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The impact of non-tariff barriers on maize and beef trade in East Africa

Joseph Karugia¹, Julliet Wanjiku², Sika Gbegbelegbe³, Jonathan Nzuma⁴, Stella Massawe⁵, Eric Macharia⁶, Ade Freeman⁷, Michael Waithaka⁸, Simeon Kaitibie⁹ and Ayele Gulan¹⁰

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¹ Corresponding author - Regional Strategic Analysis and Knowledge Support System for East and Central Africa (ReSAKSS-ECA), International Livestock Research Institute (ILRI), email:j.karugia@cgiar.org, Telephone +254 20 4223000

² ReSAKSS-ECA, ILRI, email:j.m.wanjiku@cgiar.org, Telephone +254 20 4223000

³ ReSAKSS-ECA, ILRI, email: s.gbegbelegbe@cgiar.org, Telephone +254 20 4223000

⁴ University of Nairobi, email: j.nzuma@cgiar.org, Telephone +254 20 4223000

⁵ ReSAKSS-ECA, ILRI, email: s.massawe@cgiar.org, Telephone +254 20 4223000

⁶ ReSAKSS-ECA, ILRI, email: e.macharia@cgiar.org, Telephone +254 20 4223000

⁷ ILRI, email: a.freeman@cgiar.org, Telephone +254 20 4223000

⁸ ASARECA, m.waithaka@asareca.org

⁹ ICARDA, s.kaitibie@cgiar.org

¹⁰ ILRI, email: a.gelan@cgiar.org, Telephone +254 20 4223000

The impact of non-tariff barriers on maize and beef trade in East Africa

Abstract

The East African Customs Union was established in 2005 with the aim of increasing intraregional trade. The Customs Union protocol commits member states to eliminate non-tariff barriers (NTBs) to intraregional trade. However, several NTBs are still applied by member states. This study identifies the existing NTBs on maize and beef trade and quantifies their impact on trade and welfare of EAC citizens using a Spatial Equilibrium Model (SEM). Data on NTBs were collected from traders and transporters of maize and beef cattle in East Africa. Roadblock checks, bribes and custom rules and procedures were identified as the main NTBs to trade. The SEM model shows that a 50% reduction of the cost of NTBs, or their complete elimination would improve social welfare in EAC. The study recommends: removal of the NTBs; improved efficiency in administrative procedures; and establishment of a monitoring system to track the effectiveness of implemented initiatives to remove barriers to trade.

Key words: beef, maize, non-tariff barriers, trade.

Introduction

The East African Community (EAC)¹¹ countries established a Customs Union (East African Community Secretariat, 2004) and started applying a common external tariff (CET) in January 2005 to all non-EAC imports. Under the customs union, intra-EAC tariffs were abolished. The EAC customs union commits member states to remove barriers and obstacles for trade within East Africa. These obstacles include both tariffs and non-tariff barriers to trade, whose removal reduces the cost of doing business within a region and ultimately

¹¹ The East African Community (EAC) is the regional intergovernmental organization of the Republics of Kenya, Uganda, the United Republic of Tanzania, Republic of Burundi and Republic of Rwanda with its headquarters in Arusha, Tanzania.

improves welfare. 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 Secretariat, 2004). As a customs union, the EAC has succeeded in abolishing intra-EAC tariffs and adopting a CET towards imports from non-EAC sources. However, trade between the EAC partner states is still being hampered by the existence of non tariff barriers (NTBs). It is generally accepted that NTBs lead to trade distortion with concomitant losses in welfare. However, in the EAC case, the cost of these NTBs, their impacts on regional trade and their welfare impacts are not well understood. This study examines the trade and welfare impacts of NTBs on maize and beef cattle trade within the founder EAC member states of Kenya, Uganda and Tanzania. The objectives of the study were: i) to identify the various types and numbers of NTBs applied by countries within the EAC; ii) to evaluate the cost of various types of NTB’s within the EAC partner states; and iii) to quantify the trade and welfare impacts of the identified NTBs. The knowledge generated would be of interest to EAC maize and beef cattle traders, policy makers and development agencies.

Non Tariff Barriers to trade in East Africa

Economists generally agree that NTBs are detrimental to regional trade. NTBs diminish the potential benefits that could be derived from the trade preferences offered through regional trading arrangements. These trade preference benefits include better access to partner country markets, increased export volumes and prices, improved economic welfare, more jobs, and more rapid economic growth. Moreover, NTBs are a serious impediment to the growth of intra-regional trade and the associated benefits.

In a recent study, the East African Business Council sought to identify the nature and extent of NTBs applied within the EAC. The study found out 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 (EABC, 2005). While the EABC study highlighted the main NTBs to EAC trade, it did not quantify the trade and welfare impacts of the NTBs. This study extends the EABC study by quantifying the effects of the NTBs on regional trade for beef cattle and maize.

Methodology

Economic approaches for measuring impacts of non-tariff barriers

There are three main approaches that are used to analyze the effects of trade policies on regional trade namely: Computable general equilibrium (CGE) models; partial equilibrium models; and multimarket models. Computable general equilibrium (CGE) models are multi-sector, economy wide models that can be used to study effects of policies on income, employment and welfare. CGE models provide considerable scope for understanding how changes in policy on NTBs might affect trade and investment in various market settings.

Partial equilibrium models provide a framework for analyzing tariff-rate equivalents of policy change on NTBs such as standards and technical regulations and associated welfare changes. Welfare change is estimated by investigating impacts on domestic consumer and producer surplus caused by an increase in costs to comply with standards. Demand and supply elasticities are often calibrated from existing studies. A multimarket model is a partial equilibrium model. To build a multimarket model, sectoral data must be compiled: prices (inputs, outputs), production (area, yield), production technology (conversion rates, losses, seed rates), trade volumes, taxes, transportation costs and market margins. The Spatial Equilibrium Model (SEM), a type of a multimarket model was popularized by Takayama and Judge (1971) following the seminal work of Samuelson (1952). The SEM consists of n

regions (or countries) that are separated by distance, thus the name. Trade policies and transportation costs are treated as exogenous in the model (Devadoss et al, 2005). The SEM is used frequently to determine the effects of trade policy changes on quantities, prices and welfare and was found suitable for the current study.

The spatial equilibrium model (SEM)

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. 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:

$$p_i^d = a_i - b_i y_i, i=1, \dots, n \quad (1)$$

$$p_i^s = c_i + d_i x_i, i=1, \dots, n \quad (2)$$

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 as follows:

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

Subject to

$$\sum_{j=1}^n x_{ij} \leq x_i \quad \text{for all } i \quad (4)$$

$$\sum_{i=1}^n x_{ij} \geq y_j \quad \text{for all } j \quad (5)$$

$$c_i + d_i x \geq \rho_i^s \quad \text{for all } i \quad (6)$$

$$a_i - b_i y_i \leq \rho_i^d \quad \text{for all } i \quad (7)$$

$$(1 + \delta_{ij})(\rho_i^s + t_{ij}) \geq \rho_j^d \quad \text{for all } i \text{ and } j \quad (8)$$

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

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 is quantity demanded in country i , δ_{ij} is cost of NTBs imposed by region j on imports from region i , ρ_i^d is country demand price, and ρ_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. 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 .

Data and their collection

Given the non-availability of data on NTBs in the EAC, the survey approach was employed in this study. Primary data were obtained through a detailed field survey of maize and beef cattle traders and transporters along the trade routes across the three countries. Respondents provided data on the transfer costs and the various NTBs that they face. A total of 357 beef cattle and 450 maize traders and transporters were interviewed. In addition, secondary data sources were used to provide data required by the SEM analysis. Although primary data was collected on beef cattle, these were converted to beef in kilograms for the purpose of the SEM analysis.

Results

Within the maize sector, traders and transporters in the three EAC countries mainly engage in domestic trade which constitutes more than 80 percent of their traded volume. Maize imports and exports in EAC account for less than 10 percent. Similar trade patterns are observed in the beef cattle sector. Transfer costs of maize and beef cattle per kilometre were estimated by summing all costs incurred as the traders and transporters moved commodities from the point of origin to their destination. Table 1 shows transfer costs and the main trade routes.

<Table 1 here>

The main NTBs identified in maize and beef trade within the EAC were: administrative requirements including licenses, municipal and council permits in all countries, taxes/duties mainly excise and cess duty, road blocks, custom barriers, weighbridges, licensing, corruption (e.g. bribes) and transiting costs. Licenses included business license, road transport license and a livestock clearance certificate. Cess and excise duty were the main taxes paid to trade in beef cattle and maize in the region. Beef cattle transport license was also a major duty paid in Uganda.

Road blocks were identified as a major NTB in the region. Kenya has the highest total number of road blocks impeding free trade in the EAC (Table 2).

<Table 2 here>

Bribes are paid by traders at various levels of the trade transactions in EA region.

<Table 3 here>

The number of weighbridges that traders and transporters were subjected to in Kenya, Uganda and Tanzania was small (5 in Uganda for both beef cattle and maize traders, 3 in Tanzania for both traders of beef cattle and maize while 2 for maize traders in Kenya and none for beef cattle traders in Kenya).

Traders and transporters 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 the customs while in Tanzania the traders spent less than 1 hour at custom per trip.

Welfare Impacts

The impacts of NTB's on cross border trade and welfare were computed using a static SEM. The General Algebraic Modelling Systems (GAMS) package was used to solve the equations in the model. Estimates were compiled for the quantities of maize and beef supplied and consumed in the three EAC countries, their corresponding prices and their supply and demand elasticities. In addition, data were collected on the cost of NTB's and transport costs. The own-price elasticities of supply for maize in Kenya, Uganda and Tanzania were set at 2.17, 0.8 and 1.96 respectively. These supply responses were adopted from earlier studies¹².

¹² 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 and Minot, 2002 and Wood and You, 2001.

Supply response for beef in the three EAC countries was set at 0.35¹³. On the consumption side, aggregate demand for maize and beef depends on own prices and income. The own-price elasticity of demand for maize was set at -0.80, - 0.77 and – 0.9 for Kenya, Uganda and Tanzania respectively¹⁴. Own-price elasticities for beef in Kenya, Uganda and Tanzania were set at – 1.68, - 1.01 and – 1.18 respectively. These parameters were used to calibrate the SEM to reproduce the 2006 base scenario when NTBs were the major barriers to trade in the EAC.

Three policy scenarios are simulated to quantify the impacts of NTBs within the EAC. These comprise of a 50 percent reduction in all NTBs, a complete abolishment of all NTBs and the elimination of specific NTB types such as road blocks. To solve the model, estimates were compiled for the quantities of maize and beef supplied and consumed in the three EAC countries, their corresponding prices and their price elasticities. In addition, the cost of NTBs and transport costs were used in the SEM. 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 sub-sectors in the three countries.

¹³ The beef supply responses used in this study was adopted from the IMPACT study by IFPRI.

¹⁴ The demand elasticities for maize and beef in Kenya are adopted from Musyoka, (2008), while those for Tanzania are derived from Weliwita et al, 2003 and the Ugandan estimates are derived from IFPRI. It should be noted that the estimation of all the demand elasticities satisfy the demand theory restrictions.

Impact of a complete elimination of NTBs

When NTBs within the EAC are completely abolished, maize producer and consumer prices in Kenya fall by 9 and 3 percent respectively, but increase by 20 and 24 percent respectively in Uganda (Table 4). In Tanzania producer and consumer prices fall by 35 and 5 percent respectively. The declining maize prices in Kenya result in a 4 percent rise in maize consumption, but cause a 6 percent decline in maize production. Maize consumption declines in both Uganda and Tanzania by 2 percent, while production increases by 3 and 5 percent respectively (Table 4). The changes in prices and quantities occasion changes in intra-EAC maize trade. Consequently, Uganda's exports to Kenya rise by 99 percent relative to the base solution, while Tanzania's maize exports to Kenya increase by 33 percent (Table 4).

<Table 4 here>

The welfare changes emanating from a complete abolishment of NTBs is as follows: In Kenya, maize consumer surplus increases by 3 percent, while producer surplus falls by 7 percent (Table 4). The loss in Kenya's maize producer's welfare outweighs the gain in consumer surplus. Overall, the net welfare effect of abolishing NTBs within the EAC maize sub-sector across the three countries is a 3 percent increase in social surplus.

Within the beef sub-sector, 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 4). Similarly, beef retail prices in both Kenya and Tanzania decline by more than 15 percent but increase by 39 percent in Uganda (Table 4). Subsequently, beef consumption in Kenya and Tanzania increases by 19 and 15 percent respectively while it falls by 35 percent in Uganda (Table 4). In contrast, beef production in Kenya and Tanzania falls by 20 and 17 percent respectively, while beef production increases by 13 percent in Uganda. The changes in beef prices and

volumes occasion changes in welfare measures. As a result, consumer surplus in both Kenya and Tanzania increase by 2 percent and falls by 3 percent in Uganda (Table 4). The net welfare gains within the beef sub-sectors 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.

Impact of a 50 percent reduction in NTB's

When the NTB rates within the EAC are reduced by half, maize producer and consumer prices in Kenya fall by about 4 and 2 percent respectively, increase by 8 and 20 percent respectively in Uganda and fall by 6 and 4 percent respectively in Tanzania (Table 5). Within the beef sub-sector, the reduction of NTBs by half results in a 5 and 8 percent fall in beef producer prices in Kenya and Tanzania respectively but leads to a 20 percent increase in beef prices in Uganda (Table 5). The increased beef prices in Uganda lead to a 8 percent (43,000 tones) rise in beef production in Uganda, while production in Kenya and Tanzania declines by 121,00 tones and 79,000 tones respectively from the base solution (details see Table 5). Further, consumer surplus for beef consumers in both Kenya and Tanzania increases by about 0.2 and 0.8 percent respectively from the base solution, while consumer surplus falls by about 2 percent in Uganda (Table 5).

<Table 5 here>

The welfare effects of eliminating individual types of NTBs such as roadblocks, permits and customs clearance were also analyzed but the results¹⁵ are not presented. 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 suggests 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

¹⁵ Results are available from the authors on request.

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 sub-sectors.

Conclusions and policy implications

The main purpose of this study was to assess the impact of NTBs on maize and beef cattle cross-border trade in the EAC. Main NTBs are corruption through various bribes, roadblocks barrier, custom procedures and harassment or discrimination during licensing and permits. There are also numerous administrative requirements.

The SEM results show that complete removal of all NTBs brings positive welfare change in East Africa. Reduction or removal of individual NTBs brings very minimal welfare change. In particular, the effects of eliminating three types of NTBs mainly road blocks, permits and customs clearance reported positive welfare impacts but marginal change (less than 0.5% change). The impact of NTBs on social welfare stresses the importance of eliminating or reducing the NTB's. The results of the study lead to the following recommendations:

- i) Streamline administrative procedures at border points to improve efficiency
- ii) Speed up implementation of procedures at point of origin and at the border points
- iii) Minimize time loss at check points such as roadblocks and weighbridges
- iv) Take a regional approach to removing NTBs since they are similar across the region
- v) Design and implement monitoring systems to provide feedbacks to the relevant authorities on the implementation of measures to remove barriers to trade in the EAC region.

References

- Delgado C., Minot, N, and Tiongo M., 2002. Evidence and Implications of Non-Tradability of Food Staples in Tanzania 1983-1998. American Agricultural Economics Association Annual Meeting, Montreal, Canada, July 27-30, 2003.
- Devadoss S., Aguiar A.H., Shook S.R. and Araji J. 2005. A Spatial Equilibrium Analysis of U.S-Canadian Disputes on the World Softwood Lumber Market. *Canadian Journal of Agricultural Economics* 53 (2005) 177–192.
- EABC (East African Business Council), 2005. A Study on Non-Tariff Barriers (NTBs) and Development of a Business Climate Index in the East Africa Region. March 2005.
- East African Community Secretariat., 2004. Protocol on the Establishment of the East African Community Customs Union.
- IFPRI Impact database, IFPRI.
- Musyoka, M.P., 2008., An analysis of urban household food demand in Nairobi, Kenya Egerton University, Department of Agricultural Economics and Agri-Business Management, Unpublished Thesis.
- Nzuma, J.M., 2007. An Economic analysis of the impacts of trade liberalization on Kenya's maize sector. Unpublished PhD Thesis, University of Guelph, Canada.
- Samuelson, P. 1952., Spatial price equilibrium and linear programming. *American Economic Review* 21: 283–303.
- Takayama, T. and G. Judge., 1971. Spatial and Temporal Price Allocation Models. Amsterdam: North Holland.
- Weliwita, A., Nyange, D., and Tsujii, H., 2003. Food demand patterns in Tanzania: A Censored regression analysis of microdata.” *Sri Lankan Journal of Agricultural Economics*, 5: (1) 9 – 34.
- Wood S and You L., 2001. Assessment of strategic land use options for Uganda. Potential economic benefits of increased agricultural productivity in Uganda. Submitted to USAID/Uganda. *Environment and Production Technology Division*.

Table 1: Main markets in EA and transfer cost

Maize	With NTBS			Without NTB	
	Distance in KM	Transport cost per km/ton in \$	Total transport cost \$	Transport cost per km/ton in \$	Total transport 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 es salaam – Namanga	772	0.35	270	0.24	185
Beef	With NTBS			Without NTB	
	Distance in km	Transport cost per km/ ton in \$	Total cost \$	Transport cost per km/ton in \$	Total transport 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 es salaam - Namanga	772	0.43	331.96	0.20	154.4

Table 2: Average number of road blocks and respective distances

Category	Number of road blocks			Average Distance		
	Kenya	Tanzania	Uganda	Kenya	Tanzania	Uganda
Beef cattle	12	7	5	198	341	236
Maize	10	5	14	190	278	190

Table 3: Number of respondents who gave any form of bribe as they traded

Category	Kenya		Tanzania		Uganda	
	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

Table 4. Impacts of a 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 (US\$ 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.

Table 5. Welfare impacts of reducing existing NTBs by half

	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 (US\$ Million)	1 (0.04)	2 (0.23)	1 (0.06)

Note: The values represent differences from the base scenario, Figures in Parenthesis are percentage changes from the base solution and total surplus is the summation of consumer and producer surplus for both maize and beef