Would Customs Trade Facilitation Programs stimulate COMESA intra-export flows?

Douglas Chikabwi[†] and Rudo Chikiwa[‡]

Abstract
Measures to actively facilitate trade are increasingly seen as essential to assist COMESA region in expanding its intra-exports. COMESA intra-export trade is deplorably low. This study estimated the impact of Authorized Economic Operators (AEOs), the Automated System for Customs Data (ASYCUDA) and the Single Window systems (SWs) on COMESA intra-export flows. The study used a gravity model on cross-sectional data for 16 COMESA Member States and a Poisson Pseudo Maximum Likelihood (PPML) estimator and found that operational AEOs and ASYCUDA systems increase bilateral COMESA export flows by 1.74% and 1.06% respectively. Back-to-back functional single windows increase bilateral exports by 5.7%, of which 4.7% corresponds to exporting countries and 0.93% to importing countries' program operationalization. Policies aimed at expediting the operationalization of AEOs, the ASYCUDA systems and single windows by COMESA Member States is hereby recommended for the region to stimulate bilateral intra-export flows.

Key words: Trade facilitation; intra-exports; customs; COMESA; ASYCUDA; AEO.
JEL Classification codes: F14, C13

[†] Principal Economist, Ministry of Industry and Commerce, Zimbabwe, Email: dougiechikabwi@gmail.com
[‡] Independent Researcher, 2317/10 Ndangariro Street. Mucheke B, Masvingo, Zimbabwe

1.0 Introduction

The concept of trade facilitation has, in recent years, received greater attention in the Customs fraternity than ever before. According to Grainger, (2012), trade facilitation is the simplification and harmonization of international trade procedures[1]. The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), defined trade facilitation broadly to mean 'the simplification, standardization and harmonization of procedures, associated with trade information and trade payments. Despite countless descriptions, the definitions converge on the objective, which is to improve the overall trade environment and facilitate seamless movement of goods in foreign trade.

Many developing countries in Africa have initiated unilateral reforms of customs administrations and procedures. Few among them, particularly the advanced Regional Economic Communities (RECs), East African Community (EAC) for instance, had regional reforms. The main objective of these reforms is to simplify customs procedures and facilitate trade. The trade situation in Africa needs urgent attention. The continent is a marginal player in global trade in goods despite its size. It is the second-largest continent in the world, covering approximately 30 million square kilometers. The continent is approximately three times the size of the United States but contributing only 2, 4 percent to global exports in 2018 compared to 17, 3 percent, 38, 6 percent and 40 percent for America, Asia and Europe[2] respectively.

Africa's trade supply chain is manifested with high cross border costs and delays resulting from inefficient complex border procedures. Border Posts in Africa are highly inefficient, thick and difficult to cross. As a result, trading outside Africa has become cheaper relative to trading within. For example, during the launch of Move Africa in Rwanda, in 2016, it was argued that it is easier and cheaper for Coca-Cola to buy passion fruit from China, move it to Kenya, bottle and sell it in Kenya than to buy it from the next-door Uganda. Long border waiting times and high costs of complying with border formalities have been cited as major drivers of trade outside the African region.

Literature suggests the application of World Trade Organization (WTO) trade facilitation provisions as a possible strategy to re-configure and internalize African trade. These measures have been applied and worked well in other regions of the world, the European Union (EU) for instance. Whether the same measures would similarly and effectively work in the African setting, is less known. Of course, efforts to illuminate this area is evident. Studies that attempted to shed light in this area examined the impact of individual measures on trade. Rarely did these studies attempt to examine the impacts of soft infrastructure, particularly as a bundle of reforms due to data limitation. Controversies still exists on which measures effectively work for the African region and Common Market for Eastern and Southern Africa (COMESA) region in particular. This study focuses on customs trade facilitation programs only and seeks to investigate their impacts on intra-COMESA exports.

1.1 Background

1.1.1 Border Complexities

Border crossing areas are the most intricate nodes along the trade supply chain. Although costs and delays are also incurred behind and beyond the border, several studies, Grainger, (2012), Willie, (2018) included, notes that over 60 distinct trade procedures target goods, the vehicles (ships, planes and trucks) that move the goods and their operators (drivers, seafarers, flight

[1] Where trade procedures are the 'activities, practices and formalities involved in collecting, presenting, communicating and processing data required for the movement of goods in international trade' (WTO 1998 as quoted in Grainger 2012)
[2] Author calculations based on the UNCTADStat data

crew). Border crossing points are fraught with control objects that target revenue collection; safety and security matters; environment and health issues; consumer protection; and trade policy. Often times and in several countries, a greater proportion of these controls are performed by Customs or under Customs supervision.

Moving the goods across borders involve multiple intermediaries that include transport operators, trucking and haulage companies, freight forwarders, customs brokers, banks and finance companies, insurance companies, port operators and stevedores, and Information Technology (IT) systems suppliers, (Grainger, 2012). These intermediaries specialize on their particular entitlements. Seldom will they have full knowledge of all the transactions involved in the movement of goods nor coordinate between themselves. These acts fall short of the customs and trade procedures compliance standard that demands the highest level of coordination among the business agents.

Often times, these intermediaries, are required to submit information to countless government agencies at many border posts, which themselves operate in silos. Such standards greatly stifle the movement of goods across borders. Every time a transaction between one of the parties and the government agency occurs, trade transaction costs and time costs in the form of delays occur. While modern literature condemns border inefficiencies for distracting smooth movement of goods across national borders, other scholars (see Lufuke, 2010) credited them for pushing forward the global economic liberalization agenda. Compared to other regions of the world, Africa exhibit exorbitant border crossing costs that discourages bilateral movement of goods across countries. Exporting and importing goods to and from Africa costs US$776-00 and US$978-00 respectively, compared to US$170-00 and US$122-00 export and import from Organization for Economic Cooperation and Development (OECD) high income respectively and US$238-00 and US$245-00 export and import from Europe and Central Asia respectively[3].

Of all the regions of the world, Africa depicts huge border delays. Whilst it took only 15 hours to comply with export formalities in OECD high income and less than 42 hours in Europe and Central Asia, it took 169 hours for Sub-Saharan Africa to comply with same formalities. The delays heighten when getting commodities into Africa. Importing to OECD high income took less than half a day compared to more than 9 days for Sub-Saharan Africa[4]. Customs delays as a subset of border delays in Sub-Saharan Africa are on average, the longest in the world. The average delay in Africa is 12 days compared with 7 days in Latin America. Kassahun (2014) submits that the longest delays in the region are in Ethiopia which on average took more than 30 days for customs to clear goods.

The reduction of border impediments to trade is among significant agenda items at the national, regional (COMESA, EAC) and Continental (Africa) levels. Like similar regions, European Union for instance, COMESA is seriously working to eliminate internal borders to stimulate its bilateral trade. Unilateral, bilateral and regional trade facilitation reforms[5] targeted at providing comparative advantage to the country(s) or region undertaking trade facilitation reforms in its customs are significant in COMESA than other regions of the world (Grainger, 2012).

[3] Author calculations using World Bank Doing Business, (2020) data

[4] Author calculations using World Bank Doing Business, (2020) data

[5] Implementation of Single Window and ASYCUDA Systems

Trade facilitation seeks to reduce impediments in international commerce, the majority which are found at the border. Over 75 percent of the WTO Trade Facilitation Agreement (TFA) provisions are implemented at the border and manipulate, mostly, the operations of customs. Customs, relative to other border agencies, have greater control of national borders and the movement of goods. Besides performing their direct functions, they sometimes administer duties on behalf of other agencies that are not stationed at the border. Accordingly, focusing on implementing measures that increase customs efficiencies is bound to increase bilateral trade flows as well.

The link between the implementation of customs-related trade facilitation programmes and trade flows, not need more emphasis. In fact, customs trade facilitation programs are more relevant now than before, given the ever-rising volumes of trade and increasing trade security threats (Granger, 2007a). If not properly handled, customs may be tempted to add yet new layers of controls, possibly in the security area, to offset the increasing trade volumes. In this regard, customs-related trade facilitation programmes help customs administrations meet their duties and effectively perform both the facilitation and control roles.

1.1.2 Customs functions, trade facilitation initiatives and Trade Flows

Excessive controls and inefficiencies in customs procedures are pervasive features in developing economies of the world. One of the obvious reasons is that, majority of their governments rely on customs revenue collections in the form of import duties, statutory fees and other charges on their budgets. As a result, they are contingently compelled to maintain the traditional "gatekeeping" systems that violate trade facilitation objectives. Customs functions of such countries are usually flawed with several irregularities that give rise to high cross border costs and delays which impedes legitimate trade.

Often times, customs operations in developing economies suffer from manual operations, excessive signatures and documentation, lack of and/or outdated equipment, multiple and non-probabilistic inspections and corruption (Paulo, Octaviano & Cristiano 2015). These shortcomings give rise to lengthy and costly customs formalities. The World Bank, Trading Across Borders provide annual statistics on performance of governments to manage cross border activities. Indications from the data show that clearance times, cross border fees and charges and number of documents required are consistent with the implementation level of the WTO TFA provisions.

Regions that are ranked low in the implementation commitment rankings, exhibit long clearance time, high costs and documentation requirement. Unfortunately, these regions are also ranked low in terms of trade, suggesting that, increasing implementation of trade facilitation programmes would stimulate trade. Reports shows that developing economies, which are ranked low in the implementation matrix, stand more chances to gain in trade than developed counterparts[6]. Table 1 shows the relation between WTO TFA implementation level, the time to cross a border, cross border costs and export flows.

[6] World Trade Report, 2015

Table 1: WTO TFA implementation level, Time to cross the border, Cross border costs and export flows

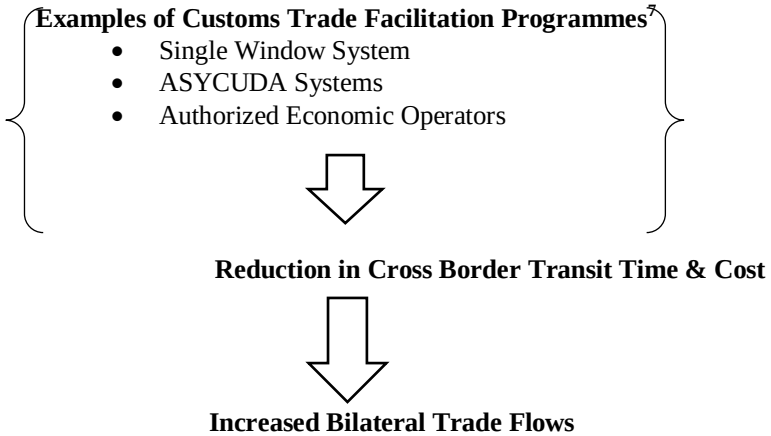
Region	TFA Implementation Level in percentage	Time to cross border in Hours Export (Import)		Cross border Cost in USD Export (Import)		Export region share to global trade (%) 2018
Europe & Central Asia	100	41.2	(43.8)	237.6	(244.7)	- -
Latin America & Caribbean	62.2	91	(98.8)	616.6	(735.7)	5.6
OECD High Income	100	15	(11.9)	170.2	(121.6)	54.8
South Asia	62.2	127.1	(179.4)	468.5	(734.6)	2.6
Sub-Saharan Africa	27.6	169	(222.3)	775.6	(977.8)	1.7

Source: World Bank Doing Business Trading Across Borders, https://www.tfadatabase.org/implementation and UNCTADSTAT

The depiction portrays that the level of implementation is consistent with export flows. Regions that are advanced in implementation, have achieved higher export flows. Africa, in particular, the Sub-Saharan part, is ranked lowest in implementation and contributes only 1.7 percent to global exports in 2018. The region had implemented only 27.6 percent of the total TFA provisions. Of the implemented provisions, customs trade facilitation programmes have not been much considered, possibly because they require significant time and resource commitments.

Developing economies, Africa included, are elusive to costs when it comes to implementation and mostly rely on development partners for both financial and technical assistance in meeting their commitments. This paper challenges the cost sensitive philosophy grappling Africa. Rather, the paper argues that, the costs of not implementing the TFA may be far higher than the immediate implementation costs. Figure 1 conceptualizes the nexus between customs trade facilitation and bilateral trade flows.

Figure 1: Nexus between customs trade facilitation and bilateral trade flows



Source: Authors Compilation

[7] Only trade facilitation programmes that are in categories of Articles V, VIII & X of the GATT 1994, Articles of the WTO TFA & Articles of the WCO are considered.

Measures that seek to simplify[8], standardize[9] and harmonize[10] customs procedures in order to expedite the movement, release and clearance of goods, including goods in transit are most welcome in Africa, particularly in the COMESA region, considering the trade situation which have not been appealing despite spirited efforts to eliminate tariff barriers. The growth in intra-COMESA trade remains low compared to the region's trade with the rest of the world both in terms of exports and imports (Chikabwi, 2020). The intra-COMESA exports only account for 6.4 percent of region's total exports compared to about 20 percent for East African Community (EAC) and 62 percent for the EU[11]. COMESA trade performance is a reflection of huge policy investments aimed at reducing tariffs and stimulate trade. Clearly, tariff liberalization has failed to jump-start COMESA trade potential.

COMESA needs to focus "outside the tariff box". Addressing non-tariff barriers, particularly border-related bottlenecks could improve COMESA trade situation. Unlocking trade flows in the COMESA region demands greater attention on the role of customs in facilitating trade. Given that, goods spent the greatest release and clearance time in customs control, means that, customs play a crucial role in influencing the speed at which goods cross national borders. Theory, however, suggests that, the implementation of trade facilitation programs such as the Automated System for Customs Data (ASYCUDA), the Single Window System and the modern border equipment (scanners), among others, increase border efficiency and subsequently trade flows. Unfortunately, the ultimate impact of these interventions to COMESA bilateral trade flows are less known.

This paper, therefore, focuses on the impact of customs trade facilitation programs on COMESA bilateral trade flows. The paper acknowledges different roles performed by various agencies at the border, but asserts that, it is customs that performs the majority of the clearance function. The paper, thus, do not disregard the functions of other agencies at the border nor it devalue their important roles in the goods clearance process. Our proclamation is that, one way or the other, parties involved in trade interface with customs in their operations. As such, customs act as a hub for other agencies, thus, implementing customs trade facilitation programmes would be implementation for all. The paper, thus, build a case for urgent implementation of customs trade facilitation programmes in the COMESA region to stimulate bilateral trade flows.

The remainder of this study is organized as follows. Whereas section 2 reviews the literature, section 3 and 4 presents the research methodology and the empirical results respectively. The last section provides the conclusion and recommendations.

2.0 Literature Review

2.1 Customs Trade Facilitation and Border Crossing Costs and Delays

The impact of customs trade facilitation programs on trade flows is transmitted through cross border costs and delays. Literature suggest that bilateral trade flows are inversely related to border costs and delays. It is further argued that, border costs and delays, are factors of customs trade facilitation programs. Customs trade facilitation, is therefore, central in accelerating bilateral trade flows. The link between customs trade facilitation and border delays, and

[8] Means processes of eliminating unnecessary elements and duplications in customs formalities, process and procedures
[9] Refers to the alignment of domestic customs formalities, procedures, operations and documents with international conventions, standards and practices
[10] Refers to processes of developing internationally agreed customs formats for practices and procedures, documents and information, (Grainger 2012).
[11] UNCTADSTAT, 2015

customs trade facilitation and border costs can be examined using the Queue theory and the iceberg model.

2.1.1 The queue theory

The contemporary management science theory called "queue theory" is critical in the analysis of border post management. The theory asserts that, long waiting periods in business are costly. Delays cause congestion, which, if not properly managed, can disrupt other business operations and clients (Anderson et al. 2011). They also attract additional cost of creating extra holding spaces, possible loss of business, possible loss of good will and a reduction in customer satisfaction (Bimha & Bimha, 2018). Maister, (2008), urged managers to understand the behaviour of queues, as in frequent times, long queues are associated with poor service quality. By analysing queues and their entire implications, managers should calculate the trade-off between the costs of improving the service quality (through delay management interventions) against the costs of delays to various players in the business and the ultimate benefits expected as a result of the interventions.

Improving time-related service quality, in border management scenarios, for instance, involves increasing the service rate by modernising border operations through the application of customs trade facilitation programmes. Theoretically, customs trade facilitation manipulates border clearance times. The majority of delays incurred at the border are amenable to customs trade facilitation. Thus, customs trade facilitation measures reduce service time, leading to less waiting times. It can therefore be concluded that border delays are a function of customs trade facilitation. This statement can be expressed mathematically as follows:

$$D_{ij} = g(ctf) \quad (1)$$

Where D_{ij} stands for bilateral border delays and ctf refers to customs trade facilitation.

2.2.2 The iceberg model

The iceberg cost model, is a simple economic model of modern trade and economic geography. The model is built on a strong assumption (Samuelson, 1954) that trade costs are proportional to the value of tradable goods, (Alfonso, Andreas & Luca 2010). Accordingly, only a fraction of the exported ice reaches its destination as un-melted ice. In order to supply *x* goods to country *j*, the destination country, from country *i*, the product originating country, $Tij(x)$ goods should be shipped from country i, where Tij>1. A constant fraction of *x* goods, Zij, melts in transit. Thus, to deliver *x* goods in country *j*, more than *x* goods should be shipped to reimburse transit costs, implying an inverse relationship between exports and bilateral trade costs (Ferguson & Forslid, 2011). Similar impact is also expressed in the traditional gravity model, where exports from country *i* to country *j* are a positive function of the economic masses of the trading countries and inversely proportionate to the distance between them. Distance in the traditional theory commonly represented trade costs (Groenewald, 2014).

Considering the iceberg and gravity theoretical underpinnings, the objective of stimulating bilateral exports cannot be met without interventions to reduce trade costs. Theory suggests that trade facilitation manipulates bilateral trade costs. Of all bilateral trade costs, on the border costs are more amenable to manipulation by customs trade facilitation. It can therefore be concluded that bilateral trade costs are a function of customs trade facilitation. This statement can be expressed mathematically as follows:

$$\tau_{ij} = g(ctf) \quad (2)$$

Where τ_{ij} stands for bilateral trade costs and ctf refers to customs trade facilitation.

The queue theory of delays and the iceberg cost model concurred that delays and costs are amenable to customs trade facilitation. Mathematically, this statement can be expressed as a combination of equation 1 and equation 2 as follows:

$$\tau\delta_{ij} = g(ctf) \quad (3)$$

Where $\tau\delta_{ij}$ stands for bilateral border costs and delays and ctf refers to customs trade facilitation.

2.2.3 Customs Trade Facilitation and Trade Flows

There are several conceptions that explains why countries trade. Among them, the Absolute Advantage theory, the Comparative Advantage theory and the Heckscher-Ohlin theory dominate the literature. Nevertheless, the comparative advantage theory, among competing theories, provides a better framework in understanding the nexus between customs trade facilitation and trade flows. Founded on strong assumptions of a two-country case, country *i* and *j*, each producing two goods, good *x* and good *y* with fixed means of production which is immobile between countries, the theory hypothesises that trade takes place between two countries with different comparative advantages, (Wang, Wang, & Lee, 2017).

The theory assumes that efficiency in production is the foundation of trade. Table 2 demonstrates circumstances under which trade can occur between two countries, country *i* and country *j*, with different production costs structures, producing two goods, good *x* and good *y*.

Table 2: Circumstances under which trade can occur between two countries.

δ_i^x	δ_j^x	$Scenario\ 1: \delta_i^x < \delta_j^x$
δ_i^y	δ_j^y	$Scenario\ 2: \delta_i^y > \delta_j^y$

According to the theory, trade can only occur between country *i* and country *j* when scenario1 and scenario 2 holds, that is when:

$$\text{Neither } \delta_i^x \neq \delta_j^x \text{ nor } \delta_i^y \neq \delta_j^y \quad (4)$$

Trade, therefore, occurs when country *i* produces good *x* cheaply than country *j* and country *j* produces good *y* cheaply than country *i*. Country *i* in this scenario is bound to export good *x* to country *j*, for which it is cost effective in producing than in country *j* and import good *y* from country *j*, where it has a comparative disadvantage. The same applies to country *j*, import good *x* and export good *y* to country *i*. This statement can be expressed in mathematical form as follows: $\delta_i^x > \delta_j^x$; $\delta_i^y < \delta_j^y$, scenario 3

Scenario 3 illustrate a case for which trade cannot occur under the comparative advantage theory. Countries involved in international trade not only accede to production costs. They also incur transaction costs in moving physical goods from the production factories in the exporting country, crossing national borders, to the final destinations in the importing country. Suppose that country *i* produces good *x* for export into country *j*, the total costs of exporting are

production costs plus bilateral transaction costs. Mathematically, this can be expressed as follows:

$$TC_{ij}^{x} = \delta_{i}^{x} + \tau_{ij} \quad (5)$$

Where TC_{ij}^{x} is the total costs of exporting good *x* from origin country *i* to destination country *j*, δ_{i}^{x} is the production cost of good *x* in country *i* and τ_{ij} are the transaction costs of exporting good *x* into country *j*.

In order for country *i* to produce and export good *x* to country *j*, the relative total cost of producing good *x* in country *i* should be lower than that of country *j* and that the relative costs of producing good *y* in country *j* should be lower than that of country *i*. Customs trade facilitation can stimulate bilateral trade flows between country *i* and country *j* through reducing total trade costs (TC_{ij}^{x}). This can be done through manipulating trade transaction costs (τ_{ij}) that can directly reduce total costs or do it indirectly through reduction in production input cost, (Yotov *et al.* 2017).

In summary, economic theory suggests that customs trade facilitation influence trade flows through its effects on bilateral border transaction costs and time. This suggests an analytical framework summarised by the following system of equations:

$$X_{ij} = g(\tau\delta_{ij}) \quad (6)$$

$$\tau\delta_{ij} = g(ctf) \quad (7)$$

Where X_{ij} are exports from country *i* to country *j*, $\tau\delta_{ij}$ are bilateral border costs and delays between country *i* and country *j* and ctf are customs trade facilitation programs.

Equation (6) shows that exports are a function of bilateral border costs and delays and equation (7) indicates that bilateral border costs and delays are a function of customs trade facilitation. Thus, manipulating customs trade facilitation variables is expected to induce changes in bilateral border costs and delays which in turn stimulate exports.

The impact of trade facilitation on trade flows has been interrogated by numerous empirical studies across the globe (Michael 2005; Grainger, 2012; Paulo, Octaviano & Cristiano 2015 and Daniel & Sylvanus 2019). Given that trade facilitation is a broad area, empirical work has not been equally distributed across the regions of the world and across TFA programmes themselves. While this study acknowledges several studies, which are mostly for single countries, little has been done to understand the impact of the same programs on a regional set-up.

Geofrey & Michael (2018); Nergiz & Ayça (2019) and Inmaculada & Santiago (2020) are among the few researchers whose work focused on economic impacts of customs-related trade facilitation programmes. Whilst Willie, (2018) examined the effects of implementing digital trade facilitation on intra-African exports, the study considered only digital customs-related measures. The study focused on the effects of implementing digital trade facilitation and did not consider the impacts of existing or rolled-out TFA programmes. The study took a holistic approach and considered the impacts of digital and non-digital customs-related TFA programmes on bilateral trade flows.

Using author constructed digital trade facilitation implementation scores for all African countries and a gravity model,_results indicated that a 1% increase in exporter score was associated with a 0.28% increase in intra-Africa exports and a 1% increase in the importer score was associated with a 0.53% increase in intra-Africa exports.

Nergiz & Ayça (2019) examined the impact of Authorized Economic Operator (AEO) program on trade of the Organization of Islamic Countries (OIC) Member States for the period 2000-2017. Using descriptive analysis, convergence analysis and gravity analysis for 132 countries, of which 57 were the OIC, both the traditional and the structural_gravity analyses indicated no impact of AEO adoption on bilateral trade of OIC countries. These findings contrast with those by Geofrey & Michael (2018) study. The bio analyzed the impact of AEO operator accreditation on trade flows, taking Uganda as a case study. Using import and export (Customs) data extracted from Uganda Revenue Authority (URA) ASYCUDA database and matched difference-in-differences regression, the study found that AEO accredited firms experienced exponential growth in trade, reduced clearance time and increased government tax revenue compared to peer firms that were not AEO accredited.

Inmaculada & Santiago (2020), using a structural gravity model for a panel of 176 countries from 1995 to 2017, analyzed the impact of Single Window system (SWs) on global trade. The study applied a log-log and a Poisson Pseudo-Maximum Likelihood estimator (PPML) with multi-dimensional fixed effects and a linearized gravity model and found that, that, total trade between two countries with functioning SWs increases by about 37 percent, of which 23 corresponds to exports and 14 to imports. Results from the PPML estimation indicate a positive and significant effect, which is however much smaller in magnitude.

In developing Africa, trade facilitation programs are mostly implemented under Rec's auspices. Although the reviewed empirical literature has been drawn from both the developed and developing world, none of the studies took a regional approach to assess the impact of regionalised programs on the region's trade flows. The impacts of these programs on trade flows at RECs levels remain a gap in literature that this study seeks to meet.

3.0 Methodology

Following the theoretical framework given in equations (6) and (7), the study applied the gravity model to evaluate the effects of customs trade facilitation programs on bilateral trade flows in the COMESA region. The model postulates that bilateral trade between countries is a positive function of their economic output and an inverse proportion of the distance between them. The model estimated in this study augmented the traditional gravity model by adding customs trade facilitation variable as follows:

$$TF_{ij} = \exp\left(\beta_0 + \beta_1 GDP_i + \beta_2 GDP_j + \beta_3 Dist_{ij} + \beta_4 Comlang_{ij} + \beta_5 Comcol_{ij} + \beta_6 Cont_{ij} + \beta_7 \Sigma\phi_{ij}\right) + \varepsilon_{ij} \quad (8)$$

Where TF_{ij} stands for bilateral trade flows between country i and country j, β_0 to β_7 are parameters to be estimated, GDP_i is the exporter economic output which is a proxy of supply potential, GDP_j is the economic output of the importing country which proxy its market size, $Dist_{ij}$ is the distance between the exporting country i and the importing country j, $Comlang_{ij}$ refers to common official language, variable taking values 1, if trading countries have common official language and zero, otherwise, $Cont_{ij}$ refers to contingent, the variable taking values 1,

if the trading countries shares a border and zero, otherwise, $\Sigma\phi_{ij}$ is vector of customs trade facilitation programs between country *i* and the importing country *j*, and ε_{ij} is the white noise error term.

Next, we disaggregated a vector of customs trade facilitation programs into specific and distinct programs whose impact were examined by estimating how much trade increases when the instruments are implemented.

$$\Sigma\phi_{ij} = \mathrm{AEO}_{ij} + Asycuda_{ij} + SW\_X_i + \mathrm{SW\_M}_j \quad (9)$$

Finally, we estimated a more detailed specification (equation 10) in a multiplicative form using the PPML as given in equation 10. Since there are presents of zeros in our exports data, PPML estimator performs very well even when the proportion of zeroes is large (Silva and Tenreyro, 2006).

$$TF_{ij} = \exp\big(\beta_0 + \beta_1 GDP_i + \beta_2 GDP_j + \beta_3 Dist_{ij} + \beta_4 Comlang_{ij} + \beta_5 Comcol_{ij} + \beta_6 Cont_{ij} + \beta_7 \mathrm{AEO}_{ij} + \beta_8 Asycuda_{ij} + \beta_9 SW\_X_i + \beta_{10} \mathrm{SW\_M}_j\big) + \varepsilon_{ij} \quad (10)$$

Where AEO_{ij} is a dummy taking the value 1 if both countries have operational AEOs, 0 otherwise, $Asycuda_{ij}$ also takes value 1 when both countries have operational ASYCUDA systems, 0 otherwise, SW_X_i takes the value 1 when the exporting country has an operational single window, 0 otherwise, similarly, $\mathrm{SW\_M}_j$ takes the value 1 when the importing country has an operational single window, 0 otherwise.

We set our empirical equation in an exponential form following Santos Silva and Tenreyro, (2006). We therefore estimate the gravity model with the Poisson Pseudo Maximum Likelihood (PPML) estimator. The use of PPML as an estimator effectively handles the presence of zero trade flows and addresses the problem of heteroscedasticity. We also account for the unobserved multilateral resistance terms by applying the directional (exporter and importer) fixed effects.

3.1 Data Sources

Cross sectional data for the year 2018 for 16 COMESA countries[12] were examined in this study. Countries included in the study and the study period were chosen based on data availability. Data on ASYCUDA, Single Window and Authorized Economic Operators (AEOs) were obtained from the ASYCUDA Database, Inmaculada & Santiago (2020) and the 2019 compendium of AEO programmes respectively. Variables that capture distance, common border, land locked, common colonizer, and common language were accessed from "Centre d'Etudes Prospectives et d'Informations Internationales" (CEPII) whilst trade flows data was downloaded from IMF-Direction of Trade Statistics. However, due to data gaps, data on trade flows was supplemented by data downloaded from the Trade Map-International Trade Statistics and the UN Comtrade Database. The supplement data was converted to conform to the IMF-Direction of Trade Statistics unit of measurement. GDP data for all countries was downloaded from World Development Indicators (WDI) and indexmundi.

[12] Burundi, Comoros, DRC, Egypt, Eswatini, Ethiopia, Madagascar, Malawi, Mauritius, Kenya, Rwanda, Somalia, Seychelles, Uganda, Zambia and Zimbabwe

4.0 Results and Discussion

4.1 Descriptive Statistics

Intra-COMESA exports reached an average of US$26.39 million in 2018. The variation in bilateral export flows is too large as some countries recorded zero flows whilst maximum export flows reached US$863.73 million. Zero flows could be because of rounding off, non-reported data or omission. A huge standard deviation in exports is not surprising. Experience shows that COMESA countries export more outside their region than within itself. For instance, Zimbabwe is a member of both COMESA and the Southern African Development Community (SADC), however, within Africa and its RECs, Zimbabwe trade more with South Africa, a SADC member state than any other COMESA country.

The average operational AEOs in COMESA reached 0.85 in 2018, operational ASYCUDA systems reached 0.88, operational single windows in exporting countries 0.25 and importing countries 0.25 for the same period. Statistics reveals that COMESA member states have got more potential to improve on implementation of single window systems than AEOs and ASYCUDA systems. Table 3 contains a summary of the main statistics for the variables used in the empirical model.

Table 3: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Exports (Millions)	26.39	94.70	0	863.73
GDP_X	4.26	7.36	1.19	3.03
GDP_M	4.26	7.36	1.19	3.03
Cont.	.1	.30	0	1
Commlangoff.	.63	.48	0	1
Commoncol.	.33	.47	0	1
AEO	.85	.36	0	1
Asycuda	.88	.33	0	1
SW_X	.25	.43	0	1
SW_M	.25	.43	0	1

4.2 Correlation Analysis

Preliminary analysis of correlation between exports and customs trade facilitation programs indicates that AEO, exporter single window and importer single window are positively correlated with exports whilst ASYCUDA system has a theoretically contradicting negative coefficient of correlation. The correlation analysis also suggests the presence of a positive association between exports and the GDP of the exporting country, GDP of the importing country, sharing a border and common colony. However, a negative association is being suggested between exports and common official language and distance. Table 4 summarises the correlation of variable used in the empirical model.

Table 4: Correlation Analysis

Variable	Exp	GDPi	GDPj	AEO	Asyc	SW_X	SW_M	Cont	Comla	Comcol	Dist
Exports	1.000										
GDPi	0.086	1.000									
GDPj	0.041	-0.067	1.000								
AEO	0.114	0.099	0.180	1.000							
Asycuda	-0.030	-0.262	-0.262	-0.018	1.000						
SW_X	0.076	-0.072	0.0048	0.243	-0.073	1.000					
SW_M	0.031	0.005	-0.072	0.243	-0.073	-0.067	1.000				
Cont	0.492	-0.020	-0.020	0.101	-0.126	0.000	-0.000	1.000			
Comla	-0.043	-0.263	-0.263	-0.023	0.078	0.120	0.120	0.138	1.000		
Comcol	0.046	-0.195	-0.195	0.000	0.107	-0.020	-0.020	0.177	0.538	1.000	
Dist	-0.180	0.387	0.387	-0.025	-0.210	-0.044	-0.044	-0.371	-0.199	-0.224	1.000

4.3 The Gravity Model Regression Results

The regression results from the gravity model are presented in Table 5. The coefficients for customs trade facilitation variables have expected signs and are highly significant implying that application of trade facilitation programs stimulate intra-exports in COMESA. A 1% increase in operationalization of AEO programs and ASYCUDA Systems in the COMESA Member States would increase bilateral export trade by 1.74% and 1.06% respectively. Similarly, a 1% increase in the operationalization of the single window system by COMESA exporting and importing countries would increase bilateral export flows by 4.78% and 0.93% respectively.

These study findings are not surprising. They present a true reflection of COMESA potential trade gains. For sure, COMESA had been lagging behind in implementing customs TFA programs, especially, digital reforms purportedly due to high cost of implementation. As such the implementation of customs trade facilitation is still low in COMESA region as their implementation is motivated by the availability of development technical and financial support. Again, the fact that these provisions are not mandatory in the WTO TFA and Annex 4 on Trade Facilitation of the African Continental Free Trade Area (AfCFTA), means that their implementation, especially by COMESA countries with weak national budgets, may not be prioritised. Thus, these trade facilitation programmes still embody huge potential trade gains for the region.

The coefficients for the traditional gravity model variables, exporter's GDP, importer's GDP, sharing a border and distance between trading countries, all, have expected signs and are highly significant. Common official language has the expected sign but is insignificant in explaining intra-COMESA exports. Coefficient of common colony is significant though contradicting with the theory. Results suggest that common colony reduces intra-COMESA export trade. The results are not surprising considering that countries with similar colonial background or who have common colony tend to have inherited common colonial systems. As such, these countries tend to have similar comparative advantages in production. They, therefore, produce similar goods at similar factor costs hence makes it difficult to trade among themselves.

Findings of our paper are comparable with other previous studies. They are similar to those by Inmaculada & Santiago (2020), who found that total trade between two countries with functioning single windows increase by approximately 37%, of which 23 corresponds to exports and 14 to imports. Our results are also in agreement with those obtained by Geofrey & Michael (2018), when they studied the impact of AEO accreditation status on the firm's trade volume in Uganda. Similarly, their study found out that AEO programs motivates trade. Our findings, however, contrast with findings by Nergiz & Ayça (2019), who, on assessing impact

of AEO programs on bilateral trade of the OIC Member States, found that the adoption of the AEO programs by OIC member states has no impact on their bilateral trade.

Table 5: Gravity Model Results

Variables	Estimated coefficient	Robust standard Error
GDP_i	2.38***	2.29
GDP_j	1.33***	2.16
$Cont_{ij}$	1.87***	0.33
$Comlang_{ij}$	0.14	0.41
$Comcol_{ij}$	-0.82*	0.45
$Dist_{ij}$	-0.001***	0.00
AEO_{ij}	1.74***	0.45
$Asycuda_{ij}$	1.06**	0.44
SW_X_i	4.78***	0.51
SW_M_j	0.93**	0.43
β_0	-1.62	0.83
Observations	240	
Adjusted R-squared	.92850629	

Note: *** p<0.01, ** p<0.05, * p<0.1

5.0 Conclusions and Policy Recommendations

This study estimated the impact of AEOs, the ASYCUDA and the single window systems on COMESA intra-export flows. The obtaining intra-COMESA export level of 11.9% compared to 18.7%; 17.9% and 63.6% for EAC, SADC and EU respectively are of concern to the region. COMESA is reputable for trading outside its region than within itself. The study used a gravity model on cross-sectional data for 16 COMESA Member States and a PPML estimator and found that operational AEOs and ASYCUDA systems increase bilateral COMESA export flows by 1.74% and 1.06% respectively. Back-to-back functional single windows increase bilateral exports by 5.7%, of which 4.7% corresponds to exporting countries and 0.93% to importing countries' program operationalization. Policies aimed at expediting the operationalization of AEOs, the ASYCUDA systems and single windows by COMESA Member States is hereby recommended for the region to stimulate bilateral intra-export flows. Future studies that build on ours might consider the impact of bilateral or regional integrated customs trade facilitation programs, including, but not limited to, programs studied in this paper.

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