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Macroeconomic and Sectoral Effects of the EAC Regional Integration on Uganda: A Recursive Computable General Equilibrium Analysis

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ABSTRACT

The paper empirically examines the implications of the implementation of the EAC regional integration on the Ugandan economy. Specifically, it analyses the likely effects of the asymmetric tariff reduction on the macro variables and quantifies the sectoral growth effects on the industrial, agricultural and services sectors. It adopts the General Equilibrium Model (CGE) for the analysis based on the Uganda 2007 Social Accounting Matrix. The primary policy simulation is the asymmetric reduction of internal tariffs across East African countries under assumptions of unemployment and free movement of factors of production. Other policy simulations that change these assumptions are analysed. Results indicate that the aggregate impact of internal tariff reduction under conditions of unemployment and free movement of factors of production is positive with average GDP growth improving by up to 0.3 percentage points over the period 2008 – 2021. However, the reduction in tariffs has negative implications for tax collections with import duties contracting by 0.3 percentage points, with no significant gains in direct taxes revenues. The rise in exports to the EAC region leads to a decline in the trade deficit by 0.8 percent during the simulation period. There are also significant growth gains for agriculture, industry and services sectors with the former registering growth improvements of 1.2 percentage points and the other two 0.7 percentage points. Therefore, Uganda should optimise gains within the EAC regional integration framework through tariff reduction and free movement of factors of production. Finally, the government should address infrastructural constraints (energy and transport) to foster growth in the manufacturing sector within the EAC region.

Key words: Computable General Equilibrium, Social Accounting Matrix, recursive dynamic, regional integration, tariffs, sectoral, aggregate, intra-regional trade, macro-closures and simulation

INTRODUCTION

There is increasing interest among stakeholders in the roles that regional integration agreements play in fostering social and economic benefits to the partner states. The overriding objective of regional integration agreements is to facilitate trade within Regional Integration Areas (RTAs) with a view to maximising gains. It is generally argued that this would lead to trade creation and thus foster convergence in income levels within a trade block. The specific objectives for the establishment of regional integration agreements have traditionally hinged around strengthening the bargaining base in global trade and accelerating mutual benefit in economic growth and development. This can be achieved through increased competitiveness, access to wider markets and attraction of investments into the RTA.

In the case of the East African Community (EAC), the major elements of the protocol for the establishment of the cooperation are meant to ensure trade facilitation through removal of non-tariff barriers and internal tariffs, while upholding the free movement of labour, capital, goods, services and the rights of establishment and residence. The above have implications for trade flows, fiscal revenue performance and competitiveness of the economic sectors, which need to be empirically investigated.

Although it is evident that intra-regional trade within the EAC has grown since the start of the implementation of the integration in 2000, there is still limited evidence in the literature regarding the impact of the cooperation on Uganda. Previous Computable General Equilibrium (CGE) studies, (for example, Mbabazi, 2002; Baur and Mugisha, 2001) although revealing, only examine the impact of trade liberalization, during a period before the implementation of the internal tariff reduction. DeRosa, *et al.,* (2002) make a commendable contribution to the literature especially with regards to industrial competitiveness. However, the study was conducted before the implementation of the EAC Customs Union (CU) when tariff reduction was implemented. Sangeeta *et al.* (2009) and Othieno and Shinyekwa (2011) estimate the effect of the EACCU on trade and welfare demonstrating sectoral impact. The studies however do not demonstrate the projected growth patterns of revenue, trade, sectoral growth among others since they use the static partial equilibrium model.

The paper seeks to address this gap by analysing economy-wide effects, particularly the future growth trends. The choice of projecting the simulations from 2008 to 2021 is based on the current development initiatives: Uganda's planning is based on the Vision 2040, a general framework from which the rest of the national plans are drawn. The current national development is based on the National Development Plan that has a vision to transform Uganda from a peasant society to a modern and prosperous country within 30 years. Thus the

simulation period will cast light on the likely contribution of the EAC integration towards the national vision.

The paper thus examines the likely effects of tariff reduction on trade flows, tax revenue, GDP growth, and industrial and agricultural sector competitiveness of the Uganda economy. The analysis is based on a recursive dynamic CGE model. The model is subjected to different policy simulations reflecting exogenous changes in the economic conditions of the Uganda Economy. The impacts of the exogenous changes are interpreted as average growth patterns and compared to the baseline scenario. The primary simulation is a reduction in internal tariffs with the EAC member states of Kenya, Tanzania, Rwanda and Burundi between 2005 and 2010. This is done under varying conditions of labour and other factor mobility.

The rest of the paper is organised as follows: Section I provides a brief background on the EAC including the intra-region trade flows and the transmission mechanisms of the EAC integration provisions. Section II provides a brief review of relevant literature. Section III discusses the methodology and data used after which we present the findings of the simulations in section IV. We finally conclude with a brief discussion of the implications of our research for policy.

Historical background of the East African Cooperation

The East African countries of Uganda, Kenya and Tanzania have a strong historical background. In 1967 the three counties signed a treaty for East African Cooperation that established the EAC. Unfortunately in 1977 the EAC was officially dissolved after ten years due to various factors. Schiff and Winters (2004) argue that several South-South Regional Integration Agreements (RTA) have failed because of disputes over the location of industries and design of compensation schemes for perceived losers. In this context Uganda and Tanzania contended that Kenya enjoyed all the gains, steadily enhancing her position as the industrial hub of the common market[1]. Thus different arguments related to resource allocation and sharing of benefits led to the collapse of the EAC and the closing of borders in 1978. The three member states lost over sixty years of co-operation and the benefits of economies of scale Schiff and Winters (2004).

Following iterative negotiations, the EAC was revived in 1999 and effectively started in 2000. The main objective of the EAC is to attain economic, social and political integration in East Africa. The salient features of the EAC Treaty are articulated in Article 5 (2), which provide for the establishment of a CU to be followed by a Common Market (CM), a Monetary Union and ultimately a Political Federation. Membership to the EAC has been expanded to five partner states after the western neighbours of Burundi and Rwanda joined the EAC in July 2007.

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1 This argument is premised on the fact that Kenya was producing 70 percent of the manufactures and exporting a growing proportion to Uganda and Tanzania, which were the relatively less developed partners. Note that by 1958, 404 out of the 474 companies registered in East Africa were located in Kenya. Hansen (1969) evidently points out that while in 1960 Kenya's manufacturing sector accounted for 10 percent of its Gross National Product (GDP); in the other two partner states, the share of manufacturing was only 4 percent

The main elements of the Protocol on the establishment of the EAC CU were thus; removal of Internal Tariffs (IT) and all Non-Tariff Barriers (NTBs) on intra-EAC trade; introduction of Common External Tariff (CET); and agreement on a list of products classified as sensitive and therefore requiring additional protection.

In light of this, negative effects on the manufacturing sector not established at the inception of the cooperation are likely to occur which require empirical analysis. Furthermore, the EAC partner states are at different levels of economic development suggesting varied effects both at the sectoral and macro levels. Unabated, this may partly provide similar conditions that led to the collapse of the EAC in 1977. There are expressed fears among manufacturers in Uganda that the country is at a disadvantage compared to its more industrialized neighbours, more specifically Kenya. There are concerns about workers and businesses from other EAC states respectively taking over jobs and establishing businesses in Uganda to the disadvantage of citizens. Therefore, there are pertinent questions that require empirical answers: What are the likely effects of the integration on tax revenue, consumption, exports and imports, exchange rate, the trade deficit, investment among others in Uganda? What will be the growth patterns of the different sectors, especially the manufacturing sector? Will Uganda's manufacturing sector experience the required growth or will it stagnate?

Objective of the study
The overall objective of this study is to establish the impact of the implementation of the EAC integration on macroeconomic variables and the different sectors of the Uganda economy. The study thus seeks to quantify the likely sectoral growth effects of the EAC integration on Uganda.

The EAC intra-regional trade flows
With the creation of one economic region at the phase of a CU in 2005, EAC targeted creating a single market of over 120 million people and a combined GDP of around US$ 30 billion. With regards to the liberalisation of intra-regional trade, the phased removal of internal tariffs and application of CET system has established a favourable environment for both increased intra-EAC trade and international trade as illustrated in Table 1. The analysis of trade flows within the EAC region gives an indication of the effects of the trade reforms**.**

The value of EAC intra trade expanded from US$ 1,801.8 million in 2004 to US$ 2,218.4 million in 2005; recording annual growth of 18 per cent. There was, however, a notable decline in EAC intra-trade in 2006. This could be attributed to adjustment difficulties of the Kenyan economy in response to the tariff reduction since it was at 10 per cent while the rest of the partners were at zero and yet Kenya is a major regional trading partner. Additionally, the tariff lines with the Common Market of Eastern and Southern Africa (COMESA) were lower at 6 and 4

percent suggesting that there could have been preference to import from this alternative source. This trend for Kenya changes as the CU advances and tariff lines fall to zero. The total EAC intra trade expanded steadily from US$ 1,979 6 million in 2006 to US$ 3,548.9 million in 2009. Both import and export trade have similarly grown following the implementation of the EAC CU. Among the partner states, Kenya has maintained a positive trade balance throughout and it is relatively high. Tanzania initially experienced growth in the negative trade balance, which eventually became positive. Uganda has had a negative trade balance which initially increased in 2005 but has steadily fallen. The performance of Rwanda and Burundi after joining the CU in 2007 shows increase in trade. Specifically for Rwanda, this is because the country has since imported more from the partner states than before. Overall, there is increased intra-regional trade among the partner states with Kenya being the major regional trading block dominating exports.

Table 1: Intra-trade flows in the EAC Regional (Exports and Imports 2004–2009 in US$ Millions)

Year	Trade flow	Uganda	Tanzania	Kenya	Rwanda	Burundi	Total
2004	Export	132.0	124.0	810.0	25.0	5.3	1,096.0
	Import	416.0	138.0	38.4	69.1	54.1	716.0
	Trade balance	-284.0	-14.1	772.0	-44.2	-49.0	380.0
2005	Export	144.7	128.9	974.1	34.9	4.0	1,287.0
	Import	551.5	160.6	61.5	99.1	59.1	9312.0
	Trade balance	-406.9	-31.7	912.6	-64.2	-55.1	355.0
2006	Export	152.9	157.8	736.0	33.1	5.5	1,085.0
	Import	430.4	175.5	84.3	143.3	60.8	894.0
	Trade balance	-277.5	-17.7	651.7	-110.2	-55.3	191.0
2007	Export	274.8	205.9	952.2	40.1	5.5	1,479.0
	Import	530.9	110.1	191.6	209.1	79.6	1,121.0
	Trade balance	-256.1	95.8	760.6	-169.0	-74.1	357.0
2008	Export	377.4	259.9	1213.0	46.2	6.6	1,903.0
	Import	570.6	205.0	182.0	394.2	84.7	1,437.0
	Trade balance	-193.0	54.9	1031	-348	-78.1	467.0
2009	Export	398.8	323.5	1167	47.3	6.0	1,943
	Import	547.0	316.9	162.2	449.7	129.0	1,605
	Trade balance	-148.2	6.5	1005.0	-402.3	-123.0	338.0

Source: East African Community Facts and Figures – 2009 and 2010

Performance of sectors

The sectors in the economy are categorised under agriculture, industry and services with many subsectors under them. The following section gives a brief analysis of the trends in the share of the sectors to the overall national GDP and sectoral growth between 2007 and 2010 (Table 2). The agricultural sector consists of cash crop, food crops, livestock, forestry and fishing. The overall performance has been declining over the years. Owing to different factors,

the growth was very low between 1.7 to 2.4 percent between 2005 and 2009 followed by a decline to 1.3 percent in 2010. The contribution of the agricultural sector to GDP has declined over the years and is at an average of 20 percent. Agriculture dominates Uganda's exports. In 2008 exports of primary agriculture commodities contributed to 46 percent of Uganda's formal export earnings (MAAIF, 2010[2]) and this is likely to remain the same for some time. The problem associated with export of primary agricultural commodities is the extremely low value received compared to the case if the commodities are processed.

The industrial sector recorded a fluctuating trend in the growth rate over the years and this is partly because of the varied performance of the different subsectors under it like mining, electricity, water supply and construction. This growth rate was largely driven by the construction and manufacturing sectors. Mining experienced an inconsistent growth rate while electricity had a low growth rate except in 2009. The contrition to GDP under the industrial sector mainly emanated from construction and manufacturing. The manufacturing sector grew over time; however, its contribution to GDP decreased from 9.1 percent in 2001 to 7 percent in 2007. Although it rose since then to 7.9 percent in 2010, the change was very small. The growth of the manufacturing sector first dropped from 7.6 percent in 2007 to 6.7 percent in 2008 but increased again to 10.2 percent in 2010. There was fear in Uganda that the sector would get affected adversely when tariffs (especially with Kenya) are removed. This is partly what led to the implementation of the principle of asymmetry to allow the Ugandan firms to become competitive. This study analyses the impact of the removal of the tariffs on the manufacturing sector in details looking at the losers and gainers.

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2 The Development Strategy and Investment Plan for the Agricultural Sector

Table 2: Sectoral growth and contribution in Uganda during 2007 to 2010

	Share of sector				Sector growth			
	2007	2008	2009	2010	2007	2008	2009	2010
Agriculture, forestry	*21.0*	*21.5*	*22.8*	*21.1*	*1.7*	*2.2*	*2.4*	*1.3*
Cash crops	2.1	2.0	1.6	1.0	8.2	11.3	5.2	-14.7
Food crops	11.1	11.8	14	12.1	2.1	2.6	2.6	2.7
Livestock	1.5	1.6	1.5	1.6	3.0	3.0	3.0	3.0
Forestry	3.5	3.4	3.3	3.6	2.2	4.2	5.9	1.9
Fishing	2.7	2.6	2.3	2.8	-5.9	-9.6	-7.3	5.9
Industry	*23.3*	*23.8*	*23.2*	*24.9*	*8*	*8.8*	*0.7*	*8.9*
Mining	0.3	0.3	0.2	0.3	5.0	10.4	-8.1	35.7
Manufacturing	7.0	7.2	7.6	7.9	7.6	6.7	10.2	5.3
Electricity	2.1	1.7	1.7	1.6	8.0	1.7	18.6	13.1
Water supply	2.5	2.4	2.3	2.3	3.9	5.1	4.0	3.6
Construction	11.5	12.2	11.4	12.6	8.8	10.7	-4.4	10.5
Services	*50.1*	*48.3*	*47.8*	*47.7*	*8*	*10.6*	*6.4*	*7.4*
Wholesale and retail	14.3	14.3	16	13.2	14	12.5	4.8	1.7
Hotel restaurants	4.0	4.1	4.0	4.5	9.2	12.5	1.1	-0.6
Transport &communication	6.4	6.9	6.2	9.2	12.6	22.7	10.2	11.9
Financial Services	3.0	3.2	3.0	3.1	-4.9	19.4	28.5	37.0
Real estate	7.1	6.6	6.2	4.3	5.6	5.7	5.7	5.7
Other business services	1.6	1.6	1.5	1.6	10.3	12.5	8.4	11.8
Public admin & defence	3.2	3.0	2.8	3.1	4.2	8.9	4.7	9.4
Education	6.8	5.5	5.1	5.2	1.4	-0.7	1.8	4.5
Health	1.5	1.1	0.9	1.1	-1.3	1.6	3.8	12.3
Other services	2.2	2.2	2.1	2.3	13.1	12.5	12	11.6
Adjustment	*5.5*	*6.4*	*6.3*	*6.4*	*24.6*	*11.6*	*5.6*	*-5.6*
Total	*100*	*100*	*100*	*100*				

Uganda Bureau of Statistics: Statistical Abstracts (2008, 2009, 2010)

The contribution to GDP by the services sectors accounts for about 50 percent. The growth in the sector between 2007 and 2009 was largely driven by the communications sub-sectors which have expanded significantly, financial services, and wholesale and retail trade. The free movement of services under the EACCM is expected to further enhance the growth of the services sectors currently driving the GDP growth of Uganda

EMPIRICAL STUDIES OF REGIONAL INTEGRATION ARRANGEMENTS

Studies evaluating the impact of regional integrations have largely depended on empirical approaches although in the recent past analytical studies[3] are taking centre stage. The static theory of regional integration arrangements has provided the necessary caution to policy makers regarding the potential pitfalls of engaging in economic cooperation to promote intra-regional trade, investment and cross-border movements of labour and capital (DeRosa, 1998). However, it has not helped much regarding making precise predications about the expected effects of CUs or Free Trade Areas (FTAs). This has resulted into efforts to use quantitative studies of regional arrangements to obtain more definitive results empirically and analytically. Several empirical studies of regional integration have been conducted to establish the impact on European Community (EC) trade particularly; manufactured goods after the Rome treaty of 1957 using a number of expert approaches (see for example, Truman, 1969; Prew, 1974; Balassa, 1967; and Aitken, 1973). The earliest empirical studies revealed that there was substantial expansion of intra-EC trade in the 1960s when the integration consisted of 6 countries[4]. The intra-EC trade as a share of total EC exports increased from 35 per cent in 1960 to 49 per cent in 1970 (DeRosa, 1998). After the expansion of the EC from 6 to 9 countries[5] from 1970 to 1981, intra- EC trade as a share of total trade grew from 49 per cent to 52 per cent. In addition to that, empirical investigations revealed emergency and growth of intra-industry trade following the formation and expansion of the EC. The studies established that following the creation of the EC, trade creation in manufactures was significantly more than trade diversion. The EC also increased its imports and exports of manufactured goods from/to non-member countries which is reflective of the liberalization and rationalization of EC tariffs under the Rome Treaty. Finally, the EC integration had a positive impact on the welfare of the citizens.

For European Union (EU), the use of analytical models like the CGE in analyzing the impact of regional integration arrangements has gained great prominence over the recent past especially with continuous development of their sophistication (for example Gaiorek, Smith and Venables, 1992; Haaland and Norman 1992; and Harrison, Rutherford and Tarr, 1994). DeRosa (1998) reveals that deepening of economic integration in the EU was expected to achieve substantial economic gains of 1 per cent of GDP per annum in several EU countries arising from pro-competitive effects of product standardization. This would also see trade diversion limiting gains in welfare.

For the North America Free Trade Area (NAFTA) studies conducted by Roland-Host, Reinert and Shiells (1992) incorporate the imperfect competition and increasing returns to scale

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3 Empirical studies (*exe post*) are largely econometric in nature analytical studies (*exe ante*) are largely CGE
4 These countries include Belgium, France, Germany, Italy, Luxembourg and the Netherlands.
5 The countries that joined include Denmark, Portugal and United Kingdoms

assumptions. Although they find that NAFTA provides positive gains to member countries, the variation in the simulated economic gains is wide. They range from insignificant to 3 per cent of GDP per annum.

When contrasted with regional integration arrangements amongst less developed countries, there is less intra-bloc trade developed. Naya and Plumber (1991) reported that the Association of Southeast Asia Nations (ASEAN) after a decade failed to increase intra-bloc trade much above its level of 15 per cent to 20 per cent of total ASEAN trade. The Latin America regional integration arrangement is one of the oldest which promoted import substitution on a region-wide basis. The expansion of intra-regional trade in manufactured good and all goods failed to match that in the EC and out-ward oriented East Asian Newly Industrialized Countries (NICs) of Korea, Hong Kong, Singapore and Taiwan. Nogues and Quintanilla (1993) report that the intra-regional trade in manufactured goods during 1965 to 1990 by the out-ward-oriented Asian NICs grew from 2 per cent of GDP to 6.9 per cent of GDP and the intra-regional trade in manufactures during the same period by the ANDEAN[6] Pact countries grew from 0.1 per cent of GDP to 0.6 per cent of GDP. The studies thus suggest that regional integration arrangements have had more positive impact among the RTA in the north than the south.

Uganda has had a number of studies on trade liberalisation which assess the impact of different trade regimes on the macroeconomic variables. Mbabazi (2002) examines tariff liberalization on the welfare of Uganda using the Uganda SAM of 1992. The study demonstrates that there is a marginal change in GDP ranging from 2 per cent to 3 percent and a minimum welfare on household, with agricultural households relatively doing better. The study further reveals that exports increased and thereafter declined while imports increased. Bauer and Mugisha (2001) analyze the impact of the reduction of both import and export tariffs on the Uganda Economy using a CGE model with focus on domestic output, exports and imports. Results show that the economic gains in the mentioned areas are much higher if both import tariffs and export duties are reduced or removed. Notable is the worsening of the trade balance due to imports increasing at a relatively higher rate than export, and worsening of the budget deficit owing to loss of government revenue from trade taxes. The study is revealing, however, it was not designed to analyse integration effects in totality and time has elapsed since it was conducted. Furthermore, it does not investigate the economy-wide impact of the EAC RTA.

DeRosa *et al.,* (2002) attempted to demonstrate the implications of the New EAC Customs Union on Uganda trade, industrial competitiveness and economic welfare. They conclude that alternatives like unilateral liberalization are likely to yield greater economic gains for Uganda than active participation in regional integration arrangements in Africa. Partial equilibrium model (SMART-WITS) studies (for example, Othieno and Shinyekwa, 2011; and Sangeeta *et al.*,

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6 Comprised of Bolivia, Chile, Colombia, Peru and Venezuela - Chile left the pact in 1976.

2009) estimate the effect of the EAC CU (Kenya specifically) on trade, revenue and welfare of Uganda. They quantify the effects, and demonstrate that contrary to the expressed fear that Uganda will adversely get affected with regard to trade, exports and industrial competitive, this is not the case. There is more trade creation than diversion, hence a positive trade effect. There is notable loss of revenue and there is lower welfare effect created by reduction and eventual elimination of tariffs with Kenya. The studies further demonstrate that whereas some sectors are likely to be impacted negatively, others would be impacted positively. However, the Sangeeta *et al.,* (2009) study is based on Uganda and Kenya only and yet the EAC CU has five member countries whose interactive effect at zero per cent tariff is likely to produce different results for Uganda. Furthermore this study does not extend to 2010 when the tariff rate was at zero. The Othieno and Shinyekwa (2011) study takes care of these limitations but the analysis is not based on a recursive dynamic CGE model. The current study is made more robust by using the CGE model which is best suited for analyzing growth patterns and trends as it is dynamic.

The transmission mechanism of EAC integration provisions

It has been argued that trade liberalisation leads to winners and losers (Karingi *et al.,* 2005). The effect of the price change, resulting from trade liberalization is determined by whether a household is a net supplier or net consumer of the liberalized good or service. When the effect increases the prices of imports, this negatively impact on the welfare of consumers and the opposite is true. The impact of trade liberalization on the population is transmitted through the effects on enterprises (investment, employment and profits); households (prices, wages, endowments, private and official transfers); and government revenue and expenditures on social services and public infrastructure (Matovu and Rudaheranwa, 2007).

The long run welfare effects of the EAC are likely to arise from efficiency gains coming from increased competition, economies of scale and expansion of investment. In the short run, the potential impact of the EAC will depend on the responsiveness of domestic industry to increased competition. Integration stimulates competition, which forces local industries to be more efficient by reducing costs of production and improving the quality of their products failure of which lead to closure. In addition, cheaper imported intermediate and capital goods increase the benefit to local processors and manufacturers. With increased market opportunities and easy accessibility to imported inputs; more investments and employment of more resources including land and labour occur, which increase incomes of the population. It is anticipated that increased market access to the regional market is important for Uganda as this is likely to significantly contribute to the eradication of poverty.

Whereas the integration was envisaged to generate major benefits, suffice to note that it comes with greater competition of firms. Locally, protected industries are likely to face

competition from imported duty free products from the partner states resulting into loss of employment and consequently de-industrialization. This may result into the shrinking of local manufacturing sector due to competition. The firms that stand to gain most are those that are already competitive and those that do not stand a high risk if not protected which makes the consideration of the principle of asymmetry relevant. Like many developing countries, Uganda relies on import trade taxes as a major source (as much as a half) of revenue. Joining the EAC integration has eroded the import tax revenue since tariffs on intra EAC trade were reduced and eventually eliminated. When trade diversion occurs this exacerbates the problem. That is why Schiff and Winters (2004) point out that the loss of government revenue lies at the heart of the trade diversion argument since revenue is transferred to partner producers.

Factor mobility and unemployment play a very significant role in determining the impact of shocks. It is the movement factors of production—labor, capital, or land—out of one production process into another in the study context. Gonzalez (2004) argues that imperfections in the degree of factor mobility between sectors or regions determine the nature and flexibility of the responses of the economy to exogenous shocks. But this also depends on the state of employment of the factors as full employment situations may not help achieve optimal results of the policy change. It is thus important to establish the tariff reduction impact on employment and the sectoral distribution of employment changes. The assumption that factors are easily movable across industries within a country is somewhat unrealistic, especially in the short run.

METHODOLOGY AND DATA

This study adopts the CGE model for analysis based on the Uganda 2007 SAM. CGE models are equilibrium models that examine changes required to move an economy from one equilibrium position to another as a result of a policy change/shock. The CGE model is an attempt to express the flows represented in a SAM as a set of simultaneous linear and non-linear equations, which define the behaviour of economic agents including the economic environment in which the agents operate. This environment is described by market equilibrium conditions, macroeconomic balances, and dynamic updating equations. The model follows the SAM disaggregation of factors, activities, commodities and institutions.

The dynamic Uganda model used in the present study was developed by Thurlow (2008a) and is based on a standard CGE model developed by Lofgren, Harris, and Robinson (2002). The model was developed from the neoclassical-structuralist modelling tradition originally presented in Dervis *et al.,* (1982). Thurlow (2008b) distinguishes the main features of this model as being recursive and dynamic in the CGE literature. In this respect the behaviour of agents is modelled based on adaptive expectations, rather than on the forward-looking expectations that underlie alternative inter-temporal optimization models. GAMS software is used to calibrate the model and performs the simulations.

Production: The model has 50 productive activities that combine primary factors with intermediate commodities to determine a level of output. The factors of production identified in the model include self-employed labour, unskilled labour, skilled labour, capital and land. The production technology is a two-nested structure. Given their technology, producers in the model make decisions aimed at maximizing profits subject to constant returns to scale. For details refer to Thurlow, (2008b)

Commodity Markets: All commodities (domestic output and imports) in the model enter the market except home-consumed output. There is a possibility of a single activity producing a number of commodities, or a number of activities producing a single commodity. The commodity output from each activity at activity price is combined under a Constant Elasticity of Substitution (CES) function to arrive at the aggregate output of each commodity in the economy at producer prices. Lofgren *et al.,* (2001) note that these outputs are imperfectly substitutable as result of, for example, differences in timing, quality and distance between the locations of activities. The demand for the output of each activity is derived from the problem of minimizing the cost of supplying a given quantity of aggregated output subject to the CES function. The aggregate output is divided between exports and commodities available for sale on the domestic market. It is assumed that suppliers maximize sales revenue for any given aggregate output level, subject to imperfect transformability between exports and

domestic sales, expressed by a Constant Elasticity of Transformation (CET) function. On the demand side, a composite commodity is made up of domestic demand and final imports and it is consumed by households, enterprises, and government. In addition, there is demand generated by domestic producers for intermediate inputs. The overall demand is met through use of domestically produced or imported commodities. The supply from domestic sources and the imported commodities are thus combined to form a composite commodity, which is sold to domestic demanders.

Institutions: The institutions represented in the model include households, enterprises, the government and the rest of the world. Households receive their income from primary factor payments of the factors of production. They also receive transfers from government and the rest of the world. Households pay income taxes and these are proportional to their incomes. Savings and total consumption are assumed to be a fixed proportion of household's disposable income (income after income taxes). The income that remains after taxes, savings, and transfers is spent on consumption. The households consume a range of commodities that include marketed commodities, purchased at market prices that include commodity taxes and transaction costs, and home commodities valued at activity-specific producer prices. Consumption is allocated across different commodities according to linear expenditure system (LES) demand functions, derived from maximization of a Stone-Geary utility function.

In the same way enterprises receive income from the production factors (capital) together with transfers from other institutions (government and the rest of the world and net capital transfers from households). Note that enterprises will then make payments to cover corporate tax to government, direct taxes, savings, and transfers to other institutions. The government receives income (revenue) from its taxing of sales, households and enterprise income; composed of direct taxes collected from households and firms, indirect taxes on domestic activities, domestic sales taxes, tariff revenue on imports, factor income to the government, and transfers from the rest of the world. The government may also receive transfers from other institutions. The government then uses the income to purchase commodities for its consumption and for transfers to other institutions. There is commodity trade with the rest of the world where all transfer payments to and from the rest of the world are fixed in foreign currency. Foreign savings (or current account deficit) are thus derived as the residual difference between foreign receipts and payments.

Macro-closures (system of constraints): Equilibrium in a CGE model is captured by a set of macro closures to achieve macroeconomic consistency. These are constraints imposed on the behavioural equations in the model. The choice of these constraints determines the way macroeconomic variables adjust in the modelled economy. In this case care has been taken to model as close as the real Ugandan Economy. The macro-economic balances specified in the

model include: *factor market balances, fiscal balance, the external trade balance, and savings-investment balance*.

Under the ***factor market*** *closure*, the quantity supplied of each factor adjusts while holding nominal wage fixed. In this case each activity can hire any amount of each factor at a given wage. This is the preferred case for Uganda because of the existence of high unemployment rate for especially labour and land.

The ***government balance*** gives the government savings as the difference between current government revenues and current government expenditures, which is a flexible residual holding all tax rates fixed. This study assumes that government savings adjusts to equate the different between government revenue and spending.

The ***external balance*** holds foreign savings (or borrowing) fixed while allowing for the real exchange rate to adjust. In a situation where all factors remain constant and foreign savings are below the exogenous level, a depreciation of the real exchange rate corrects this situation through reduction of imports and increasing earnings from exports (the world price is fixed and depreciation makes exports attractive to foreigners).

The **Savings and investment closure** is investment-driven where the savings rate adjusts to maintain a fixed level of investment. Sufficient savings to equate the cost of investments are generated by adjusting the savings rate of selected non-government institutions until the balance is reached. It is implicitly assumed that the government implements policies that generate the necessary private savings to finance the fixed investment quantities.

Recursive dynamics: Given that the EAC trade reforms are likely to have cumulative effects of reduced revenue, this is best captured and analysed under a dynamic rather than a static framework. The static version of the CGE model is unable to account for the second-period effects of a shock to the economy. These limitations can be overcome by extending the static model to a recursive dynamic model in which selected parameters are updated based on the modelling of inter-temporal behaviour and results from previous periods (Thurlow, 2008b). Furthermore, the recursive dynamic CGE model explains the exogenous productivity gains from the trade reforms. The dynamic model is also exogenously updated to reflect demographic and technological changes that are based on observed or separately calculated projected trends. In this context the resultant revenue shortfalls will inevitably lead to increased government borrowing which increases chances of crowding out private investment and therefore a decline in long run growth rates. These dynamics emanating from progressive and asymmetrical reduction in internal tariffs can therefore be analysed under a dynamic framework and that is why it the recursive dynamic CGE model chosen for the analysis.

The Uganda Social Accounting Matrix (SAM): The study uses the 2007 Uganda SAM which is a table that summarizes the economic activities of all agents in the economy. The agents specified in this respect include households, enterprises, government and the rest of the world. The SAM spells out relationships that exist among these agents. There is purchase of inputs (goods and services; imports, labour, land and capital etc); production of commodities; payment of wages, interest rent and taxes; and savings and investment. The SAM is conventionally structured to include a block of production activities, involving factors of production, households, government, stocks and the rest of the world. For details of the description of the Ugandan SAM refer to Twimukye *et al.,* (2009).

Policy simulations: The analysis in the paper is based on a set of policy simulations. The impacts of the simulations are interpreted as average growth patterns and changes different from and compared to the baseline scenario[7]. In this context, there is no internal tariff reduction between Uganda and the EAC partner states. The primary simulation in the study is the reduction of internal tariffs with Kenya, Tanzania, Burundi and Rwanda. Kenya as a result of the principle of asymmetry phased the reduction of the internal tariffs from 10 percent in 2005 to zero in 2010 by annual reduction of 2 percent. Tanzania reduced internal tariffs to zero percent with Uganda in 2005. Rwanda and Burundi joined the EAC in 2007 and reduced their internal tariffs to zero with Uganda just like Tanzania. This is the main simulation referred to as ALLEAC. The simulation then makes additional conditions that keep slightly changing as explained below to give us 4 simulations:

Simulation I: The main ALLEAC simulation is done under conditions of unemployment and mobility of factors of production. This is premised on the fact that the unemployed factors will be employed since they are mobile to propel high sectoral growth rates in Uganda. This simulation demonstrates the effect of free movement of factors of production (labour and capital) in addition to reduction in tariffs.

Simulation II: In the second simulation, we assume the main ALLEAC under conditions of unemployment, which is labelled ALLEAC1. However, this time, it is assumed that factors of production are immobile. This simulation against the first one seeks to demonstrate the significance of mobility of capital and labour.

Simulation III: In the third simulation, we assume the main ALLEAC under conditions of unemployment of only skilled labour and mobility of factors of production, which is labelled ALLEAC2. In this case only skilled labour can be employed excluding the other types of labour.

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7   Under the baseline scenario it is assumed that there are no specific changes taken in policy.

Simulation IV: In the fourth simulation, we assume the main ALLEAC under conditions of unemployment of only unskilled labour and mobility of factors of production, which is labelled ALLEAC3. In this case only unskilled labour can be employed excluding the other types of labour.

RESULTS AND DISCUSSIONS

Introduction

The section presents findings of the macro and sectoral effects of the EAC tariff reduction on the Uganda economy. The impact on macro variables under the four policy simulation are presented and discussed. This is followed by presentation and discussion of the sectoral effects specifically; the agricultural, manufacturing and services sectors.

Aggregate impact

Whereas the GDP growth rate under the baseline simulation is 6.1 percent, when the economy is shocked by the tariff reduction under policy simulation I, the growth is 6.4 percent during the period (2008 - 2021) as demonstrated in Table 4. This is only possible under the conditions of unemployment and free mobility of all factors of production. Thus the aggregate impact of the EAC tariff reduction schedule on GDP under policy simulation I is positive with 0.3 percent point change. Simulation II produces an inferior growth rate of 5.4 percent which is below the baseline. Thus, when there is no free movement of factors of production, the unemployed labour and capital will not be utilized leading to a lower growth of GDP compared to the baseline simulation. Policy simulations III and IV have equally inferior growth rates of each 6 per cent suggesting simulation I is the best. The underlying explanation behind the best growth rates under simulation I is the assumption of unemployment and mobility of factors of production.

The analysis thus suggests that Uganda is likely to benefit from the EAC integration agreement, especially under conditions of unemployment and free mobility of factors of production. It is stressed that labour mobility will play a major role for optimal gains from the EAC by Uganda in addition to the free movement of capital to increase investment levels in the country. Without free movement of all factors of production, the unemployed labour and capital will not be optimally utilized leading to a lower growth of GDP. It is plausible to argue that tariff reduction and free movement of factors of production is the best alternative growth policy option for Uganda in the context of the EAC integration.

The results have demonstrated that all categories of labour should be free to move for optimal results. Deliberate efforts should be taken to enhance movement of all categories of labour. Policy should consider enhancing the movement of factors of production both in Uganda and at the regional level as a prerequisite to reaping optimal mutual benefits. Uganda should enhance skills development and satisfy the domestic labour market. Current immobility of labour can further be addressed through development of specific programs for unskilled labour, implementation of vocation training, science and technology; and standardization of educational, training and certification systems within the EAC labour market. The role of polytechnics and technical institutions is therefore very crucial.

Table 3 Macro economic development under the different policy simulations (average growth 2008 – 2021)

Macro variable GAMS code		INITIAL	BASE	ALLEAC	ALLEAC1	ALLEAC2	ALLEAC3
Absorption	QABSTOT	26445.5	5.6	6.0	5.1	5.6	5.6
Private Consumption	QHTOT	18742.5	6.1	6.7	5.9	6.3	6.5
Investment	QINVTOT	5014	4.6	4.2	2.2	4.0	2.7
Government consumption	QGTOT	2689	3.0	3.0	3.0	3.0	3.0
Exports	QETOT	3334.6	9.7	9.9	9.2	9.9	9.9
Imports	QMTOT	9189.8	6.5	7.0	6.3	6.7	6.9
Real exchange rate	REXR	66.4	-1.6	-0.8	-1.2	-1.0	-1.3
Nominal Exchange rate	NEXR	100	-1.7	-0.9	-1.3	-1.1	-1.4
Industrial Production Price	PDIND	150.7	-0.1	0.0	-0.1	0.0	-0.1
Consumer Price Index	CPI	100	-0.1	-0.1	-0.2	0.0	-0.3
Investment to GDP	INVGDP	21.8	-0.5	-0.5	-0.7	-0.5	-0.7
Private saving to GDP	PRVSAVGDP	7.6	0.0	0.0	0.0	0.0	0.0
Foreign saving to GDP	FORSAVGDP	9.7	-0.3	-0.3	-0.2	-0.2	-0.3
Trade deficit to GDP	TRDDEFGDP	25.4	-0.6	-0.8	-0.8	-0.8	-0.8
Government saving to GDP	GOVSAVGDP	5.3	-0.2	-0.3	-0.5	-0.3	-0.5
Import duties to GDP	IMPTAXGDP	4.5	0.0	-0.3	-0.3	-0.3	-0.3
Direct duties to GDP	DIRTAXGDP	3.0	0.0	0.0	0.0	0.0	0.0

Source: Calculations from the simulation outputs

Simulation I: Unemployment and mobility of factors of production

This simulation reflects the conditions where the unemployed factors of production have the chance to move to sectors within the country where they can be used in the production process. Results of policy simulation I are illustrated in Table 3 under ALLEAC. On the demand side of the economy, total absorption increases by 6 percent which is likely to have resulted from increased private consumption of 6.7 percent during the simulation period. It is observed that private consumption grows at a higher rate given the increase in incomes arising from increased exports and reduced prices of imports owing to the elimination of import tariffs. Private savings as percent of GDP are rather indifferent as they do not seem to increase or reduce over the period. This is partly explained by the increased private consumption. Foreign savings on the other hand fall by 0.3 percent. Government savings also exhibit a negative growth of 0.3 percent which is partly explained by high government consumption at 3 percent. There is thus a decline in overall savings that is partly explained by increase in both private and government consumption. As a result of this, the growth in investment is at 4.2 percent, slightly lower than that baseline scenario of 4.6 percent. The policy options in response to this could be to target reduction of consumption, increased savings and attraction of investments in the country.

Intuitively, the import duties decline by 0.3 percent as Uganda reduces and eliminates import duties from the EAC partner states. The growth of direct taxes remains constant at zero percent during the simulation period. The reduction in import taxes and the rather indifferent growth in direct taxes would mean reduction in government consumption which is not the

case. This is a major area of contention in RTA as import duties are a major source of revenue for countries. Uganda will have to seek other revenue sources to fill the gap. This can be done by exploring new tax bases and increasing the level of economic activities in the economy in order to collect more revenue. The essence of tariff reduction among the EAC countries was to increase specialization in order to reap economies of scale which should address the loss of customs tax by broadening the tax base. Therefore, it is expected that in the long run, direct taxes will increase as a result of increased economic activities.

Uganda's trade deficit has been growing both with the EAC countries and the rest of the world. As a percentage of GDP, the simulation reveals that the trade deficit will decline at 0.8 percent during the simulation period. Although it is a small decline, this will be a positive development as it will not be increasing which has been a concern. This is explained by the higher growth in exports to the EAC partner states compared to imports. The growth of Uganda's exports during the simulation period will increase from the base line 9.7 percent to 9.9 percent arising from increased regional demand as a result of the reduction and elimination of internal tariffs. The expansion in exports is also explained by the low rate of appreciation of the exchange rate which is at 0.8 percent compared to the baseline scenario of 1.6 percent. This trend in the growth of exports corroborates the growth in Uganda's exports illustrated in Table 1. At the same time, imports will grow at a higher rate of 7 percent compared to the base line scenario of 6.5 percent. The growth in imports is explained by the elimination of internal tariffs along the partner states borders. The partner states of the EAC among many objectives wanted to increase intra-regional trade and this simulation demonstrates that this is happening.

In summary, reduction of import tariffs accompanied by a situation of unemployment and mobility of factors of production would provide the best conditions for Uganda to optimally benefit from the EAC. This would give Uganda the highest growth rate between 2008 and 2021, increase exports reasonably and reduce the trade deficit. Particularly, the free movement of services and factors of production is noted for leading to the exploitation of existing resources.

Simulation 2: Unemployment and immobility of factors of production

Policy simulation II considers reduction of tariffs accompanied by unemployment and immobility of factors of production. This experiment against the first experiment seeks to demonstrate the importance of mobility of capital and labour within the EAC region. The CPI will decline at a high rate which is 0.2 percent compared to the baseline of 0.1 percent. The total absorption is lower at 5.1 percent than both the baseline and simulation I which are 5.6 and 6 per cent, respectively. Private consumption is positive but it grows at a lower rate (5.9 percent) than under the baseline and the first simulation (6.1 and 6.7 percent, respectively). Private savings as percent of GDP do not seem to increase or reduce over the period. Foreign savings on the other hand decline at a lower rate of 0.2 percent. Government savings to GDP exhibit a higher negative growth of 0.5 percent. Like in policy simulation I, there is a decline in overall savings that is partly explained by the increase in private and government consumption.

The performance of import duties and direct taxes is similar to that under simulation I. The import duties decline at 0.3 percent as a result of reduction/elimination of import duties from the EAC partner states and the growth of direct taxes remain constant at zero percent during the simulation period. As a percentage of GDP, the trade deficits will decline at 0.8 percent during the simulation period as the case is in simulation I. The growth in Uganda's exports during the simulation period under simulation II is positive and high at 9.2 percent although it is lower than the growth at base line (9.7 percent) and simulation I at 9.9 percent. This lower growth under simulation II can be explained by higher appreciation of the exchange rate of 1.2 percent compared to 0.8 percent under simulation I. Imports exhibit a similar trend where they grow at 6.3 percent compared to baseline and simulation I (6.5 and 7 percent, respectively).

This simulation suggests that Uganda should participate in the EAC integration under some pre-condition for optimal mutual benefit. Without taking into consideration the free movement of factors of production and employing the unemployed factors of production, the benefits are likely to be minimal. Thus, reduction of tariffs along the EAC borders is the first step that should be accompanied by a set of policy actions and in this case ensuring that factors of production are able to move freely.

Simulation III: Unemployment of only skilled labour and mobility of factors

Policy simulation III considers reduction of tariffs accompanied by unemployment of skilled labour and mobility of all factors of production. This means that only skilled labour can be tapped excluding the other types of labour which are assumed to be at full employment. In the recent past, Uganda has experienced an influx of skilled personnel in the hotels and manufacturing sectors from Kenya which is confirmed by the analysis under this simulation. From the macro perspective, the effects of tariff reduction show results that are close to the baseline but relatively less robust compared to results under simulation I (unemployment and mobility of all factors of production). The CPI does not change this time. The total absorption is the same as that at the baseline of 5.6 percent. Private consumption is positive and it grows at a higher rate (6.3 percent) compared to the baseline and the first simulation (6.1 percent). Private savings as percent of GDP do not seem to increase or reduce over the period. Foreign savings on the other hand decline at a lower rate of 0.2 percent. Government savings to GDP exhibit a higher negative growth of 0.3 percent than the baseline of 0.2 percent.

The growth rate of import duties and direct taxes is similar to that under simulation I. While import duties decline at 0.3 percent as a result of reduction/elimination of import duties from the EAC partner states, the growth of direct taxes remain constant at zero percent during the simulation period. As a percentage of GDP, the trade deficits will decline at 0.8 percent during

the simulation period which is higher than the case under the baseline (0.6 percent), a positive trend. The growth of Uganda's exports under simulation III is positive and high at 9.9 percent, the same as under simulation I and higher than the base line (9.7 percent). Imports grow at a higher rate of 6.7 percent compared to 6.5 percent at the baseline. This is however lower than the case is in scenario I. It is important to note that exports will grow at a higher rate than imports which explains the decline in the percentage of the trade deficit to GDP.

Although the growth patterns of the macro variables under simulation III depict better performance than the baseline, they do not exceed those under simulation I. Simulation III therefore emphasizes the significance of skilled labour mobility and utilization of the unemployed factors of production.

Simulation IV: Unemployment of only unskilled labour and mobility of factors

The simulation considers reduction of tariffs accompanied by unemployment of unskilled labour and mobility of all factors of production. On the demand side of the economy, total absorption increases by 5.6 percent, similar to the baseline simulation demonstrating an indifferent impact of the simulation. However, private consumption grows at a higher rate given the increase in incomes arising from increased exports and reduced prices of imports owing to the elimination of import tariffs. Furthermore, the growth in investments is very small at 2.7 percent compared to the baseline simulation of 4.6 percent. Private savings as percent of GDP do not change over the simulation period. This is partly explained by the increased private consumption. Foreign savings like in simulation I exhibit a negative growth of 0.3 percent which is partly explained by high government consumption at 3 percent. Government savings on the other hand fall by 0.5 percent and this is higher than it is for the baseline and simulation I. The overall savings position by both government and the private is declines partly explained by increase in both private and government consumption.

Import duties decline by 0.3 percent as Uganda progressively reduces and eliminates import duties from the EAC partner states. The growth of direct taxes remains constant at zero percent during the simulation period. Like the other simulations, it is demonstrated that the removal of internal tariff by the EAC partner states leads to reduction in customs revenue and in the short run; Uganda will have to seek alternative sources. As a percentage of GDP, the simulation reveals that the trade deficit will decline at 0.8 percent during the simulation period. Even when this is relatively a small decline, it is a positive development given that Uganda's deficit has been consistently growing in the past decade. The decline is explained by the growth in exports to the EAC partner states which will grow at 9.9 percent compared to imports at 6.9 percent.

The performance of the macro variables corroborates the growth of Uganda's GDP during the period of analysis. The growth in both government and private consumption is higher than the growth in investments which is a concern and this is partly because both government and private savings are negative as a total. The government needs to implement policy options that will increase savings and therefore investments. These could be tailor made policies to attract foreign direct investment, such as a package of investment incentives and improvement of the public and social infrastructure. There is a problem of compensating for the lost import revenue. The fact that the growth of direct taxes remains constant at zero percent during the simulation period raises concerns. Increasing direct taxes may not be the alternative as this reduces the gains in welfare. This is typical for all RTAs and the EAC has not been an exception. Uganda will have to seek other revenue sources to fill the gap. This can be done by exploring new tax bases and increasing the level of economic activities in the economy in order to collect more revenue. In the long run, it is expected that direct taxes will increase owing to increased economic activities.

The analysis highlights the potential of tariff reduction on the performance of exports to gradually reduce the trade deficit that has characterized Uganda's trade balance. Although imports increase, the growth of exports is higher which, is a positive development. This means that Uganda's trade deficit that has been growing both with the EAC countries will in the long run reduce. It is however, noted that trade with the EAC countries is lower compared to the rest of the world suggesting the overall deficit may persist.

Sectoral impact

This section presents results and discussions of the sectoral impact of the EAC provisions of tariff reduction between 2008 and 2021 on the Ugandan economy. Although the impact varies depending on the sector and the policy simulation, what distinctly emerges is higher growth performance exhibited by simulation I compared to the rest of the policy simulations. Prior to and during the implementation of the EAC treaty, fears were expressed by especially manufacturers in Uganda; that the sector would stagnate. They argued that most of their industries were in infancy faced by challenges related to inadequate infrastructure and this was the basis for offering asymmetric tariff reduction to Uganda manufacturers on sensitive products. The sectors are many but they are conveniently categorized as agriculture, industry (with special emphasis on manufacturing and processing) and services. Details are in Table 4.

Simulation I: Unemployment and mobility of factors of production

The paper demonstrates that sectoral growth will not be impeded, but rather enhanced especially when there is free movement of factors of production to tap into the unemployed resources. The agricultural sector in Uganda has been struggling with performance characterized by low productivity and production, registering very low growth rates and

declining contribution to GDP. Under simulation I, the growth is estimated to be 4.7 percent compared to the baseline of 3.5 percent during 2008-2021 period. This growth rate is way above the current average rate of 2 percent but below the envisaged and targeted 6 percent growth under the Comprehensive African Agricultural Development programme (CAADP)[8]. This growth will be driven mainly by the growth in the fisheries, forestry, horticulture, roots and *matooke* sub-sectors. The removal of internal tariffs will boost agricultural exports regionally in addition to the growing food processing and non food processing industries that rely on agriculture for raw materials. This is corroborated by Shinyekwa and Othieno (2012) in a study that demonstrates that Uganda's comparative advantage with the rest of the EAC partner states is increasing in processed agricultural products.

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8 The African Heads of State and Government at the African Union Summit in Maputo, Mozambique in 2003 adopted the Comprehensive African Agricultural Development Programme (CAADP). The main objective of CAADP is to help African countries accelerate economic growth through agriculture-led development, which eliminates hunger, reduces poverty and food insecurity, and enables expansion of exports. In Uganda CAADP is implemented through the Development Strategy and Investment Plan which has articulated four major investment programs for the next five years, which include: Enhancing agricultural production and productivity; improving access to and sustainability of agricultural markets; creating an enabling environment for investment in agriculture; and institutional development for the agricultural sector.

Table 4: Average growth rate by sector in percentage (2008-2021)

Sectors		BASE	ALLEAC	ALLEAC1	ALLEAC2	ALLEAC3
Overall GDP		*6.1*	*6.4*	*5.4*	*6.0*	*6.0*
Agriculture		*3.5*	*4.7*	*3.5*	*3.5*	*4.2*
Roots		3.8	4.0	3.7	3.7	3.7
Pulses		3.0	3.5	2.9	3.0	3.1
Horticulture		3.9	4.5	3.9	4.0	4.0
Crops		2.2	3.2	2.5	2.4	2.2
Matooke		4.1	4.3	4.0	4.0	4.1
Livestock		1.4	1.4	1.3	1.3	1.4
Forestry		4.4	6.8	4.3	4.2	6.7
Fish		5.3	10.1	5.1	5.2	8.8
Industry		*5.2*	*5.9*	*3.9*	*4.7*	*5.0*
Mining		5.9	5.2	3.9	4.9	4.5
Manufacturing		4.9	6.1	4.0	4.6	5.2
Food processing		4.8	7.0	4.6	4.9	6.0
	Meat processing	3.0	4.0	3.1	3.0	3.1
	Fish processing	4.8	14.8	5.1	5.7	11.5
	Grain processing	5.8	5.7	5.1	5.3	5.5
	Feed stock	3.6	4.4	3.6	3.6	3.7
	Other food processing	5.0	6.0	4.7	5.2	5.3
	Beverages & tobacco	6.6	6.8	6.1	6.4	6.8
Non-Food Processing		5.1	5.3	3.4	4.3	4.4
	Textiles & clothing	5.7	6.3	4.4	4.8	5.9
	Wood & paper	3.3	3.8	0.3	0.8	2.9
	Fertilizer	4.0	3.6	2.1	2.9	2.4
	Other chemicals	6.1	6.6	5.4	6.3	5.9
	Machinery & equipment	4.8	6.8	3.9	5.8	5.0
	Furniture	5.7	5.6	4.3	5.0	5.2
	Other manufacturing	5.9	4.4	3.1	4.3	3.5
Utilities		**6.9**	**6.8**	**6.3**	**7.2**	**6.3**
Construction		**5.1**	**4.7**	**3.2**	**4.6**	**3.6**
Services		**5.2**	**5.9**	**5.1**	**5.7**	**5.4**
Private		**7.0**	**7.7**	**6.7**	**7.4**	**7.4**
	Trade	5.5	6.5	5.1	5.5	6.0
	Hotels & catering	15.6	13	14.4	15.1	14.4
	Transport	6.4	8.3	7.1	7.4	8.2
	Communications	5.8	6.9	5.6	6.6	6.1
	Banking	4.0	6.8	3.9	5.8	4.8
	Real estate	7.7	6.8	6.8	7.1	7.0
	Community services	5.6	7.0	5.3	6.0	6.4
	Other private ser	5.7	6.5	5.2	5.9	5.9
Public		**3.5**	**4.2**	**3.4**	**4.0**	**3.5**
	Research & Development	3.0	3.0	3.0	3.0	3.0
	Public administration	3.0	3.0	3.0	3.0	3.0
	Education	3.6	5.3	3.6	4.9	3.8
	Health	4.2	5.3	4.1	5.1	4.3

Source: Authors calculations –results of the simulations conducted

There is a noticeable low growth in the livestock sub-sector below the actual during the period 2007 - 2010. The current low performance in the sector is characterized by low utilization of improved technology, inadequate use of modern equipment, and poor methods of farming. The implementation of the Development Strategy and Investment Plan (DSIP) for the Agricultural Sector can address these constraints by tapping and utilizing redundant resources that are currently unemployed.

The fisheries sub-sector in Uganda has become very important to the economy. It is one of the leading foreign exchange earners - earnings from fish exports increased from negligible amounts to USD $ 144 million in 2004/2005. As a proportion of exports, fish exports rose from less than 1 percent in the 1990s to almost 20 percent in 2002 (World Bank and MTTI, 2006). However, the sub-sector started to decline after 2006 partly attributed to the declining fish stocks in the lakes given bad fishing practices. This explains the negative growth rates in the last three years. The simulation results suggest that the sub-sector will grow at 10 percent. This entails significant investments in restocking and regeneration of the fish stocks in the water bodies, building strong institutions for managing the fisheries sector, and adoption of aquaculture as an option to supplement production.

The industrial sector will grow at a higher rate of 5.9 percent than the baseline simulation of 5.2 percent. However, this growth will be manifested/distributed differently amongst the different sub-groups and categories. Although the mining sub-sector will grow at 5.2 percent, this is less than the baseline scenario of 5.9 percent. This is however, likely to change once oil extraction starts in the Albertan region. Under manufacturing, while food processing (this is agro-processing in meat, fish, gain, feed stocks, beverages and tobacco) will register the highest growth of 7 percent, non-food processing, (textile, wood, paper, fertilizer, furniture, machinery and chemicals) will grow at 5.3 percent which is higher than the baseline simulation.

The Industrial sector relies on the agricultural sector for its raw materials implying the performance of the sector also partly relies on the performance in the agricultural sector. Although there is competition from the well established industrial sector in Kenya, the removal of import tariffs will widen the market for Uganda's industrialists especially in Rwanda and Burundi. In addition the high CET will make some Uganda firms more competitive following trade creation and diversion. Besides, Uganda could specialize in agro-industries where she holds comparative advantage.

The overall impact on the services sector is positive, however, the individual services sub-sector reveal different growth rates. All the services sub-sectors show growth rates higher than the national GDP growth of 6.4 percent. The hotel and catering sub-sectors however reveal the highest growth rates amongst them all of 13 percent although this is lower than

that of the baseline scenario of 15.6 percent. With the free movement of services, the services sectors will be boosted as more efficient providers will move in to provide services displacing inefficient providers in addition to filling up previously non exploited areas. Banking, transport, communications and hotels are likely to experience these trends more and faster than the other sub-sectors. Trade will grow at 1 percent point more than at the baseline as a result of tariff reductions along the EAC partner country boarders. Real estate will grow at a lower rate than the baseline.

The public sector services growth rate during 2008-2021 will be 4.2 percent, 0.7 percent points higher than the baseline. This growth will be driven by mainly education which can be explained by the influx of students from EAC partner states into Uganda high schools and universities. Uganda is the current education hub for the region for both secondary and university education. What Uganda should do is to effect pertinent reforms in the sector in order to maintain the lead and also the EAC laws regarding movement of persons should ease the processes for students to move and reside in Uganda.

Simulation II: *Unemployment and immobility of factors of production*

The overall GDP growth under simulation II is lower (5.4 percent) than what would be experienced under the baseline (6.1 percent) and simulation I (6.4 percent). At the sectoral level, it emerges that all sectors would grow at lower rates as the case is at the overall GDP growth during 2008-2021. The agricultural sector would perform as under the baseline (3.5 percent). The industrial sector would be most hard hit with a lower growth rate of 3.9 percent compared to the baseline at 5.2. Although positive, a growth rate of 3.9 percent compared to simulation I of 5.9 is not desirable. The manufacturing sector in a similar way would grow at a lower but positive rate of 4 percent. The lower growth in output is witnessed amongst the sub sectors and subgroups including agro-processing and non agro-processing industries. The poor growth performance under simulation II can be explained by the immobility of factors of production which renders it difficult for the economy to tap into the created and expanded EAC regional market.

Simulation III: *Unemployment of only skilled labour and mobility of factors*

There are mixed trends in the growth patterns among the sectors during the simulation period of 2008 – 2021 under simulation III. While some of the sectors experience losses in the growth rate of GDP compared to the baseline, others do not. Agriculture has the same growth rate (3.5 percent) as that of the baseline. Manufacturing grows at a lower rate of 4.6 percent compared to the base line of 4.9 percent. Construction grows at 4.6 percent which is lower than the baseline of 5.1. Utilities and services grow at higher rates under this scenario than the baseline. The mixed trends underline the role of skilled labour in the growth patterns of the different sectors. The impact of the EAC is thus dependent on a combination of tariff

reduction and other requisite policies for example mobility of labour. The performance under this experiment is inferior to the one with mobility of both skilled and unskilled labour under simulation I, further emphasizing the role of free movement of factor of production in stimulating growth.

Simulation IV: *Unemployment of only unskilled labour and mobility of factors*

The results of simulation IV are similar to those of simulation III with mixed trends in the growth patterns among the sectors during the simulation period of 2008 – 2021. In some instances the sectors will grow at higher rates than those exhibited at the baseline and in others the growth rates will be lower. The overall sectoral performance is lower than that of simulation I. The agriculture sector will grow at a 4.2 percent which is high and close to simulation I. This can be explained by the fact that the agricultural sector in Uganda is dominated by unskilled labour and once this category of labour is mobile, it is likely to be exploited. Manufacturing grows at a higher rate of 5.2 percent compared to the baseline of 4.9 percent, but lower than under simulation I at 6.1 percent. Food processing will experience a high growth rate driven by fish processing, beverages and tobacco. Construction will grow at 3.6 percent which is lower than the baseline of 5.1. Services will grow at a slightly higher rate (5.4 percent) under simulation III than the baseline (5.2 percent). Similarly, the mixed trends underline the role of unskilled labour in the growth patterns of the different sectors. Although the performance under this simulation is inferior to the one with mobility of both skilled and unskilled labour under simulation I, it is better than when there is no mobility of labour and other factors of production.

CONCLUSIONS AND POLICY IMPLICATIONS

The paper analyses the impact of reduction of tariffs along the EAC borders on the Uganda economy under very important assumptions: (i) unemployment and mobility of factors of production; (ii) unemployment and immobility of factors of production; (iii) unemployment of only skilled labour and mobility of factors of production and (iv) unemployment of only unskilled labour and mobility of factors of production. The evidence from the study leads to the conclusion that Uganda's participation in the EAC trade agreement contributes reasonably to the growth of the country's GDP (0.3 percentage points above the baseline). Through the different simulation scenarios, it is concluded that mobility of factors of production is instrumental in generating the GDP growth. Findings under assumption I reveal that most of the macro variables will grow at higher rates and the overall growth of GDP will also be higher. The other assumptions give inferior growth rates. There will be a problem of compensating for the lost import revenue following elimination of tariffs in a situation where direct taxes grow at a constant rate. On a positive note, exports to the EAC partner states will increase gradually reducing the trade deficit that has characterized Uganda's trade balance regionally.

Evidence on sectoral performance marginally varies depending on the sector, with a net positive impact further strengthening the argument for Uganda participation in the EAC trade agreement. Most of the sectors grow at a rate above the GDP growth rate of 6.4 percent. The study further identifies the sectors that perform well in terms of growth, which enhances strategic investment within the country. The manufacturing sector demonstrates high growth rates dispelling the fears especially among the Uganda manufacturers that the implementation of the EAC provisions will make them adversely lose competitiveness. It is noted that although there is competition from the well established industrial sector in Kenya, the removal of import tariffs will widen the market for Uganda's industrialists especially in Rwanda and Burundi. The results also reveal that the agricultural sector which has been characterised by non impressive growth will register higher growth above the recent and current growth rates that have sometimes been negative. The initiative under the DSIP framework (four pillars) to promote agriculture in Uganda is critical. In light of this, Uganda needs to specialise where the country has a regional comparative advantage in agriculture. The results suggest that free movement of factors of production will positively impact the overall services sector especially the banking, transport, communications and hotels sub-sectors, demonstrated by higher growth rates. The fact that some services sub-sectors will register higher growth rates than the national GDP growth further underlines the gains from the reforms.

The Government of Uganda should pursue the implementation of the EAC integration agreement as a viable project with immense prospects and potential, while at the same time addressing possible challenges. This may take a proactive process accompanied by a number

of policy mixes for optimal results. To foster the growth in the manufacturing sector in Uganda, government should address infrastructure constraints (energy and transport mainly) and firms should specialize in areas where they hold both competitive and comparative advantage. The manufacturing sector should endeavour to utilise agro-based inputs locally available to enhance inter-sectoral linkages and save foreign exchange used to import industrial input. Given that the agricultural sector performance is driven by some sub-sectors, these should be targeted for policy interventions for prioritization by the DSIP. Uganda and the EAC partner states should foster free movement of all factors of production as provided for under the EA Common Market. In light of this, individual national laws regarding employment should be amended to reflect the EAC protocol. Labour immobility challenges should be addressed through the development of specific programs for unskilled labour, implementation of vocation training, science and technology; and standardization of educational, training and certification systems within the EAC labour market. The government should pursue policy options to encourage savings and therefore investments in addition to deliberate policies to attract both domestic and foreign direct investment - incentives and improvement of public and social infrastructure. Uganda should increase efficiency and specialization in the production sectors to reap from economies of scale that will broaden the tax base. In the short and medium term, Uganda should implement internal resource mobilisation strategies that may review the current tax incentive structure. In order to analyse the effects of the mobility of factors of production among the five EAC countries, there is need to build a multi-sectoral regional CGE model and SAM which this study could not do given that it used the Uganda CGE model and SAM.

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APPENDIX

Table A1. CGE model sets, parameters, and variables

Symbol	Explanation	Symbol	Explanation
Sets			
$a \in A$	Activities	$c \in CMN(\subset C)$	Commodities not in *CM*
$a \in ALEO(\subset A)$	Activities with a Leontief function at the top of the technology nest	$c \in CT(\subset C)$	Transaction service commodities
$c \in C$	Commodities	$c \in CX(\subset C)$	Commodities with domestic production
$c \in CD(\subset C)$	Commodities with domestic sales of domestic output	$f \in F$	Factors
$c \in CDN(\subset C)$	Commodities not in *CD*	$i \in INS$	Institutions (domestic and rest of world)
$c \in CE(\subset C)$	Exported commodities	$i \in INSD(\subset INS)$	Domestic institutions
$c \in CEN(\subset C)$	Commodities not in *CE*	$i \in INSDNG(\subset INSD)$	Domestic non-government institutions
$c \in CM(\subset C)$	Aggregate imported commodities	$h \in H(\subset INSDNG)$	Households
Parameters			
$cwts_c$	Weight of commodity c in the CPI	$qdst_c$	Quantity of stock change
$dwts_c$	Weight of commodity c in the producer price index	$\overline{qg_c}$	Base-year quantity of government demand
ica_{ca}	Quantity of c as intermediate input per unit of activity a	$\overline{qinv_c}$	Base-year quantity of private investment demand
$icd_{cc'}$	Quantity of commodity c as trade input per unit of c' produced and sold domestically	$shif_{if}$	Share for domestic institution i in income of factor f
$ice_{cc'}$	Quantity of commodity c as trade input per exported unit of c'	$shii_{ii'}$	Share of net income of i' to i (i' ⬚ INSDNG'; i ⬚ INSDNG)
$icm_{cc'}$	Quantity of commodity c as trade input per imported unit of c'	ta_a	Tax rate for activity a
$inta_a$	Quantity of aggregate intermediate input per activity unit	$\overline{tins_i}$	Exogenous direct tax rate for domestic institution i
iva_a	Quantity of aggregate intermediate input per activity unit	$tins01_i$	0-1 parameter with 1 for institutions with potentially flexed direct tax rates
$\overline{mps_i}$	Base savings rate for domestic institution i	tm_c	Import tariff rate
$mps01_i$	0-1 parameter with 1 for institutions with potentially flexed direct tax rates	tq_c	Rate of sales tax
pwe_c	Export price (foreign currency)	$trnsfr_{if}$	Transfer from factor f to institution i
pwm_c	Import price (foreign currency)		

Table A1 continued. CGE model sets, parameters, and variables

Symbol	Explanation	Symbol	Explanation
Greek Symbols			
α_a^a	Efficiency parameter in the CES activity function	δ_{cr}^t	CET function share parameter
α_a^{va}	Efficiency parameter in the CES value-added function	δ_{fa}^{va}	CES value-added function share parameter for factor f in activity a
α_c^{ac}	Shift parameter for domestic commodity aggregation function	γ_{ch}^m	Subsistence consumption of marketed commodity c for household h
α_c^q	Armington function shift parameter	θ_{ac}	Yield of output c per unit of activity a
α_c^t	CET function shift parameter	ρ_a^a	CES production function exponent
β^a	Capital sectoral mobility factor	ρ_a^{va}	CES value-added function exponent
β_{ch}^m	Marginal share of consumption spending on marketed commodity c for household h	ρ_c^{ac}	Domestic commodity aggregation function exponent
δ_a^a	CES activity function share parameter	ρ_c^q	Armington function exponent
δ_{ac}^{ac}	Share parameter for domestic commodity aggregation function	ρ_c^t	CET function exponent
δ_{cr}^q	Armington function share parameter	η_{fat}^a	Sector share of new capital
υ_f	Capital depreciation rate		
Exogenous Variables			
$\overline{CPI}$	Consumer price index	$\overline{MPSADJ}$	Savings rate scaling factor (= 0 for base)
$\overline{DTINS}$	Change in domestic institution tax share (= 0 for base; exogenous variable)	$\overline{QFS}_f$	Quantity supplied of factor
$\overline{FSAV}$	Foreign savings (FCU)	$\overline{TINSADJ}$	Direct tax scaling factor (= 0 for base; exogenous variable)
$\overline{GADJ}$	Government consumption adjustment factor	$\overline{WFDIST}_{fa}$	Wage distortion factor for factor f in activity a
$\overline{IADJ}$	Investment adjustment factor		
Endogenous Variables			
AWF_{ft}^a	Average capital rental rate in time period t	QG_c	Government consumption demand for commodity
$DMPS$	Change in domestic institution savings rates (= 0 for base; exogenous variable)	QH_{ch}	Quantity consumed of commodity c by household h
DPI	Producer price index for domestically marketed output	QHA_{ach}	Quantity of household home consumption of commodity c from activity a for household h
EG	Government expenditures	$QINTA_a$	Quantity of aggregate intermediate input
EH_h	Consumption spending for household	$QINT_{ca}$	Quantity of commodity c as intermediate input to activity a
EXR	Exchange rate (LCU per unit of FCU)	$QINV_c$	Quantity of investment demand for commodity
$GSAV$	Government savings	QM_{cr}	Quantity of imports of commodity c
QF_{fa}	Quantity demanded of factor f from activity a		

Table A1 continued. CGE model sets, parameters, and variables

Symbol	Explanation	Symbol	Explanation
Endogenous Variables Continued			
MPS_i	Marginal propensity to save for domestic non-government institution (exogenous variable)	QQ_c	Quantity of goods supplied to domestic market (composite supply)
PA_a	Activity price (unit gross revenue)	QT_c	Quantity of commodity demanded as trade input
PDD_c	Demand price for commodity produced and sold domestically	QVA_a	Quantity of (aggregate) value-added
PDS_c	Supply price for commodity produced and sold domestically	QX_c	Aggregated quantity of domestic output of commodity
PE_{cr}	Export price (domestic currency)	$QXAC_{ac}$	Quantity of output of commodity c from activity a
$PINTA_a$	Aggregate intermediate input price for activity a	RWF_f	Real average factor price
PK_{ft}	Unit price of capital in time period t	$TABS$	Total nominal absorption
PM_{cr}	Import price (domestic currency)	$TINS_i$	Direct tax rate for institution i (i □ INSDNG)
PQ_c	Composite commodity price	$TRII_{ii'}$	Transfers from institution i' to i (both in the set INSDNG)
PVA_a	Value-added price (factor income per unit of activity)	WF_f	Average price of factor
PX_c	Aggregate producer price for commodity	YF_f	Income of factor f
$PXAC_{ac}$	Producer price of commodity c for activity a	YG	Government revenue
QA_a	Quantity (level) of activity	YI_i	Income of domestic non-government institution
QD_c	Quantity sold domestically of domestic output	YIF_{if}	Income to domestic institution i from factor f
QE_{cr}	Quantity of exports	ΔK^a_{fat}	Quantity of new capital by activity a for time period t

Table A2. CGE model equations

Production and Price Equations	
$$QINT_{c\,a} = ica_{ca} \cdot QINTA_a$$	(1)
$$PINTA_a = \sum_{c \in C} PQ_c \cdot ica_{ca}$$	(2)
$$QVA_a = \alpha_a^{va} \cdot \left(\sum_{f \in F} \delta_{f\,a}^{va} \cdot \left(\alpha_{f\,a}^{vaf} \cdot QF_{f\,a} \right)^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}}$$	(3)
$$W_f \cdot \overline{WFDIST}_{fa} = PVA_a \cdot QVA_a \cdot \left(\sum_{f \in F'} \delta_{f\,a}^{va} \cdot \left(\alpha_{f\,a}^{vaf} \cdot QF_{f\,a} \right)^{-\rho_a^{va}} \right)^{-1} \cdot \delta_{f\,a}^{va} \cdot \left(\alpha_{f\,a}^{vaf} \cdot QF_{f\,a} \right)^{-\rho_a^{va}-1}$$	(4)
$$QF_{f\,a} = \alpha_{f\,a}^{van} \cdot \left(\sum_{f' \in F} \delta_{f\,f'\,a}^{van} \cdot QF_{f'\,a}^{-\rho_{f\,a}^{van}} \right)^{-\frac{1}{\rho_{f\,a}^{van}}}$$	(5)

Production and Price Equations	
$$W_{f'} \cdot WFDIST_{f'a} = W_f \cdot WFDIST_{fa} \cdot QF_{fa} \cdot \left(\sum_{f'' \in F} \delta^{van}_{f f'' a} \cdot QF_{f'' a}^{-\rho^{van}_{fa}} \right)^{-1} \cdot \delta^{van}_{f f' a} \cdot QF_{f' a}^{-\rho^{van}_{fa}-1}$$	(6)
$$QVA_a = iva_a \cdot QA_a$$	(7)
$$QINTA_a = inta_a \cdot QA_a$$	(8)
$$PA_a \cdot (1 - ta_a) \cdot QA_a = PVA_a \cdot QVA_a + PINTA_a \cdot QINTA_a$$	(9)
$$QXAC_{ac} = \theta_{ac} \cdot QA_a$$	(10)
$$PA_a = \sum_{c \in C} PXAC_{ac} \cdot \theta_{ac}$$	(11)
$$QX_c = \alpha^{ac}_c \cdot \left(\sum_{a \in A} \delta^{ac}_{ac} \cdot QXAC_{ac}^{-\rho^{ac}_c} \right)^{-\frac{1}{\rho^{ac}_c - 1}}$$	(12)
$$PXAC_{ac} = PX_c \cdot QX_c \left(\sum_{a \in A'} \delta^{ac}_{ac} \cdot QXAC_{ac}^{-\rho^{ac}_c} \right)^{-1} \cdot \delta^{ac}_{ac} \cdot QXAC_{ac}^{-\rho^{ac}_c - 1}$$	(13)
$$PE_{cr} = pwe_{cr} \cdot EXR - \sum_{c' \in CT} PQ_c \cdot ice_{c'c}$$	(14)
$$QX_c = \alpha^t_c \cdot \left(\sum_r \delta^t_{cr} \cdot QE_{cr}^{\rho^t_c} + (1 - \sum_r \delta^t_{cr}) \cdot QD_c^{\rho^t_c} \right)^{\frac{1}{\rho^t_c}}$$	(15)
$$\frac{QE_{cr}}{QD_c} = \left(\frac{PE_{cr}}{PDS_c} \cdot \frac{1 - \sum_r \delta^t_{cr}}{\delta^t_c} \right)^{\frac{1}{\rho^t_c - 1}}$$	(16)

Table A3. CGE model equations (continued)

$$QX_c = QD_c + \sum_r QE_{cr}$$	(17)
$$PX_c \cdot QX_c = PDS_c \cdot QD_c + \sum_r PE_{cr} \cdot QE_{cr}$$	(18)
$$PDD_c = PDS_c + \sum_{c' \in CT} PQ_{c'} \cdot icd_{c'c}$$	(19)
$$PM_{cr} = pwm_{cr} \cdot \left(1 + tm_{cr} \right) \cdot EXR + \sum_{c' \in CT} PQ_{c'} \cdot icm_{c'c}$$	(20)
$$QQ_c = \alpha^q_c \cdot \left(\sum_r \delta^q_{cr} \cdot QM_{cr}^{-\rho^q_c} + (1 - \sum_r \delta^q_{cr}) \cdot QD_c^{-\rho^q_c} \right)^{-\frac{1}{\rho^q_c}}$$	(21)

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