturally, all standard gravity variables are dropped. The most noteworthy result of the structural gravity analysis of this paper is that neither OIC AEO programs nor MRAs signed by these countries have an impact on the bilateral trade of the 57 OIC Member States with each other and the rest of the world. In other words, the expected trade facilitation impact of the authorized economic operator programs at the country level in the OIC sample is absent.

As a robustness check, rather than treating missing trade observations as zeros we let them stay as missing and rerun the regression in Column (2) and we report the results in Column (3). The results are qualitatively the same with the previous.

Table 4. Gravity Estimations (Equation 6)					
Variables	(1) 2000-2017 Panel	(2) 2000-2017 Pair FEs	(3) 2000-2017 Missing		
AEO x INTL	0.843	-0.142	-0.111		
	(0.561)	(0.116)	(0.124)		
MRA	0.606**	-0.076	-0.060		
	(0.286)	(0.054)	(0.055)		
INTL	-4.768***				
	(0.399)				
ln <i>DIST</i>	-0.622***				
	(0.130)				
CNTG	0.306				
	(0.315)				
LANG	0.231				
	(0.235)				
CLNY	0.683***				
	(0.225)				
Observations	195.097	198,691	155.835		
Exporter-time FEs	X	X	X		
Exporter-time FEs	X	X	X		
Bilateral FEs		Х	Х		
Missing set to 0	Х	Х			

m 11 / **a**

Note: The dependent variable is the bilateral nominal trade flows $(X_{ij,t})$ including domestic trade $(X_{ii,t})$. All regressions include exporter-time and importer-time fixed effects. Except for Column (3), in all regressions non-reported international trade flows are set to zero. Column (1) presents gravity estimates using PPML for the period 2000-2017. Columns (2) and (3) report structural gravity estimates using PPML for the period 2000-2017 with directional country-pair fixed effects.

Next, we estimate equation (7) using the data obtained from our survey. In the regressions, we use exporter-time, importer-time and pair fixed effects in a PPML setting (same as column 3 of Table 4). Table 5 reports the results in regards to the key variables only.

The results show that even with detailed information on the important characteristics of an AEO program, there is no impact of these programs on the magnitude of bilateral trade of OIC Member States with an operational AEO program. In other words, the targeted trade facilitation effect of AEO programs is missing in bilateral trade data.

Table 5. Gravity Estimations (Equation 7)					
Variables	(1)	(2)	(3)		
Type x <i>INTL</i>	0.026 (0.037)				
Benefits x INTL		0.014			
		(0.027)			
Converge x <i>INTL</i>			0.193		
			(0.195)		
Observations	18,413	18,413	18,413		

Note: The dependent variable is the bilateral nominal trade flows $(X_{ij,t})$ including domestic trade $(X_{ii,t})$. All regressions include exporter-time and importer-time fixed effects. In all regressions, non-reported international trade flows are set to zero and PPML is used for the period 2000-2017.

6. Conclusion and Discussion

This paper investigated the impact of AEO program adoption on the trade of the members of the Organization of Islamic Countries for the period of 2000-2017.

The empirical analysis conducted with 132 countries for the period 2000-2017 by using the gravity analysis suggests that bilateral trade of the 57 OIC Member States with their partner countries does not increase significantly with the adoption of the AEO program. In other words, trade facilitation objective of the program has not been achieved in the OIC.

To further investigate the trade facilitation impact of the AEO programs in the OIC Member States, a convergence analysis is conducted based on the survey conducted with countries in the OIC countries. The results suggest that there is a high level of de-jure convergence in terms of AEO implementation among the OIC Member States. While evaluating the survey results, two points should be taken into consideration: (i) Survey results may have the usual biases; (ii) The AEO programs on paper and their application could be different due to the insufficient institutional background of some of the OIC Member States.

The variables obtained from this never-before-used dataset were employed in the gravity regressions. Neither the coverage rate of the supply chain (proxied by different types of operator), nor the structure of benefits offered by the program (proxied by different types of benefits in the program) have any effect on the trade of these countries.

To sum up, the analysis in this paper suggest that, although AEO is a well-designed program comprising safety and security of the supply chain as well as trade facilitation due to the requirement of institutional improvement for the companies and Customs, it does not serve its purpose of increasing trade at the country level for the OIC Member States.

A couple of policy recommendations emerge as a result of the analysis in this paper. Firstly, one reason for not observing significant trade benefits is the limited participation of the firms in these AEO programs. Considering the fact that AEO is a voluntary program, attracting companies to participate in the program has vital importance. Therefore, the benefits provided by the AEO program to the private sector should be evaluated against the costs borne by firms and traders to obtain authorization. Such costs include application and procedure-related fees, but also the costs of carrying out necessary changes in order to become eligible for authorization. Immediate release of cargo upon arrival by Customs and other government agencies, deferred payment of duties and taxes and relief from guarantee/bond requirements may have a significant role in increasing the AEO participation among firms in the OIC Member States.

Secondly, another reason for the apparent lack of trade facilitation effect is the discrepancy between the de-jure measures and the de-facto situation in terms of the implementation of the AEO programs. The common challenges of the OIC AEO programs could be summarized as follows: (i) The companies are not able to utilize all the benefits provided by the associated AEO program for various reasons; (ii) Customs Authorities struggle with resource constraints that prevent them from employing a sufficient number of qualified personnel solely working for the AEO program; (iii) Costs of the program for the private sector are quite high; (iv) AEO programs do not encompass the supply chain as a whole; (v) The number of MRAs are very limited. Without addressing these issues, it may not be possible for a large number of firms to fully realize trade facilitation benefits of the program. As a result, trade facilitation at the country level is not observed, though increases in trade at the firm-level may still be possible.

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Appendix

Country	Launch	AEO Program Name	
	Year		
Azerbaijan	2013	Authorized Economic Operator	
Brunei Darussalam	2017	Sutera Lane Merchant Scheme	
Egypt	2014	Authorized Economic Operator	
Indonesia	2015	Authorized Economic Operator	
Jordan	2005	Golden List Program	
Malaysia	2010	Authorized Economic Operator	
Morocco	2006	Authorized Economic Operator	
Oman	2017	Authorized Economic Operator	
Saudi Arabia	2017	Saudi Authorized Economic Operator	
Tunisia	2010	Authorized Economic Operator	
Turkey	2013	Authorized Economic Operator	
Uganda	2013	Authorized Economic Operator	

Table A1. AEO Programs in the OIC Member States

Source: Authors' compilation using WCO (2018) data.

Afghanistan	Albania	Angola	Argentina	Armenia	Australia
Austria	Azerbaijan	Bahrain	Bangladesh	Belarus	Belgium
Benin	Bolivia	Bosnia and Herzegovina	Brazil	Brunei Darussalam	Bulgaria
Burkina Faso	Cameroon	Canada	Chad	Chile	China
Colombia	Comoros	Costa Rica	Côte d'Ivoire	Croatia	Czech Republic
Denmark	Djibouti	Dominican Republic	Ecuador	Egypt	El Salvador
Estonia	Finland	France	Gabon	Gambia	Georgia
Germany	Ghana	Greece	Guatemala	Guinea	Guinea Bissau
Guyana	Hungary	Iceland	India	Indonesia	Iran
Iraq	Ireland	Israel	Italy	Japan	Kazakhstan
Kenya	Korea	Kuwait	Kyrgyz Republic	Latvia	Lebanon
Libya	Lithuania	Luxembourg	Malaysia	Maldives	Mali
Mauritania	Mauritius	Mexico	Moldova	Mongolia	Morocco
Mozambique	Myanmar	Netherlands	New Zealand	Niger	Nigeria
Norway	Oman	Pakistan	Panama	Paraguay	Peru
Philippines	Poland	Portugal	Qatar	Romania	Russian Federation
Saudi Arabia	Senegal	Serbia	Sierra Leone	Singapore	Slovak Republic
Slovenia	Somalia	South Africa	South Sudan	Spain	Sri Lanka
Suriname	Sweden	Switzerland	Syria	Tajikistan	Thailand
Togo	Tunisia	Turkey	Turkmenistan	Uganda	Ukraine
UAE	UK	US	Uruguay	Uzbekistan	Venezuela
Vietnam	West Bank and Gaza	Yemen	Zambia		

Table A2. Countries Included in the Gravity Analysis