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Regional Strategic Analysis and Knowledge Support System
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2009

The Impact of Non-tariff Barriers on Maize and Beef Trade in East Africa

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ABBREVIATIONS AND ACRONYMS

ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
CET	Common external tariff
COMESA	Common Market for Eastern and Southern Africa
EA	East Africa
EABC	East Africa Business Council
EAC	East African Community
EPRC	Economic Policy Research Centre
ESRF	Economic and Social Research Foundation
FAOSTAT	Food and Agriculture Organization of the United Nations Statistics database
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
KIPPRA	Kenya Institute of Public Policy Research and Analysis
MT	Metric ton
NEPAD	New Partnership for Africa's Development
NTBs	Non-tariff barriers
OECD	Organisation for Economic Co-operation and Development
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
SADC	Southern African Development Community
SEM	Spatial equilibrium model
SLA	Softwood Lumber Agreement
SPS	Sanitary and phytosanitary

ABSTRACT

The East African Community (EAC) Custom's Union Protocol commits partner states, among other things, to the immediate elimination of all existing non-tariff barriers (NTBs) to trade on intra-EAC trade and to further refrain from introducing new ones. However, trade among the EAC countries is greatly hampered by the existence of NTBs, raising concerns among policymakers and the business community. This study quantifies the cost of various types of NTBs within the EAC and evaluates their welfare impacts on formal trade in maize and in beef cattle in Kenya, Uganda, and Tanzania using a spatial equilibrium model (SEM). The data used in this study were derived from a regional survey of 807 formal traders and transporters undertaken within the EAC border points in 2007. They were complemented by secondary data on maize and beef production, consumption, prices, and elasticity parameter estimates derived from various sources.

The quantification of the trade and welfare impacts of NTBs involved three main scenarios: a complete elimination of all the existing NTBs within the EAC; a 50 percent reduction in NTBs; and the separate elimination of individual types of NTBs such as roadblocks, permits, and customs clearance. In conformity with findings from other studies on regional trading blocks in Africa, intra-EAC trade in maize and beef was disturbingly low. In addition, the study found that the main types of NTBs within the three founder members of the EAC were similar. They included administrative requirements (mainly licenses, municipal and council permits), taxes/duties (mainly excise and cess duty), roadblocks, customs barriers, weighbridges, licensing, corruption (for example, bribes), and transiting. On average, the cost of maize NTBs in U.S. dollars[1] per kilometer per ton[2] was estimated at $0.09, $0.15, and $0.11 in Kenya, Uganda, and Tanzania respectively. The cost of beef trade NTBs to beef trade in US dollars per kilometer per ton was estimated at $0.17, $0.31, and $0.23 in Kenya, Uganda, and Tanzania respectively.

The results of the welfare analysis varied across the three countries, but the net monetary gains were positive in all cases. A complete abolishment or a reduction of the existing NTBs in maize and beef trade increased intra-EAC maize and beef trade flows with Kenya importing more maize from both Uganda and Tanzania while Uganda's beef exports to Kenya and Tanzania increased. As a result, positive net welfare gains were attained for the maize and beef subsectors in the entire region. In all cases, those who gained from the proposed reductions in NTBs could potentially compensate the losers leading to potential improvements in welfare. These findings give compelling evidence in support of the elimination of NTBs within the EAC Customs Union.

The study recommends taking a regional approach to eliminating the existing NTBs since they are similar across the member countries and across commodities so as to exploit economies of scale. Other policy recommendations include streamlining of administrative procedures at border points to improve efficiency; and speeding up of implementation of procedures at point of origin and at the border points. Finally, the

[1] All dollars are U.S. dollars.
[2] All tons are metric tons.

study recommends the need to design and implement monitoring systems to provide feedback to the relevant authorities on the implementation of measures to remove unnecessary barriers to trade within the EAC.

SECTION 1. INTRODUCTION

The East African Community (EAC) is the regional intergovernmental organization of the republics of Kenya, Uganda, Tanzania, Burundi, and Rwanda, with its headquarters in Arusha, Tanzania. Originally founded in 1967, the EAC collapsed in 1977, but was revived in 1999. The Treaty for the re-establishment of the East African Community was signed on 30 November 1999 and entered into force on 7 July 2000 following its ratification by the original three partner states: Kenya, Uganda, and Tanzania. The republics of Rwanda and Burundi acceded to the EAC Treaty on 18 June 2007 and became full members of the community with effect from 1 July 2007, creating a regional block of 120 million people, a land area of 1.85 million square kilometers, and a combined gross domestic product (GDP) of about US$41 billion (EAC 2009).

The EAC aims at widening and deepening cooperation among the partner states in several areas including the political, economic, and social fields for their mutual benefit. In an effort to achieve these aims, the EAC countries established a Customs Union in 2005 and are working towards the establishment of a common market by 2010, a monetary union by 2012 and ultimately a political federation of the East African states (EAC 2009). Over time, the EAC has also created an East African Legislative Assembly and a Court of Justice. Under the Customs Union, intra-EAC tariffs were abolished while a common external tariff (CET) was established for goods and services imported from non-EAC countries. The EAC CET has three applicable tariff bands on imports originating from third countries (0 percent on raw materials, 10 percent on intermediate products, and 25 percent on finished products), although rates above 25 percent apply to a number of “sensitive” products. However, Kenya, the region’s largest exporter, continues to pay duties on its goods entering the other four countries until 2010 based on a declining scale (Karugia et al. 2008a; EAC 2009).

The three founding member states have a long history of regional integration. The three countries share a common history, culture, and infrastructure, and have relatively uniform agroclimatic conditions (UNCTAD 2005). Unlike Kenya and Tanzania, Uganda is landlocked and relies on the other two countries for access to sea ports. The three countries are members of the World Trade Organization and other trading arrangements. However, while Kenya and Uganda are members of the Common Market for Eastern and Southern Africa (COMESA), Tanzania is member of the Southern African Development Community (SADC). Trade between among the three countries is carried out through both formal (regulated and recorded) and informal (unregulated and unrecorded) channels (RATES 2003). Informal trade accounts for over 95 percent of trade in livestock and up to 60 percent for staple grains (Ackello-Ogutu and Echessah 1997; Little 2007). Moreover, informal regional trade brings much gain in terms of regional food security and efficiency in resource allocation.

The creation of the EAC Customs Union is expected to increase trade and investment flows between member states and at the same time create a large market for the East African people. The expanded trade and cooperation of the partner states offers the prospect of economic growth and prosperity for East Africans. However, for these outcomes to be realized the Customs Union must urgently eliminate all obstacles that act as impediments to the realization of smooth trade and investment flows in the region.

These obstacles include both tariff[3] and non-tariff barriers (NTBs) [4] to trade, whose removal reduces the cost of doing business and ultimately improves welfare. Within Eastern and Southern Africa, tariffs play a much less important role as a barrier to cross-border trade than NTBs do (EABC 2005).

Under the EAC Customs' Union Protocol, partner states have committed themselves to eliminate "with immediate effect" all existing NTBs on intra-EAC trade and to refrain from introducing new ones. However, trade between the EAC countries is still being hampered by the existence of NTBs that are variously applied by the member states (EABC 2005). Within the community, the main types of NTBs include customs documentation and administrative procedures, immigration procedures, quality inspection procedures and transiting procedures that are cumbersome, unstandardized, and costly (EABC 2005). Thus, EAC trade liberalization and associated welfare gains would depend primarily on the elimination of policies and procedures linked to structural NTBs.

Economists generally agree that NTBs are detrimental to regional trade. These barriers diminish the potential benefits of trade preferences such as regional trading arrangements. Moreover, NTBs are a serious impediment to the growth of intraregional trade and their associated benefits. The existence of NTBs increases the cost of doing business, which ultimately leads to huge welfare losses (EABC 2005). However, the cost of these NTBs and their trade and welfare implications within the EAC are not well understood. This paper quantifies the cost of various types of NTBs and evaluates their welfare impacts on formal trade in maize and in beef cattle in Kenya, Uganda, and Tanzania using a spatial equilibrium model (SEM). The data used in this study were derived from a regional survey of formal traders undertaken within the EAC border points in 2007. They are complemented by secondary data on maize and beef production, consumption, prices, and elasticity parameter estimates that were adopted from earlier studies in the region. The information generated from this study would be of interest to EAC maize and beef cattle traders, policymakers, and development agencies.

The reminder of the paper is organized as follows. Section 2 provides a review of the experiences and lessons from the trade literature in terms of the relevant empirical approaches and past studies. This is followed by a description of the quantitative model, the data sources, and a specification of the scenarios considered in the study in Section 3. Section 4 provides a discussion of the results generated and their implication in the context of the EAC. Finally, Section 5 features the major finding and conclusions drawn from the study along with the appropriate policy recommendations are discussed.

[3] While tariffs are taxes imposed on goods when they are moved across political barriers, NTBs are all barriers to trade that are not tariffs (Deardorff and Stern, 1997).
[4] In the EAC Protocol, NTBs means "laws, regulations, administrative and technical requirements other than tariffs imposed by a partner state whose effect is to impede trade (EAC, 2004)."

SECTION 2. EXPERIENCES AND LESSONS FROM LITERATURE ON TRADE

In this section, we review some of the available evidence on the likely implications of NTBs on EAC countries. The studies so far carried out on NTBs are of two categories. The first category is those studies that have attempted rigorous empirical analysis. The second consists of descriptive (analytical) studies. The former group of studies, while trying to be empirical, have leaned more towards the partial equilibrium analysis following the Viner-type model of analyzing regional trade agreements.

2.1. Review of previous studies

The economic effect of NTBs has received a great deal of attention in the literature in recent times. With diminishing tariffs, the focus of trade policymakers and analysts is logically turning towards NTBs. It is well known that tackling NTBs poses many challenges for the analyst because of their diverse and complex nature, and the lack of available evidence. However, there is a substantial amount of literature on individual types of NTBs, and in some instances sophisticated empirical analyses of their effect. Beghin and Bureau (2001) and Deb (2006) provide by far the most comprehensive review of the approaches used to assess the implication of NTBs on agricultural trade.

Beghin and Bureau (2001), in their analysis of sanitary, phytosanitary, and technical barriers to trade, reviewed the methodologies to model and quantify NTBs to trade in the agricultural and food sectors. The authors limited their analysis to sanitary, phytosanitary, and technical regulations that can have an impact on trade and focused on methods that provide some quantitative estimates of the impact of such barriers on market equilibrium, trade flows, economic efficiency, and welfare. The authors categorized the approaches used to quantify the impacts of NTBs into eight groups: the price-wedge method, inventory-based approaches, survey-based approaches, gravity-based approaches, risk-assessment-based cost-benefit measures, stylized microeconomic approaches, and the use of sectoral or multimarket models. The authors noted that a single analytical method may not be adequate to quantify the cost of the entire spectrum of NTBs. Given the heterogeneous nature of NTBs, the authors concluded that a unifying methodology does not exist. Quantification of the effects of such measures has therefore focused on a particular product and has relied on methods that belong to different fields of the economic literature.

In addition, Beghin and Bureau (2001), critically analyzed the principle behind each approach, reviewed past studies, and assessed the practical validity of each approach in the assessment of the impact of NTBs on trade and welfare. The authors' discussion of the practical validity of each approach is was particularly relevant and useful to our study. For instance, survey-based methods are reported to be useful when other sources of information are lacking. Given the non-availability of data on NTBs in the EAC, the survey approach would be appropriate in our study to identify and quantify the cost of various NTBs within the region. Surveys make it possible to narrow the scope of the analysis and to focus on the relevant issues by asking practitioners (for example, traders) which measures have more impact on their activity. When coupled with in-depth interviews of a sample of the population surveyed, these approaches have sometimes

provided counter-intuitive assessments of the importance of trade barriers. Surveys can also be designed to provide information (such as ranking the importance of the measures on a scale) that can be used in econometric studies. This contributed to the choice of survey methodology for our study. In addition, Beghin and Bureau (2001) concluded that quantification using sectoral models can provide useful estimates of the trade and welfare effects of NTBs. This is relevant to our study. In particular, a multi-market model would be appropriate for this study given its objective of quantifying trade and welfare impacts.

Multimarket models are policy tools that can be used to analyze a wide range of sectoral issues. To build a multimarket model, sectoral data must be compiled, which includes obtaining figures for prices (inputs, outputs), production, trade volumes, taxes, transportation costs, and market margins. Supply and demand parameters are then obtained through econometric estimations or from "guesstimates" based on data in the literature (this was used in our study). Unlike partial equilibrium models, which typically focus on the dynamics in a single sector, multimarket models measure the interactions between different markets in an economy as specified by the analyst (Goletti and Rich 1998) and were thus adopted for this study. Multimarket models are useful in analyzing the impact of changes in public policy at the sectoral level. These policy changes can be traced to examine their effects on production, demand, trade, and welfare (Rich and Lundeberg 2002; Devadoss et al. 2005).

The spatial equilibrium model (SEM), which is a type of a multimarket model, was adopted for this study. The SEM consists of *n* regions (or countries), separated by distance. In this study the regions consisted mainly of the three founding member countries (Kenya, Uganda, and Tanzania) in the EAC. The SEM treats trade policies and transportation costs as exogenous (Devadoss et al. 2005). The model is used frequently to determine the effects of trade policy changes on quantities, prices, and welfare and was found suitable for this study. The model also focuses on sectoral analyses. This study analyzes the trade and welfare impact of NTBs on regional trade for two tradable commodities: maize and beef cattle.

Recently, Deb (2006) provided a more comprehensive review of the existing approaches to quantify the implications of NTBs. According to Deb (2006), 13 methods and approaches have been used to study NTBs, each with its own strengths and weaknesses. These approaches include those by Beghin and Bureau (2001) in addition to: (a) frequency-type measures; (b) quota-auction price measures; (c) tariff equivalent; (d) Trade Restrictiveness Index (TRI); (e) effective protection; and (f) measure of equivalent of nominal rates of assistance. Deb (2006), like Beghin and Bureau (2001), reported that in the absence of information from other sources, as was the case in our study, survey-based methods are useful. These methods make it possible to identify barriers which are difficult to measure, for example administrative procedures. Deb (2006) also stressed that NTBs can be quantified by using sectoral or multimarket models (for example, partial or spatial equilibrium models). These models make it possible to assess not only the impact of regulations on trade flows and on welfare but also provide more quantitative results. The author concluded that there is no unique or first-best method to appropriately quantify the size and impact of NTBs. Each methodology has its own methodological limitations and advantages based on the

availability of information and data. As such, estimating the impact of NTBs remains a major challenge for trade analysts.

Nogueira (2008) carried out an economic analysis of sanitary and phytosanitary (SPS) barriers to trade imposed by China, India, Mexico, and Taiwan on the Washington State apple industry using a partial equilibrium multiregional trade model. Specifically, the work analyzed the effects of changing the level of SPS barriers to trade on the revenue received by Washington State producers, and the economic surplus of importers and exporters. Systems of equations that characterize all stages of the export model were estimated, and incorporated into an estimate of the cost of complying with the SPS regulations. The author estimated export quantity changes for Washington State apples given specific changes on SPS costs. This allowed calculation of the associated revenue changes for Washington producers with different SPS costs.

Furthermore, welfare changes were estimated by calculating changes in surplus for both importers and exporters. The results (Nogueira, 2008) yielded estimates to provide policy recommendations that can be used by the industry to argue for the reduction of SPS barriers in other countries. Specifically, the results showed that exports to Mexico and Taiwan may increase greatly if SPS barriers decrease. Even though exports to India may decrease if SPS barriers are enforced, the loss may not be large. In general, the author provides further evidence of the potential gains for producers, exporters, and importers if SPS barriers decrease.

Gomez-Plana and Devadoss (2004) carried out a spatial equilibrium analysis of trade policy reforms on the world wheat market. This study developed a large-scale spatial equilibrium trade model for wheat to analyze the effects of removing trade barriers (tariffs and subsidies) on each country's/region's price, supply, demand, trade, welfare, and bilateral trade flows. The results showed that trade liberalization leads to an increase (decrease) in prices in the exporting (importing) countries. Production and exports increase in the exporting country, and consumption and imports increase in the importing country. Consequently, the volume of trade also increases. The welfare of most countries rises, and thus, world welfare also rises. Our study looks at the effect on EAC welfare of removing or reducing NTBs on maize and beef trade.

In an attempt to develop a business climate index in 2005, the East African Business Council (EABC) identified the nature and extent of NTBs applied within the EAC using descriptive measures. The EABC study found that indeed NTBs existed in the general areas of business registration and licensing, customs procedures, police road checks, road axle regulations and control, and standards and certification requirements. In decreasing order of severity, the authors ranked the major NTBs as: (i) administration of duties/taxes; (ii) corruption; (iii) customs administration; (iv) transiting checks; (v) police checks; (vi) immigration procedures; and (vii) licensing procedures. While the EABC study highlighted the main NTBs to EAC trade, it did not quantify the welfare impacts of these NTBs. Our study extends the EABC study by quantifying the effects of the NTBs on welfare and regional trade for beef cattle and maize.

Analysis of the EAC (particularly Kenya, Uganda, and Tanzania) trade with other Common Market for Eastern and Southern Africa (COMESA) countries over the period

2001 to 2005 was carried out (Ihiga 2007; Mmasi and Ihiga 2007; Tumuhimbise and Ihiga 2007). This included a detailed analysis of export and import including EAC/COMESA destination countries, export and trends, and major products traded between 2001 and 2005. Consultations were held with relevant representatives of the private and public sector. These consultations were validated and updated earlier on identified NTBs and identified new NTBs. The analysis found that a number of NTBs affect the ability of Kenyan, Ugandan, and Tanzanian businesses to export and import.

The major related NTBs were reported to be; customs and administrative entry procedures barriers; SPS measures; technical barriers to trade, the time and costs involved in accessing these services among others. Problems were also identified under SPS measures which included standards, time spent during inspection in export destination markets, especially Kenya, and lack of harmonized procedures for issuance of certification marks within the EAC and other distribution related obstacles that hinder access to EAC/COMESA markets. The studies thus recommended the need for partner states within the EAC and COMESA to consolidate and demonstrate their political and technical goodwill to implement aspirations of the EAC and COMESA treaties. Emphasis was also placed on need to build capacity at the coordinating ministry and business associations to enable the NTBs monitoring committee to play its role of facilitating, reporting, monitoring, and eliminating NTBs. The studies also recommended the need to harmonize regional transit traffic schemes aimed at reducing the transport and trade facilitation costs in the different countries. This will ensure that transportation within the region becomes more efficient and cost effective through harmonized transit procedures. This study extended the work by specifically addressing the barriers in the agricultural sector mainly to beef cattle and maize trade. Our study further quantified the impact of the NTBs on welfare.

OECD (2000) conducted a survey of 55 firms in the United States, Japan, the United Kingdom, and Germany on exports impediments. One of the sectors surveyed was dairy products. A finding of this survey of the dairy sector was that few firms considered standards to be of great concern as a trade barrier. In dairy products there were problems in certification and approval delays for exporters of specialty products, but dealers in bulk dairy goods reported few difficulties. The survey method used in the Organisation for Economic Co-operation and Development (OECD) study brought to the fore the administrative and bureaucratic NTBs that exporters of specialty dairy products face, providing a basis for our study to use survey methodology to identify NTBs in maize and beef cattle trade in East Africa (EA).

Kinnucan and Zhang (2004) developed a partial equilibrium model to determine the welfare effects of the 2006 Softwood Lumber Agreement (SLA) between the United States and Canada. They considered an eight-equation model including the rest of the world's imports of Canadian softwood lumber and Canadian supply exempt from the SLA export restrictions. Their results suggested that because of the SLA, Canadian consumers gained by $2.59 billion, producers by $0.45 billion, and the treasury by $0.23 billion. Producers in the U.S. benefited by $7.74 billion and U.S. consumers lost by $12.48 billion. The authors found that the SLA was a fairly efficient mechanism for transferring surplus from U.S. consumers to producers, and the combined net loss for the U.S. and Canada was only about 5 percent of the bilateral softwood lumber trade

value. The study concluded that welfare effects of an agreement concerning trade restrictions can be positive or negative. Our study has used the SEM to shed light on the impact of removal or reduction of NTBs experienced in beef and maize trade in the East African region.

In conclusion, with diminishing tariffs, the focus of trade policymakers and analysts is logically turning towards NTBs. Even though there is a substantial amount of literature on individual types of NTBs, and in some instances sophisticated empirical analysis of their effect, limited attempts have been made to empirically model their impacts. These limitations notwithstanding, this paper attempts to quantify the costs and impacts of NTBs within the EAC using a SEM that is informed by data from a survey and secondary sources.

SECTION 3. METHODOLOGY

This section presents the methods used to quantify the cost and impact of NTBs in the EAC. Given the scarcity of data on cross-border trade in this region, two approaches were used. First, a survey approach was used to obtain data on the cost of various NTBs in the three EAC countries. The information generated from the survey was then used in the calibration of the SEM that quantifies the impact of NTBs.

3.1. The spatial equilibrium model

This study adopts the SEM used in Devadoss et al. (2005) and adjusts it to estimate the impacts of NTBs on maize and beef cross-border trade within the EAC since intra-EAC import tariffs have been abolished. The SEM provides quantitative measures of the welfare impacts of reducing NTBs, which helps to weight the benefits and costs of preferential trade liberalization. It is calibrated to the price and quantity values for the 2006 data based on elasticity estimates adopted from earlier studies undertaken in the region. Following Devadoss et al. (2005), the inverted supply and demand functions for maize and beef in Kenya, Uganda, and Tanzania can be represented as follows:

$p_i^d = a_i - b_i y_i$, i=1,…,n (1)

$p_i^s = c_i + d_i x_i$, i=1,…,n (2)

where *a*, *b*, *c* and *d* are coefficients, and p_i^d, p_i^s, y_i and x_i are regional demand and supply prices and regional quantities demanded and supplied in *i*th region. The supply and demand functions are used in the calibration of SEM, which provides the welfare objective function and the market clearing conditions mathematically as follows:

$$W = \sum_{i=1}^{n}(a_i - b_i y_i)y_i - \sum_{i=1}^{n}(c_i + d_i x_i)x_i - \sum_{i,j} x_{ij} t_{ij} - \sum_{i,j} x_{ij}\left(\rho_j^d - \rho_i^s\right) + \sum_{i,j} x_{ij}\left(\rho_j^d \frac{1}{1+\delta_{ij}} - \rho_i^s\right) \quad (3)$$

Subject to

$\sum_{j-1}^{n} x_{ij} \leq x_i$ for all *i* (4)

$\sum_{i-1}^{n} x_{ij} \geq y_j$ for all *j* (5)

$c_i + d_i x \geq p_i^s$ for all *i* (6)

$a_i - b_i y_i \leq p_i^d$ for all *i* (7)

$$(1+\delta_{ij})(p_i^s + t_{ij}) \geq p_j^d \qquad \text{for all } i \text{ and } j \qquad (8)$$

$$y_i, x_i, x_{ij} > 0 \qquad \text{for all } i \text{ and } j \qquad (9)$$

where x_{ij} is the quantity of beef cattle or maize transported from region i to j, t_{ij} is the unitary transportation cost from i to j, y_i is quantity demanded in country i, δ_{ij} is cost of NTBs imposed by region j on imports from region i, p_i^d is country demand price, and p_i^s is country supply price.

The SEM employs a non-linear optimization technique to maximize the net social monetary gains function (equation 3), subject to a set of linear constraints (equations 4 to 9). The net social monetary gain function is used as the objective function instead of net social welfare function since NTBs are modeled. The net social monetary gain is the sum of all the countries total revenues, minus total production costs, minus transportation costs, minus net societal loss arising from NTBs. Equation (4) states that the total quantity of maize/beef transported from country '*i*' must be lower or equal to national production in that country. Equation (5) states that the total quantity transported into a country must be greater than or equal to quantity demanded in the destination country. Equation (6) shows that the regional EAC supply price must be greater than or equal to the specific country supply price. Equation (7) is similar to equation (6) but relates to demand; it implies that regional and national demand prices must be equal if national demand is positive. If the regional demand price is lower than the national demand price, then national demand ought to be zero. Equation (8) is a market clearing condition showing that market supply price in *i* plus transportation cost adjusted for NTBs must be greater than or equal to market demand price in *j*. The last constraint shows that demand, supply, and transported quantities are non-negative.

The underlying assumption related to equations (6), (7) and (8) is that the price difference between any two countries is explained by transportation costs, comparative advantage, and NTBs. In this analysis, tariff barriers are not considered since intra-EAC tariffs were zero rated in 2005 with the formation of the EAC customs union. However, various other forces affect market prices in the EAC, but might not be captured in the SEM model presented above. For example, due to poor communication networks, traders in Tanzania or Uganda might generally be uncertain of what the price of maize/beef might be in Kenya such that the prices at which they are expecting to sell their products in Kenya might differ from that defined in the model. Similarly, some traders in Uganda, Kenya, or Tanzania might sell their maize/beef cattle at prices below or above that defined in the model because they have a lower/higher negotiating power than their buyers do. In addition, it might be true that roads work better between Kenya and Tanzania compared to between Kenya and Uganda such that the true transportation cost per kilometer between Kenya and Tanzania might be lower than that between Kenya and Uganda.

3.2. Model calibration

The welfare impacts of NTBs on cross-border trade within the EAC are computed from a SEM of maize and beef trade in Kenya, Uganda, and Tanzania. It is a static partial equilibrium model that comprises four blocks of equations: prices, supply, consumption, and market clearing identities for maize and beef at the wholesale level. The General Algebraic Modeling Systems (GAMS) package was used to solve the equations. It is calibrated to reproduce the 2006 base values, when NTBs were the major barriers to free trade within the EAC. To solve the model, estimates were compiled for the quantities of maize and beef supplied and consumed in the three countries, their corresponding prices, and their price elasticities. In addition, data on the cost of NTBs and transport costs were used in the SEM. The estimates of the quantities produced and consumed in the three countries were derived from three-year averages over the 2004–2007 period.

The base data used for policy simulations are presented in Table 1. On average, the trends indicate that Kenya consumes more maize than it produces and is therefore a net importer of the commodity (Table 1). In contrast, Uganda and Tanzania are net exporters of maize. Kenya and Tanzania are net importers of beef while Uganda is a net exporter. On average, the annual consumption, and production, and own-price elasticities of both the supply and demand of maize and beef, in Kenya, Uganda, and Tanzania was estimated as are shown in Table 1. These supply and demand responses were adopted from earlier studies. [5]

In this model, tariffs are not considered since it is assumed that these were abolished by the EAC Customs Union. However, the model considers the cost of NTBs as shown in Table 1.

Table 1. Base data for policy simulation

	Base values		
Variable	**Kenya**	**Uganda**	**Tanzania**
Maize consumption	3,411,680	1,047,769	3,766,663
Beef consumption	634,703	120,686	275,005
Maize production	3,228,594	1,285,000	3,817,875
Beef production	422,320	340,479	480,336
Nominal prices ($/MT*)			
Maize price	203	144	167
Beef price	1,859	1,300	1,729
Own-price elasticities			
Price elasticity of demand for maize	-0.8	-0.77	-0.9
Price elasticity of demand for beef	-1.68	-1.01	-1.18
Price elasticity of supply for maize	2.17	0.8	1.96
Price elasticity of supply for beef	0.35	0.35	0.35
NTB costs ($/MT/km)			
Maize	0.09	0.15	0.11
Beef	0.17	0.31	0.23

[5] In particular, the elasticity of supply for maize in Kenya is adopted from Nzuma (2007), while those for Uganda and Tanzania are derived from Delgado et al. (2002) and Wood and You (2001).

Distances (km)			
Kenya	0	673	922
Uganda	673	0	1595
Tanzania	922	1595	0

* MT = metric tons.

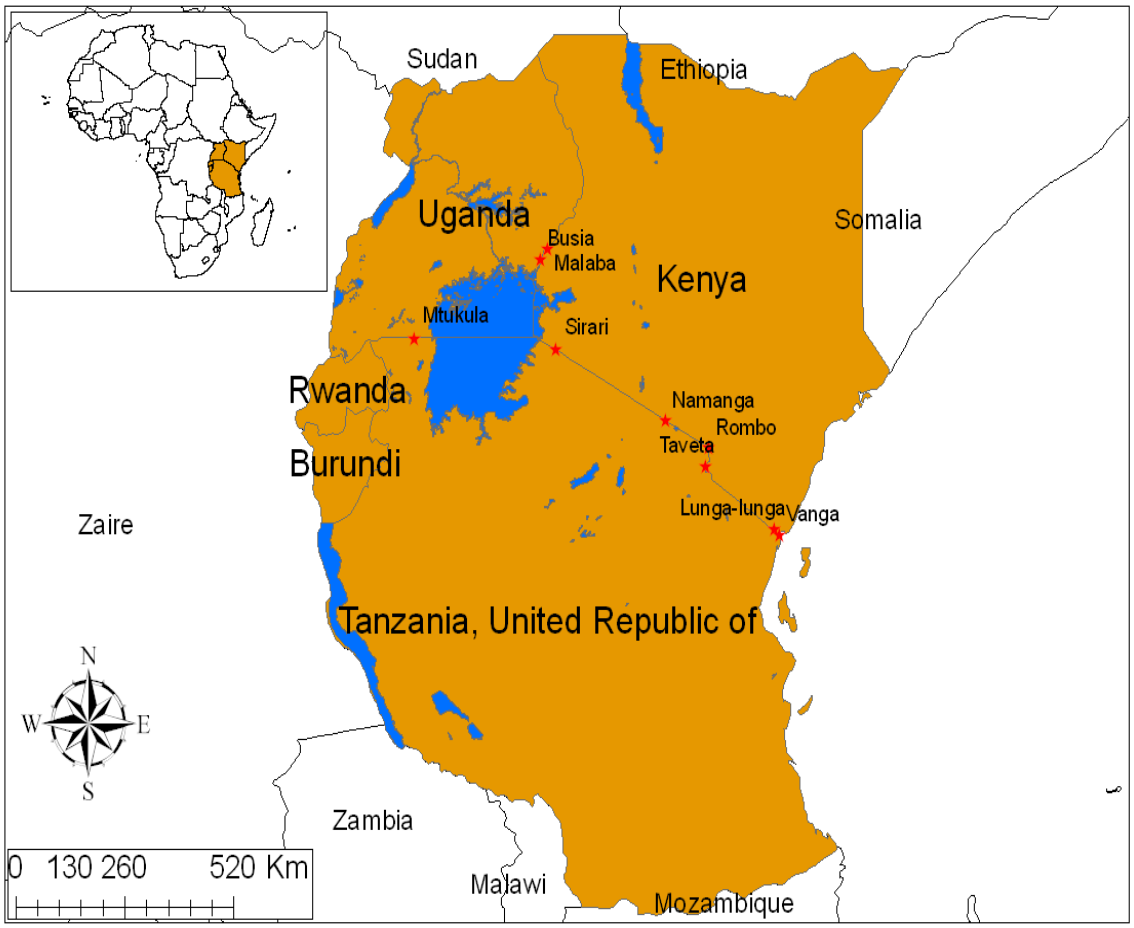
Equations (1) and (2) were used to simulate four policy scenarios that quantify the impacts of NTBs on trade and welfare within the EAC. These comprise a baseline, a complete abolishment of all NTBs, a 50 percent reduction in all NTBs, and the elimination of specific NTB types such as roadblocks. The simulation provides quantitative measures of the welfare impacts of NTB reductions, which helps to weigh the benefits and costs of increased preferential trade liberalization within the three EAC countries. In this analysis, the change in consumer surplus is measured by the area to the left of the demand curve between the new and old prices. Similarly, the change in producer surplus is measured by the area to the left of the supply curve between the two prices. The results of the quantification of the cost of NTBs along with the welfare simulation results are presented in Section 4.

3.3. Data sources

This study uses both primary and secondary data sources. Secondary data on the production and consumption of maize and beef along with their corresponding prices were compiled from both domestic and international sources. The domestic sources consisted of publications from the country national statistics offices and annual reports from the ministries of agriculture. In addition, the Food and Agriculture Organization of the United Nations online statistical database (FAOSTAT) was used to complement some of the domestic secondary data sources. The supply and demand elasticity estimates used in this study were adopted from earlier studies undertaken in the region. One of the main requirements in deciding on the demand elasticity estimates to use was that they must have been derived from demand systems that satisfy the basic economic assumptions on consumer behavior such as adding-up, homogeneity, and symmetry.

However, the model calibration required data on transportation costs from one country to another and the cost of NTBs applied across the three countries. This information was generated from a field survey of 807 enterprises that was conducted in 2007. A cluster sampling method was used to identify 357 and 450 beef cattle and maize traders and transporters respectively who were interviewed using a semi-structured questionnaire. In the first stage of the cluster sampling, the major markets located along the main trade routes and the major border points in Kenya, Uganda, and Tanzania were selected.

Map 1. Map of the surveyed areas



Source: ILRI, GIS database.

The main border points across which trade in maize and beef cattle is conducted within the EAC are shown in Map 1. Along the Kenya-Tanzania border, the main transit points included Tanga, Taveta, Namanga, and Sirari, while Busia and Malaba were the main border points between Kenya and Uganda (Map 1). The main transit point for trade between Uganda and Tanzania was Mutukula. These border points are situated along the most widely used transportation routes that link the capital cities of the three EAC countries. Kenya, Tanzania, and Uganda have two, three, and four commonly used trade routes respectively.

The second stage of the cluster sampling selected a total of 807 beef cattle and maize traders and transporters in the selected markets along the major trade routes. The methods used in the measurement of the cost of the various types of NTBs are described in Table 2. One of the major challenges in the quantification of the cost of various types of NTBs was the standardization of the cost to comparable units. This arose because the survey team captured the cost of NTBs in local currencies per trip, rather than in dollars per unit weight per unit distance. To come up with a NTB

standardized cost, the average distance and the quantities were used to compute costs in dollars per ton per trip.

Table 2. Measurement of the cost of NTBs

Variable	Description/quantification
Administrative requirements	Amount paid in $ to obtain licenses, custom clearance, road toll stations, council and municipal permits, security, branding of livestock
Duties/taxes	Amount paid in $/ton per trip
Corruption	Frequency, amount paid in $/ton as a bribe per trip
Roadblocks	Frequency, time lost per trip due to roadblocks; monetary cost in $/ton to overcome the roadblock barrier
Road toll stations	Monetary cost paid in $/ton per trip
Weighbridge	Frequency, time lost at weighbridge; monetary cost in $/ton to overcome the barrier per trip
Custom procedure	Time lost due to queues at custom, monetary cost paid in $/ton per trip to overcome any barrier at custom
Immigration	Monetary cost paid in $/ton per trip
Transiting	Monetary cost paid in $/ton per trip
Standard and certification	Monetary cost paid in $/ton per trip
Vehicle hire and maintenance	Monetary cost in $/ton per trip
Security	Monetary cost paid in $/ton per trip to security personnel
Loading and off loading	Monetary cost paid in $/ton per trip
Transporters allowances	Monetary cost paid in $/ton per trip

Note: All primary data were collected in country local currency but were also converted into $ for uniformity across the countries using exchange rates at the time of the survey. It is also important to note that primary data involved collection of data on live beef cattle but for the SEM analysis live beef animals were converted into beef in kilograms.

The main types of NTBs whose costs were sought included administrative requirements (mainly licenses, municipal and council permits in all countries), duties/taxes (mainly excise and cess duty), roadblocks, toll stations, weighbridges, customs procedures, immigration, transiting, standardization and certification, vehicle hire and maintenance, and security. To elicit these costs, beef cattle and maize traders and transporters were interviewed using a semi-structured questionnaire to assess the transportation cost and various NTBs that they face while trading in maize and beef cattle across the three EAC countries. In addition, customs officials were interviewed to verify the information provided by the traders and transporters. The costs derived were compiled using descriptive methods and later used in the calibration of the SEM. The results generated from this study are presented in the next section.

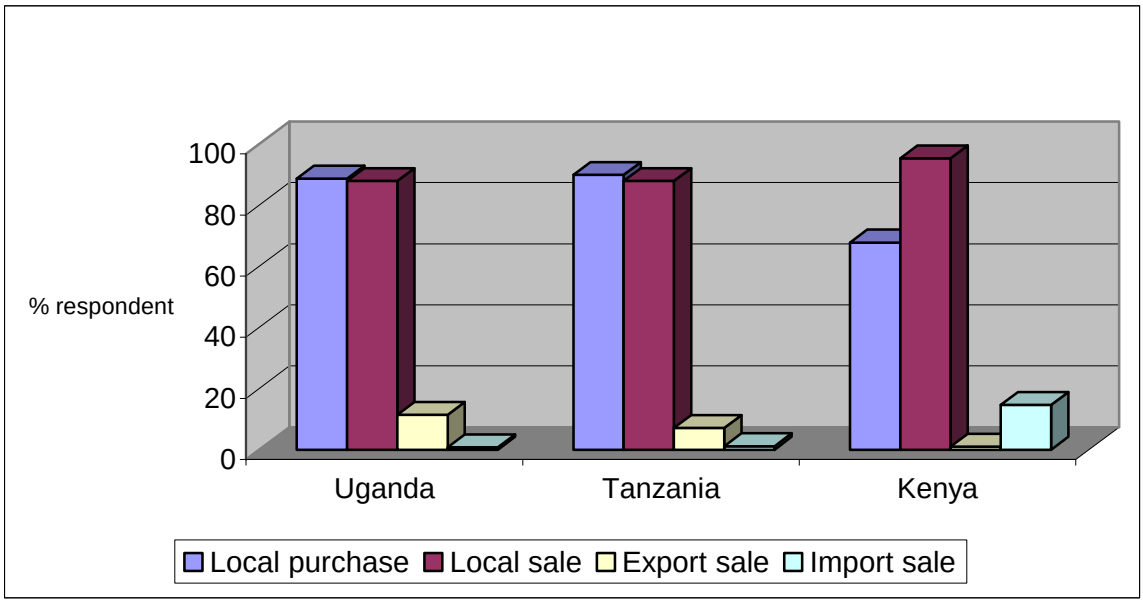
SECTION 4. RESULTS AND DISCUSSION

The results generated from the study are presented in this section. First, the results of the quantification of the cost of various NTBs from the regional survey of maize and beef cattle traders across the three EAC countries are presented. This is followed by a discussion of the trade and welfare impacts of NTBs.

4.1. Trends in maize and beef trade

Domestic trade in maize and beef remains the dominant trade within the three EAC countries. In the maize sector, traders and transporters in the three countries mainly engage in local purchase and sale with over 80 percent of the respondents reporting to have engaged in domestic or local trade (Figure 1). In contrast, less than 10 percent of the traders reported that they participated in regional maize trade. The low rates of intraregional trade might be an indication of the existence of NTBs to trade given that intra-EAC tariffs have been abolished. Not surprisingly, maize exports in Kenya were lower than imports while the reverse was true in both Uganda and Tanzania. This implies that Kenya is a net importer of maize, while Uganda and Tanzania are net exporters creating an opportunity for regional trade flows in maize.

Figure 1. Maize trade within the EAC

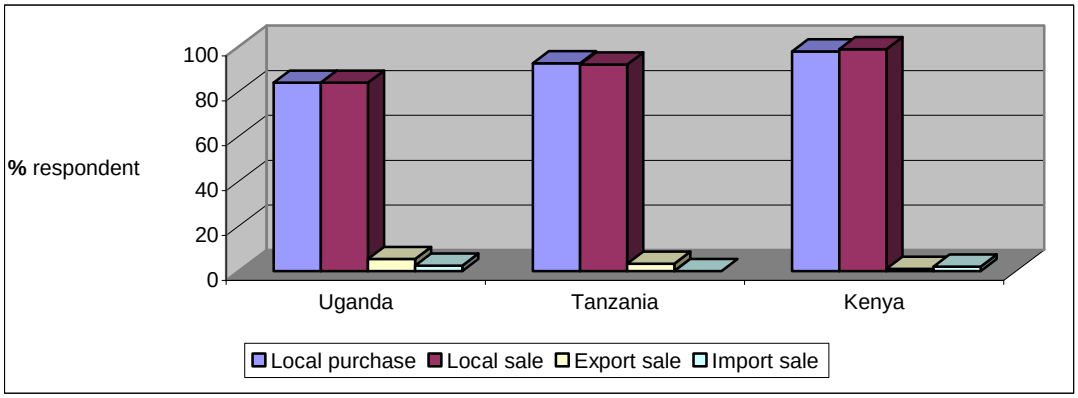


Source: Survey, 2007/2008.

On average, domestic trade in beef was much higher than that in maize, with about 85 percent of the traders reporting to have engaged in domestic trade (Figure 2). Unlike the trends in the maize trade, Uganda and Tanzania are net exporters of beef while Kenya is a net importer of beef. However, regional trade in beef was much less than that in maize

with less than 5 percent of the respondents reporting to have engaged in it (Figure 2). These trends imply the existence of more NTBs in the beef trade than in the maize trade.

Figure 2. Beef trade within the EAC



Source: Survey, 2007/2008.

In conformity with findings in other regional trading blocks in Africa, intra-EAC trade in maize and beef is disturbingly low. The low intra-EAC trade flows in these two basic food commodities coupled with the simultaneous existence of food deficits and surpluses in the region undermines food security in the EAC (Karugia et al. 2008b). Similar results have been reported for the COMESA region, where intra-COMESA agricultural trade is less than 10 percent of total trade. Given that intra-EAC tariffs have been abolished, it would appear that NTBs are critical obstacles to trade in the region. However, these findings should be interpreted with caution since the region also experiences high informal trade in both maize (Figure 3) and beef cattle (RATES 2003). Typically, maize crosses EAC borders informally in small quantities that are transported by bicycle (Figure 3). Informal beef cattle trade is made possible by the movement of cattle on foot across EAC border points.

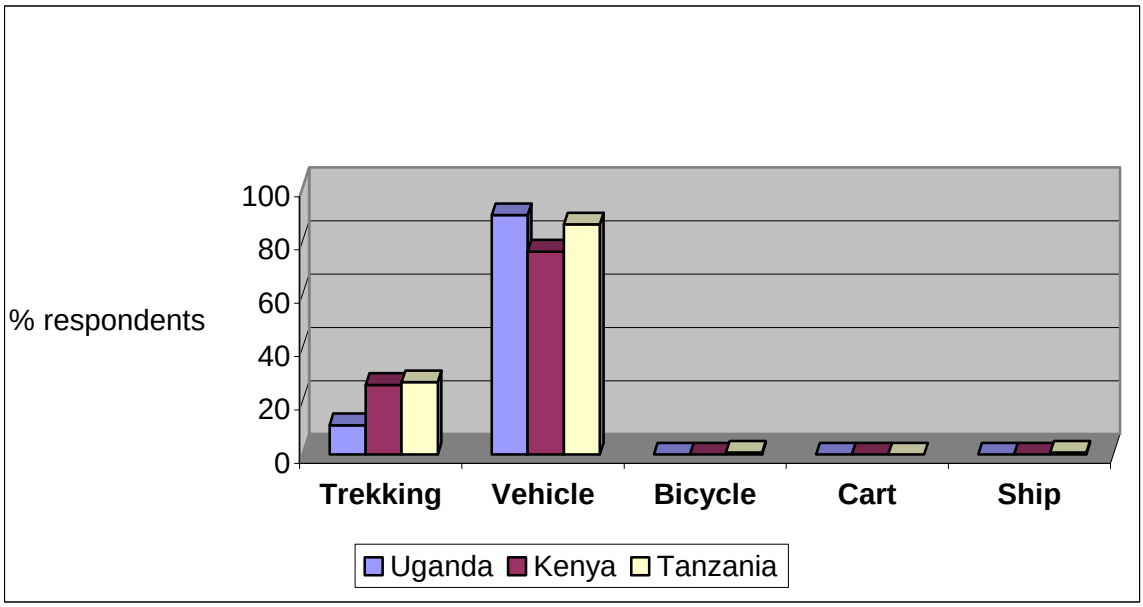
Figure 3. Unrecorded /informal cross-border trade at East African borders

Source: RATES (2003)

4.2. Transportation methods

Perhaps informal cross-border trade within the EAC hinges on the transportation method used. The modes of transport used by traders and transporters in the three East African countries for maize and beef cattle are presented in Figures 4 and 5. Vehicles including trucks, trailers, lorries, and pick-ups were the main means of transportation adopted by most of the sampled traders and transporters. The lorry seemed to be the most common mode of transport for maize. About 70 percent of sampled traders in Kenya used lorries, while in Uganda and Tanzania, the proportion was 52 percent and 36 percent respectively. The other means of transport such as bicycles, carts, and ships were infrequently used. However, another common mode of transport used by the beef cattle traders was trekking to the market place. Despite the existence of a railway line linking the three EAC countries, none of the traders interviewed reported using this mode of transport for their merchandise. This is particularly worrying, especially since rail cargo transport is, on average, 15 percent cheaper than road transport.

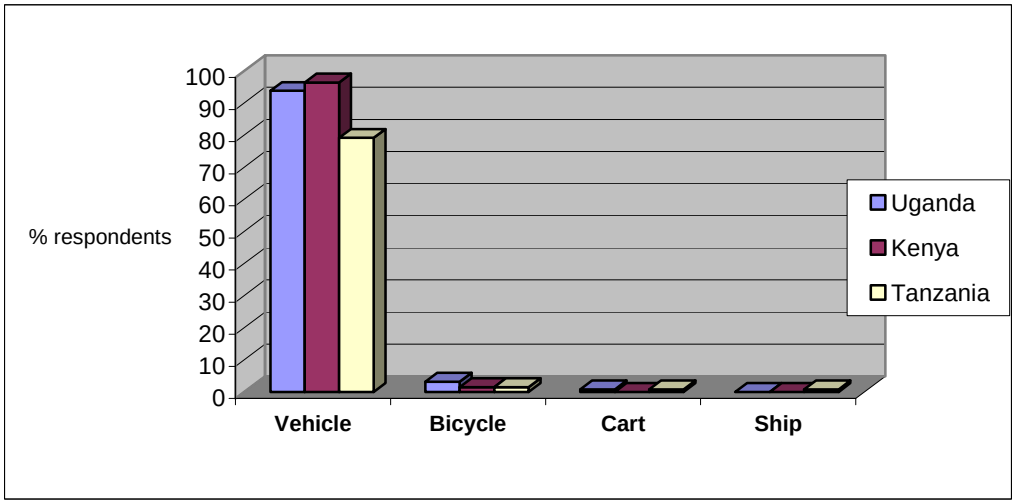
Figure 4. Means of transporting beef cattle in EAC



Source: Survey, 2007/2008.

Generally, all traders and transporters of beef cattle and maize traveled over 150 km per trip within the region from the origin of their merchandise to the final destination. In addition, the amount of time taken per trip across the three countries was up to two days (Table 3). The highest distances per trip were reported in Tanzania where maize and beef cattle traders and transporters covered an average of 278 and 341 km respectively (Table 3). This is expected since Tanzania is much larger than either Kenya or Uganda. Tanzania's vastness offers an expanded market and the highly dispersed markets in the country are an avenue that traders should seek to exploit.

Figure 5. Means of transporting maize in the EAC



Source: Survey, 2007/2008

In addition, traders and transporters of beef cattle and maize in Tanzania transported the highest quantities among all the three countries in the region in both inter and intraregional trade. Tanzania traders and transporters on average transported the most beef cattle and maize per trip (Table 3).

Table 3. Average distance and trip duration for beef cattle and maize trade in the EAC

Beef cattle	**Uganda**	**Tanzania**	**Kenya**
Distance (km)	236	341	198
Average duration per trip (days)	2	2	2
Average no. beef cattle per trip	17	34	20
Maize	**Uganda**	**Tanzania**	**Kenya**
Distance (km)	190	278	190
Average duration per trip (days)	2	1	2
Quantity of maize per trip (tons)	13	21	16

Source: Survey, 2007/2008.

The transfer cost of maize and beef cattle per kilometer was estimated by the summation of all costs incurred as the traders and transporters moved their merchandise from the point of origin to their final destination. These costs were further split into two groups: non-NTB transfer costs (costs that are not NTB such as vehicle hire and maintenance, loading and offloading, and transporters' allowances) and NTB transfer costs (weighbridges, security, transiting, customs clearance, road toll stations, branding of cattle, standards and certification, and bribes). In addition, some extra NTB costs were incurred through bribes and the extra time that was spent in queues as traders acquired various trade services.

4.3. Cost of NTBs in maize and beef trade within the EAC

The main markets in East Africa and the associated transfer costs are shown in Table 4. In Kenya, the average transportation cost for maize with NTBs per ton per kilometer decreased without NTBs (Table 4). The cost of NTBs applied on maize imports into Kenya from Uganda and Tanzania was on average $0.09 per ton per kilometer. The cost of beef trade NTBs in Kenya was $0.17 per ton per kilometer (Table 4).

Table 4: Main markets in East Africa and transfer cost with and without NTBs

Maize	**With NTBs**			**Without NTBs**	
	Distance (km)	**Transfer cost per km/maize ton ($)**	**Total transfer cost ($)**	**Transfer cost per km/maize ton ($)**	**Total transfer cost ($)**
Nairobi–Namanga	170	0.46	78	0.37	63
Nairobi–Busia	500	0.46	230	0.37	185
Busia–Kampala	250	0.44	110	0.29	73
Dar–Namanga	772	0.35	270	0.24	185
Beef	**With NTBs**			**Without NTBs**	
	Distance (km)	**Transfer cost per km/beef ton ($)**	**Total cost ($)**	**Transfer cost per km/beef ton ($)**	**Total transfer cost ($)**
Nairobi– Namanga	170	0.34	57.8	0.17	28.9
Nairobi–Busia	500	0.34	170	0.17	85
Busia–Kampala	250	0.40	100	0.09	22.5
Dar–Namanga	772	0.43	331.96	0.20	154.4

Source: Survey, 2007/2008.

A similar analysis reveals that the cost of NTBs applied on maize imports into Uganda and Tanzania were about $0.15 per ton per kilometer and $0.11 per ton per kilometer respectively (Table 4). The cost of beef cattle trade NTBs relative to maize trade NTBs were much lower across the three EAC countries. NTB costs for beef cattle traders in Kenya, Uganda, and Tanzania were about $0.17, $0.31, and $0.23 respectively. The implication that can be drawn from these findings is that the beef trade was more liberal than the maize trade in the region.

As expected from the findings of the EABC (2005) study, the main types of NTBs within the three EAC countries are similar. Roughly a third of the respondents indicated that businesses licenses were a mandatory administrative requirement for trade in both maize and beef cattle. Various trade licenses are required within the EAC. These include a business license, road transport license and a livestock clearance certificate. In addition, security constitutes a main administrative requirement in Tanzania.

Even though roadblocks improve security along major highways, the cumbersome clearance at such roadblocks wastes time (see Figure 6). These roadblocks were reported to be manned by unfriendly police officers who wasted trader's time. In addition, the roadblocks are fertile ground for the extortion of bribes by police officers. The long hours taken to clear a vehicle at a roadblock is meant to induce the traders to offer a bribe so that their vehicles are cleared faster. As such, they add a cost stream to the cost of doing business.

Figure 6. Police inspecting vehicles at a Kenyan road block

Source: Gitonga Marete (2008).

Paradoxically, roadblocks were identified as a major NTB in the region. Kenya had the highest total number of roadblocks (Table 5). Kimenyi (2008) reported that, on average, there were 47 roadblocks on the road from Mombasa to Busia (a distance of 1,050 km). The Kenya Government intends to reduce the number of roadblocks from 47 to 15 (a reduction of 68 percent) to encourage regional trade. However, the number of weighbridges was low. Over a third of all respondents reported that they had wasted time at roadblocks; they therefore said that roadblocks are an NTB to trade within the region. Only about 10 percent of all respondents in the three countries indicated they had not wasted time at roadblocks. Thus, the time spent at each roadblock is used as a proxy in the computation of the cost of NTBs.

Table 5. Average number of roadblocks and respective distances

	Number of roadblocks			**Average distance (km)**		
Category	Kenya	Tanzania	Uganda	Kenya	Tanzania	Uganda
Beef cattle	12	7	5	198	341	236
Maize	10	5	14	190	278	190

Source: Survey, 2007/2008.

Traders of both maize and beef cattle encountered long queues at customs offices. The longest time spent in queues per trip was approximately 7 hours in Uganda by maize traders. Kenya beef cattle and maize traders spent on average 3 hours at customs while in Tanzania the traders spent less than 1 hour at customs offices per trip. These long queues were attributed to inadequate staff at most customs offices, discrimination, and failure by customs officials to clarify rules and regulations. In addition, the level of corruption in terms of payment of bribes at the various border points within the EAC was quite high. Over half the traders and transporters gave bribes in order to overcome various trade barriers (Table 6). Almost all respondents in Tanzania (97 percent) paid a

bribe (Table 6). In contrast, 65 percent and 56 percent of the respondents in Kenya and Uganda paid bribes (Table 6).

Table 6: Number of respondents who bribed as they traded

	Kenya		Tanzania		Uganda	
Category	No.	Percent	No.	Percent	No.	Percent
Beef cattle traders	29	62	68	96	40	61
Beef cattle transporters	29	64	107	98	10	53
Maize traders	35	51	81	94	21	33
Maize transporters	44	83	145	99	25	76

Source: Survey, 2007/2008.

The traders and transporters were asked to report the amount of money they gave as a bribe or additional informal monetary costs imposed on them at each trading stage. At customs departments, maize traders paid the highest additional monetary cost in Kenya compared to Uganda and Tanzania in order to overcome any trade barrier (Table 7). Corruption, inconvenient operating hours, discrimination, and inadequate numbers of staff caused traders to incur these extra costs at customs in order to receive the required services as they traded in maize. These unofficial payments could be termed as bribes and are an important component of corruption.

Table 7. Monetary cost paid to overcome barriers per trip ($)

	Maize			Beef cattle		
Issue	**Kenya**	**Tanzania**	**Uganda**	**Kenya**	**Tanzania**	**Uganda**
Customs	314	4	130	0	1	39
Immigration	8	1	49	0	0	22
Roadblocks	218	15	509	115	13	402
Weighbridges	41	10	12	-	-	-
Transiting	1	0	44	23	0	17
Licensing	466	4	61	7	4	97
Standards	38	2	76	0	1	180
Municipal	19	14	78	1	16	137
Council	4	25	3	8	27	5
Other problems	5	0	14	0	15	0

Source: Survey, 2007/2008.

Beef cattle and maize traders had to incur extra costs because of corruption in all three countries. Tanzanian maize traders had to pay officials more money than that required administratively to obtain municipal council permits. Beef cattle traders in the country faced discrimination and harassment when obtaining permits from the council; they also had to deal with corruption at roadblocks. At roadblocks in Uganda, unfriendly police checks coupled with police harassment resulted in higher costs being incurred. Beef cattle traders in Kenya had to pay to get through roadblock barriers. Results in Table 7 show that bribery/corruption mainly takes place at customs offices, roadblocks, during licensing, and at municipal and council offices for both maize and beef cattle. The highest intensity of corruption is reported in Kenya among the maize traders.

The percentage shares of different types of transportation costs and other NTBs in total transfer costs incurred by transporters and traders are shown in Table 8. Vehicle hire

and maintenance are relatively high in the EAC and contributed the highest share of the total transfer costs per trip. A major contributor to the road transport cost was vehicle operating costs which included fuel, tires, maintenance and depreciation cost of the vehicle among others. The high cost of transportation can be attributed to the poor road network in the countries, high fuel costs and the high cost of renting the vehicles used.

Table 8. Specific transfer costs of maize and beef cattle (percent of total)

	Maize			Beef cattle		
Cost description	**Kenya**	**Tanzania**	**Uganda**	**Kenya**	**Tanzania**	**Uganda**
Weighbridges	2.41	0.97	4.25	0.00	0.10	0.00
Vehicle hire & maintenance	46.08	69.19	21.75	51.05	58.91	46.15
Security	0.45	0.73	0.26	0.26	6.69	1.48
Transiting	0.49	0.00	33.87	0.49	0.00	9.47
Municipal permits	3.61	2.39	2.21	4.20	3.69	3.18
Council permits	3.74	4.31	1.79	4.24	4.69	3.15
Licenses	2.75	0.37	4.46	1.74	0.17	5.93
Customs clearance	12.83	0.75	2.75	0.62	0.05	2.98
Immigration	0.00	0.13	0.31	0.00	0.00	2.35
Standards and certification	4.92	0.41	2.63	8.53	1.14	3.89
Road toll stations	1.42	0.35	0.63	0.00	0.34	2.89
Loading	3.80	5.45	1.51	1.93	1.30	3.36
Br bes	1.94	1.27	1.41	7.43	1.47	3.17
Off-loading	2.19	4.51	2.01	5.45	0.49	4.84
Transporter's allowance	3.38	5.51	1.38	5.37	7.63	1.45
Branding of cattle	-	-	-	0.63	0.36	1.08
Other costs	10.03	3.71	18.81	8.08	13.01	4.67
Total transfer Costs	100.00	100.00	100.00	100.00	100.00	100.00

Note: Official road toll stations in Kenya were abolished but the study captured non-official road toll stations.
Source: Survey, 2007/2008.

The cost of various NTBs as a share of total transfer costs is shown in Table 9. The cost of NTBs for maize trade in Kenya accounted for approximately 35 percent of total maize transfer cost. The situation is much worse in Uganda where NTBs accounted for over 50 percent of total maize transfer cost. However, in Tanzania, only 12 percent of total maize transfer cost was accounted for by NTBs. For the beef cattle trade, Kenya and Uganda reported that NTBs constituted over 25 percent of the total transfer costs while Tanzania reported approximately 19 percent of total transfer costs were contributed by NTBs. This implies that NTBs are an important component of the transfer costs of both maize and beef cattle trade within the EAC.

Table 9: NTBs as a percentage of total transfer costs

	Maize			Beef cattle		
NTB description	**Kenya**	**Tanzania**	**Uganda**	**Kenya**	**Tanzania**	**Uganda**
Weighbridges	2.41	0.97	4.25	0	0.1	0
Security	0.45	0.73	0.26	0.26	6.69	1.48
Transiting	0.49	0	33.87	0.49	0	9.47
Municipal permits	3.61	2.39	2.21	4.2	3.69	3.18
Council permits	3.74	4.31	1.79	4.24	4.69	3.15
Licenses	2.75	0.37	4.46	1.74	0.17	5.93
Customs clearance	12.83	0.75	2.75	0.62	0.05	2.98
Immigration	0	0.13	0.31	0	0	2.35
Standards and certification	4.92	0.41	2.63	8.53	1.14	3.89
Road toll stations	1.42	0.35	0.63	0	0.34	2.89
Bribes	1.94	1.27	1.41	7.43	1.47	3.17
Branding of cattle	0	0	0	0.63	0.36	1.08
Transfer costs taken up by NTBs (percent)	34.56	11.68	54.57	28.14	18.7	39.57

Source: Survey, 2007/2008.

4.4. Trade and welfare impacts of NTBs

The variables of interest in the quantification of the impacts of NTBs on cross-border trade are maize and beef prices, demand, supply, trade flows, and welfare changes (consumer and producer surplus). The base scenario replicates the existing trade patterns where the three EAC countries trade in both maize and beef. Since maize retail prices are higher in Kenya than in Uganda and Tanzania, Kenya formally imports maize from both Uganda and Tanzania to the tune of 134,000 and 86,000 tons respectively. Uganda exports beef to both Kenya and Tanzania since beef retail prices are lower in Uganda than in both the other countries. The base scenario produces positive welfare impacts for the maize and beef subsectors in the three countries. Overall, the combined social surplus for the maize and beef subsectors in Kenya, Uganda, and Tanzania amounted to $2.3 billion, $0.8 billion, and $1.8 billion respectively.

4.4.1. Impact of a complete elimination of NTBs

When NTBs within the EAC are completely abolished, various changes relative to the base solution are observed. Maize producer and consumer prices in Kenya fall by about 9 percent and 3 percent respectively, but increase by 20 percent and 24 percent respectively in Uganda (Table 10). In Tanzania producer and consumer prices fall by 35 percent and 5 percent respectively (Table 10). The declining maize prices in Kenya result in a 4 percent rise in maize consumption, but cause a 6 percent decline in maize production (Table 10). Maize consumption declines in both Uganda and Tanzania by 2 percent, while production increases by 3 percent and 5 percent respectively (Table 10). The changes in prices and quantities occasion changes in intra-EAC maize trade. Consequently, Uganda's exports to Kenya rise by about 99 percent relative to the base solution, while Tanzania's maize exports to Kenya increase by 33 percent (Table 10). The percentage changes in intra-EAC maize exports appear substantial but the changes in export volumes are quite small since the model only takes note of the formal maize trade.

Table 10. Impact of a complete elimination of NTBs

Variable description	Complete elimination of NTBs		
	Kenya	Uganda	Tanzania
Maize			
Producer price ($/MT)	-14 (-8.86)	26 (19.55)	-55 (-34.59)
Consumer price ($/MT)	-6 (-2.96)	35 (24.31)	-8 (-4.79)
Quantity demanded ('000 MT)	55 (3.61)	-14 (-2.34)	-21 (-1.56)
Quantity supplied ('000 MT)	-145 (-6.49)	16 (3.25)	179 (4.69)
Quantity traded ('000 MT)			
Kenya	-118 (-3.69)	0 (0)	0 (0)
Uganda	133 (99.25)	-59 (-5.4)	0 (0)
Tanzania	29 (33.72)	0 (0)	-10 (-0.27)
Consumer surplus ($ million)	12 (7.43)	-14 (-4.69)	-1 (-0.6)
Producer surplus ($ million)	-11 (-2.77)	16 (12.31)	2 (0.64)
Social surplus ($ million)	1 (4.66)	2 (7.62)	1 (0.04)
Beef			
Producer price ($/MT)	-939 (-15.51)	454 (34.92)	-829 (-14.95)
Consumer price ($/MT)	-1047 (-15.22)	528 (38.82)	-914 (-15.41)
Quantity demanded ('000 MT)	294 (19.3)	-43 (-35.54)	155 (16.36)
Quantity supplied ('000 MT)	-121 (-19.66)	43 (12.65)	-81 (-16.88)
Quantity traded ('000 MT)			
Kenya	1 (0.19)	0 (0)	0 (0)
Uganda	2 (9.70)	-3 (-1.8)	5 (19.23)
Tanzania	1 (1.50)	0 (0)	-2 (-0.5)
Consumer surplus ($ million)	3 (1.51)	-5 (-3.36)	9 (1.65)
Producer surplus ($ million)	-2 (-0.18)	9 (6.46)	-7 (-0.84)
Social surplus ($ million)	1 (1.33)	4 (3.10)	2 (0.81)
Total surplus ($ million)	2 (0.09)	6 (0.56)	3 (0.11)

Note: The values represent differences from the base scenario; figures in parentheses are percentage changes and total surplus is the summation of consumer and producer surplus for both maize and beef; MT = metric ton.
Source: Author's SEM Analysis, 2008.

The welfare changes emanating from a complete abolishment of NTBs in the maize trade within the EAC vary across the three countries. In Kenya, consumer surplus increases by 3 percent, while producer surplus falls by 7 percent (Table 10). The loss in Kenya's maize producer's welfare outweighs the gain in consumer surplus. Thus, the net effect is a 5 percent decline in social welfare for the maize subsector in Kenya. In contrast, consumer surplus in Uganda and Tanzania falls by 5 percent and 0.6 percent respectively, while producer surplus increases by 12 percent and 0.64 percent respectively (Table 10). The net welfare effect within the maize subsectors in Tanzania and Uganda is an increase of 8 percent and 0.04 percent respectively in social surpluses (Table 10). Overall, the net welfare effect of abolishing NTBs within the EAC maize subsector across the three countries is a 3 percent increase in social surplus.

Within the maize subsector, the greatest gainers from a complete abolishment of NTBs would be maize producers in Uganda while the greatest losers from this policy change would be maize producers in Kenya. Ugandan maize producers benefit from the increasing domestic maize prices and expand their exports to Kenya. In contrast, Kenya's maize producers are hurt by the declining maize prices and as a result cut back on production. However, Kenyan maize consumers benefit from a complete abolishment of NTBs, while their counterparts in Uganda and Tanzania are hurt by this policy change. Overall, the gainers from a complete elimination of NTBs within the EAC maize

subsector can potentially compensate the losers and thus, the policy can be recommended based on the compensation principle.

Within the beef subsector, a complete elimination of NTBs yields a 15 percent decline in beef producer prices in both Kenya and Tanzania but leads to a 35 percent increase in Ugandan beef producer prices relative to the base solution (Table 10). Similarly, beef retail prices in both Kenya and Tanzania decline by more than 15 percent but increase by 39 percent in Uganda (Table 10). Subsequently, beef consumption in Kenya and Tanzania increases by 19 percent and 15 percent respectively while it falls by 35 percent in Uganda (Table 10). In contrast, beef production in Kenya and Tanzania falls by 20 percent and 17 percent respectively, while it increases by 13 percent in Uganda (Table 10). As a result, Uganda expands its beef exports to Kenya and Tanzania by 10 percent and 19 percent respectively while Tanzanian beef exports to Kenya rise by about 2 percent.

The changes in beef prices and volumes occasion changes in welfare measures. As a result, consumer surplus in both Kenya and Tanzania increases by 2 percent and falls by 3 percent in Uganda (Table 10). However, producer surplus within the beef subsectors in Kenya and Tanzania falls by less than 1 percent while in Uganda, producer surplus for beef producers increases by 6 percent relative to the base solution. The net welfare gains within the beef subsectors of the three countries is a 3 percent increase in social surplus in Uganda and 1 percent increases in social surplus in both Kenya and Tanzania. Thus, social surplus in the three countries increase by an aggregate 4 percent. Once again, beef producers in Uganda would gain most from a complete removal of NTBs within the EAC while beef producers in Tanzania would be the greatest losers from this policy change. As observed in the maize subsector, the gainers from a complete removal of NTBs within the EAC beef subsector can potentially compensate the losers. Thus, a complete elimination of beef trade NTBs leads to a potential improvement in welfare and should be advocated as an appropriate policy.

4.4.2. Impact of a 50 percent reduction in NTBs

The impacts of a 50 percent reduction in NTBs within the EAC closely tracks those that of a complete elimination of NTBs but are less pronounced. When the existing NTB rates within the EAC are reduced by half, maize producer and consumer prices in Kenya fall by about 4 percent and 6 percent respectively, but increase by 8 percent and 20 percent respectively in Uganda (Table 11). In Tanzania producer and consumer prices fall by 6 percent and 4 percent respectively (Table 11). The declining maize prices in Kenya result in a 3 percent rise in maize consumption, but decreases domestic maize production in the country by about the same percentage. However, maize production in Uganda increases by 3 percent as consumption falls by 2 percent (Table 11). In Tanzania, maize production falls by 2 percent while consumption increases by 1 percent (Table 11). As a result of the price changes, Uganda's exports to Kenya rise by about 25 percent relative to the base solution, while Tanzania's maize exports increase by 17 percent (Table 11).

Table 11. Welfare impact of reducing the existing NTBs by half

Variable description	50% reduction in existing NTBs		
	Kenya	Uganda	Tanzania
Maize			
Producer price ($/MT)	-7 (-4.43)	11 (8.27)	-9 (-5.66)
Consumer price ($/MT)	-4 (-1.97)	29 (20.14)	-7 (-4.19)
Quantity demanded ('000 MT)	33 (2.97)	16 (1.53)	-16 (-1.42)
Quantity supplied ('000 MT)	-85 (-2.63)	370 (2.79)	34 (1.89)
Quantity traded ('000 MT)			
Kenya	0 (0)	0 (0)	0 (0)
Uganda	67 (25)	-29 (-2.65)	0 (0)
Tanzania	15 (17.44)	0 (0)	-5 (-0.13)
Consumer surplus ($ million)	7 (3.39)	-7 (-4.34)	-1 (-0.3)
Producer surplus ($ million)	-6 (-2.05)	8 (6.15)	2 (0.64)
Social surplus ($ million)	1 (1.34)	1 (1.84)	1 (0.34)
Beef			
Producer price ($/MT)	-659 (-5.45)	384 (19.54)	-749 (-8.32)
Consumer price ($/MT)	-1048 (-7.27)	538 (19.56)	-904 (-9.86)
Quantity demanded ('000 MT)	295 (9.61)	-45 (-17.19)	154 (6)
Quantity supplied ('000 MT)	-121 (-9.06)	43 (7.65)	-79 (-6.46)
Quantity traded ('000 MT)			
Kenya	0 (0)	0 (0)	0 (0)
Uganda	1 (4)	-1 (-0.6)	2 (7.69)
Tanzania	0 (0)	0 (0)	0 (0)
Consumer surplus ($ million)	1 (0.15)	-3 (-2.01)	4 (0.82)
Producer surplus ($ million)	-0.5 (-0.09)	3 (3.63)	-4 (-0.48)
Social surplus ($ million)	0.5 (0.14)	3 (1.62)	1 (0.34)
Total surplus ($ million)	1 (0.04)	2 (0.23)	1 (0.06)

Note: The values represent differences from the base scenario; figures in parentheses are percentage changes from the base solution and total surplus is the summation of consumer and producer surplus for both maize and beef; MT = metric ton.
Source: Author's SEM Analysis, 2008.

When existing NTBs in the maize trade are reduced by half, the general welfare impact is a smaller increase in surpluses relative to the complete elimination of NTBs. In Kenya, consumer surplus in the maize subsector increases by 4 percent while it declines by 4 percent and 0.3 percent in Uganda and Tanzania respectively (Table 11). However, maize producers in Kenya lose from the declining maize prices as their producer surplus declines by 2 percent while their counterparts in Uganda and Tanzania gain by about 6 percent and 0.64 percent respectively. Overall, social surplus in the maize sector increases by 1 percent, 2 percent, and 0.3 percent in Kenya, Uganda, and Tanzania respectively (Table 11). It can therefore be concluded that the maize subsectors in the three countries are better off with a 50 percent reduction in NTBs.

Within the beef subsector, the reduction of NTBs by half results in a 5 percent and 8 percent fall in beef producer prices in Kenya and Tanzania respectively, but leads to a 19 percent increase in beef prices in Uganda (Table 11). The increased beef prices in Uganda lead to an increase of 8 percent in beef production in Uganda, while production in Kenya and Tanzania declines by 9 percent and 6 percent respectively from the base solution. However, beef retail prices fall in Kenya and Tanzania by 7 percent and 10 percent respectively while they increase by 20 percent in Uganda. As a result, beef consumption in Kenya and Tanzania increases by 10 percent and 6 percent respectively, while Uganda's beef consumption declines by 19 percent. In addition, Uganda's beef exports to Kenya and Tanzania increase by 4 percent and 8 percent.

With regard to the welfare measures, consumer surplus for beef consumers in both Kenya and Tanzania increases by about 0.2 percent and 0.8 percent respectively from the base solution, while consumer surplus falls by about 2 percent in Uganda (Table 11). In contrast, beef producer surplus falls by about 0.1 percent and 0.5 percent from the base in Kenya and Tanzania respectively while it increases by about 4 percent in Uganda (Table 11). Overall, social surplus within the beef subsector in Kenya, Uganda, and Tanzania rises by 0.1 percent, 2 percent, and 0.3 percent respectively (Table 11). Thus, the total social surplus for the beef subsectors in the three countries increases by 2.4 percent. Beef producers in Uganda would gain the most from a reduction in beef NTBs within the EAC while beef consumers in Uganda would be the greatest losers from this policy change. Overall, EAC is better off with reduced NTBs in the beef subsector.

In addition, the welfare effects of separately eliminating individual types of NTBs such as roadblocks, permits, and customs clearance were also analyzed but the results are not presented.[6] The welfare impacts of eliminating specific NTBs were positive but marginal. However, the welfare impacts give compelling evidence in support of eliminating NTBs. The foregoing analysis seems to suggest that a complete abolishment or a reduction of the existing NTBs in maize and beef trade increases intra-EAC maize and beef trade flows as Kenya imports more maize from both Uganda and Tanzania, and Uganda exports more beef to Kenya and Tanzania. As a result, positive net welfare gains are attained for the entire EAC maize and beef subsectors. In both cases, the gainers from the proposed reductions in NTBs can potentially compensate the losers. These findings give compelling evidence in support of eliminating NTB within the EAC Customs Union.

[6] Results are available from the authors on request.

SECTION 5. CONCLUSIONS AND POLICY IMPLICATIONS

This paper quantifies the cost of various types of NTBs and evaluates their welfare impacts on formal trade in maize and beef cattle in Kenya, Uganda, and Tanzania using a SEM. The data used in this study were derived from a regional survey of formal traders and transporters undertaken within the EAC border points in 2007. It is complemented by secondary data on maize and beef production, consumption, prices, and elasticity parameter estimates that were derived from various sources. The quantification of the trade and welfare impacts of NTBs involved three main scenarios: a complete elimination of all the existing NTBs within the EAC; a 50 percent reduction in the level of the existing NTBs; and the welfare effects of separate elimination of individual types of NTBs such as roadblocks, permits, and customs clearance.

In conformity with findings from other studies on regional trading blocks in Africa, intra-EAC trade in maize and beef is disturbingly low. The low regional trade flows within the EAC could be attributed to the continued application of NTBs by the member states despite their commitment to abolish them. One of the most interesting findings from this study is that the main types of NTBs within the three founding members of the EAC are similar. They include administrative requirements (mainly licenses, municipal and council permits), taxes/duties (mainly excise and cess duty), roadblocks, customs barriers, weighbridges, licensing, corruption (for example, through bribes), and transiting.

The transfer cost of maize and beef cattle per kilometer was estimated by the summation of all costs incurred as the traders and transporters moved their merchandise from the area of origin to their final destination. These costs were further split into two groups: non-NTB transfer costs (costs that are not NTB: vehicle hire and maintenance, loading and offloading, and transporters' allowances) and NTB transfer costs (weighbridges, security, transiting, customs clearance, road toll stations, branding of cattle, standards and certification, and bribes). On average the cost of maize NTBs in U.S. dollars per kilometer per ton was estimated at $0.09, $0.15, and $0.11 in Kenya, Uganda, and Tanzania respectively. The cost of beef trade NTBs in dollars per kilometer per ton was estimated at $0.17, $0.31, and $0.23 in Kenya, Uganda, and Tanzania respectively.

The welfare impact emanating from the reduction or elimination of NTBs in maize and beef trade within the EAC varies across the three countries. Specifically, a complete abolishment or a reduction of the existing NTBs in maize and beef trade increases intra-EAC maize and beef trade flows. As a result, Kenya imports more maize from both Uganda, and Tanzania and Uganda exports more beef to Kenya and Tanzania. As a result, positive net welfare gains are attained for the entire EAC maize and beef subsector. In both cases, the gainers from the proposed reductions in NTBs can potentially compensate the losers resulting in a potential improvement in welfare.

Within the EAC maize subsector, the greatest gainers from the elimination of NTBs would be maize producers in Uganda while the greatest losers from this policy change would be maize producers in Kenya. Ugandan maize producers benefit from the increasing domestic maize prices and expand their exports to Kenya. In contrast, Kenya's maize producers are hurt by the declining maize prices and as a result cut back

on production. However, Kenyan maize consumers benefit from the elimination of NTBs, while their counterparts in Uganda and Tanzania are hurt by this policy change. In addition, beef producers in Uganda would gain most from the elimination of NTBs within the EAC while beef producers in Tanzania would be the greatest losers from this policy change. These findings give compelling evidence in support of eliminating NTBs within the EAC Customs Union.

The specific policy recommendations that can be drawn from this study include:

> EAC member countries should streamline administrative procedures at border points to improve efficiency by harmonizing trade regulations.
>
> EAC member countries should speed up implementation of procedures at point of origin and at the border points.
>
> There is need to minimize time loss at check points such as roadblocks and weighbridges.
>
> The EAC should take a regional approach to removing NTBs, since they are similar across the member countries and across commodities, so as to exploit economies of scale.
>
> Efficient monitoring systems should be designed and implemented to provide feedback to the relevant authorities on the implementation of measures to remove unnecessary barriers to trade in the region. This would ensure that the measures implemented were sustainable. Monitoring bodies should comprise stakeholders from government and the private sector. To yield high impacts to all levels of traders, small-scale traders should also be represented.
>
> All EAC member countries should fast track the complete elimination of all existing NTBs since such a strategy would yield positive welfare gains.
>
> There is need to greatly improve the road network to reduce the high transportation costs.

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