TRADE FACILITATION THROUGH AEO MUTUAL RECOGNITION ARRANGEMENTS: EVIDENCE FROM THE LOGISTICS PERFORMANCE INDEX

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Abstract: This study empirically examines the relationship between the expansion of Authorized Economic Operator (AEO) Mutual Recognition Arrangements (MRAs) and a country's logistics performance. The main objective of the research is to identify the interrelationship between the number of MRAs and key Logistics Performance Index (LPI) outcomes, with particular attention to customs efficiency, and to assess whether wider MRA networks are associated with improved logistics rankings. For this purpose, a cross-country statistical dataset was compiled using the latest internationally comparable LPI edition (2023) and corresponding MRA information. The empirical analysis applies correlation-based methods and visual diagnostics (scatter plots and trendlines) to evaluate the direction and strength of the association between MRA coverage and LPI performance. The results indicate that a broader MRA network is associated with better logistics outcomes and improved customs-related rankings, although cross-country differences remain significant. The findings provide both theoretical and practical implications for strengthening trade facilitation policies, enhancing the operational effectiveness of MRAs, and improving the institutional mechanisms that support reliable and predictable cross-border supply chains.

Keywords: Authorized Economic Operator (AEO); Mutual Recognition Arrangement (MRA); trade facilitation; customs efficiency; Logistics Performance Index (LPI); WCO SAFE Framework; supply chain security; risk management; cross-border cooperation; Utility Block (UB).

1. Introduction

An increase in foreign trade volumes expands the scale of production, boosts foreign currency earnings, strengthens competitiveness, and creates new jobs. Therefore, establishing a favorable organizational and legal environment for entrepreneurs engaged in export and import activities is highly relevant. In international trade operations, differences in rules governing the movement of goods, customs clearance procedures, border controls, required documentation, and risk management mechanisms lead to bureaucratic barriers and additional costs. As

a result, time losses occur, logistics costs rise, disruptions emerge in supply chains, and business risks intensify.

To harmonize trade procedures and create a predictable environment for trusted business operators, countries conclude bilateral and multilateral agreements. Such arrangements strengthen interstate cooperation, align regulatory requirements, and expand businesses' opportunities to access international markets.

Within the framework of the WCO SAFE Framework, the AEO concept and Mutual Recognition Arrangements (MRAs) serve as important instruments. An MRA provides that an AEO status granted by the customs administration of one country as "trusted" is also recognized by the partner country, and that reciprocal facilitation benefits are provided to AEOs. This article examines whether an increase in the number of MRAs may influence the Logistics Performance Index (LPI), which reflects a country's logistics efficiency. In particular, it advances the hypothesis that such an effect may be reflected through positive changes in the "customs efficiency" component.

Literature Review.

Numerous studies have been conducted on this topic. Tuan Pham examined the factors influencing MRA negotiations for AEO programmes and, as a result, proposed the MRA Development Model to facilitate both bilateral and multilateral negotiations. This model was developed to support trade facilitation and secure global supply chains.[1]

Nkhahle and Baldavoo conducted an analysis of the implementation of the WCO SAFE Framework within the SARS, with particular emphasis on the AEO programme. The results noted that AEO compliance had increased and trade facilitation had improved in South Africa. [2]

Hanafi Amin Firdaus analysed the introduction of the Mutual Recognition Arrangement for Authorised Economic Operators (MRA AEO) between Indonesia and the UAE and its implications for economic growth. According to the research findings, the MRA AEO simplifies export-import operations. It was noted that the MRA AEO reduces complex procedures in customs clearance for entities with AEO status, lowers the proportion of inspections, and contributes to saving time in clearance procedures. It was also noted that this mechanism has a positive impact on foreign trade activity by reducing logistics costs and increasing the efficiency of processes. [3]

Chang-Bong Kim, Il-Sok Chung and Hye-Young Joo examined the impact of the AEO MRA on the efficiency of exporters and importers in Korea using a structural equation model on a sample of companies. The results show that annual

trade volume amplifies the effect of the AEO MRA. They demonstrated that the impact of the AEO MRA enhances logistics efficiency and does not directly affect operational efficiency, and that if logistics cooperation is low, the AEO MRA's effect on logistics efficiency may go unnoticed.[4]

Fazliddin Elmurodovich Khujayev analysed the development of transport infrastructure in states through the dynamics of freight and passenger traffic. The analyses have demonstrated that the problems in this area can be resolved by creating a single integrated transport space based on advanced infrastructure. Infrastructure-level disparities and the low degree of unification of regulatory and legal documents were identified as factors constraining integration.[5]

2. Materials and Methods.

This study empirically assesses the relationship between the extent of AEO MRAs and a country's logistics performance. The empirical design is based on a one-year cross-sectional comparison (2023), because the latest internationally comparable Logistics Performance Index (LPI) results reported by the World Bank correspond to the 2023 edition.[6] To measure the strength and direction of linear association between MRAs and LPI indicators, the analysis applies the Pearson correlation coefficient (r), which ranges from −1 to +1. The coefficient is defined using the standard Pearson correlation formulation between the country-level MRA count and the selected LPI rank indicators. All computations were carried out in MS Excel using the CORREL function, and statistical significance was evaluated via t-statistics. For visual interpretation, the relationship between MRA counts and the LPI grouped rank was illustrated using a scatter plot with a fitted trendline and corresponding goodness-of-fit measure.

3. Resultsand Discussion

MRA is an agreement concluded between customs administrations within the framework of the WCO SAFE Framework, which—based on the similarity/equivalence of the parties' AEO programmes (security criteria and validation procedures) - provides that an AEO status granted by one party is also recognized by the other party, and that, in return, reciprocal facilitation benefits are granted to AEOs.

Table 1. Most countries with the highest number of MRAs (2026)

№	Country	Launch date	Number of MRAs	Number of AEOs	Number of AEOs recognized under MRAs
1	China	2021	34	5882	4542
2	India	2011	28	5720	1147
3	Republic of Korea	2009	27	845	268
4	Hong Kong	2012	20	81	81

5	United States	2001	20	11020	498
6	South Africa	2021	17	177	177
7	Saudi Arabia	2018	16	406	406
8	Singapore	2007	15	84	84
9	Australia	2016	14	900	900
10	Brazil	2014	14	581	441

The number of MRAs and AEOs is updated on a quarterly basis; therefore, the figures presented in the table may vary slightly depending on the reporting period. WCO Online AEO Compendium (OAC)

The data in Table 1 above shows that China holds the leading position in terms of the number of mutual recognition agreements (MRAs) on AEO status: the country has established cooperation with 34 states under MRAs. The AEO programme in China was implemented in 2021, and the registration of 5,882 AEO entities in a short period demonstrates the growing institutional appeal and scope of application of the system. Furthermore, according to the table, the number of AEO recognised under the MRA in China is 4,542.

The next leading country is India, where the AEO programme has been in operation since 2011. According to data for the study period, 5,720 AEOs have been registered in India, of which 1,147 have been recognised under the MRA. Furthermore, as India has established MRA with 28 countries, national AEO entities are also able to benefit from simplified procedures in partner countries.

Overall, the table shows that a significant share of the entities that systematically develop their AEO programme and expand their MRA network are relatively economically developed countries. In this context, a higher number of MRAs is often closely associated with effective customs risk management systems, supply chain security requirements, institutional capacity, and an active level of international cooperation.

At the same time, it is natural for a gap to exist between the total number of AEOs and the number of AEOs recognized under MRAs. Within bilateral arrangements, the parties mutually agree - based on their national legal requirements and the structure of their AEO programmes - whether facilitation benefits and special simplifications will apply to all AEOs or only to specific categories (groups) of AEOs. As a result, the coverage of AEOs and the share of AEOs granted cross-border recognition through MRAs differ from one country to another.

Within the European Union, the AEO system also occupies a distinct position. The EU AEO programme was developed on the basis of the WCO SAFE approach and has been fully operational since 1 January 2008. The main principle of the EU is that even if AEO status is granted by the customs authority of one Member State, it is recognised throughout the Union, and economic operators can

benefit from AEO privileges in all Member States. Currently, there are over 18,437 AEOs operating across the European Union, and 8 MRAs have been concluded.

Above, the content of MRA for AEO status and their mechanisms for influencing international trade processes were outlined. However, when assessing the practical effectiveness of MRAs, it is important not to be limited to their normative-legal existence, but also to determine empirically to what extent these agreements are reflected in the outcomes of the logistics system. To this end, the study adopts the Logistics Performance Index (LPI) as the international indicator that comprehensively represents the efficiency of countries' customs and logistics systems. The LPI determines a country's logistics efficiency ranking through indicators such as customs efficiency, quality of infrastructure, international freight shipments, logistics service capabilities, quality of tracking and monitoring, and on-time delivery. This allows for the analysis of the correlation between the number of MRAs and logistics outcomes.

Improving customs efficiency can be achieved by increasing the number of AEOs, while expanding the number of MRA agreements can contribute to attaining the targeted outcomes reflected in the LPI indicators. This gives rise to the hypothesis that a higher number of MRAs is associated with an improvement in a country’s LPI ranking. To test and substantiate this hypothesis, a correlation analysis was conducted to examine the relationship between the increase in the number of MRAs and improvements in LPI performance.

In this study, data were compared based on the 2023 situation in order to assess the relationship between MRA agreements and logistics performance. The rationale for choosing 2023 is that the most recent internationally available LPI results published by the World Bank refer to the 2023 edition, and this index serves as the only up-to-date, comparable database for cross-country benchmarking.

Only those countries for which both MRA and LPI indicators were fully available for 2023 were included in the comparison (sample: 81 countries). Accordingly, the analysis follows a “one year—one cross-section” approach, aiming to quantify the statistical association between the number of MRAs and LPI outcomes (in particular, indicators related to customs performance).

The Pearson correlation coefficient (r) was applied. This coefficient measures the strength of a linear relationship between two variables on a scale from −1 to +1, where $r > 0$ indicates a positive association and $r < 0$ indicates an inverse association. Calculations were performed in MS Excel using the CORREL function, and statistical significance was assessed using t-statistics. The sample size was $N = 81$ countries.

In the analysis, the main independent variable (X) was the number of MRA agreements. The dependent variables (Y) were rank-based indicators constructed from LPI 2023 results: the overall LPI grouped rank, customs grouped rank, logistics competence and quality grouped rank, and timeliness grouped rank. A key methodological point is that for rank indicators, lower values represent better performance (i.e., rank 1 is the best). Therefore, if an increase in the number of MRAs is associated with an improvement in ranking positions, the expected correlation coefficient is negative ($r < 0$)—which is interpreted in this context as a positive effect in terms of improved performance.

To assess the strength of the linear relationship between the number of MRA agreements and LPI indicators, the Pearson correlation coefficient was applied. It is calculated using the following formula:

$$r_{XY} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

Where:

r_{XY} - Pearson correlation coefficient;

x_i - the number of MRA agreements for the i-th country;

y_i - the LPI indicator value for the i-th country;

$\bar{x}$, $\bar{y}$ - the corresponding mean values, respectively.;

n — the number of countries (sample size).

To facilitate a visual interpretation of the correlation analysis results, the relationship between the number of MRA agreements and the LPI grouped rank was illustrated using a scatter plot. The obtained results are presented in the following figure (Figure 1).

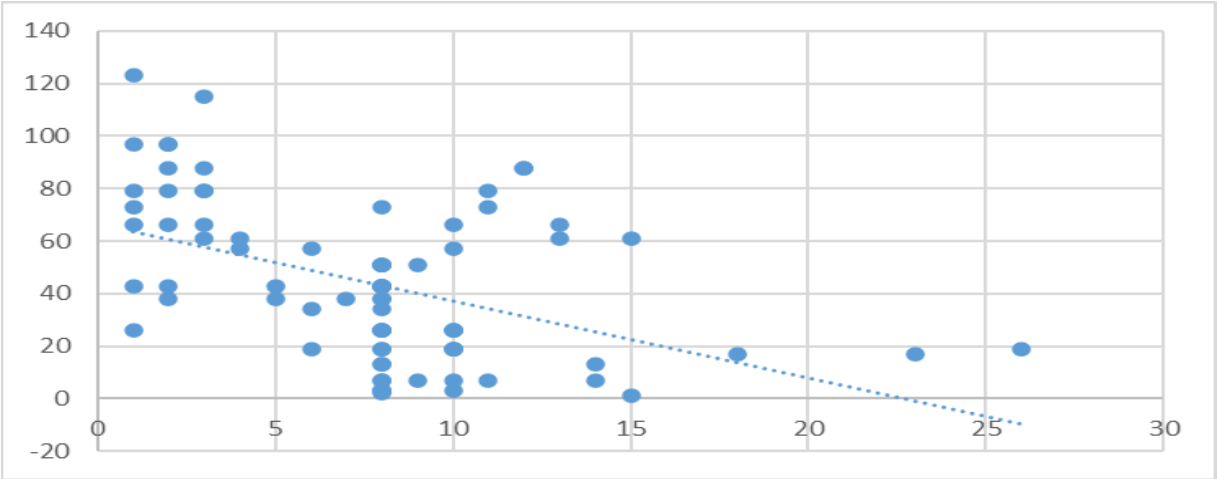

Figure 1. Correlation between the number of MRA agreements and the LPI grouped rank (2023)

As shown in Figure 1 above, in the 2023 cross-section an inverse (downward) trend is observed between the number of MRA agreements and the LPI grouped rank. This can be explained by the fact that for LPI rank indicators, smaller values indicate better performance. Therefore, as the number of MRAs increases, a country's position in the LPI ranking tends to improve. According to the Pearson correlation results, $r = -0.467$ ($n = 81$), indicating a moderate and statistically significant relationship.

The coefficient of determination for the trendline is also $R^2 \approx 0{,}218$, indicating that the number of MRAs explains a certain share of the variation in the LPI grouped rank. Similar results were observed for the LPI sub-components: the correlation with the Customs grouped rank is $r = -0{,}427$, with Logistics competence and quality $r = -0{,}464$, and with Timeliness $r = -0{,}442$ (all $n = 81$; $p < 0{,}001$). These findings empirically support the hypothesis that an increase in the number of MRA agreements is associated with improvements in LPI performance, particularly in customs efficiency indicators.

LPI performance is influenced by a range of factors beyond the number of MRAs. In particular, the development of transport and logistics infrastructure [5], the level of digitalization, the volume and composition of foreign trade, the institutional environment, customs risk management systems, and the quality of the logistics services market play an important role in explaining countries' LPI outcomes. Within the scope of this study, however, the ability to compile a complete and fully comparable dataset for these factors was limited; therefore, they were not included in the model as separate control variables.

Strengthening cooperation within AEO programmes is an important factor for promoting trade and ensuring supply chain security in Central Asia. Although AEO systems have been introduced in some countries of the region, differences in the legal framework, compliance requirements, the range of benefits granted, and practical implementation mechanisms still create a number of challenges for entrepreneurs engaged in cross-border trade.

Based on the findings, it was concluded that the WCO AEO Utility Block (UB) mechanism can be used more actively to support the effective operationalization and expansion of MRA agreements. The Utility Block (UB) provides a common basis for exchanging AEO-related information between customs administrations in a standardized format. In particular, it enables the timely and reliable transmission of data on an operator's authorization (status), the scope of the certificate, as well as information on the suspension or revocation of that status.[7]

Using the UB increases transparency, interoperability, and the level of trust between partner customs administrations, reduces the need to develop separate 'custom' technical solutions for each bilateral arrangement, and helps implement the MRA not merely as a political agreement but as a genuinely operational mechanism in practice. As a result, opportunities to deliver facilitation measures and benefits for businesses holding AEO status under the MRA framework are expanded.

4.Conclusion

Based on the analysis, the substance, practical significance, and implementation value of MRAs under the AEO programme were examined in a systematic manner. The MRA mechanism enables AEOs to benefit from simplified customs procedures in partner countries, thereby reducing clearance time, lowering transaction costs, and optimizing repetitive inspections and bureaucratic barriers. Within the scope of the study, it is substantiated that expanding the MRA network is a crucial factor for achieving policy objectives related to improving a country's performance in the Logistics Performance Index - particularly in the "customs efficiency" dimension - and for increasing the number of AEOs. The results of the correlation analysis indicate an association between a higher number of MRAs and improved LPI outcomes, confirming that the MRA track contributes to enhancing the efficiency of logistics and customs processes.

Moreover, as the number of MRA agreements increases, the practical value of AEO status rises: facilitation benefits are recognized not only domestically but also across partner jurisdictions. This strengthens the predictability, stability, and speed of customs clearance in foreign trade operations and makes obtaining AEO status more attractive for businesses.

As a practical recommendation, it is advisable to use the AEO–MRA Utility Block (UB) documents developed by the WCO during MRA negotiations and implementation. This approach helps standardize technical requirements and information exchange elements, thereby reducing the time and organizational costs associated with preparing the agreement and putting it into operation.

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