DEVELOPING MODELS FOR ESTIMATING THE IMPACTS OF NON-TARIFF BARRIERS IN THE EAC REGION

FINAL STUDY REPORT

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Acronyms & Abbreviations

AD	Anti- dumping
CCTTFA	Central Corridor Transit Transport Facilitation Agency
CET	Common External Tariff
COMESA	Common Market for Eastern and Southern Africa
CTO	Corridor Transport Observatory
CU	Customs Union
EABC	East African Business Council
EAC	East African Community
EALA	East African Legislative Assembly
FE	Fixed Effects
FTA	Free Trade Area
KRA	Kenya Revenue Authority
NCTTCA	Northern Corridor Transit and Transport Coordination Authority
NMCs	National Monitoring Committees
NTBs	Non-Tariff Barriers
NTMs	Non-Tariff measures
OLS	Ordinary Least Squares
PPML	Poisson Pseudo Maximum Likelihood
QR	Quantitative Restrictions
RE	Random Effects
RECs	Regional Economic Communities
SADC	Southern Africa Development Community
SG	Safe Guards
SPS	Sanitary and Phytosanitary
TRQ	Tariff Rate Quarters
URA	Uganda Revenue Authority
URT	Uganda Revenue authority
WTO	World Trade Organization
TBTs	Technical Barriers to Trade

Executive Summary

Non -Tariff barriers (NTBs) have remained the main international trade barrier in the last 2 decades and have been on an increase, with the number of non -tariff measures initiated for the last decade globally having more than doubled. In East African Community (EAC) region, NTBs have continued to exist too, transforming and appearing in different forms and significantly impacting trade. NTBs reported for the first time in EAC accounted for over 4 percent of all the NTBs existing in the region in 2021. Among the efforts towards elimination of such barriers, implemented by EAC partner states is the EAC Elimination of Non-Tariff Barriers Act, 2017, a legal framework for monitoring and addressing NTBs in the region, the EAC Time-Bound Programme for the elimination of identified and reported NTBs, among other measures such as utilization of regulations, directives and decisions, as well as recommendations made by the EAC Council of Ministers.

It is important to develop a quantitative assessment measurement of the impacts of NTBs, which also measures the impacts of removal of the barriers, a process which has remained a challenge in the region.

> The main objective of this study was to develop a model for estimating the impact of NTBs within the EAC region focusing on NTBs identified along the Northern and Central transport corridors. More specifically the study has:
>
> i. Reviewed various NTBs impact estimation techniques,
> ii. identified EAC NTBs whose impacts can be quantitatively estimated,
> iii. Identified EAC NTBs for estimation of impacts, and developed a model for estimating NTBs impact on trade in the EAC region.

Models developed strengthen the EAC NTBs programme, as they provide a method of quantifying the trade flow impact of NTBs and their elimination and hence provide guidance with regards to optimal use of resources for NTB elimination.

The study used quantitative methods to develop NTB impact estimation models. Data used for the development of the model was obtained from the EAC database portal, Northern Corridor Transit and Transport Coordination Authority (NCTTCA) Secretariat and the Central Corridor Transit Transport Facilitation Agency (CCTTFA) Secretariat, and from the EAC timebound NTBs elimination programme. Data used was in quarterly frequencies. Due to lack of data, model estimations were made for four (4) EAC Partner States of Kenya, Rwanda, Tanzania and Uganda. Two models were developed:

i) The model for estimation impacts of NTBs on intra- EAC Trade

This model was estimated using augmented gravity model. The variables of this model included: bilateral export flows, GDP, GDP per capita and, exchange rate; NTBs implied by data collected along the Northern and Central transit corridors including transit time for goods (from port of entry to the capital city of destination country), and, weighbridge non-compliance; and eight NTBs reported in the EAC NTBs timebound elimination programme and which were in the process of being resolved in 2022 were also included in the model.

The model was estimated using Poisson Pseudo Maximum Likelihood (PPML) estimation technique and the results showed that significant determinants of exports among EAC Partner States are:

i. Distance between two EAC trading partner States. If distance between two EAC Partner States increases by 1 KM, exports in EAC are likely to reduce by a value of about US$ 0.13M.

ii. GDP of exporting Partner State. An increase of GDP of the exporting country by US$ 1M, is likely to lead to an increase in exports of that particular country to EAC by about US$ 0.48M.

iii. GDP of an importing EAC Partner State. An increase by US$ 1M of the GDP of the importing country is likely to lead to an increase in imports of that country from EAC Partner States by slightly over US$ 0.19M.

iv. GDP per capita of exporting EAC Partner State. An increase in GDP per capita of the exporting country by US$ 1 is likely to lead to a decrease in exports of that country to EAC by US$ 0.183M.

v. GDP per capita of importing EAC Partner State. An increase in GDP per capita of the importing country could lead to EAC exports decreasing by US$ 0.37M.

vi. Real exchange rate of an exporting Partner State. An increase in real exchange rate of an importing country by US$ 1 is likely to lead to reduction in imports of that country from EAC by about US$ 0.05M.

vii. Weighbridge non-compliance in the Central Corridor. Decrease in weighbridge non -compliance in the Central Corridor by 1%, is likely to contribute to an increase in EAC trade of a value of US$ 0.02M.

viii. NTB identified in the EAC NTB timebound elimination programme and analyzed in this study are likely to have contributed to reduction of exports to EAC by a value of US$ 0.06M.

Real exchange rate of an exporting country had insignificant impacts while increase in transit time in both Northern and Central Corridors though insignificant, is likely to lead to decrease in trade. Weigh bridge non- compliance on the Northern corridor does not significantly affect trade.

It is concluded that NTBs that significantly affect trade in EAC are:

i. Time release at Dar Es Salaam port.
ii. Weighbridge non-compliance in Kenya.
iii. Weighbridge non- compliance in Tanzania.
iv. Ban of Uganda poultry products from Kenyan market.

ii) Model for estimation of trade cost impact of NTBs

This regression model was estimated using random effects technique, and used income, transport cost, transit time, distance between trading parties, price data and import elasticity. The estimation was done separately for the Northern and Central corridors.

For model estimating trade costs along the Northern corridor, significant determinants of trade costs are:

i. Distance between the port of Mombasa and the destination city. An increase in distance of 1 KM from the port of Mombasa to destination town in EAC Partner State is likely to contribute to an increase in trade cost by slightly above **US$ 1.07/KM.**

ii. Transit time to destination. Increase in transit time from Port of Mombasa to destination town in EAC Partner State by 1 hour is likely to lead to an increase in trade cost by **US$ 2.**

iii. The price level at the export destination (importing) country. Increase in price of an EAC importing country by 1percent, is likely to lead to an increase in trade costs by slightly over **2.5 percent.**

For the model estimating determinants of trade costs along the Central corridor, significant determinants of trade costs are:

i. Distance between Dar- Es Salaam and the capital city of the destination EAC country. An increase of destination country by 1KM, is likely to contribute to an increase in trade cost of **US$ 3.22 per KM.**

ii. GDP of exporting country. An increase in GDP of the exporting country of **US$ 1M,** is likely to reduce trade cost by **US$ 1.15M.**

iii. Transport costs between Dar Es Salaam and the EAC capital cities. An increase in transport cost of **US$ 1 per KM** is likely to lead to an increase in trade cost of **US$ 4.635 per KM.**

iv. Price in the importing country. An increase in price in the importing country by 1 percent, is likely to contribute to an increase of **3.7 percent** of trade cost.

iii) Conclusions and Recommendations

Based on the findings on the developed models, it is concluded that:

i. It is possible to use the developed models to estimate the impact of NTBs in EAC, hence informing policy on elimination of NTBs. Two models have been developed and tested using data: model for estimating NTBs impacts on trade (export) flows, and, model for estimating trade cost impact of NTBs, one for Northern corridor and one for the Central corridor.

ii. Data still remains a challenge for the estimation of models.

The study recommends that:

iii. The Developed models can be integrated into the NCTTCA and CCTTFA systems and implemented as soon as possible and on a quarterly basis.

iv. Northern and Central corridors transport observatories need to step up data collection for the countries of Burundi and South Sudan. This will enable expansion of the model coverage beyond the current 4 countries to all EAC Partner States.

Models for estimating the impact of NTBs within the EAC region

1. INTRODUCTION

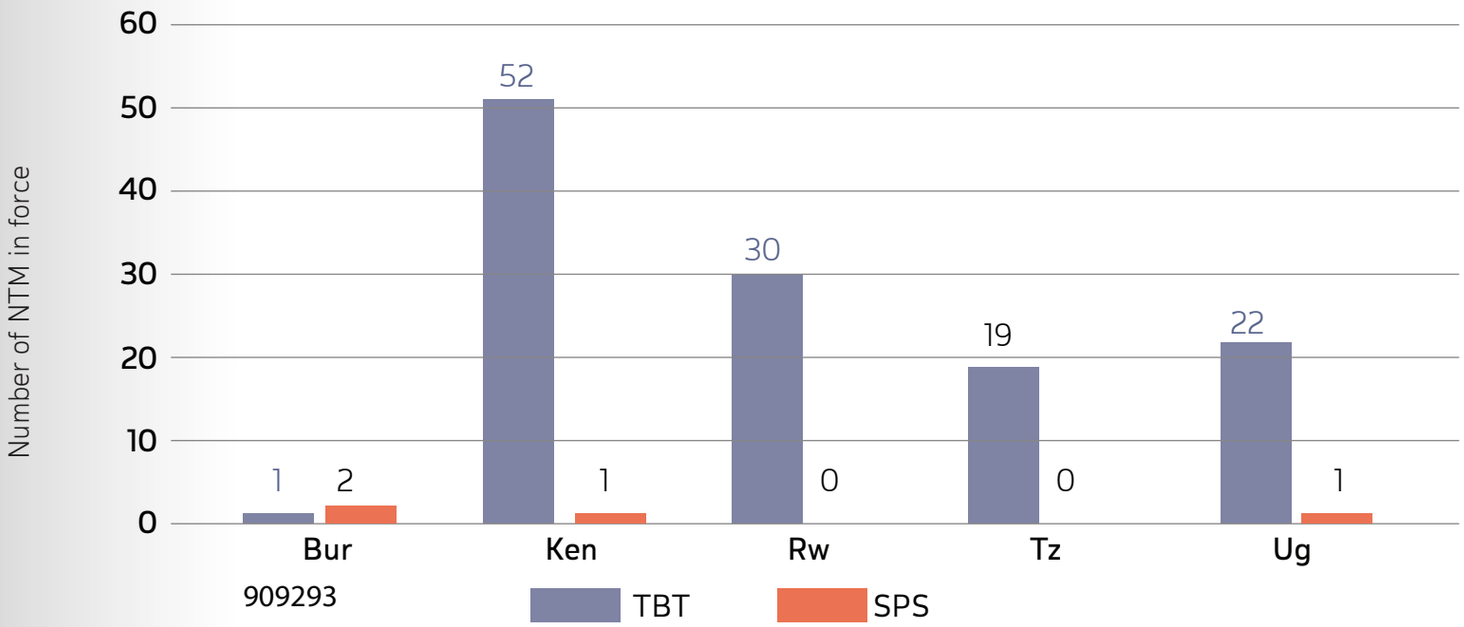
1.1 The Non -Tariff Barriers issue

World Trade Organization (WTO) defines Non-Tariff Barriers (NTBs) as measures that restrict import or export of goods through means other than tariffs, such as quotas, import licensing systems, sanitary regulations, prohibitions, among others; which is the same definition as that for non-Tariff measures (NTMs). NTB restrictions are as a result of prohibitions, conditions, or specific market requirements that prevent, restrict and or make trade of products difficult or costly. They arise from different measures taken by governments in the form of laws, regulations, policies, conditions, restrictions or specific market entry requirements, and private sector business practices, or prohibitions that protect the domestic industries from foreign competition.

These measures include a host of domestic actions by governments such as trade remedies including countervailing and anti-dumping duties, "voluntary" export restraints, subsidies which sustain in operation loss making enterprises, technical barriers to trade, and obstacles to the establishment and provision of services. Non -Tariff barriers (NTBs) have remained the main international trade barrier in the last 2 decades and have been on an increase. Statistics from the WTO show that for the last decade (2010- 2021, the number of NTBs initiated on a yearly basis globally have more than doubled representing an increase of 115 percent. In terms of specific measures, technical barriers are the largest, followed by Sanitary and Phytosanitary (SPS), anti-dumping, countervailing and safeguard measures respectively. For EAC Partner States, though WTO records several NTMs as having been initiated, a few of them are recorded as being in force as shown in *Figure 1.*

Apart from Burundi, majority of the NTM measures notified as in force in WTO are TBTs in while a lower number is SPS, with the region having not notified any measures that are anti- dumping (AD), quantitative restrictions (QR), Safe guards (SG) or tariff rate quarters (TRQ). With majority of the TBTs being related to alcoholic beverages specifications, labeling and regulatory requirements.

Figure 1:
Number of NTM in force in EAC Partner States as notified to WTO



Source: WTO data (2023)

At the multilateral WTO level, there are several agreements aimed at reduction on NTB effects of the NTMs.

These include agreement on:

i. Application of Sanitary and Phytosanitary measures;
ii. Technical barriers to trade;
iii. Trade-related investment measures;
iv. Pre-shipment inspection;
v. Rules of origin;
vi. Import licensing procedures;
vii. Subsidies and countervailing measures;
viii. Safeguards.

For all these agreements, WTO members are obliged to notify WTO when they are implementing them for purposes of transparency.

The WTO Agreement on Trade Facilitation (WTO, 2017) which aims at expediting the movement, release and clearance of goods, including goods in transit, is further an attempt at the multilateral level to address non-tariff barriers in a comprehensive manner. The agreement provides for publication and availability of information; reduction of fees and charges related to importation and exportation and penalties; release and clearance of goods; border agency cooperation; movement of goods intended for import under customs control; formalities connected with importation, exportation and transit; freedom of transit; notifications; and; provision of assistance and support for capacity building.

1.2 EAC Policy on Non -Tariff barriers

The East African Community (EAC) Partner States have made remarkable strides towards regional integration, with the region becoming a Customs Union in 2005 with a Free Trade Area (FTA) and a Common External Tariff (CET) applicable to goods imported from EAC region.

> Further the region became a Common Market in 2010, providing withing the Partner States
>
> i. Free movement of goods
> ii. Free movement of persons
> iii. Free movement of labour /or workers
> iv. Right of establishment
> v. Right of residence
> vi. Free movement of services, and,
> vii. Free movement of capital.

Intra - EAC trade has been impeded by existence of non-tariff barriers in the region.

> The EAC Non-Tariff barriers Act 2017 (East African Legislative Assembly -EALA, 2017), is the main policy framework for addressing NTBs in the region. The Act
>
> i. Provides a legal framework for the removal of non- tariff barriers in the Community,
> ii. Provides for a mechanism for identifying and monitoring the removal of non -tariff barriers; and;
> iii. Removes restrictions that make importation or exportation within and outside the Community difficult or costly.

Further the law prohibits activities by Partner States and by public officers and institutions of Partner States that create non-tariff barriers. It also provides for establishment of National Monitoring Committees (NMCs) at the partner state's level; and National Focal Points in every partner state's Ministry responsible for East African Community Affairs, all for the purposes of addressing matters related to NTBs. It further sets the procedure of elimination of non-tariff barriers by mutual agreement; by implementation of the East African Community's time bound programme for elimination of identified NTBs, and also by referencing to the Council.

> Based on the Act, EAC categorizes NTBs broadly into 2 categories
>
> i. Activities by Partner States that create non-tariff barriers, and,
> ii. Certain activities by public officers and institutions of Partner States that create NTBs.

The activities by Partner States that create non-tariff barriers are classified in 7 categories based on the WTO categorization including:

Category 1:
Government participation in trade and restrictive practices tolerated by government. These include: export subsidies, government monopoly in export and import, state trading and preference given to domestic bidders or suppliers, requirement for counter trade, domestic assistance programmes for companies, discriminatory or flawed Government procurement policies.

Category 2:
Customs and administrative entry procedures. These include: governments imposing anti-dumping duties, arbitrary customs classification, misinterpretation of rules of origin, import licensing, decreed customs surcharges, additional customs and other charges, international taxes and charges levied on imports and other tariff measures.

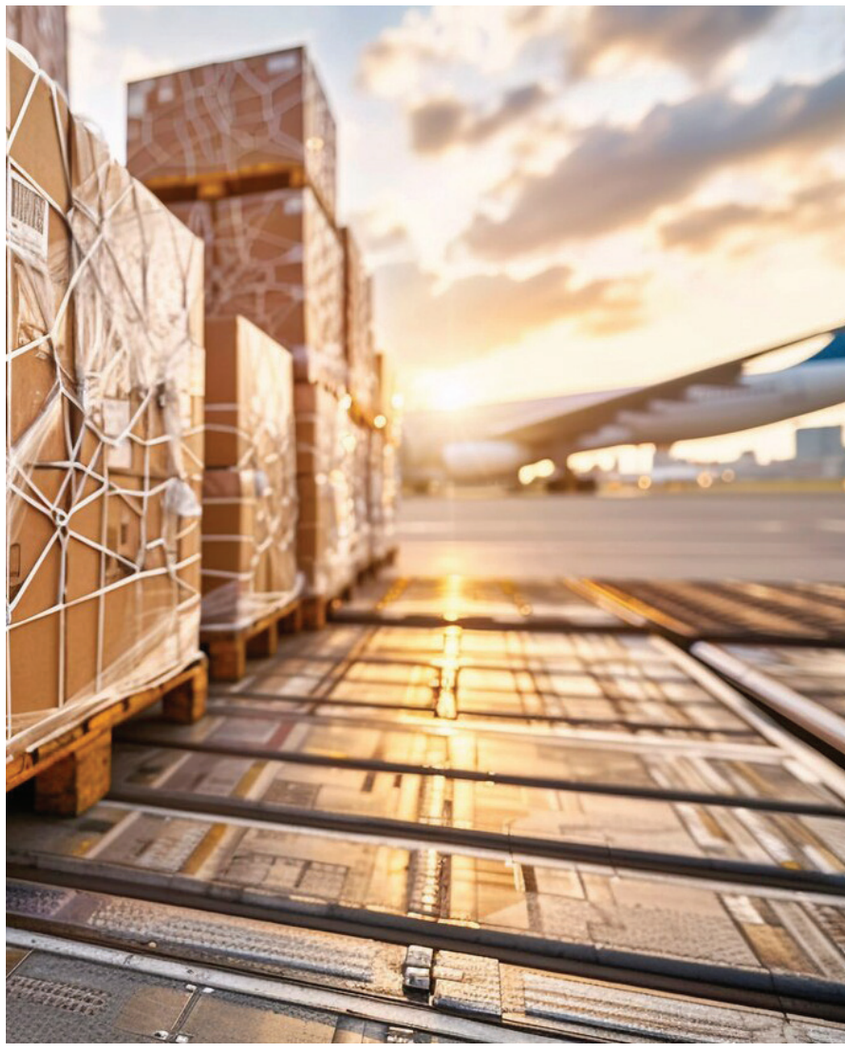
Category 3:
Technical barriers to trade. These include: restrictive technical regulations and standards not based on international standards, inadequate or unreasonable testing and certification arrangements, disparities in standards, intergovernmental acceptance of testing methods and standards, packaging, labeling and marking.

Category 4:
SPS Measures. These include Sanitary and Phyto sanitary Measures, conformity assessment related to SPS/TBT, special customs formalities not related to SPS/TBT, other technical measures.

Category 5:
Specific limitations. These include: quantitative restrictions, exchange control, export taxes, quotas, import licensing requirements, proportion restrictions of foreign to domestic goods (local content requirement), minimum import price limits, embargoes, non-automatic licensing, quotas, prohibitions, quantitative safeguard measures, export restraint arrangements, other quantity control measures.

Category 6:
Charges on imports, including prior import deposits and subsidies, administrative fees, special supplementary duties, import credit discriminations, variable levies, border taxes.

Category 7:
Other (procedural problems), including arbitrariness, discrimination, costly procedures, lack of information on procedures or on charges, requirement for complex or a wide variety of charges and documentation.



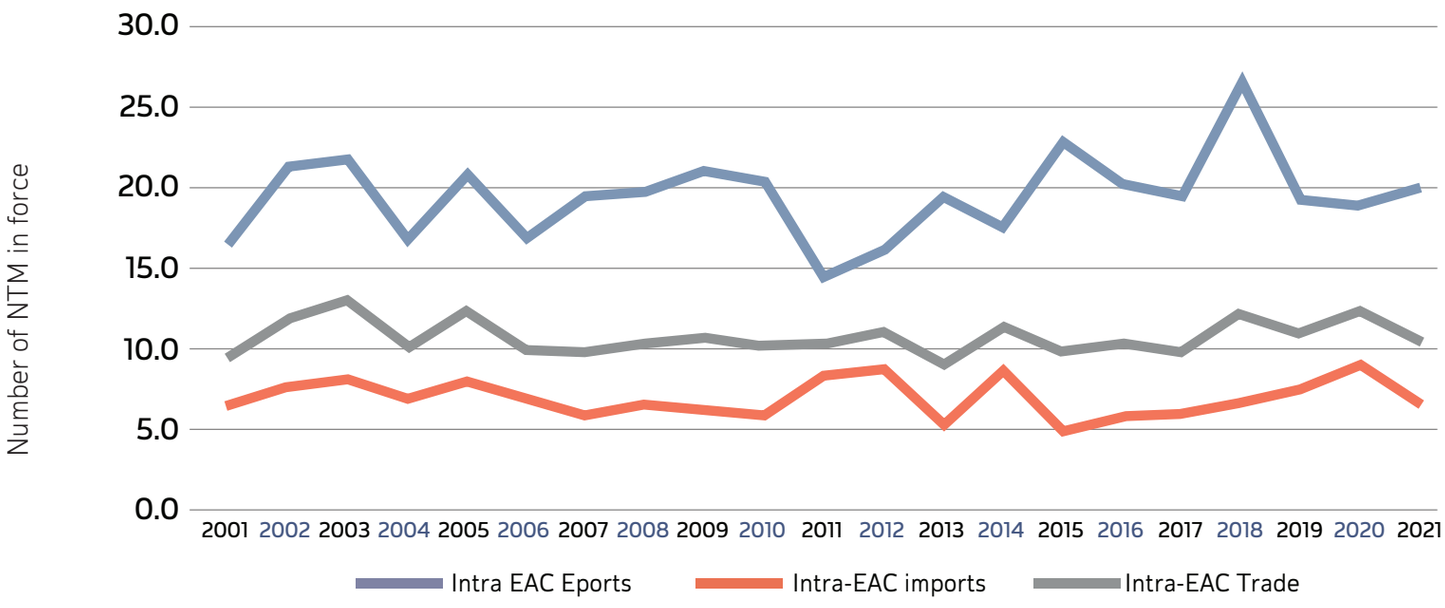
The COMESA-EAC-SADC NTB online reporting mechanism for NTBs in addition to the seven NTB classification categories, adds an eighth category of transport, clearing and forwarding, which adds value in capturing specific trade facilitation related NTBs.

> Activities by public officers and institutions of Partner States considered to lead to NTBs are identified as those that
>
> i. Cause additional cost to the business of an affected party including surcharges and custom bonds
> ii. Result in wastage of time or loss of business or market including, delays in clearing imports and lengthy testing and certification procedures
> iii. Lead to ban on market entry and loss of potential markets
> iv. Amount to corrupt practice;
> v. Restrict business transactions in the Partner State
> vi. Does not recognize the East African Rules of Origin and which lead to additional cost for verification of the goods and loss of business, and,
> vii. Causes any other impediment to trade within the Community, as may be determined by the Council.

1.3 Intra- EAC Trade

The main trading partners for EAC have predominantly remained non – EAC Partner States, with intra- EAC trade (both exports and imports) accounting for about 11 percent of the total EAC trade for last decade (Figure 2).

Figure 2:
Intra EAC Trade



Data source: COMTRADE database, accessed through WITS

Intra- regional exports have shown a slight increasing trend accounting for about 20% of the total EAC exports. Imports account for about 7 percent of the total EAC imports (Figure 2), clearly the regions' imports are sourced from extra EAC countries. Although determinants of trade are many ranging from production, export and consumption capabilities, trade facilitation and trade barriers also can contribute to low intraregional trade as has been argued by CUTS (2010), ODI (2016), and, Tralac (2021), among other studies.

1.4 The NTB problem in EAC

Among the efforts towards elimination of NTBs implemented by EAC Partner States are the EAC Elimination of Non-Tariff Barriers Act, 2017 which presents the main legal framework for monitoring and addressing NTBs in the region. Other important efforts are the time-bound programme for the elimination of identified and reported NTBs in the region, and, utilization of regulations, directives and decisions, as well as recommendations made by the EAC Council of Ministers. Notably the Time-Bound Programme for the Elimination of Identified Non-Tariff Barriers has been existing since 2009. The updated EAC timebound programme of elimination of NTBs for 2021, shows that majority (92%) of the 255 NTBs which had been reported since 2009 had been resolved, while the remaining ones were in the process of resolution as of 2021.

Despite the NTB elimination efforts, NTBs have continued to exist, transforming and appearing in different forms. Based on data from the EAC timebound programme of elimination of NTBs, the NTBS reported for the first time in 2021 accounted for over 4 percent of all the NTBs. Table 1.1 shows NTBs reported by the EAC Partner States for the first time in 2021.

Studies have shown that NTBs have significant impact on trade in EAC. It is therefore important to develop a quantitative assessment of potential costs and benefits arising from reduction of key NTBs experienced along the Northern and Central Corridor. Quantification of the impact of identified NTBs, as well as the effects of removed NTBs, remains a challenge in the EAC region. Currently, quantification is focused on the incidence of NTBs, cost and benefits of removal of NTBs on specific sectors of the economy. The impact of identified NTBs is not based on scientific criteria and there is limited quantification on the economic impact of the optimal use of resources for NTB elimination.

Table 1.1:
NTBs reported by EAC Partner States in 2021

NO.	ISSUE
1	PVOC is currently a requirement for seed shipment into Uganda
2	On 5th March, 2021 the Republic of Kenya, through the Ministry of Agriculture, Livestock, Fisheries and Cooperatives (Agriculture and Food Authority) issued a letter to the Commissioner of Customs, Kenya to stop importation of maize from the United Republic of Tanzania following a report from a surveillance which indicated high levels of mycotoxins that are very consistently beyond safety limits
3	Exporters of mattresses are suddenly required to pay 1250 USD dollars per mattress. This is an unclear tax and exorbitant.
4	Uganda subjecting to Kenya perfumed petroleum jelly certified with Kenya SMark and manufactured using the EAC harmonized standards to Destination Inspection (DI) and its costly charges
5	Tanzania is charging FULL CET, RDL among other levies on Kenyan wholly produced cement despite the Verification Report recommending that products qualify should be accorded preferential treatment. Additionally, despite URT commitment in the Bilateral and SCTIFI that URT grants preferential treatment to wholly produced cement as required by the EAC rules of Origin, URT is still charging duties of 35%. This is despite Tanzania not being under any stay of application
6	Tanzania denial of preferential market access for Apple Juice and Strawberry manufactured in Kenya while citing reasons that the products are not originating from Kenya.
7	The government of Kenya without giving any reason arbitrarily banned all poultry products from Uganda from accessing the Kenyan market. It is not clear when the ban will end or if it will end
8	On 4th December Juba Trades Union reported challenges in clearing their consignment at Mombasa Port due to new regulations, which is not clear to them at the time they getting their goods for the holiday season, the complain of challenges with the new introduce system including the payment which is not clearly justified or oriented to the stakeholders, clearing process at Mombasa come to stop and goods stop flowing to Nimule border of South Sudan.
9	Uganda Revenue Authority has introduced a mandatory requirement for import certificate for export and transit cargo to DRC and South Sudan.
10	On 3rd December Traders reported that URA enforce regulation on all transit cargo to South Sudan and DRC, where all consignment is to pay a fee (charges) of $150 to $214 depending on the type of cargo.
11	Uganda denial of preferential market access for footwear manufactured in Kenya by Umoja Rubber.
12	Republic of South Sudan is imposing a digital border security Control Tag of 100 USD and a control fee of 30 USD at every entry or exit.

Source: Extracted from EAC Timebound programme of Elimination of NTBs

1.5 Objectives of this study

1.5.1 General Objective

This study develops a model for estimating the impact of NTBs within the EAC region focusing on NTBs identified along the Northern and Central transport corridors.

1.5.2 Specific Objectives of the Study

The specific objectives of this study were to:

i. Review various NTBs impact estimation techniques,
ii. Identify EAC NTBs whose impacts can be quantitatively estimated,
iii. Identify EAC NTBs for estimation of impacts,
iv. Develop a model for estimating NTBs impact in the EAC region.

1.6 Scope of the Study

The scope include:

i. Analysing EAC NTBs categories and identifying those categories whose impacts can be quantitatively estimated;
ii. Identifying EAC NTBs for estimation of impact, guided by EAC timebound matrix of NTBs;
iii. Identifying the data required for the estimation of impact of NTBs, and its collection frequency.
iv. Identifying and presenting the appropriate estimation technique and statistical software for the NTBs impact estimation;
v. Developing a model for estimating the prioritized NTBs impact in the EAC region;
vi. Testing the estimation model;
vii. Presenting the NTBs estimation model for validation in EAC stakeholder's workshop.
viii. Piloting the NTBs impact estimation model based on NTBs data collected in the Northern and Central Transport Corridors.

1.7 Contribution of this study

This study contributes to the strengthening of the EAC NTBs programme, by providing a model for estimating effects of NTBs and also the effects of their removal or elimination. The models developed provide a method of quantifying the economic impact of NTBs and their elimination and hence provide guidance with regards to optimal use of resources for NTB elimination. This information is not only useful to TMEA but also inform EAC Secretariat, EAC Partner States, the business community including the East African Business Council (EABC), as well as other development partners, and other Regional Economic Communities (RECs) involved in the quest of addressing the issue of NTBs.

1.8 General methodology

The general methodology of the study involved: (i) visits to the Northern Corridor Transit and Transport Coordination Authority (NCTTCA) Secretariat and the Central Corridor Transit Transport Facilitation Agency (CCTTFA) Secretariat. The purpose was to discuss with the two corridors transport observatory project (CTO) officers on the data availability and the frequency of collection of this data. Methodology also involved literature review, development of models, testing and piloting the models. Both quantitative and qualitative methods were used in the study, relying on both primary and secondary data, which were obtained or mined in addition to the corridors transport observatory projects of the Northern and Central corridors from EAC database portal. Due to lack of data, model estimations were made for four (4) EAC Partner States of Kenya, Rwanda, Tanzania and Uganda.

2. LITRATURE REVIEW

2.1 Estimation of impacts of NTBs

2.1.1 General Techniques and approaches of estimation of impacts of NTBs

There are a number of techniques that have been used to quantify the impact of NTBs. Some of these techniques include:

i. Frequency type measures. Under this approach, numerous NTBs are weighted based on their recurrence on what is known as frequency ratio. The impact coverage ratio is then computed on each and every merchandise subject to the particular NTBs.

ii. Price-comparison measures. This approach examines the charges imposed on foreign products as a result of NTBs. It's indicative of the degree within which household costs would look like in the presence of trade liberalization.

iii. Quantity-impact measures. These measures are based on cross-product or cross-country modelling of trade. They compare the impact of trade under the influence of NTBs and without.

iv. Cost and benefits analysis. Under this approach, particular NTBs are frequently examined in a cost – benefit analysis framework. The investigation therefore addresses not just one expense related to the NTBs but also those related to the setup of the boundary measures.

v. Gravity model approach. This approach has been extensively used to analyze trade related impacts. It allows for the addition of several factors of NTBs that might impede trade as illustrative variables.

vi. Survey based approach, involves the use of data collection tools at primary level that are letter on collated and analyzed to give the impacts of NTBs on trade. It can easily be used to recognize, diffuse and scarcely quantify boundaries.

2.1.2 NTBs existing in EAC region

The purpose is to provide a better understanding of the NTBs and the various categories of NTBs which exist in the EAC region. The EAC timebound matrix of NTBs was reviewed with a view to identifying actionable NTBs for prioritization for purposes of inclusion in the models of the impacts of NTBs which are being developed under this study. Table 2.1 shows the currently existing barriers in the EAC which were in the process of being resolved or were reported as new NTBs in 2021, under the EAC timebound matrix of NTBs.

Table 2.1:
NTBs identified under the EAC timebound matrix of NTBs in 2021

NO.	ISSUES REPORTED	STATUS IN 2021
1	Non-harmonized road user charges / road tolls in EAC Partner States.	
2	Numerous monetary charges required by various agencies in the United Republic of Tanzania on exports of dairy products	In process of being resolved
3	Despite Kenya Tobacco raw material being fully sourced in Kenya, the manufacturers are required to pay 80 per cent higher excise for cigarettes exports into Tanzania. Cigarettes manufactured in Kenya exported to Tanzania required to have a local 75% tobacco.	In process of being resolved
4	Tanzania still charges US$500 to Uganda trucks compared to US$152 charged on Rwanda trucks.	In process of being resolved
5	Discriminatory treatment (Excise duty) of Kenyan manufactured products among others Juices products	In process of being resolved
6	Uganda rejection of tissue paper manufactured in Kenya by Africa Cotton Industries. Uganda does not allow group packaging of tissue paper as provided for under the EAC harmonised standard and has not requires conformity to Uganda National standard.	In process of being resolved
7	Tanzania charging of Business Visa of USD 250 to EAC business persons entering URT charged as Certificate of Temporary Assignment (CTA) at all borders	In process of being resolved
8	Milk exported to Tanzania attracts numerous charges collected by different institutions including Tanzania Bureau of Standards, Tanzania Foods and Drugs Authority and Tanzania Dairy Board. Import a Kg of milk in Tanzania, under the newly signed Animal Diseases and Animal Products Movement Control Regulations published on 31st August 2018 (Government Notice No 476) and which entered into force on 1st October 2018, Tanzania now requires to pay Tsh 2,000 on milk imported from outside the country from Tsh150. This is a 1,233%. This is a total ban since milk imported cannot compete with the local one.	In process of being resolved
9	Discriminatory treatment (Excise duty) of Kenyan manufactured products among others pharmaceutical products.	In process of being resolved
10	Uganda does not recognize the Calibration Certificate issued by the Weight and Measures Agent (WMA) for oil tank from URT and traders are forced to undergo recalibration by Ugandan counterpart Authority (Uganda Bureau of Standards) at a charge odd USD 230. This increases the cost of doing business. The trader paid Uganda shillings 2,655,600. It was stated that the certificate from URT is valid for the period of one year.	In process of being resolved

Source: EAC (2021). Extracted from the updated EAC timebound programme in elimination of NTBs

Table 2.1:
NTBs identified under the EAC timebound matrix of NTBs in 2021

NO.	ISSUES REPORTED	STATUS IN 2021
11	Iniquitous tax and restriction of trade in Uganda as Kenyan producers being charged 18% VAT, 6% withholding tax and 1% road levy (cumulatively a tax equal to 25%, payable to Uganda Revenue Authority (URA). In Uganda chicken is not vatable, yet they charge VAT on chicken from Kenya.	In process of being resolved
12	The issue of Kenya Pipeline Company requiring upfront payments or a guarantee cheque for storage of oil and after expiration of the grace period of 21 days they charge 2$ per cube meter (1000 liters) per day as a fine while in Tanzania the grace period goes up to 2months. Also, in order to be able to import products through KPC, a foreign registered company is required to have an agreement with a Kenya based company to bid for them in other to be part on the Open Tender System.	In process of being resolved
13	Tanzania is charging FULL CET, RDL among other levies on Kenyan wholly produced cement despite the Verification Report recommending that products qualify should be accorded preferential treatment. Additionally, despite URT commitment in the Bilateral and SCTIFI that URT grants preferential treatment to wholly produced cement as required by the EAC rules of Origin, URT is still charging duties of 35%. This is despite Tanzania not being under any stay of application	New
14	Tanzania denial of preferential market access for Apple Juice and Strawberry manufactured in Kenya while citing reasons that the products are not originating from Kenya.	New
15	The government of Kenya without giving any reason arbitrarily banned all poultry products from Uganda from accessing the Kenyan market. It is not clear when the ban will end or if it will end	New
16	On 4th December Juba Trades Union reported challenges in clearing their consignment at Mombasa Port due to new regulations, which is not clear to them at the time they getting their goods for the holiday season, the complain of challenges with the new introduce system including the payment which is not clearly justified or oriented to the stakeholders, clearing process at Mombasa come to stop and goods stop flowing to Nimule border of South Sudan.	New
17	Uganda Revenue Authority has introduced a mandatory requirement for import certificate for export and transit cargo to DRC and South Sudan.	New
18	On 3rd December Traders reported that URA enforce regulation on all transit cargo to South Sudan and DRC, where all consignment is to pay a fee (charges) of $150 to $214 depending on the type of cargo.	New
19	Uganda denial of preferential market access for footwear manufactured in Kenya by Umoja Rubber.	New
20	Republic of South Sudan is imposing a digital border security Control Tag of 100 USD and a control fee of 30 USD at every entry or exit.	

All these NTBs look actionable. In the development of the model for measuring the impact of the NTBs in EAC, attempts were made to estimate the impacts of as many of these NTBs as possible.

2.1.2 Review of NTBs data existing in the Northern and Central Corridor Transport Observatories

Review of data available in the websites of the transport observatories enabled the identification of the existing data for the estimation of impact of NTBs. It assisted in the determination of the collection frequency of the data that was used in the model. Data used in the models, including that obtained from the corridor Secretariats is discussed in detail under section 3 of this study.

2.3 Models for estimating Trade impacts of NTBs

2.3.1 At RTA level

Literature on developed models for estimating NTBs impacts in specific RTAs is scarce. In doing this study, we did not find models developed for specific RTAs, however there are several measures which have been undertaken in various countries to estimate the impacts of NTMs, which have also been updated frequently. These studies are also a cross countries and across products and also which apply

i. World Bank's Overall Trade Restrictiveness Index (OTRI)

The OTRI are computed annually when new trade flows and tariff data are available. These indices feed into the annual Global Monitoring Report, which is jointly published by the World Bank and the International Monetary Fund. The OTRI indices allow users to have a comprehensive view of the restrictions on both exports and imports by summarizing in a single number the different effects trade policies have on a country's trade flows (e.g., tariffs, quotas, non-automatic licensing, antidumping duties, countervailing duties, tariff-quotas, subsidies, etc.). These indices can be compared across countries.

The OTRI captures the trade policy distortions imposed by countries on their imports. It measures the uniform tariff equivalent of the country tariff and non-tariff barriers (NTB) that would generate the same level of import value for the country in a given year. Tariffs are either based on the MFN tariffs applied to all trading partners, or the applied tariffs, which take into account bilateral trade preferences.

The approach uses ad valorem equivalent of NTB as estimated by Kee, Nicita and Olarreaga (2009). They use information on tariffs, Ad-Valorem Equivalent (AVE) and elasticities of import demand at the tariff line level (with the demand elasticities being estimated in Kee, Nicita and Olarreaga, 2004). AVEs of NTBs are estimated using types of NTBs (i) core NTBs (price and quantity control measures, technical regulations, as well as monopolistic measures, such as single channel for imports) and agricultural domestic support. The approach predicts imports using factor endowments and study their deviations in the presence of NTBs, for each HS six-digit tariff line where at least one country has some type of NTB (around 4800 tariff lines). The quantity impact of NTBs on imports is converted into price equivalent (or AVE) using import demand elasticities.

ii. IMF's Measure of Aggregate Trade Restrictions

IMF has developed a Measure of Aggregate Trade Restrictions (MATR) and their economic effects on countries. This is an empirical measure of how restrictive official government policy is towards the international flow of goods and services, using data from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. As observed by (Flores et al.; 2022) this measure is simple, ad hoc, plausible, quantitative, easily updated, based solely on policy-relevant measures of trade policy, and covers an unbalanced sample of up to 157 countries annually between 1949 and 2019. MATR is used to show that trade restrictions are harmful for the economy and lead to significant contractions in output. The variables used include tariffs, non-tariff barriers such as exports and import restrictions and restrictions on requiring, obtaining, and using foreign exchange for current transactions.

> It is based on the IMF's variables related to:
> i. Exchange rate measures;
> ii. Arrangements for payments and receipts;
> iii. Imports and imports payments;
> iv. Exports and exports proceeds; and
> v. Payment and proceeds from invisible transfers and current transfers.

These variables are further decomposed into sub-categories, with the simplest version of MATR being the unweighted sum of up to 22 possible variables.

The advantage of the approach is that it is strongly correlated with existing measures that capture the intensity of trade restrictions, as well as with the de facto measures of their consequences, such as trade openness. The approach is based on sensible, plausible, trade policy inputs with a transparent, accessible, reliable source, but it is however an ad hoc measure, without a clear theoretical interpretation. It is also an aggregate measure of trade restrictions composed only of aggregate data, not a weighted average of disaggregated data (Flores et al.; 2022).

iii. Estimating Ad Valorem Equivalents of Non-Tariff Measures by OECD

OECD combines price-based and quantity-based approaches, to estimate trade effects of non-tariff measures (NTMs) for roughly five thousand (5000) traded goods and for 80 countriesby estimating Ad-valorem equivalents (Cadot, Gourdon and van Tongeren, 2018). The ad valorem equivalent (AVE) of an NTM is the proportional rise in the domestic price of the goods to which it is applied, relative to a counterfactual where it is not applied. It is often interpreted as measuring the distortion imposed by the NTM to the domestic economy.

The approach distinguishes several types of NTM measures and ascertains their distinct effects on trade volumes and prices, with the latter feature allowing disentangling trade-cost effects associated with non-tariff measures from possible demand-enhancing effects that come from reducing information asymmetries and strengthening consumer confidence in imported products. The volume-based estimates yield information on how NTMs ultimately affect trade: the trade cost associated with NTMs, as captured by the ad valorem estimates, often reduces trade volumes, as expected, but not always. In a number of cases, in particular in the sanitary and phytosanitary (SPS) area, trade is found to expand, even though trade costs rise. This is likely explained by closer regulatory environments between the countries, but the trade-enhancing features of such measures merit further study. NTBs are broadly classified into three categories including: technical measures, non- technical measures and export related measures.

One of the challenges of this approach is the assumption that the ad valorem equivalent (AVE) of an NTM is the proportional rise in the domestic price of the goods to which it is applied, relative to a counterfactual where it is not applied, which would be true in an economy characterized by pure and perfect competition and the absence of externalities or public goods, it is not true in more general – and realistic – settings.

iv. UNCTAD's ad valorem equivalents of NTMs

> UNCTAD classifies, under its multi-agency group of experts NTMs into six categories of:
>
> i. Sanitary and phytosanitary measures,
> ii. Technical barriers to trade,
> iii. Pre-shipment inspection and other formalities,
> iv. Non-automatic import licensing, quotas, prohibitions, quantity-control measures and other restrictions other than SPS or TBT measures,
> v. Price control measures including additional taxes and charges, and,
> vi. Export related measures.

These measures are publicly accessible through Trains database, which can also be accessed through wits platform. These incidence indicators of NTMs data are updated on a yearly basis and are available on a reporter country and on product (at specific HS Code level).

The estimation framework allows for AVEs assessing the overall costs associated with technical NTMs (as defined by the 6 classification) and also assessing the overall costs for the remainder of NTMs as a group. Estimates are based on data on NTMs as in the new database. The analysis for 2018 utilizes a reduced sample of NTM data collected between 2012 and 2016. The data is transformed into a cross-section database spanning about 40 importing countries plus the European Union, about 200 exporting countries, and about 5000 products at the HS 6 -digit classification. The additional data required for the estimation originates from TRAINS (tariffs) and the UN Comtrade database (trade flows). As for interpreting the AVEs of NTMs, the interpretation is similar to that of a tariff: AVEs represent the additional costs that the presence of NTMs has on international trade.

vi. Overview of models used

This study has reviewed models used for estimating impacts of NTBs. The models used measure trade restrictiveness index while majority of them measure the ad- Varolem equivalents of the effects of NTBs. Gravity models are the most commonly used approaches for estimating these effects. There are two reasons for the popularity of gravity models.

First, from an econometric viewpoint these models have high accuracy in explaining mutual trade flows between countries. Second, they are relatively simple tools for assessing the impact of various factors on the dynamics of international trade. In addition to standard variables for the basic gravity model, the standard gravity model variables' high explanatory power suggests that the statistical significance of the additional variables included in the model show their real significance for the country's foreign trade and its economy as a whole.

To study various economic policies, gravity models include additional variables that characterize the influence of the presence or absence of tariffs, as well as variables reflecting different political and institutional characteristics of countries that may affect international trade. NTBs however, are not directly observable variables and in economic literature there is no consensus about their assessment. However, a gravity model of trade is the traditional tool for assessing the impact of NTBs on mutual trade. This study therefore employs gravity model approach to estimate the effects of various NTBs on EAC trade.

3. DEVELOPMENT OF THE MODELS

3.1 The Gravity Model for estimation impacts of NTBs on EAC Trade

3.1.1 Theory of Gravity Model

The basis of the gravity model is Newton's law of universal gravitation, which implies that trade between two countries depends on the size of their economies and the distance between the two countries. In economic literature, it is one of the most stable empirical relations in economic analysis (Head, Mayer, 2014). Its foundation has been theoretically supported by Anderson and van Wincoop (2003) in describing trade flows.

Gravity models are used to determine NTBs' impact on trade flows and are used to convert this effect into ad valorem tariff equivalents (Kee et al., 2009). NTBs are most often approximated by dummy variables, which are a very rough approximation of NTBs, in contrast to calculated variables, in particular indexes. The model takes the following form:

$$x_{ij} = \frac{y_i y_j}{y_w}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma} \quad \text{.....1}$$

where x_{ij} is the export value from i to j y_i (y_j) is the exporter (importer) production (consumption), y_j is the global output, t_j indicates bilateral trade resistance, o shows elasticity of substitution between goods; P_i (P_j) represents CES consumer price indices for goods i and j, respectively. These prices are defined as a function of each country's full set of bilateral trade resistance terms:

$$P_i = \left(\sum_{i=j}^{j}\left[\frac{t_{ij}}{P_j}\right]^{1-\sigma}\theta_j\right)^{1/(1-\sigma)} \qquad P_j = \left(\sum_{i=j}^{j}\left[\frac{t_{ij}}{P_i}\right]^{1-\sigma}\theta_i\right)^{1/(1-\sigma)} \quad \text{.....2}$$

where, indicates the income shares of country i and j. The component as a function of unobservable trade costs can be replaced by observable trade costs in form of transport costs and a border variable

$$t_{ij} = d_{ij}^{\rho} b_{ij}^{\delta_{ij}} \quad \text{.....3}$$

Here is the distance between *i* and j and *p* the corresponding coefficient. (- 1) is the ad-valorem tax equivalent (AVE) of all trade barriers resulting from an international border. The factor takes the value of 1 if i and j are different countries and zero otherwise.

This represents inter and intra-national trade, respectively (Anderson and van Wincoop, 2003). Typically, a further set of continuous variables such as tariffs, export and subsidies, and dummy variables including contiguity, common language and colonial history are components of the trade cost function.

3.1.2 Model specification

This study adopted gravity model to estimate the impacts of NTBs on intra EAC partners' trade. To study various economic policies, gravity models include additional variables that characterize the influence of the presence or absence of tariffs, as well as variables reflecting different political and institutional characteristics of countries that may affect international trade.

Gravity models show that at equilibrium, bilateral trade depends on exporter and importer price levels which themselves depend on trade barriers such as tariffs as presented in equation 4:

$$x_{ij} = \frac{y_i y_j}{y_w}.(t_{ij})^{1-\sigma} \quad \text{.....4}$$

Where:
xij is exports of one EAC partner State i to EAC Partner State j; yi and yj are incomes of countries i and j respectively; tij is the tariff charged by country j on its imports from country i.

To specify the empirical model for the study, bilateral trade resistant equation 3 is substituted into equation 4 and then log-linearized to obtain equation 5:

$$\ln x_{ij} = \alpha_i + \rho_j + \beta_1 \ln y_i + \beta_2 \ln y_j + (1-\sigma)\ln t_{ij} + \varepsilon_{ij}$$

.....5

There is need to account for the unobserved price resistance terms for exporter and importer since they form multilateral resistance terms that captures bilateral trade costs. They form the substitutability between country's different trading partners and allow accounting for unobserved heterogeneity in econometric sense and therefore their omission might lead to model misspecification.

This involves the use of exporter-importer fixed effects to capture the countries specific characteristics (Feenstra, 2002 and Chen, 2004). A reduced-form of gravity equation with theory-motivated multilateral resistance terms (MRTs) that only include exogenous variables (Baier and Bergstrand (2009) and Baier et al., 2010) is then generated. This approach gives a practical advantage and allows for explicit estimation of country-specific variables. A more general gravity equation is therefore specified as shown in equation 6:

$$\ln x_{ij} = c + \beta_1 \ln y_i + \beta_2 \ln y_j + \beta_3 \ln(1+T_{ij}) + \beta_4 \ln d_{ij} + \sum \theta_n dum_{ij} + \alpha_m \ln NTB_{ij} + \varepsilon_{ij} \quad \text{.....6}$$

Where, Xij is export value from country i to j; yi is the national output/ income for country i; yj is the national output/income for country j; dij is the distance between country i and country j; dumij is a sum of dummies; and; NTBij is an average of non-tariff barrier imposed by country j on imports from i; and; ij is the error term.

Further, the standard gravity model specified in equation 6 is augmented to specify NTBs observed along the Northern and Central corridors as well as those presented in the EAC timebound matrix of NTB elimination. This detailed equation 7 is shown below:

$$\ln x_{ij} = c + \beta_1 \ln y_i + \beta_2 \ln y_j + \beta_3 \ln d_{ij} + \beta_4 ER_i + \beta_5 ER_j + \beta_6 Landl + \beta_7 Cont_{ij} + \beta_8 Lang_{ij} + \beta_9 \ln TTDij + \beta_{10} \ln WBij + \beta_{11} CuCT + \beta_{12} LBCT + \beta_{13} ONTBij + \varepsilon_{ij} \quad \text{.....7}$$

Where:
ERi and ERj is the exchange rate of exporting and importing country respectively; Landl is an indication of whether or not a country is landlocked; Contij is a variable indicating whether or not the two countries share a border; Langij is a variable measuring the effect of a common language; TTij is the transit time for goods (from port of entry to the capital city of destination country – best capita city of exporting country to capital city of destination country; is weighbridge performance (time or compliance), is clearance times either Mombasa (for goods passing through the Northern corridor) or Dar- ES Salaam (for the goods passing through the Central corridor); is the land border clearing times between partner countries; ONTBij are other barriers as reported in the EAC Time Bound NTB Elimination Mechanism. The other variables of the model are as defined in equations 5 and 6.

3.1.3 Model data types and sources

The data used in the model and their detailed description are shown in Table 3.1

Table 3.1:
Data types and sources

VARIABLE	DEFINITION AND MEASUREMENT	A PRIORI EXPECTATION	DATA SOURCE
x_{ij}	Export value from country i to j (US$ M)		PS Revenue authorities
y_1	National output for country i (US$ M)	> 0	National Bureau of statistics
y_1	National output for country j (US$ M)	> 0	National Bureau of statistics
d_{ij}	Distance between country i and country j (KM)	0 <	N& C corridor Secretariats
ERi	Exchange rate for the exporting country (US$)	> 0	Central banks
ERj	Exchange rate for the importing country (US$)	> 0	Central banks
LandI	Whether or not a country is landlocked (dummy variable taking the value 1 if the country is landlocked and 0 otherwise)	> 0	Maps
$Cont_{ij}$	Sharing a border - contiguity (dummy variable taking the value one for contiguity of the two countries)	> 0	Maps
$Lang_{ij}$	Common language is spoken by at least 90% of the population in both countries (dummy taking a value of 1 if common language and a zero if otherwise)	> 0	Secondary data
TTD_{ij}	Transit time between the exporting and importing country (hours)	0 <	Corridor secretariats
*WBij**	Weighbridge non -compliance %	> 0	Corridor Secretariats
CRTij	Clearance times either Mombasa or Dar- ES Salaam (hours) by each partners' revenue Authority.	0 <	Corridor Secretariats
*ONTBij**	Other barriers (Dummy)	0 <	EAC Time Bound NTB matrix
E_{ij}	Error term		

Other NTBs *(ONTBij)* which are being resolved or are newly reported under the EAC timebound NTBs elimination matrix and were included in the model are detailed under Table 3.2. The expectation is that they are likely to lead to reduction in trade.

Table 3.2:
NTBs included in the model

INDICATOR	DEFINITION	SOURCE OF DATA	A PRIORI EXPECTATION
TC_{ij}	The dependent variable on total trade cost US$ M) (with i being the exporting country and j the importing country).	Estimated	
y_1	National income of country exporting country i (US$ M)	EAC trade statistics portal	> 0
y_1	National income of country j (US$ M)	EAC trade statistics portal	> 0
$transp\_c_{ij}$	Transport cost between country i and j (US$)	Corridor Secretariats	> 0
$transit\_t_{ij}$	Transit time between Port of entry to destination (days)	Corridor Secretariats or EAC time bound NTB matrix	> 0
d_{ij}	Distance between capital cities of countries i and j countries (KM)	Maps	> 0
LandI	Price indices of country i and j respectively (Index)	EAC trade statistics portal	> 0
$Cont_{ij}$	Error term		

The estimated model (equation 7) shows the impact of specific NTBs on bilateral basis for 2 EAC Partner States and in the whole of EAC trade. The model is estimated on data on quarterly basis.

3.2 Estimating trade cost impact of NTBs

3.2.1 Trade cost model specification

Bilateral trade cost affects trade between nations including those in regional trade agreements. Its impact is very critical to traders especially the hidden costs that comes in as a result of the NTBs. Total trade cost is therefore a factor of numerous costs involved in conducting trade. WTO (2017) identifies determinants of trade costs for high- and low-income economies to include transport and travel costs, information and transaction costs, ICT connectedness, tariffs, NTMs, aggregated trade facilitation indicators (ATFI), governance quality, among other costs. The study further finds that transport and travel costs account for 25% of trade costs in low-income countries, while NTMs account for % of these costs.

To estimate trade cost, a simple linear relationship is specified as follows:

$$TC_{ij} = f(y_i, y_j, tran\_c_{ij}, tariff_i, ntb_i, d_{ij}, p_i, p_j) \quad \text{.....8}$$

Where; TCij is the trade costs between the exporting and the importing country; yi and yj are GDPs of the exporting and importing countries respectively; tariff is the total of the tariff of the exporting country, pi and pj are the average prices in the exporting and importing countries respectively; and the other variables are as described in the earlier equations.

From the above relationship, we therefore specify a regression equation as follows;

$$TC_{ij} = \alpha + \beta_1 y_i + \beta_2 y_j + \beta_3 tranport\_c_{ij} + \beta_4 transit\_tij + \beta_5 d_{ij} + \beta_6 p_i + \beta_7 p_j + \varepsilon_{ij} \quad \text{.....9}$$

Income, transport cost, transit time, distance between trading parties and price data.
From the specified model (equation 9), variables of interest are described in detail in Table 3.3.

Table 3.3:
Description of variables used

INDICATOR	DEFINITION	SOURCE OF DATA	A PRIORI EXPECTATION
TC_{ij}	The dependent variable on total trade cost US$ M) (with i being the exporting country and j the importing country).	Estimated	
y_1	National income of country exporting country i (US$ M)	EAC trade statistics portal	> 0
y_1	National income of country j (US$ M)	EAC trade statistics portal	> 0
$transp\_c_{ij}$	Transport cost between country i and j (US$)	Corridor Secretariats	> 0
$transit\_t_{ij}$	Transit time between Port of entry to destination (days)	Corridor Secretariats or EAC time bound NTB matrix	> 0
d_{ij}	Distance between capital cities of countries i and j countries (KM)	Maps	> 0
P_i, P_j	Price indices of country i and j respectively (Index)	EAC trade statistics portal	> 0
E_{ij}	Error term		

Trade cost was estimated by examining the difference between the estimated model with NTBs and that without as shown in equation 10.

$$TC_{ij} = \frac{(\frac{\Delta \ln x_{ij}}{\ln x_{ij}}).100}{Eji} \quad \text{.....10}$$

Where; is the equivalent trade cost in country i; represent trade flow indicators (exports) from country i to country j; and Eji represents import elasticity of demand;

estimated as $(\frac{\Delta \ln E_{ji}}{\ln E_{tj}}).100$ 11

Where:
Eji is imports of country j from country i and Et is the total imports of county j.

But $\Delta \ln X_{ij} = \ln X_{ij} - \ln X_{ij}^{NTB}$

; that is trade flows without NTBs should be greater than that with NTBs.

4. RESULTS AND DISCUSSION

4.1 Model on Impacts of NTBs on Trade

The Regression analysis was done for the gravity model as presented in equation.

$$ln\,x_{ij} = c + \beta_1\,ln\,y_i + \beta_2\,ln\,y_j + \beta_3\,ln\,d_{ij} + \beta_4\,ln\,tariff_{ij} + \beta_5 ER_i + \beta_6 ER_j + \theta_1 Landl + \theta_2 Cont_{ij} + \theta_3 Lang_{ij} + \acute{a}_1 \ln TTDij + \acute{a}_2 \ln WBij + \acute{a}_3 CuCTij + \acute{a}_7 LBCT + \acute{a}_8 ONTBij + \varepsilon_{ij} \quad \text{.....12}$$

Under *ONTBij*, 9 NTBs specified in form of dummy variables are described as follows:

Table 4.1:
NTBs incorporated as dummy variables

NTB SPECIFICATION IN THE MODEL	DESCRIPTION OF THE NTB
Ke_ntb_1	Ban of Uganda poultry products from Kenyan market
Tz_ntb_eac1	Numerous monetary charges required by various agencies in the United Republic of Tanzania on exports of dairy products
Tz_ntb_2	Roo for Cigarettes manufactured in Kenya
Tz_ntb_3	Tanzania ban of Kenya meat and poultry exports
Ug_ntb_1	Discriminatory treatment (Excise duty) of Pharmaceuticals
Ug_ntb_2	Discrimination of Kenya poultry exports paying a cumulative tax of 25% (including VAT, withholding tax and road levy), while in Uganda, chicken is not vatable
Ug_ntb_3	Mandatory requirement for import certificate for export and transit cargo to DRC and South Sudan
Ug_ntb_4	Non harmonization weights and measure certificates from Tanzania

4.1.2 Descriptive Statistics

Table 4.2 shows the means and the standard deviations of the key variables used in this model used in this study.

Table 4.2:
Descriptive statistics of the key variables used in the model

VARIABLES	N	MEAN	SD	MIN	MAX
exp_ij	240	1.253e+07	1.568e+07	90,805	6.672e+07
wdist_ij	240	1,100	443.2	513	1,780
gdp_i	240	12,818	8,198	2,240	28,277
gdp_j	240	12,341	8,200	2,240	28,277
gdpcap_i	240	287.1	115.7	176.5	538.4
gdpcap_j	240	279.1	120.7	135.5	538.4
rer_i	240	1,744	1,361	100.7	3,767
rer_j	240	1,859	1,457	100.7	3,767
tr_msa	240	46.77	3.712	41.42	57.33
tr_dar	240	66.39	8.579	58.57	86
ttd_nc	240	170.4	48.52	120.6	321.7
ttdcc	240	126.1	41.42	96.80	230.3
wbnc_nc	240	6.845	1.060	4.533	9.137
wbnc_cc	240	0.846	0.398	0.282	1.629

The total number of each variable observations analysed in this model for the period 2017-2021 and with data organized on quarterly year basis is 240. The mean value of bilateral exports between 2 EAC Partner States for the period 2017 – 2021 were of a value of US$ 12.53M, with a standard deviation of US$ 15.68M, indicating a large difference between bilateral export observations of the various EAC Partner States from the mean of exports, whose minimum value was US$ 90,805, and the maximum was US$ 66.72M.

The mean distance between the capital cities of the four countries analysed is 1,100KM, with a standard deviation of 443.2KM, and with the shortest distance between cities being 513 KM while the largest distance is 1,780 KM.

The mean income observation is US$ 12,818M with a standard deviation of 8,198M indicating a large dispersion of the sizes of GDP among the analysed EAC Partner States, with a minimum observed value of US$ 2,240M and largest observation being US$ 28,277M.

The mean income per capita of the EAC for the analysed period was US$ 287.1, with a standard deviation of US$ 115.7, the minimum observed value being US$ 176.5 and the maximum being US$ 538.4.

The mean real exchange rate of the EAC countries to the US$ for the observations was 1,744, with a standard deviation of 1,362, and a minimum and a maximum of 100.7 and 3,767 respectively.

The mean custom's release time at the port of Mombasa is 46.77 hours with a standard deviation of 3.71 hours, with minimum of 41.4 hours and a maximum of 57.33 hours. The mean release time at the Port of Dar Es Salaam is 66.39 hours with a standard deviation of 8.58 hours, with minimum of 58.57 hours and a maximum of 86 hours.

The mean transit time from Port of Mombasa to capital city of destination country is 170.4 hours with a standard deviation of 48.52 hours, a minimum of 120.6 hours and a maximum of 321.7 hours. The mean transit time from the Port of Dar Es Salaam to capital city of destination country is 126.1 hours with a standard deviation of 41.4 hours, a minimum of 96.8 hours and a maximum of 230 hours.

The mean weighbridge non-compliance level on the Northern Corridor (Mombasa to Busia) is 6.8%, with a standards deviation of 1%, a minimum and a maximum of 4.5% and 9.5% respectively. The mean weighbridge compliance level in Central Corridor (Tanzania) for the observed period is 0.8%, with a standards deviation of 0.4%, a minimum compliance of 0.3% and a maximum of 1.6%.

4.1.3 Regression estimation procedure

The model was estimated using, fixed effects (FE), random effect (RE) and Poisson Pseudo-Maximum Likelihood (PPML) to allow for comparison. The decision on which technique best estimates the specified model depends on a number of diagnostic tests conducted. To do this, a Hausman specification test was conducted. We rejected the null hypothesis for the FE and RE estimations.

Further to test the significant effects of the OLS results versus the PPML model results, a Breusch - Pagan Lagrange Multiplier test was conducted. Here we rejected the null hypothesis and concluded that PPML estimation is most appropriate. There is evidence of some significant differences across countries, therefore we run a PPML regression model. Several variables including population, and several dummies including dummies for landlockedness status of the importing and exporting country, sharing a border, among other NTBs reported in the EAC timebound NTB elimination Programme showed multicollinearity and hence were omitted from the estimation. The results of the regression model are shown in Table 4.3.

Table 4.3:
Results of regression analysis

VARIABLE	FIXED EFFECTS (FE)	RANDOM EFFECTS (RE)	PPML
lngdp_i	1.503	2.191***	0.143***
	(6.644)	(0.316)	(0.0200)
lngdp_j	2.579	2.789***	0.187***
	(5.397)	(0.181)	(0.0122)
lngdpcap_i	-0.978	-2.620**	-0.167**
	(6.990)	(1.126)	(0.0786)
lngdpcap_j	-3.128	-5.292***	-0.364***
	(5.596)	(0.699)	(0.0457)
rer_i	-3.669	-0.255	-0.0157
	(2.127)	(0.216)	(0.0131)
rer_j	-5.715**	-0.742***	-0.0509***
	(2.362)	(0.173)	(0.00895)
lntr_msa	0.918*	0.503	0.0332
	(0.445)	(0.478)	(0.0491)
lntr_dar	0.211	0.583**	0.0388
	(0.285)	(0.230)	(0.0332)
lnttd_nc	-0.0342	-0.142	-0.00944
	(0.294)	(0.255)	(0.0164)
lnttdcc	0.165	-0.275	-0.0184
	(0.295)	(0.186)	(0.0211)
wbnc_nc	-0.00318	0.167	0.0101

Table 4.3:
Results of regression analysis

VARIABLE	FIXED EFFECTS (FE)	RANDOM EFFECTS (RE)	PPML
	(0.244)	(0.341)	(0.0270)
wbnccc	-0.375**	-0.295**	-0.0199**
	(0.157)	(0.145)	(0.00897)
ke_ntb_ug_dumy	-0.688**	0.107	0.00607
	(0.261)	(0.265)	(0.0154)
ug_ntb_k1_dumy	-0.405*	0.575**	0.0342
	(0.188)	(0.289)	(0.0209)
ug_ntb_k2_dumy	-0.0698	0.0369	0.00135
	(0.154)	(0.107)	(0.0239)
ug_ntb_k3_dumy	-0.193	-0.00823	-0.00130
	(0.156)	(0.107)	(0.0159)
ug_ntbt1_dumy	0.0258	0.829***	0.0616***
	(0.329)	(0.272)	(0.0135)
lnwdist_ij		-1.897***	-0.128***
		(0.170)	(0.0109)
Constant	60.15***	30.83***	3.822***
	(17.37)	(7.758)	(0.484)
Observations	240	240	240
R-squared	0.120		0.809
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

The regression results from the 3 model estimation techniques show the RE and FE and PPML models on 240 observations. The R squared is, 0.11 and 0.80 for FE and the PPML respectively. The PPML estimation technique, show that the explanatory variables explain over 80% of the exports in EAC. Significant variables of this regression are shown in Table 4.4.

Table 4.4:
Significant variables

VARIABLES	VARIABLE DESCRIPTION	PPML ESTIMATED COEFFICIENT
lnwdist_ij	Distance between capital cities of 2 EAC trading partners	-0.129***
lngdp_i	GDP of exporting country	0.147***
lngdp_j	GDP of importing country	0.188***
lngdpcap_i	GDP per capita of the exporting country	-0.183**
lngdpcap_j	GDP per capita of the importing country	-0.368***
rer_j	Exchange rate in importing country	-0.0515***
wbnc_cc	Weighbridge compliance in Tanzania	-0.0201**
ug_ntbt1_dummy	Ban of Uganda poultry products from Kenyan market	0.0603***

These significant results show that:

i. As distance between two EAC Partner States increases by 1 KM, exports in EAC are likely to reduce by a value of about US$ 0.13M. Distance is a proxy of transport costs as countries close to each other are likely to trade together more than countries which are far away, proximity of countries suggests less transport costs.

ii. An increase of GDP of the exporting country by US$ 1M, is likely to lead to an increase in exports of that particular country to EAC by about US$ 0.48M.

iii. An increase by US$ 1M of the GDP of the importing country is likely to lead to an increase in imports of that country from EAC Partner States by slightly over US$ 0.19M. Increased income shows the increased capacity of the exporting country while it shows increase in demand of the importing country. These observations are in line with the a priori expectations.

iv. An increase in GDP per capita of the exporting country by US$ 1 is likely to lead to a decrease in exports of that country to EAC by US$ 0.183M. The decrease in exports as GDP per capita increases may be due to increased domestic consumption by the partner states as GDP per capita increases.

v. An increase in GDP per capita by US$ 1 of the importing country could lead to EAC exports decreasing by US$ 0.37M. As incomes increase, demand may change to other high value and luxury goods, which may be imported from outside the EAC.

vi. An increase in real exchange rate of an importing country by US$ 1 is likely to lead to reduction in imports of that country from EAC by about US$ 0.05M. This observation is in line with the a priori expectation of the model as an increase in exchange (depreciation of domestic currency) makes imports expensive.

vii. Increase in weighbridge non -compliance in the Central corridor by 1%, is likely to contribute to a decrease in EAC trade of a value of US$ 0.02M.

viii. With regards to NTB dummies identified in the EAC NTB timebound elimination programme: Kenya's ban of imports of poultry from Uganda is likely to have contributed to reduction of exports to EAC by a value of US$ 0.06M. All these findings are in line with the model's a priori expectation.

ix. Numerous monetary charges required by various agencies in the United Republic of Tanzania on exports of dairy products (as reported as an NTB in the EAC NTB timebound elimination programme) is likely to have contributed to decreased trade of a value of US$ 0.06M.

All the other NTBs as reported in the EAC timebound NTB elimination programme were either dropped by the model or were insignificant and are contrary to the expectation that they contribute to increase in trade. It is concluded that compliance with these requirements therefore could be facilitating trade in EAC.

Increase in real exchange rate was insignificant while increase in transit time in both Northern and Central corridors though insignificant, is likely to lead to decrease in trade. Weigh bridge non- compliance on the northern corridor does not significantly affect trade.

Equation for estimation is therefore presented as:

$$lnXij = 3.822 - 0.128 + 0.143lngdp\_i + 0.187lngdp\_j - 0.167\ lngdpcap\_i - 0.364lngdpcap\_j - 0.0157rer\_i - 0.0509rer\_j + 0.033lntr\_msa + 0.0388lntr\_Dar - 0.00944lnttd\_nc - 0.0184lnttd\_cc + 0.0101wbnc\_nc - 0.0199wbnc\_cc + 0.00607\ ke\_ntb\_ug\_d + 0.0342ug\_ntb\_k1\_d + 0.0342ug\_ntb\_k1\_d + 0.00135ug\_ntb\_k2\_d - 0.00130ug\_ntb\_k3\_dumy + 0.0616\ ug\_ntbt1\_d$$

Where, variables are as described in Tables 3.1 & 3.2.

4.1.4 Diagnostic tests

Multicollinearity and Hausman test are presented in Annex 2. Variables that suffered from serial correlation were dropped. Hausman test guided the study on the appropriate model to adopt and from the test result, the random effect model was the most appropriate.

4.2 Results of the estimation of the model on trade cost impacts of NTBs

The following model was estimated:

$$TC_{ij} = \alpha + \beta_1 y_i + \beta_2 y_j + \beta_3 tranport\_c_{ij} + \beta_4 transit\_tij + \beta_5 d_{ij} + \beta_6 p_i + \beta_7 p_j + \varepsilon_{ij}$$

With

$$TC_i = \frac{(\Delta \ln x_{ij} / \ln x_{ij}).100}{E_j}$$

The model was estimated separately for the Northern and Central Corridors. Estimation of the regression equation was done using ordinarily least squares (pooled OLS), fixed effects (FE) and random effects (RE) estimation techniques to allow for comparison. Hausman specification test was conducted, leading to rejection of the null hypothesis for the FE estimations. To test the significant effects of the OLS results versus the RE model results, a Breusch - Pagan Lagrange Multiplier test was conducted, leading to rejection of the null hypothesis and conclusion that the RE estimation is most appropriate.

(a) For the Northern corridor

Descriptive statistics for the Northern corridor estimated model are shown in Table: 4.5.

Table 4.5:
Descriptive statistics for Northern corridor trade cost model

VARIABLES	N	MEAN	SD	MIN	MAX
wdist_ij	120	1,013	542.9	479	1,700
gdp_i	120	11,999	9,288	2,240	28,277
gdp_j	120	11,999	9,288	2,240	28,277
ttd_nc	120	162.1	48.15	120.6	321.7
transpc_ijkm	120	3.372	1.982	1.271	8.038
price_pi	120	150.4	32.05	106.5	205.3
price_pj	120	150.4	32.05	106.5	205.3

A total of 120 observations were analysed for this model. The mean distance between two countries' capital cities is 1,013 KM, with a standard deviation of 9,288 KM, the minimum distance between the cities is 479 KM while the largest distance is 1,700KM.

The mean income of the countries is US$ 11,999M, with a standard deviation of US$ 9,288M, a minimum income of US$ 2.24M and a maximum of US$ 28.28M (the largest observation being over 12 times larger than the smallest).

Transit time through Kenya for the observed period was on average 162.1 hours (6.75 days), with a standard deviation of 48 hours (or 2 days), the minimum and maximum transit time being 120.6 hours (5 days) and 321.7 hours (or 13.4 days) respectively. Transport cost had a mean of US$ 3.372/ KM, with a standard deviation of US$ 1.98/KM, and the minimum and maximum being US$ 1.27/KM and US$ 8.04 /KM respectively. The mean price for the countries (measured as inflation rate, base period 2015) was 150.4%, with a standard deviation of 32% while the minimum inflation rate was 106.5% and the maximum was 205.3%.

The results of the regression model are shown in Table 4.6.

Table 4.6:
Regression results for the model estimating trade cost for the Northern Corridor

VARIABLES	(POOLED_OLS)	(FE)	(RE)
lnwdist_ij	3.223**		3.223**
	(1.450)		(1.450)
lngdp_i	-1.151**	-6.457**	-1.151**
	(0.452)	(2.647)	(0.452)
lngdp_j	-0.0621	3.469	-0.0621
	(0.452)	(2.613)	(0.452)
lnttdcc	-0.239	0.0379	-0.239
	(0.653)	(0.712)	(0.653)
lntransc_ijkm	4.635*	3.336	4.635*
	(2.671)	(2.958)	(2.671)
lnprice_pj	3.704***	2.975**	3.704***
	(1.236)	(1.411)	(1.236)
Constant	31.09**	12.64	-31.09**
	(15.29)	(23.31)	(15.29)
Observations	120	120	120
R-squared		0.158	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results show that the significant determinants of trade costs along the Northern corridor are:

i. The distance between the port of Mombasa and the destination. An increase in distance of 1 KM from the port of Mombasa to destination town in EAC Partner State is likely to contribute to an increase in trade cost of slightly above US$ 1.07/KM.

ii. Transit time to destination. Increase in transit time from Port of Mombasa to destination town in EAC Partner State by 1 hour is likely to lead to an increase in trade cost of US$ 2.

iii. The price level at the export destination country. Increase in price of an EAC importing country by US$ 1, is likely to lead to an increase in trade costs of slightly over US$ 2.5.

These three variables are in line with the a priori expectation that: as distance between the two trading partners, transit time to destination and the price in the importing country increases, trade costs are likely to increase. Transport cost though positive, was insignificant. The data for transport cost along the Northern corridor was not comprehensive.

GDP of the exporting country, GDP of the importing country, transport costs, and the price of the importing country did not show significant impact on the cost of trade. If GDP of the exporting country increases by US$ 1M, then trade cost is likely to reduce by 0.033M while an increase by US$ 1M of income of the importing country is likely to contribute to a reduction of trade costs by US$ 0.246M. Although these findings are insignificant, they are in line with a priori expectation, as income increases, demand for goods and services increases, which is likely to lower prices for goods and services.

If transport cost per KM increases by US$ 1, trade cost is likely to increase by US$ 0.856. This increase is in line with the a priori expectation as increase in transport cost is expected to contribute to increase in trade cost. An increase of price by US$ 1 in an exporting country is likely to lead to increase in trade cost of US$ 0.859, while an increase by US$ 1 of price in the importing country is likely to lead to an increase in trade costs of US$ 3.62. All these effects are in line with the a priori expectation.

The estimation equation therefore is presented as:

lntc_nc = -25.65 + **8.251lndist_ij** - 0.0329lngdp_i - 0.246 lngdp_j +**1.909lnttd_nc** + **0.856lntranspc_ij** + 0.859lnprice_pi **+3.622lnprice_pj**

Where variables are as described in Tables 3.1.

(b) For the Central corridor

Descriptive tests for this model are shown in Table 4.7.

Table 4.7:
Descriptive statistics

VARIABLES	N	MEAN	SD	MIN	MAX
wdist_ij	120	1,263	545.0	513	1,780
gdp_i	120	8,993	5,379	2,240	19,218
gdp_j	120	8,993	5,379	2,240	19,218
ttd_cc	120	5.253	1.729	4.034	9.597
transpc_ij	120	2.34	0.571	1.79	3.112
price_pi	120	128.6	20.98	102.5	186.5
price_pj	120	140.2	30.01	102.5	186.5

The analyses on trade costs in the Central corridor was based on 120 observations. The mean distance between the capital cities is 1,263 KM, with a standard deviation of 545 KM, the minimum distance between the cities is 513 KM while the largest distance is 1,780KM.

The mean income of the countries is US$ 8,993M, with a standard deviation of US$ 5,378M with a minimum and maximum income of US$ 2.240M and a maximum of US$ 19.218M (the largest observation being over 8.5 times larger than the smallest).

Transit time through Tanzania for the observed period was on average 5.24 days, with a standard deviation of 1.7 days, the minimum and maximum transit time being 4 days and 9.5 days) respectively. Transport cost had a mean of US$ 2.34/ KM, with a standard deviation of US$ 0.571/KM, with the minimum and maximum costs being US$ 1.79/KM and US$ 3.11 /KM respectively. The mean price for the countries (measured as inflation rate, base period 2015) was 150.4%, with a standard deviation of 32% while the minimum inflation rate was 106.5% and the maximum was 205.3%.

The results of the regression model are shown in Table 4.8,

Table 4.8 (b):
Results of the estimation model

VARIABLES	(POOLED_OLS)	(FE)	(RE)
lnwdist_ij	3.223**		3.223**
	(1.450)		(1.450)
lngdp_i	-1.151**	-6.457**	-1.151**
	(0.452)	(2.647)	(0.452)
lngdp_j	-0.0621	3.469	-0.0621
	(0.452)	(2.613)	(0.452)
lnttd_cc	-0.239	0.0379	-0.239
	(0.653)	(0.712)	(0.653)
lntransc_ijkm	4.635*	3.336	4.635*
	(2.671)	(2.958)	(2.671)
lnprice_pi	0.192	-8.592***	0.192
	(1.816)	(2.896)	(1.816)
lnprice_pj	3.704***	2.975**	3.704***
	(1.236)	(1.411)	(1.236)
Constant	-31.09**	12.64	-31.09**
	(15.29)	(23.31)	(15.29)
R-squared		0.158	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The estimated model results show the following as significant determinants of trade costs, which are also in line with the a priori expectations:

Distance between Dar- Es Salaam and the capital city of the destination EAC country. An increase of destination country by 1KM, is likely to contribute to an increase in trade cost of US$ 3.22.

GDP of exporting country. An increase in GDP of the exporting country of US$ 1M, is likely to reduce trade cost by US$ 1.15.

Transport costs between Dar Es Salaam and the EAC capital cities. An increase in transport cost by US$ 1 per KM is likely to lead to an increase in trade cost of US$ 4.635.

Price in the importing country. An increase in price in the importing country by 1%, is likely to contribute to an increase in trade costs of US$ 3.7

Other variables including income of the importing country, transit time between Dar Es Salaam and the capital city of the destination country and the price of the exporting country are insignificant, however, all but transit time are in the direction of the a priori expectation. An increase in GDP of the importing country by US$ 1M is likely to lead to reduction in trade costs by US$ 0.0621M, while an increase in transit time by 1 day is likely to lead to a reduction in trade costs by US$ 0.24M. Increase in price in the exporting country by 1% is likely to lead to an increase in trade costs by US$ 0.192.

The unexpected negative sign of the transit time could be due to data limitation as data used was that from Dar Es Salaam to destination. Increased transit time may also be related to non-payment of other costs which could be related to expediting the transit process. Data between specific countries e.g., use of data on transit time between Uganda and Rwanda though not available could lead to more interesting results.

The model is:

$$lntc\_cc = \mathbf{-31.09} + \mathbf{3.223}lndist\_ij - \mathbf{1.151}lngdp\_i - 0.621lngdp\_j - 0.239lnttd\_cc + \mathbf{4.635}lntranspc\_ij + 0.192lnprice\_pi + \mathbf{3.704}lnprice\_pj$$

Where variables are as described in Tables 3.1 and 3.2.

5. SUMMARY OF KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Key findings

This study has developed models for estimating the impacts of NTBs on EAC trade. More specifically the study:

i. Reviewed various NTBs impact estimation techniques commonly used,
ii. Identified EAC NTBs whose impacts can be quantitatively estimated,
iii. Identified EAC NTBs for estimation of impacts, and
iv. Developed models for estimating NTBs impact in the EAC region.

Commonly used approaches for estimation of impact of NTBs include frequency measures and gravity model. EAC NTBs which can be quantified were identified from the Northern and Central corridors; and from the EAC list of identified NTBs under the NTB Timebound elimination Programme. Based on this information, 9 NTBs from the EAC timebound NTB elimination mechanism, and other NTBs including transit time from the ports of Mombasa and Dar es Salaam, customs release time at the ports, weighbridge non-compliance in both Kenya and Tanzania were prioritized for estimation of impacts. Other possible NTBs were not prioritized due to lack of data.

Two key models were developed including:

i. A model for estimating the impact of NTBs on intra- EAC trade; and;

ii. A model for estimating the cost impacts of NTBs, one based on NTBs recorded along the Northern corridor; and one based on NTBs along the Central corridor.

Data availability was a key challenge in the estimation of the models, and led to estimation of the models' for only 4 EAC Partner States of Kenya, Rwanda, Tanzania and Uganda.

Estimation of the model for the impact of NTBs on EAC trade was done using the PPML techniques and the results showed that significant determinants of exports among EAC Partner states are:

i. The further EAC Partner States are from each other, the less likely they are to trade with each other.
ii. An increase of GDP of the exporting and importing EAC Parter State is likely to lead to an increase in exports of that particular country to EAC Partner States.
iii. Increase in GDP per capita of the exporting and importing EAC Partner States are likely to contribute to reduced exports in EAC.
iv. Increase in exchange rate of an importing country is likely to lead to reduction in imports of that country from EAC.
v. Reduction in weighbridge non- compliance along the Northern corridor is likely to lead to increased trade in EAC.
vi. Increase in weighbridge non-compliance in the Central Corridor (weighbridges in Tanzania) is likely to contribute to a decrease in EAC exports.

Factors which have not significant affected intra-EAC trade include:

Real exchange rate of exporting EAC Partner State, transit time along the Northern and Central corridors, weighbridge non – compliance on northern corridor, ban of imports by Kenya of Uganda poultry products, discriminatory treatment (excise duty) of pharmaceuticals, discrimination of Kenya poultry exports paying a cumulative tax of 25% (including VAT, withholding tax and road levy), while in Uganda, chicken is not vatable, and mandatory requirement for import certificate for export and transit cargo to DRC and South Sudan.

With regards to the model on trade costs: (i) for the model based on NTBs on the Northern corridor, the significant determinants of trade costs are:

i. Distance between two capital cities in EAC. An increase in distance from the port of Mombasa to destination town in EAC Partner State is likely to contribute to increase in trade cost.
ii. Transit time in Kenya. Increase in transit time from port of Mombasa to destination town in EAC Partner State is likely to lead to increase in trade cost.
iii. Level of price in the importing country. Increase in price of an EAC importing country is likely to lead to an increase in trade costs.

The model for the Central corridor showed that significant determinants of transport cost along the Central corridor are:

i. GDP of an exporting country. If GDP of the exporting country increases, then trade cost is likely to reduce.

ii. Income of an importing country. An increase of income of the importing country is likely to contribute to a reduction in trade costs.

iii. Transport costs. An increase in transport cost, is likely to lead to an increase in trade cost.

iv. Level of price in an exporting country. An increase in price in an exporting country is likely to lead to an increase in trade costs.

v. Level of price in an importing country. An increase of price in the importing country is likely to lead to an increase in trade costs.

5.2 Conclusions

Based on the findings on the developed models, it is concluded that:

i. It is possible to use the developed models to estimate the impact of NTBs in EAC, hence informing policy on elimination of NTBs. The models which have been developed and tested using data available for four EAC Partner State countries for the period 2017 – 2021 are:

   a) Model for estimating NTBs impacts on trade (export) flows, and,
   b) Model for estimating trade cost impact of NTBs, one for Northern corridor and one for the Central corridor.

ii. Data still remains a challenge for the estimation of models.

5.3 Recommendations

5.3.1 On the developed models

i. There is need for the corridors to step up data collection for the countries of Burundi and South Sudan. This will enable expanding the scope of the models to cover all EAC Partner States. The developed 2 models can be integrated into NCTTCA and CCTTFA transport observatories and be implemented immediately, from the fourth quarter of 2023.
ii. The trade costs' model can be improved especially with more data being collected consistently on quarterly basis and incorporated in the model to better capture more NTB variables which contribute to increased transport costs (as discussed below).
iii. The two models need to be calibrated every year with available data to make them more plausible.
iv. Detailed data needs for more plausible models:

a) Data for the model estimating the impacts of NTBs on EAC Trade flows

1. Bilateral export trade data for each two of EAC Partner State countries in US$.
2. Distance between EAC Partner State capital cities (KM).
3. GDP of each EAC countries in US$.
4. 4.GDP per capita for each EAC Partner State in US$.
5. Real exchange rate for each EAC Partner State (local currency to the US$).
6. Time release at Port of Mombasa (Hours).
7. Time release at Port of Dar Es Salaam (Hours).
8. Time release at one stop land border points (Hours) on:
   i. The Northern Corridor (Kenya- Uganda) – Busia and Malaba; Uganda Rwanda (2 border posts), Rwanda - Burundi (2) border posts; Uganda- South Sudan (1 border post).
   ii. The Central Corridor: Tanzania and Uganda (2 borders); Tanzania and Rwanda (2 borders), Tanzania and Burundi; Uganda – Rwanda; Rwanda -Burundi.
9. Transit time on Northern corridor: Port of Mombasa to destination country capital city and to Nairobi (Hours).
10. Transit through countries i.e., from land border to the next land border (Hours).
11. Transit time between 2 capital cities (Hours).
12. Transit time on Central Corridor: Port of Dar to destination country capital city and to Nairobi (Hours).

13. Transit through countries i.e., from land border to the next land border (Hours)
14. Transit time between 2 capital cities (Hours).
15. Weighbridge performance data for all the countries and for all weighbridges existing in the specific Partner State (%).
16. Information on dummy variable on sharing a border, whether landlocked or not is easily available (value of the dummies is either 1 or 0)
17. Information with regards to NTBs reported in the EAC Timebound elimination programme – to identify which ones have been resolved, and any new ones that have come up within any given quarter in a year. The current NTBs are:

    i. Ban of Uganda poultry products from Kenyan market.
    ii. Numerous monetary charges required by various agencies in the United Republic of Tanzania on exports of dairy products.
    iii. Roo for Cigarettes manufactured in Kenya.
    iv. Tanzania ban of Kenya meat and poultry exports.
    v. Discriminatory treatment (Excise duty) of Pharmaceuticals.
    vi. Discrimination of Kenya poultry exports paying a cumulative tax of 25% (including VAT, withholding tax and road levy), while in Uganda, chicken is not vatable.
    vii. Mandatory requirement for import certificate for export and transit cargo to DRC and South Sudan.
    viii. Non harmonization weights and measure certificates from Tanzania.

b) Data for the model estimating trade cost impact of NTBs

1. Total trade cost between 2 EAC countries (MUS$).
2. National income (GDP) of EAC countries (MUS$).
3. Transport cost between capital cities of each EAC country (US$/KM).
4. Transport cost between the ports of entry i.e., Mombasa and Dar Es Salaam and any capital city of EAC destination country (US$/KM).
5. Transit time between 2 capital cities of EAC country (Hours).
6. Economic distance between capital cities of countries of each 2 EAC countries (KM).
7. Price indices of country (Real inflation rate).
8. Other data needed to make the model better:
    i. Vehicle factors (such as maintenance costs (US$ per trip).
    ii. Any other payments made enroute (US$ per trip).
9. Driver allowances (average per trip).
10. Data on import elasticities (needed for estimation of trade cost).

5.3.2 On model to be developed in the future

In addition to the developed models, it is recommended that data be collected towards development of other two models

i. On estimating the impacts of transit time and delays, and,
ii. Estimating transport costs. Some of the data that needs to be collected towards development of these models include:

1. Transit time from port of entry (i.e., Mombasa and Dar- Es Salaam) to capital cities of EAC destination countries.
2. Transit time within each country (from border of entry to border of exit).
3. Transit time from border of entry of an EAC country to the capital city of that country.
4. Customs release time at each land border.
5. Weighbridge compliance of all weighbridges in each EAC partner state (along the northern Corridor and those along the Central Corridor.

Time taken by truck at the port of Mombasa and port of Dar Es Salaam (truck turnaround time).

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ANNEX 1: DESCRIPTIVE STATISTICS-GRAVITY MODEL VARIABLES

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
exp_ij	240	1.253e+07	1.568e+07	90,805	6.672e+07
wdist_ij	240	1,100	443.2	513	1,780
gdp_i	*240*	*12,818*	*8,198*	*2,240*	*28,277*
gdp_j	240	12,341	8,200	2,240	28,277
gdpcap_i	240	287.1	115.7	176.5	538.4
gdpcap_j	240	279.1	120.7	135.5	538.4
pop_i	240	4.125e+07	1.764e+07	1.201e+07	6.359e+07
pop_j	240	4.125e+07	1.764e+07	1.201e+07	6.359e+07
rer_i	240	1,744	1,361	100.7	3,767
rer_j	240	1,859	1,457	100.7	3,767
tr_msa	240	46.77	3.712	41.42	57.33
tr_dar	240	66.39	8.579	58.57	86
cdt_msa	240	97.41	14.90	72.95	136.1
cdt_dar	240	256.3	48.11	12.13	370.4
ttd_nc	240	170.4	48.52	120.6	321.7
ttdcc	240	126.1	41.42	96.80	230.3
wbnc_nc	240	6.845	1.060	4.533	9.137
Wbnc_cc	240	0.846	0.398	0.282	1.629
lnxp_ij	240	15.17	1.803	11.42	18.02
lnwdist_ij	240	6.915	0.433	6.240	7.484
lngdp_i	240	9.165	0.858	7.714	10.25
lngdp_j	240	9.126	0.847	7.714	10.25
lngdpcap_i	240	5.591	0.355	5.173	6.289

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
lngdpcap_j	240	5.552	0.383	4.909	6.289
lnpop_i	240	17.39	0.609	16.30	17.97
lnpop_j	240	17.39	0.609	16.30	17.97
var31	240	6.853	1.370	4.612	8.234
var32	240	6.892	1.401	4.612	8.234
lntr_msa	240	3.842	0.0762	3.724	4.049
lntr_dar	240	4.188	0.120	4.070	4.454
lncdt_msa	240	4.568	0.151	4.290	4.913
lncdt_dar	240	5.522	0.262	2.496	5.915
lnttd_nc	240	5.105	0.247	4.792	5.774
lnttdcc	240	4.792	0.285	4.573	5.439
var39	240	1.911	0.158	1.511	2.212
var40	240	-0.290	0.513	-1.267	0.488
com_lang	240	0.500	0.501	0	1
var42	240	1.500	0.501	1	2
var43	240	2.500	0.501	2	3
var44	240	3.500	0.501	3	4
ke_ntb_ug	240	0.0333	0.180	0	1
tz_ntb_eac	240	0.250	0.434	0	1
tz_ntb_k1	240	0.0833	0.277	0	1
tz_ntb_k2	240	0.0167	0.128	0	1
ug_ntb_k1	240	0.0500	0.218	0	1
ug_ntb_k2	240	0.0333	0.180	0	1
ug_ntb_k3	240	0.0167	0.128	0	1
ug_ntbt1	240	0.0500	0.218	0	1

ANNEX 2: DIAGNOSTIC TEST – GRAVITY MODEL

I.Multicollinearity results

VIF was utilized to report the test for multicollinearity

VARIABLE	VIF	I/VIF
lngdp_i	676.08	0.001479
rer_i	442.44	0.002260
lnpop_i	242.69	0.004120
lngdpcap_j	202.00	0.004951
rer_j	118.14	0.008465
lnpop_j	18.79	0.053214
wbc_t	3.62	0.276373
lntr_dar	2.79	0.358433
lnttdcc	2.44	0.409955
wbct	1.88	0.531899
lncdt_dar	1.33	0.749859
lnttd_nc	1.28	0.782860
lncdt_msa	1.25	0.803013
lntr_msa	1.22	0.816924
lnwdist_ij	1.20	0.830577
Mean VIF	114.48	

II.Stationarity test

Levin–Lin–Chu unit-root test was used to test for panel unit root (See appendix)

VARIABLE	P-VALUE	VERDICT
lnxp_ij	0.0042	Stationary
lngdp_i	0.5401	Non-stationary
lngdpcap_i	0.3020	Non-stationary
lngdpcap_j	0.0000	Stationary
lnpop_i	0.5401	Non-stationary
lnpop_j	0.3020	Non-stationary
lnwdist_ij	0.0000	Stationary
rer_i	0.2625	Non-stationary
rer_j	0.3214	Non-stationary
lnTR_Msa	0.0000	Stationary
lnTR_Dar	0.0033	Stationary
lnCDT_ Msa	0.0447	Stationary
lnCDT_Dar	0.0000	Stationary
lnTTD_NC	0.0135	Stationary
lnTTD-CC	0.0026	Stationary
WBC_T	0.0025	Stationary

Conclusion;

Conclusion; Some VIF values are more than 5 indicating presence of multicollinearity.

III.Hausman test

Hausman test was used to choose between RE and PPML model

Verdict-p-value (0.1795)>0.05, PPML model is appropriate/preferred to RE

Test of H0: Difference in coefficients not systematic

chi2(17) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 22.14

Prob > chi2 = 0.1795

(V_b-V_B is not positive definite)

Test of H0: Difference in coefficients not systematic

chi2(17) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 22.14

Prob > chi2 = 0.1795

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