Potential short-run and long-run impact of sector specific free trade agreements: The case of U.S.'s African Growth and Opportunity Act (AGOA)

Aloyce R. Kaliba, Associate professor
College of business, Department of economics and finance
Southern University and A&M College, T.T. Allain # 155

Ummy Mwalimu and George Kabelwa, Research Assistants
Economic and Social Research Foundation (ESRF), Dar-es-Salaam, Tanzania

ABSTRACT: We use CGE model to assess the impact of free trade agreement on poverty. The study uses Tanzania participation in AGOA (U.S.'s African growth and opportunity) as a case study. In this study, exogenous improvement in a household's consumption and income are taken as an important source of welfare gain. The major results indicate that the welfare impact of AGOA on Tanzania is not well defined. Whereas AGOA creates incentives for exporters, rural households lose due to a decrease in production and increase in price of food crops such as sorghum, millet, and cassava. A fall in producers' prices is accompanied with a fall in wages, capital return, and land rent. However, in the long-run and due to lower marketing margins, AGOA has the potential of developing internal markets for domestically processed goods and increasing export of traditional cash crops. Impact of trade agreement should be considered in a long term perspective rather than the short term impact.

Keywords: AGOA, Free Trade and Tanzania.

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Contact: Department of Economics and Finance, Southern University and A&M College, Baton Rouge.
Contact: Aloyce_k@yahoo.com

BACKGROUND INFORMATION

INTRODUCTION

Tanzania is varied in its physical environment. The contrasts range from abundant wildlife plains to heavily populated agricultural areas. Abundant mineral resources exist, but have not been exploited fully. Tanzania is known for its diversity and magnitude of wildlife. This is partially because 25% of the country is protected in reserves. Tanzania has a total land area of 945,000 sq km with more than forty million hectares of arable land and good tropical climate, adequate rainfall and ample water resources for irrigation purposes. Current population is estimated at more than 36 million people with per capita GDP of about US$ 270. Eighty per cent of the population depends on agriculture, the sector that also contributes more than 50% to GDP and 70% of exports earnings.

In the 1960's and '70's, Tanzania implemented economic socialism under ujamaa policy of self-reliance. The elements of the policy included nationalization and price control. During that period, Tanzania attempted to ensure self-reliance on food production by large-scale state farms. The result was a short-run economic growth, but a long-run economic downturn. By the early 1980's Tanzania was the world's second poorest country in GDP per capita terms. During the 1980's, Tanzania tried its own structural adjustment programs. These included the National Economic Survival Program in 1981 and the Structural Adjustment Program in 1983. However, Tanzania could not attract enough external resources to implement them successfully.

The World Bank and International Monetary Fund (IMF) were invited to launch an Economic Recovery Program (ERP) in 1986. The aim was to achieve sustainable growth in real income and output. For agriculture, the goals were to promote better pricing of crop production, improved product and input marketing. The policy major output would have been increased government outlays, increased industrial capacity utilization by liberalizing raw material imports and decreased balance of payments deficit through devaluation. Other policy outputs were related to export incentive schemes, foreign exchange liberalization, and better control of the budget deficit and money supply. Although agricultural prices increased, producers' benefits were reduced by inflation. In addition, the marketing reform failed to improve producer margins. Despite these problems, agricultural output and exports rose, industrial imports increased, and per capita income gained about 6%.

In 1989, the ERP program was modified to create an Economic and Social Action Program (ESAP). The goal of the new program was to rehabilitate the physical infrastructure and ease social negative impacts of ERP. While, industrial capacity and nontraditional exports (other than agriculture) increased, farmers did not benefit as prices for their crops did not improve and prices for inputs such as fertilizer rose. Simultaneously, job creation declined and minimum wages actually decreased. Moreover, although the ERP and ESAP did produce some positive responses they also increased poverty gap within the population (BOT, 1997).

A new ERP under the Enhanced Structural Adjustment Facility (ESAF) was started in mid 1996 and ended in 1999. The focus of the ESAF was on improving the infrastructures to reduce transaction cost and provision of social services. However, due to the debt burden the success on poverty alleviation was minimal. While economic growth increased during the ESAF period, it was evident that the amount of both income and non-income poverty were roughly the same as they were a decade ago. As a follow-up to ESAF, the International Development Association (IDA) and IMF agreed to support a comprehensive debt reduction package for Tanzania under the enhanced Heavily Indebted Poor Countries (HIPCs) Initiative, for twenty years (i.e., 2000-2020). The IMF and IDA started providing interim debt relief in April 2000. The enhanced HIPCs Initiative will help Tanzania to advance its poverty reduction programs and stimulate economic growth. The debt reduction operation was to translate into debt-service relief over time of US$3 billion, or about one-half of Tanzania's debt-service obligations during fiscal years 2001-2003 and about one-third of Tanzania's debt-service obligations thereafter (IMF, 2001). The assistance provided by IDA (of US$1.2 billion) will be spread over a period of 20 years, covering 69.1 percent of Tanzania's debt-service obligations to IDA. IMF will deliver debt relief of about US$ 152 million) over a 10-year period. This will cover about 58% of debt-service obligations to the fund. It is anticipated that this will create room for additional public expenditures on poverty reduction. Tanzania's eligibility for debt relief under the enhanced HIPCs Initiative is recognition by the international community of the progress made in implementing economic reforms and adoption and implementation of a participatory poverty reduction strategy (URT, 2001).

The enhanced HIPCs Initiative aims at reducing the net present value (NPV) of debt-to-export ratio to 150% and debit-to-government revenue ratio to 250%. The reduction will mean that debt service payments will be cut by an average of 47% over time (54% for 2000/03), from $193m before HIPC assistance in 1999/00, to an average of $116m overt 2003 - 2011. However, due to worsening terms of trade, there is strong evidence indicating that the 'debt-to-export ratio is expected to remain below the target ceiling of 150% throughout the period 2000-2007 and in the long-run debt may be higher than before 2000 (Jubileeplus, 2002).

The historical performances of Tanzania trading activities have persistently been on the decline. After independence in 1960, Tanzania maintained a surplus balance of trade up to 1969 but has experienced a widening trade deficit since then. Import demand has increasingly been financed through external borrowing and assistance. Between 1979 and 1995, export earnings were barely adequate to meet a third of imports. A leap in export earnings recorded in 1994 resulted from, among other things, the implementation of trade liberalization measures and changes in both volumes and prices for three major crops: coffee, cotton and tobacco. Export earnings from the three products peaked in 1996, but starting from 1997 onwards, there has been resumption of the declining trend in terms of volume of output and earnings.

For example, merchandise exports declined from US$ 764 million in 1996 to US$ 603 million by 1999 with a slight improvement to US$ 751 million in 2000. Agricultural commodities accounted for more than 70% of merchandise exports while manufactured products contributed only about 15% of exports. The contribution of tradable services to foreign earnings has increased substantially thanks to the rapid growth of the tourism industry. Earnings from tourism grew at an average of 29%, increasing from US$ 65 million in 1989 to US$ 730 million by 1999. Currently, the major export products are coffee, cotton, sisal, cashew nuts, cloves, diamonds and gold. Products with high export potential include: gemstones and minerals, fish and fish products, horticultural products and spices, cotton and textiles, handicrafts and tourism services (URT, 2003). Constraints to trade expansion and growth in Tanzania include: low production capacity; technology-related problems; inadequate physical and economic infrastructure; and, the consequences of marginalization in the context of globalization.

Table 1 presents the structure of the Gross Domestic product (GDP) in 2001. From Table 1, the GDP at factor cost was about 7,576 billion Tshs ($8.6 billion). In the same year, the trade deficit amounted to 702 billion Tshs (or about $ 0.8 billion). Imports were 25% of the GDP at market price or 26% of the GDP at factor cost. Household's production for home consumption contributed, respectively, 24% and 26% to GDP at market price and factor cost. In Tanzania, AGOA offers an opportunity of guarantee export market for ready-made fabrics and textile, which can stimulate investment in cotton production and processing; thus increased employment of the rural poor. It is an opportunity to decrease trade deficit and achieve the objectives of HIPCs Initiative. The immediate effect of AGOA is mainly through a reduction in tariff and search costs. Removal of import tariffs by the U.S. increases the competitiveness of AGOA eligible products by directly decreasing the costs of exporting the goods. In addition, guaranteed market reduces export search costs. Market search is costly, both in terms of labor costs for search activities and the cost of holding inventory during the search activities. In the export market, exporter incurs the cost of time invested in search for market information and trading partners. As shown by Diamond (1971), market search cost alters the equilibrium price prediction from competitive to monopoly pricing. Importers with one price quote would not want to search for a second quote, unless the new price quote is expected to be lower by at least the amount of the search cost. On the other hand, exporters have incentives to price slightly above any common price, and the non-cooperation equilibrium in a single-stage yields a monopoly price. Zero market search-cost and in the absence of capacity constraint and other market imperfections, would produce incentives to drive prices to efficiency levels (Davis and Holt, 1996). For illegible commodities, the potential long-term economic impact of AGOA will be transmitted through improved productive efficiency of intermediate inputs. The presence of experienced U.S. managers among Tanzania firms and availability of appropriate technology are likely to improve productive efficiency and international competitiveness of Tanzania products. In addition, U.S. firms may help Tanzania firms to finance capital accumulation and firm expansion.

To assess the potential impact of AGOA requires a fundamental model that integrates both macro and micro economic information. Computable general equilibrium (CGE) models are increasingly becoming important tools for applied poverty analysis. The two advantages of CGE models include depicting the entire economic structure during the analysis and the limited data requirements. The underlying principle for these models is that prices and production or consumption in both factor and output markets are endogenous as is income. At equilibrium, four major market characteristics must be fulfilled. First, the total market demand equals the total market supply; this is for every factor and output markets. Second, prices are set so that equilibrium profits of firm are zero with all rents accruing to factors. Third, household incomes equal household expenditures. Fourth, government tax revenues equal government expenditures that include subsidy payments. Thus, the CGE model contains a complete specification of the optimization problems facing all actors in the economy. This makes it possible to trace all results of the model to specific agents in the economy.

The benchmark data for computable general equilibrium models are usually social accounting matrices (SAM). The techniques of formulating CGE models based on any SAM are detailed in Abbink, Braber and Cohen (1995). Löfgren, Harris, and Robinson (2001) present a procedure for constructing an algebraic standard CGE model in General Algebra Modeling System (GAMS) Software (Brooke, Kendrick and Meeraus, 1992). Rutherford presents a simplified implementation of the same model using GAMS/MPSGE software (Rutherford, 1998).

A static CGE model of Tanzania was formulated using GAMS/MPSGE software. In the model, outputs in all sectors are endogenously determined and prices are assumed sufficiently flexible to clear the commodity and factor markets. Domestic production includes marketed outputs and those outputs produced and consumed at home. Goods and factor markets are associated with a supply-demand balance condition. Households and enterprises or corporations are subject to budget constraints. For enterprise, any revenue from factor earnings is allocated to tax payments or transfers to households. The government is likewise subject to a budget constraint such that expenditures equal tax revenue. The investment-savings balance ensures payment for any undertaken investments. In order to explore the temporal impact of AGOA; growth in technical efficiency of intermediate inputs and capital accumulation from one period to the next was update exogenously. Change in capital stock and saving from one period to the next were updated endogenously to assess the potential impacts of AGOA on poverty measures such as incidence of poverty, intensity of poverty and poverty vulnerability.

The following section presents a summary on AGOA as related to Tanzania's textile industry. The Tanzanian's Social Accounting Matrix for fiscal year 2001 that forms the basis for the CGE model is reviewed in section 3. The structure of the CGE model used in the analysis is discussed in section 4. Literature on factor productivity analyses is reviewed in Section 5. Results of the factor productivity analyses and simulation experiments for the CGE models are discussed in section 6; conclusions and policy implications are presented in section 7.

THE AFRICAN GROWTH AND OPPORTUNITY ACT

The African Growth and Opportunity Act (AGOA) is developed to provide reforming Sub-Saharan African (SSA) countries the most liberal and duty-free access to the U.S. market. Eligible Sub-Saharan African countries may export to the U.S. some listed goods subject to zero import duty (AGOA, 2000). AGOA was signed into law in 2000 as Title 1 of The Trade and Development Act of 2000 as amended to AGOA II in 2002 as section 3108 of the Trade Act of 2002. AGOA III was signed into law in July 2004. AGOA III extends the trade benefits to 2020. AGOA III also expands the third-country fabric provision rule, which permits some countries to use fabric from another country to produce goods that are AGOA eligible. Currently, 37 SSA countries qualify for the trade benefits offered by AGOA.

The act supports U.S. businesses that invest in Sub-Sahara Africa, with anticipation of building stronger markets and partnership between U.S. and African firms. In addition, AGOA offers tangible incentives for African countries to continue their efforts to open their economies and build free markets. AGOA can change the course of trade relations between Africa and the

U.S. for the long term, while helping millions of African families to find opportunities to build prosperity: by reinforcing African reform efforts; by providing improved access to U.S. technical expertise, credit, and markets; and by establishing a high-level dialogue on trade and investment. Since its implementation, AGOA has encouraged substantial new investments, trade, and job creation in Africa. AGOA has helped to promote Sub-Saharan Africa's integration into the multilateral trading system and allowing a more active role in global trade negotiations. AGOA has also contributed to economic and commercial reforms, which make African countries more attractive to U.S. companies (AGOA, 2002). Beneficiary countries are subject to an annual review to ensure that they are on course with policy reform, including economic liberalization and the formation of democratic institutions. As highlighted by the African leaders in 2001 when meeting the U.S. president, AGOA is a window of opportunity for poor African countries for job creation and poverty alleviation, a vehicle for attraction of foreign direct investment through the lucrative market access opportunities it affords.

The statistical database of the U.S. department of commerce indicates that from 1999 to 2003, imports from AGOA-eligible countries increased by more than 50%. The United States imported $24.4 billion of duty-free goods under AGOA in 2003. However, three sectors (i.e., energy-related products, textiles and apparel, and transportation equipment) accounted for over 90% of the imports. Major beneficiaries of AGOA were Nigeria, Angola, Gabon and South Africa, which accounted for 86% of total exports shipped in 2002 and 2003. Benefits to Nigeria, Angola and Gabon are credited to export of oil and natural gas products. Benefits to South Africa, and other countries such as Lesotho, Cameroon, Kenya, Chad and Madagascar accrue from export of textile and apparel products. Combined, the nine countries accounted for 91% of the total export in 2002 and 2003. In the same period, of the $6.4 billion non-energy products exported under AGOA, apparel accounted for more than 36%. Lesotho is the major exporter of apparel under AGOA, rising from $251 million in 2001 to $393 million in 2003. Some reports indicate that AGOA created 62,395 jobs through direct and indirect impacts in South Africa. Similar trends on new jobs creation are observed in Lesotho, Kenya, Madagascar, and Swaziland. A good summary on AGOA legislation and participation process can be found in Nouve and Staatz (2003).

However, two major problems do exist. First, in most AGOA-eligible countries major apparel plants are foreign owned. Weak or lacks of will or capacity to enforce labor law, the working conditions and wages offered are very low. Wages range from $0.5/day in Malawi to $1.93/day in Lesotho. Despite job creation, such wages will have little or no impact on poverty alleviation. Second, establishing an apparel factory requires relatively little capital investment compared to a textile mill that require several years to breakeven. Therefore, the bulk of investment has been concentrated on apparel production rather than the textile sector. Insistence of economic and/or political shocks could result in a complete collapse of the apparel and textile industries in these countries.

It is also a common knowledge that that many foreign investors are reluctant to make major long-term investments because AGOA is not a free trade agreement, thus creating policy uncertainties. For example, when a bill on AGOA III stalled in the U.S. legislative bodies, some foreign-owned firms in Madagascar started to relocate to Asian countries. At the same time, about one thousand garments workers in Swaziland lost their jobs due to downsizing. To remove this uncertainty it is argue that AGOA should not be a unilateral U.S. action but a trade agreement among these countries. While the trade concessions under AGOA are temporary and unilaterally determined by the United States, trade agreements tend to long-term and disputes are subject to mutual reviews that remove uncertainties in the decision-making process.

Internationally, export quotas of textile and apparel products under the World Trade Organization's (WTO's) Multi-fiber Agreement may be eliminated in the future. For AGOA-eligible countries, to survive the fierce competition in the world market, competitiveness and vertical integration are needed at every stage of the textile and apparel sectors-from cotton production to ginning, spinning and weaving the fabric. Without removal of domestic U.S. agriculture subsidies, these countries will never be able to compete with the U.S. agricultural products. AGOA-eligible countries may end up in partisan politics and fail to participate on issue of removing subsidies in the U.S. agriculture. Despite all these shortcomings, for eligible countries, AGOA is still a window of opportunity for developing trade-based economies that favor poor households. Careful planning in terms of investment and policy decisions are needed to counter the regressiveness of AGOA.

Whereas AGOA creates a positive environment for the U.S. firms to invest in SSA, it is clear that the benefits are still skewed toward export of oil and gas products. Most observers agree that growth in the petroleum and mining sectors probably would have occurred due to other market factors. Importantly, growth in these sectors produces relatively low direct benefits to poor households in rural areas. Since poor households depend on agriculture, expanding market access for agricultural products will have the greatest impact on both economic development and poverty alleviation. Health concerned and population diversity in the U.S. have created profound niche markets for year-round fresh fruits and vegetables, horticulture and floriculture products, organic food, aquaculture and seafood, spices, craft items and many more. Imperatively, marketing research and investment in value-added processing plants, as well as the enhancement of export product quality and phyto-sanitary standards might diversify export opportunities for AGOA-eligible countries, including Tanzania.

TANZANIA REACTION TO AGOA

Tanzania was made eligible for AGOA benefits in 2000. It, however, qualified for its preferential treatment for leather and textiles in 2002, having established an effective export visa system and an enforcement mechanism to prevent transshipment under the Tanzania Customs and Export Regulations act of 2001, section GN 260, that amend the East African Customs and Transfer Tax Management Act of 1970 (GoT, 2002). As regard to export earnings under AGOA, Tanzania's export was below $1.7 million in 2003. Tanzania needs all the market access it can get, as well as good prices for its exports to counter its heavy trade deficit of more than $900 million (BoT, 2004). Due to her comparative advantage in cotton production, Tanzania is mainly focusing on exporting fabric, textile, and leather products to the U.S. market. The center of attention is on producing value added products for export instead of exporting raw cotton and cotton lint.

Tanzania's cotton processing and textile industries, which dominated the manufacturing sector in the 1970s and early 1980s, have long suffered serious setbacks leading to under utilization of homegrown cotton and available industrial capacity. In the country, more than 5 million peasants are involved in cotton farming. During its peak, the cotton processing and textile industry provided employment to over 35,000 people. The total investment was in excess of $500 million. The industry was the third contributor to the government revenue through various taxes and as the largest exporter of manufactured goods in the country. Various economic problems in the late 1980's led to the industries to collapse. In 1996, for example, two industries were operating out of the 35 textile mills established during the peak period. Most of the textile firms in Tanzania where fully integrated (i.e., undertook all the operation from spinning, weaving to finishing (TCB, 2002).

The government of Tanzania has undertaken measures to revive the textile and leather sector through improved government macro and micro policies, and privatizing public textile mills and ginneries. Some of the privatized firms are in operation after the new owners had undertaken rehabilitation and modernization of the industries. Some new textile mills and ginneries have been established. Cotton production has increased from less than 100,000 bales of cotton lint in 1995 to more tan 350,000 bales in 2003 (each bale weigh 181 kg). Currently there are about 30 cotton ginneries and 49 textile mills in Tanzania; however, only 18 out of 49 textile mills were operating at full capacity in 2003.

To revamp the cotton sector, the Tanzania Cotton Rehabilitation program with the aim of increasing cotton production and productivity was launched in 2001 (TCB, 2002). The major objectives of the program are to increase cotton production to about 750,000 bales per year by 2006 and increasing premium grade cotton produced in Tanzania. This is to be achieved by rehabilitating existing research facilities, developing and releasing new varieties, encouraging farmers to grow certified seeds, and strengthening the exiting extension services. Nevertheless, in order to achieve the set target, the domestic price, policy support, and other marketing services should be favorable to farmers and exporters for new capital injection. On the textile industry, the focus is on increasing the capacity of producing value added products and supporting the privately owned industries. Regarding the market, it is anticipated that AGOA will guarantee the export of all value added products from these sectors.

Apart from enabling trade policy environment, the success of AGOA will largely depend on the production structure of the Tanzania economy and the capacity to change, with changing economic environment. On the domestic front, Tanzania faces a number of constraints and challenges. These include: poor record of social indicators, wide spread poverty and increasing income inequality, HIV/AIDS, low domestic resource mobilization, low level and unsupportive development of basic infrastructure, divide to a digital opportunity, overwhelming supply side constraints aggravated by low productivity in agriculture and low level of human resources development, and environmental degradation. Externally the debt overhang remained a serious constraint. Debt servicing obligations diverted the much-needed resources for enhancing economic growth and improving delivery of social services. A number of areas can be identified as potential growth "centers" once the right mixes of policies is pursued. These include: agriculture once transformed to a modern and commercial sectors; manufacturing once investments are stimulated into export of value added products; mining as driven by private sector initiatives; and, tourism through aggressive promotion of the Tanzania's unique tourist attractions (URT, 2001). Table 2 presents the Tanzania production structure in 2001.In Table 2, only 8% of produced output was directly exported.

COMPUTABLE GENERAL EQUILIBRIUM MODEL FOR TANZANIA

A 2001 TANZANIA SOCIAL ACCOUNTING MATRIX

A proper assessment of the distributional effect of different development program or policy options requires a comprehensive framework to analyze interactions and linkages between different sectors of the economy at the macro and micro levels. A social accounting matrix (SAM) is a statistical representation of the circular flow, in which every transaction between the actors in the economic system is accounted for. In other words, the SAM is a presentation of the System of National Accounts (SNA) elaborating the supply and demand system in an economy. It shows how income is derived from production activities and how it is distributed to the various socio-economic groups (Pyatt and Round, 1979). The matrix integrates the flow of goods and payments between institutions in the economy. A simple SAM contains four sectors, namely activities; commodities; factors of production; and institutions. Production firms purchase inputs from other industries and pay for factors of production such as capital and labor and for other services rendered. The factors of productions pass this money along to households. The households, in turn, pay the commodity sectors for purchases of food, clothing, and other services. The SAM, therefore, provides a comprehensive and detailed quantified description of the macro and micro economic interrelationships in the country. It thus serves as a useful tool for policy analysis at both macro and micro levels (Cohen, 1988).

Thurlow and Wobst (2003) present a detailed account on the processes of developing the SAM. The SAM itself contains six sections: a) activities: agricultural (21 accounts) and non-agricultural (22 accounts); b) commodities: agricultural (21) and non-agricultural (22 accounts); c) marketing margins (3 accounts), d) factors of production (13 accounts); e) institutions: households (12 accounts), government (1 account), and enterprise or corporation (1 account); f) taxes (6 account); and g) one account for trade and investment. The household section is divided into urban and rural households. In each category, households are organized into six groups that include households below the poverty line, between food and basic needs, non-poor-head with no education, non-poor-head without primary education, non-poor-head without secondary education, and non-poor-with secondary education. Table 3 presents disposable income among Tanzania households in 2001.

Disposable income is the part of a person's income remaining after deducting personal income taxes. In national income accounting, disposable income is the total disposable income of all consumers. Disposable income is part of income (after taxes) that is available for saving or spending. From Table 3, per capital disposable income was 220,476 Tshs (or equivalent to $251) in 2001. About 80% of the population lived in rural areas and earned about 69% of the total national disposable income of about 6,903 billion Tshs. Factors of production was divided into a subsistence factor, labor, agricultural capital, non-agricultural capital, and agricultural land. Labor supply was divided into child, female, and male labor sub-groups. Child labor supply is for participants aged 10 to 14. Female and male labor supply is for participants aged above 14 years and grouped into those without formal education, finished primary school, unfinished secondary school, and finished secondary school or higher education. Table 4 summarizes major sources of income to households. In general, rural households derive the greatest proportion of income from the subsistence factor. The subsistence factor was largely used in the production of food and non-traditional food crops, which are mainly for home consumption. It is a composite of labor and capital (Thurlow and Wobst, 2003). Urban households derive most of the income from firms, which represents enterprise or corporations mainly in forms of wages and salaries. This is also true for rural households with at least primary educations. It can also be noted that capital as a source of income is important in rural areas. In the SAM-data nonagricultural capital comprised 76% of the total capital supply.

Taxes include direct taxes, import tariffs, export taxes, value added or activity taxes, indirect or sale taxes, and factor taxes. The marketing margins include export transaction costs, domestic sales transaction costs, and import transaction costs. Marketing margins combine trade and transport costs. They represent real costs associated with the distribution of products from their point of production or port of importation to the point of purchase. The averages marketing margins and tax rates in 2001 are summarized in Table 5. The textile and the leather industry face the worst business environment in terms of higher marketing margins, import tax and indirect tax rates. Higher import tax rates among the textile and leathers industry and agro-processing and manufacturing sectors are mainly imposed to protect the local industries. Higher indirect tax rate on the textile and leather products are for revenue collection purposes.

Tables 6 present the general basic structure and the aggregated 2001 macro SAM for Tanzania. As shown in Table 6, a square SAM is balanced when the rows sums equal the column sums, roughly corresponding to the conventional notion of double-entry-book-keeping and satisfying the zero profit and market clearing conditions. In the Table, the activity column represents expenditure by production activities, which show that about 6 trillion Tshs was spent on intermediate inputs, 8 trillion Tshs was spent on factor of productions, and the activities paid 21 billion in value added tax. The commodity column (C) shows that good value at 12 trillion Tshs was marketed in the domestic market and the retail and marketing cost was about 356 billion Tshs. The indirect tax on marketed output was 436 billion Tshs, and value of import at cif was about 2 trillion Tshs. The factor column (F) shows how the factor income was distributed to households (i.e., 2 trillion to enterprises, 5 trillion to households, 18 billion was paid to government as factor income tax, and 25 billion was paid as dividends to factors own by foreigners). The enterprise income (column E) was distributed to households (2 trillion Tshs), 1 billion Tshs was paid to the government as dividend, and 96 billion Tshs was paid in form of enterprise or corporate taxes. Columns H, which represents households expenditure shows that goods valued at about 2 trillion Tshs was produced and consumed at home by households. Private household consumption was valued at about 5 trillion. The households paid 94 billion Tshs in income tax and households saving were 903 billion Tshs. The government column (G) indicates that the government paid for goods and services valued at 514 billion Tshs, distributed 61 billion as direct support to households, and saved about 91 billion Tshs. The government collected 666 billion Tshs in tax revenue (column TA). The trade column (TR) shows that commodities values more than 1.3 trillion Tshs were exported. The households received 403 billion Tshs in form of remittances from abroad. Foreign investment was about 324 billion Tshs. About 1.3 trillion Tshs was invested in the production of commodities (Column I). The average daily exchange rate in 2001 was 877 Tshs per U.S. $ (BoT, 2004). A thing to note in Table 6 is that the Tanzania SAM distinguishes between goods produced for home or own consumption and goods produced for the domestic markets. Goods produced for home consumption appear as payment from households to activity accounts and is valued at households' consumption prices, which does not include marketing margins and sales taxes that may be levied on marketed commodities. In addition, the economy exports commodities instead of activities. Source of data and definitions of each entry in the aggregate SAM are discussed in detail in Thurlow and Wobst (2003) see also Appendix 1 for the SAM sub-matrices definitions.

THE STEADY-STATE (STATIC) MODEL

Calibration or benchmarking determines the values of the normalizing parameters to replicate the observed flow values incorporated in the SAM. This process assumes that all equations describing market equilibriums in the CGE model are met in the benchmark period (Vargas et all, 1999). Since CGE modeling deals with flexible functional forms, such as the constant elasticity of substitution (CES) or the constant elasticity of transformation (CET), the calibration process is supplemented with exogenously determined elasticities of substitution. Other parameters to be obtained from the literature include income elasticities and price elasticities of export and import demand. These parameters are used in the calibration process of the various components of the CGE model.

Since in CGE analysis only relative prices matter, all prices and factor rents are normalized to unity in the initial equilibrium. With prices normalized to one, the flow values in the SAM are physical index of quantity in the commodity (industry) and factor markets. Once all the parameters are specified, the model is solved to reproduce the benchmark data. In addition to providing a check on the accuracy of the calibration, the replication process also shows that there is a complete balance between circular flows of income and expenditures or there is a micro-consistency within the SAM data. Counterfactual equilibrium is obtained by introducing shocks to exogenous variables, changes in market conditions, or changes in any policy variable and rerunning the model. In other words, the CGE models work by using SAM data to describe the economy in a benchmark year, and by then varying one or more elements to shock the economy and register changes among macro and micro variables

The CGE approach offers an opportunity to transform a SAM into an economy-wide static or dynamic model without many supplementary data while focusing on the demand side of the economy (Robinson, 1989). The CGE models work by using SAM data to describe the economy in a benchmark year; and then, varying one or more elements to shock the economy and register changes among macro and micro variables. The formulated static Tanzania CGE model contains a system of simultaneous equations divided into four blocks: price; production and trade; institution; and the economic system constraint blocks. The price block consists of equation in which endogenous models prices are linked to other prices (endogenous or exogenous) and non-price model variables. The production block covers domestic production and input use; allocation of domestic output to home consumption, the domestic market, and export; the aggregation of supply to the domestic market; and the definition of the demand for trade inputs that is generated by the distribution processes. The institution block has equations that define income distribution to factor of production and owner of factor of production, intra-institutional transfers, household consumption expenditures on both domestically produced and imported commodities, investment demand and saving rates; and government expenditure. The fourth block contains equations that balance the market for factors of production, market for commodities (demanded equals supply), and government expenditure (revenue equal expenditure).

Specifically, in a GAMS/MSPGE framework (Appendix 2), the model included: seven classes of production activities, eleven classes of prices or cost indexes, and three types of consumers (i.e., households, government, and private firms). Production activities included: total domestic production, production of output to domestic and export markets, production for export markets, aggregate supplies, transportation margins, household consumption, and aggregate investments. Price or cost indexes include: output supply price, domestic sales price for marketed output, domestic export price, composite demand price for marketed output, household consumption price, trade and transport margins, factor prices, tax revenue, enterprise or private firm rents, export and export prices in foreign currency, and price of investment.

Nested CES (constant-elasticity-of-substitution), Leontief (fixed-coefficient), and Cobb-Douglas functions represent production technology in the model (Figure 1). The domestic production activity has a nested CES cost function with a Leontief aggregation across intermediate input and factor demands at the top level. The reference output quantities are the SAM values of domestic marketed output, household production for own consumption, and value of export. There are two types of inputs to the domestic production function, corresponding to aggregate intermediate input demand and value added. Value added is the Cobb-Douglas function of the primary factors, while intermediate input functions are defined by fixed input-output coefficients. In the model an ad-valorem tax rate is applied only to domestic sales. The reference price or the user cost gross ad-valorem tax rate is the reference for domestic output price. The ad-valorem tax revenue is paid to the government. Both the domestic output price and the ad-valorem tax rate were estimated from the SAM data.

In the model, the production sectors produce differentiated goods for domestic market, households' own consumption, and export markets, sectoral allocation between the markets being a CET (constant-elasticity-of-transformation) functions. The value of export at producer prices and export marketing margins serves as an input in the export sector. Producer price and trade and transportation margins serve as inputs associated with price for domestically marketed output. The aggregate supply or the Armington aggregation activity constitutes a composite of imported and domestic goods that are imperfect substitutes. The activity is presented a nested CES cost function with elasticity of substitution between imports and domestically produced goods being equal to zero.

Indirect taxes are levied on aggregate commodities and import tariffs are levied on imported commodities. The marketed output price index serves as an input to the Armington aggregation sectors. There are three types of inputs to the Armington aggregation activity: domestic sales price; trade and transportation costs; and price of foreign exchange. The domestic sale price represents domestic use of locally produced goods, trade and transportation costs represent domestic sales and import transaction costs, and prices of foreign exchange represent value of imports at cif. In this activity, top-level substitution elasticity equals to two, and a vector of second level input nests, each with an elasticity of substitution equal to zero (Leontief technology). Using a Leontief aggregation on the inputs assures that domestic and import margins remain strictly to the base year level. The commodity flows in the model are presented in Figure 2.

Final consumption by consumers and producers is characterized as a Cobb-Douglas composite of goods. Price of investment serves as an input to the investment sectors. Aggregate investments equal to savings. The input is the composite demand price index for marketed output, which defines the benchmark quantity of private investment. The model statement concludes with a specification of commodity endowments and demand for each institution. Households are endowed with income from primary factors, government transfers, earning from private firms and from rest of the worlds. They are also endowed with negative quantities that represent demands for investment (or savings) and income taxes. Household income is allocated to private consumption. For enterprise, any revenue from factor earnings is allocated to tax payments or transfers to households. The government sector is likewise subject to a budget constraint such that government revenue from different sources equals expenditures that include government transfers, savings and debit payments. Flows of institutional incomes and domestic demand are presented in Figure 3.

The model was is written in a mathematical programming system for general equilibrium (MPSGE) language, specially designed for solving Arrow-Debreu economic equilibrium models (Rutherford, 1998). The idea of the MPSGE program is to provide a simpler way to write down and analyze complicated systems of nonlinear inequalities. The circular flow of commodities, income and services in the complete model are presented in Figure 4.

THE RECURSIVE DYNAMIC CGE MODEL

The simplest dynamic CGE model is a steady-state model explained above. Essentially, a steady-state model is a static model with one period, where some steady-state conditions are satisfied primarily with respect to investments. The steady-state model is useful to illustrate the balanced growth path that may emerge in the long-run and can be used to analyze the steady state properties of the equilibrium. This type of model can however not be used to analyze the transition paths from the current growth path to a sustainable growth path. The recursive-dynamic CGE models are characterized as a series of individual one-period model simulations. The model is solved recursively, for each period separately, where the periods are linked through the capital stock. In comparison to the steady-state model, the recursive-dynamic approach has an advantage of enabling the calculation of the transition path from the initial steady state to a new steady state, which is of particular importance for policy making, and cannot be studied in a steady-state model (Dellink, 2005).

The recursive dynamic CGE model is developed to capture the transition path of AGOA in a 20 years period. Changes in productive efficiency were modeled using Constant Elasticity of Substitution (CES) production functions as follows:

$$Y = \theta[\varphi L^{\rho} + \beta K^{\rho} + \gamma(\lambda M^{\rho})]^{\eta/\rho} \tag{1}$$

where Y is total output, L is labor, K is capital, and M is intermediate inputs. In Equation 1, θ, ϕ, ϱ, β, γ, and η are CES production function parameters and λ is the productivity shift parameter for intermediate inputs. The parameter η is a measure of the economies of scale, while the parameter ϱ yields the elasticity of substitution (ς) such that ς = 1/(1 + ϱ). To separate the elasticity of scale, from the other parameters requires that α + β +γ = 1. This also imposes constant return to scale. The productivity shift parameter, λ, equals 1 in the reference case, greater than 1 in the case of an increase in intermediate inputs productivity, less than 1 when there is a decrease in intermediate inputs productivity.

The SAM data provides benchmark equilibrium point, defined by stocks of available labor (L_0), Capital (K_0), and intermediate inputs (M_0). If the respective reference price are PL_0, PK_0, and PM_0, and the value of total output is Y_0, the zero profit condition imply:

$$Y_0 = PL_0 * L_0 + PK_0 * K_0 + PM_0 * M_0. \tag{2}$$

This allows writing the CES production function in calibrated share form and constant economies of scale as follows:

$$Y = Y_0[\varphi(L/L_0)^{\rho} + \beta(K/K_0)^{\rho} + \gamma(\lambda(M/M_0)^{\rho})]^{1/\rho}, \tag{3}$$

In which,

$$\begin{aligned} \varphi &= PL_0 * L_0 / Y_0, \\ \beta &= PK_0 * K_0 / Y_0, \\ \gamma &= 1 - \alpha - \beta. \end{aligned} \tag{4}$$

It can also be shown that the unit cost function (c), defined as an index price in the benchmark is:

$$c = [\varphi(PL/PL_0)^{(1-\varsigma)} + \beta(PK/PK_0)^{(1-\varsigma)} + (1 - \varphi - \beta)(PM/PM_0)^{(1-\varsigma)}]^{1/(1-\varsigma)}, \tag{5}$$

where PL is the equilibrium price for labor, PK is the equilibrium price for capital, and PM is equilibrium price for intermediate inputs. Demand for intermediate inputs is therefore:

$$\mathbf{M = (M_0/\lambda)\ Y\ (cML_0\lambda/PM)^{\varsigma}.} \tag{6}$$

For the case were ς=1, then the effect of λ on the compensated demand for intermediate inputs operates through the effect of λ on c (i.e., c decreases as λ increases). The effect of an improvement in productivity change is to reduce the compensated demand for M for each unit of output. The technique outlined above for representing technical change works for any nested CES function, independent of the depth of nesting. However, there is also a need to adjust the reference quantity in inverse proportion to productivity improvement index and simultaneously increase the reference price in proportion to the improvement. When, $\varsigma > 0$, there are both exogenous and endogenous technical change. The shift parameter, λ, changes the underlying technology by shifting the isoquant. Productivity change is through movements along the isoquants. Substitution of intermediate inputs for other factors of production is achieved by changes in relative price of intermediate inputs.

Recursive dynamic CGE models solve a sequence of static equilibria. The equilibria are connected to each other through capital accumulation equation. The interdependence allows the model to be sequentially solved for each determined period. Specifically, capital stock in each period is set equal to the last period's capital stock plus new investment minus depreciation. In the Tanzania SAM data, investment is presented by commodity and not by factor of production (i.e., the investment data is note disaggregate by both factors of production and commodity). The output-to-capital ratio, which provides the unit capital required to produce one unit of output, was used to develop the capital accumulation equation as follows:

$$KD_{g,f,t+1} = \upsilon_{g,f,t}(1-\delta)KD_{g,f,t} + \varepsilon_{g,f,t}(P_{inv}IT_{g,t}), \tag{7}$$

where $KD_{g,f,t}$ is the capital stock for commodity g, f is type of factor of capital stock , t is the time frame, δ is depreciation rate, $\varepsilon_{g,f,t}$ is the investment share to capital and introduces investment by designation as represented in the SAM data, P_{inv} is price of investment which is equal one for the calibrated model and estimated for the counterfactual model, and $IT_{g,t}$ is the nominal total investment for commodity g in time t. The parameter $\upsilon_{g,f,t}$ represents the exogenous capital shift as related to AGOA policy. The nominal total investment is a product of marginal propensity to consume and private expenditure. The marginal propensity to consume was estimated from the SAM data as a ratio of base year investment demand and base year total expenditure.

POVERTY ANALYSES IN A CGE FRAMEWORK

The measurement and analysis of poverty are crucial for cognitive purposes (to know what the situation is), for analytical purposes (to understand the factors determining this situation), for policymaking purposes (to design interventions best adapted to the issues), and for monitoring and evaluation purposes (to assess the effectiveness of current policies and to determine whether the situation is changing). Various definitions and concepts exist for defining poverty. This study focuses on what is typically referred to as incidence of poverty, that is, whether households possess enough resources or abilities to meet their current needs. This definition is based on a comparison of households' income or consumption with some defined threshold below which individuals are considered as being poor in that particular attribute. Finally, the study considers the vulnerability dimension of poverty, defined here as the probability or risk today of being in poverty-or falling deeper into poverty-at some point in the future. Vulnerability is a key dimension of poverty, since it affects households' behavior (in terms of investment, production patterns, coping strategies) and their perception of their own situation. In another words, poverty vulnerability is a stochastic dimension of poverty. Whereas incidence and severity of poverty measure ex-post poverty (poverty alleviation), vulnerability to poverty is an ex-ante concept.

Although the concepts, measures, and analytical tools can be applied to numerous dimensions of poverty, two important measures are needs to be estimated. The first step involves estimating the poverty equivalent scale. The second step involves estimating the poverty line. The standard means of determining whether a household is poor involves a comparison of its estimated poverty equivalent scale (or welfare measure) to a poverty line. In analyzing poverty, Deacaluwe et al (2001) shows that a beta function adopts fairly well under asymmetric situations by generating skewed distributions, and is more flexible in terms of utilizing socio-economic information contained in the household level data. The beta function is defined as

$$I(w:p,q)=\frac{1}{B(p,q)}\left[\frac{(w-w_{min})^{p-1}(w_{max}-y)^{q-1}}{(w_{max}-w_{min})^{p+q+1}}\right]; \qquad \text{where,} \tag{8a}$$

$$B(p,q)=\int_{w_{min}}^{w_{max}}\frac{(w-w_{min})^{p-1}(w_{max}-w)^{q-1}}{(w_{max}-w_{min})^{p+q+1}}\Delta W. \tag{8b}$$

In Equation (8) w is the welfare measure (e.g., income or consumption) for a group of households, W_{max} and W_{min} are, respectively, the maximum and minimum welfare measure within a particular household group, and p and q are, respectively, beta function parameters that influence the shape and the skewness of the distribution. The advantage of the beta function is that it can be skewed to the left or to the right and be symmetric. If p and q are greater than unity and p > q, the distribution is skewed to the left and the mode is situated on the left side of the distribution and vice versa. As the inequality between p and q increases, the skewness increases. If p equals q, the function becomes symmetric. When w in Equation (8) is known, the parameters p and q can be estimated using maximum likelihood. The most popular money-metric poverty index (or incidences of poverty) is that of Foster, Greer and Thorbecke (1984) defined as:

$$P_{\alpha}=\int_{W_{min}}^{z}\left[\frac{z-w}{z}\right]^{\alpha} I(w:p,q)\partial w \cong \left[\frac{M}{N}\left(\frac{z-w}{z}\right)^{\alpha}\right] \tag{9}$$

In Equation 9, P_{α} is the measure of deepness of poverty; z is the poverty line or a poverty threshold, α is the poverty aversion parameter or a measure of inequality parameter, M is the number of poor households, and N is the total population. When α=0, then P_{α} measures the incidence of poverty or headcount ratio, which is given by the proportion of the population who are poor. When α =1, P_{α} measures the poverty gap or poverty depth given by the aggregate income shortfall of the poor as proportion of the poverty line and normalized by the population size. It is also an indicator of the minimum cost of eliminating poverty using perfectly targeted transfers. When α =2, the index measures the severity (or intensity) of poverty and gives more weight to the poorest of the poor.

In the literature, there are two kinds of poverty lines: one is an absolute poverty line and the second is a relative poverty line. The absolute poverty line is based on a basket of quantities of commodities reflecting basic needs or minimum consumption requirements for each individual member of the population (Ravallion, 1994). With this approach, the value of the basket is determined using prevailing price and a minimum per capital income line (poverty line) determined. Relative poverty lines are used to define the poor relative to the average living standards in a given country. A relative poverty line is determined in relation to a certain percentage of the mean, mode or median of per capita expenditure or income within the country. For example, it may be determined that households receiving less than 50% of the median per capital income are poor. Although the minimum basket of goods may remain the same, both lines are not fixed, as the monetary value of the basked will change with inflation and the relative poverty line will change with average expenditure or income levels.

Poverty vulnerability is probability of an individual or household falling below the poverty line in the near future. Let the income distribution of a particular household group be that as shown in Figure 5. Following a positive external shock on the economy, the income distribution may shift to the right (from B_1 to B_2). Changes in price or income will shift the poverty line to the right (from P_1 to P_2) or to the left (from P_1 to P_3). Poverty vulnerability can be estimated as a difference between the areas of B2 (new income distribution) evaluated at P_2 or P_3 (new poverty lines) and P_1 (old poverty line). The estimated area measures the proportion of the population that moved into or out of poverty. In addition, if the shift in income is symmetric – dispersion parameters of both income distributions are similar, the area of graph B2 evaluated at P_1, P_2 or P_3 is equal to the area of graph B1 evaluated at the same points. Poverty vulnerability is therefore estimated as the area between new and old poverty lines.

The Tanzania Bureau of Statistics uses two poverty lines: the food poverty line and the basic need poverty line. Both lines are determined from the household budget survey data using the reported consumption pattern by the second quintile of the sample population. Usually, the group consumption per adult equivalent per day for 28 days are tabulated for all food items whose consumption is reported in the survey data. The consumed food items are adjusted so that their calorific values sum to 2,200 calories per day, the minimum calorie requirement for an adult. These quantities are then priced using median unit price calculated from the survey data. The quantities define the basic need basket and the value of the basic need basket gives the food poverty line. To account the fact that households consumes other non-food items, the basic need poverty line is calculated by adding 25% of the within group expenditure on non-food items. For 2001, and using the same data used to construct the 2001 SAM, the food poverty line were, respectively, 5,607 Tshs/28 days and 5,107 Tshs/28 days in urban and rural areas. The analogous values for the basic need poverty line were 7,680 Tshs/28 days (or 99,566 Tshs/year) and 6,996 Tshs/28 days (or 90,948 Tshs/year) for urban and rural areas, respectively (NBS, 2002). Based on the 2001 daily exchange rate this is equivalent to $0.20 - 0.30/day which was below the World Bank's poverty line of about $1/day.

For this study, the basic need poverty line developed by the Tanzania Bureau of Statistics was adopted. For simulation purposes, the poverty line itself (z in Equation 8) was determined endogenously within the CGE model. This is achieved by adjusting the estimated basic need poverty line by the Laspery's price index. As shown above the basic need poverty line is determined by a basket of quantities of commodities reflecting basic needs. The monetary value of the poverty line is obtained by multiplying the basic needs basket by their respective prices and aggregated across commodities. The commodity prices are endogenously determined within the model, so is the monetary value of the line. We can define the base year monetary value of the basic need basket as a proportion of total household expenditure. Since the basic need basket remain invariant from on simulation to another, it can be easily shown that the poverty line after the model simulation is:

$$P_{bs}Q_b = P_{b0}Q_b\left[P_sQ_0 / P_0Q_0\right] \quad = P_{b0}Q_b(RPI), \tag{9}$$

where P_{bs} is the price of basic needs basket after the model simulation, Q_b is the quantities of the basic needs basket, P_s is price of all commodities after simulation, Q_0 is the quantities of all commodities consumed, and RPI is the Laspeyres price index. Equation (9) indicates that a change in commodity prices following the external economic shock, the poverty line will also shift. Increase (decrease) in commodity prices will shift the poverty line to the right (left) and poverty will increase (decrease).

PRODUCTIVITY AND EFFICIENCY ANALYSES

In this section, we briefly describe the procedure used to estimate total factor productivity measures along with mathematical techniques used to calculate Malmquist Productivity Indices using Data Envelopment Analyses techniques. This is related to the fact that poverty level of any country is usually related to potential for economic growth. Without sustainable economic growth, it is unlikely that the poverty alleviation goals can be achieved. In return, economic growth can be impacted by a number of factors that include but not limited to: changes in terms of trade, and changes in factor productivity. As shown earlier, AGOA may improve Tanzania terms of trade. However, this is a short-term phenomenon. In the long-run, the sustained manner of alleviating poverty is to increasing the amount of output produced per unit of factors of production (i.e., increase in factor productivity). Higher levels of productivity translate into higher returns for the factors of production, which generally go hand in hand with job creation, improved living standards, and international competitiveness of local firms. In this section, procedures for estimating Total Factor Productivity (TFP) growth are discussed. This is within an output distance function framework and looking at the following components of TFP: technical change or technical progress and technical efficiency change. The Data Envelopment Analysis (DEA) technique for estimating and decomposition of TFP are presented in the following subsection.

DECOMPOSITION OF TOTAL FACTOR PRODUCTIVITY USING DEA

A simple definition of total TFP is the ratio of outputs to inputs used in the production process.

The common measure of TFP is the Malmquist total factor productivity index (MTFPI) as suggested by Caves, Christensen and Diewert (1982) and developed further by Färe et al (1989, 1992). The MTFPI is developed using the relationship between Farrel's (1957) efficient measure and the Shephard's (1953) distance functions. The output distance functions describe the maximal proportional expansion of the output vector, given input vector. Likewise, input distance function defines minimal proportional of input vector, given an output vector. The MTFPI as defined in Färe et al (1992) is a prod uctivity measure, which can be decomposed into technical efficiency change and technological progress as follows:

$$M_i^{t+1}(x^t, y^t, x^{t+1}, y^{t+1}) = \Delta EFFC \text{ x } \Delta TECH,$$

where;

$$\Delta EFFC = D_i^{t+1}(x^{t+1}, y^{t+1}) / D_i^t(x^t, y^t), \tag{10}$$

$$\Delta TECH = \left[\frac{D_i^t(x^{t+1}, y^{t+1})}{D_i^{t+1}(x^{t+1}, y^{t+1})} \text{ x } \frac{D_i^t(x^t, y^t)}{D_i^{t+1}(x^t, y^t)} \right]^{1/2}.$$

In Equation (10) M_i^{t+1} (.) is the MTFPI of a decision-making unit (DMU) using period t+1 technology relative to the period t technology, D_i^{t+1}(.) and D_i^t(.) are respective distance functions. The MTFPI is therefore a product of technical efficiency change (ΔEFFC) between period t and t+1 and a technological progress ($\Delta TECH$) within the same period. Technical efficiency change represents a change in relative distance of the observed production from the maximum potential production (moving closer to the production frontier). The technological progress or technical change is represented as the geometric mean of the two productivity indexes and represents the shift in production technologies between period t and t+1. Since Equation (10) represents the productivity of the production point (x^{t+1}, y^{t+1}) relative to point (x^t, y^t), a value of greater that unity represents a positive factor productivity growth between the two periods and vice versa.

In this paper, we measure total factor productivity (TFP) of the Tanzania processing and manufacturing sectors using the MTFPI method as described in Fare et al (1994). This approach uses data envelopment analysis (DEA) methods to construct a piece-wise linear production frontier for each firm in the sample. By definition, DEA is a linear-programming methodology, which uses data on the input and output quantities of a group of countries to construct a piece-wise linear surface over the data points. This frontier surface is constructed by the solution of a sequence of linear programming problems. The degree of technical inefficiency (the distance between the observed data point and the frontier) is produced as a byproduct of the frontier construction method.

DEA can be either input-orientated or output-orientated. In the input-orientated case, the DEA method defines the frontier by seeking the maximum possible proportional reduction in input usage, with output levels held constant. In the output-orientated case, the DEA method seeks the maximum proportional increase in output production, with input levels held fixed. The two measures provide the same technical efficiency scores when constant returns to scale (CRS) technology apply, but are unequal when variable returns to scale (VRS) is assumed. For estimation of MTFPI, the CRS technology is preferred. Coelli and Rao (2003) argue that when using aggregate data, it does not appear to be sensible to consider a variable returns to scale, especially when there are greater variability in size of operations. In addition, Grifell-Tatjé and Lovell (1995) illustrate that the estimated MTFPI may not correctly measure TFP changes when VRS is assumed for the technology. They suggest that it is important that CRS be imposed upon any technology that is used to estimate distance functions for the calculation of a MTFPI; otherwise, the resulting measures may not properly reflect the TFP gains or losses resulting from scale effects. In addition, as discusses by Ray and Mukherjee (1996) and Färe and Mitchell (1987) imposing VRS can results in infeasible or unbounded solutions.

The calculation of MTFPI using DEA techniques uses the fact that the Farrell's efficiency measure is the inverse of the Shephard's (1953) distance function. By exploiting this relation and by using the method originally proposed by Charnes, Cooper and Rhodes (1978), DEA techniques can be used to estimate the Farrell's efficiency measure, find the reciprocal of the solutions, and then substitute them into Equation (10) to derive the MTFPI and the associated decompositions. If there are a set of observed decision making units (DMUs), {DMU j; j=1,…,n}, associated with m inputs, {x_{ij}; i=1,…, m}, and s outputs, {y_{rj}; r=1,…,s}, the jth DMU in period t is therefore represented by the vector (x_j^t, y_j^t) and the jth DMU in period t+1 is represented by the vector (x_j^{t+1}, y_j^{t+1}). Four linear programming models are needed to solve all four components of Equation (10). For example, the distance function of an observed DMU_{j0} at period t from the frontier built on the observation at period t+1 (and using output-orientation) can be estimated using the following linear programming model:

$$
\begin{aligned}
&\left[D_i^t(x^{t+1}, y^{t+1})\right]^{-1} = \underset{\phi_{j0}, z_j}{Max}\,\phi_{j0} \\
&s.t. \\
&\sum_j z_j x_{ij}^t + s_{ij0}^+ = x_{ij0}^{t+1} \qquad \forall i \\
&\sum_j z_j y_{rj}^t - s_{rj0}^- = \phi_{j0} y_{rj0}^{t+1} \qquad \forall r \\
&z_j, s_j^+, s_j^- \ \geq \ 0 \qquad \forall j,
\end{aligned} \tag{11}
$$

where ϕ_{j0} is the Farrel's efficient measure under CRS for the reference DMU, z_j are nonnegative weights that characterize the level of performance of an efficient firm against which the performance of the selected firm is compared. s_{ij0}^+ and s_{rj0}^- are the slacks in input i and output r respectively. Slack in inputs $(s_j^+ > 0)$ represents an additional inefficiency use of inputs and a slack in output ($s_j^- > 0$) represent an additional inefficiency in the production of output. The technology described by Equation (11) satisfies convexity, strong disposability of outputs and inputs, and constant returns to scale (Charnes, Cooper and Rhodes, 1978).

The objective of the model is to achieve the maximum feasible radial expansion in the output of each DMU without violating best production practice. A DMU is technically efficient if the maximum is unity. The problem is solved once for each DMU in a sample period t and yielding the relevant distance function in period t. The other three components of Equation (10) that include three distance functions (i.e., $D_i^{t+1}(x^{t+1}, y^{t+1})$, $D_i^{t+1}(x^t, y^t)$, and $D_i^t(x^t, y^t)$)are estimated by modifying the constraint equations. A thing to note is that a superscript on the distance function will be similar to the superscripts of the left side variables and the superscripts within the distance function will be similar to the superscripts of the right side variables. For example, the distance function $D_i^{t+1}(x^t, y^t)$ uses data from both periods to evaluate (x^t, y^t) relative to technology constructed from t+1 (Armah, Park and Lovell, 1999).

DATA FOR FACTOR PRODUCTIVITY ANALYSES

This section presents the source of data and measures of inputs and output used in the analysis. The dataset used in the analysis was obtained from the Center for the Study of African Economics (CSAE), University of Oxford. This dataset containing firm-level production and accounts data on a sample of firms within the Tanzanian manufacturing sector, collected in a series of surveys termed Wave 1 to 4. These surveys were conducted through the Regional Program Enterprise

Development (RPED) project organized by Africa Technical Department of the World Bank. The actual surveys were conducted by the Helsinki School of Economics, in collaboration with the Tanzanian Confederation of Industries and the University of Dar es Salaam (for 1992/1995 data) and team of researchers from CSAE and Economic and Social Research Foundation (ESRF) based in Dar-es-Salaam (for 1996/98 data).

The four RPED surveys collected one year of data, plus historical data for some of the key variables. Wave 1 was undertaken in August 1993 and collected data for 1992; Wave 2 was undertaken in October 1994 and collected data for 1993; Wave 3 was undertaken in January 1996 and collected data for 1995 for some firms and 1994 for others; and Wave 4 was conducted in late 1999 and collected data for 1996, 1997 and 1998. The four waves give a maximum number of six observations per firm over the 6 years period (CSAE, 2002a, 2002b). The dataset from Wave 5 (1999-2001), which was conducted between January-February 2002, is not yet available for public use (Harding, Söderbom and Teal, 2002).

Based on the Data User Guides (CSAE, 2002a, 2002b), the total sample size were 217 firms in Wave 1, 213 firms for Wave 2, 152 firms for Wave 3, 192 for Wave 4. No replacement firms were selected in Wave 3, which accounts for the fall in sample size. There were 103 replacement firms in Wave 4. The sampling frame was the 1989 Industrial Census (for formal sector firms) produced by the Tanzania's National Bureau of Statistics, which nominally included all manufacturing firms with 10 employees or more. In addition, a sample of informal sector firms were also chosen randomly by the interview teams in the locations in which the survey was conducted. The firms constitute a panel, which is intended to be broadly representative of the size distribution of firms across the major sectors of Tanzanian manufacturing industry. These sectors include food processing, textiles and garments, wood products and furniture, metal products and machinery (CSAE, 2002a, 2002b).

The data were collected using a using a structure questionnaire, where the respondents were the owners or senior managers and, for relevant sections, workers of the sampled manufacturing firms. The questionnaire was designed by a team from the World Bank. Over the four waves of the survey, the structure of the questionnaire and the range of questions included evolved in the light of field experience and in response to emerging research issues. The overall questionnaire was divided into a number of sections, grouping questions related to different aspects of firm-level structure and performance and also a section of supplementary labor market information gathered from interviews with a sample of up to 10 workers within each firm. In order to capture the range of earnings and human capital characteristics of the workforce, interviewers were instructed to select workers from the range of occupational categories within each firm, The detail of the surveys can be found in CSAE, 2002a, 2002b) and the dataset are available the CSAE website.

For the purpose of this study, six variables were extracted from the dataset. This includes: output (OUTPUT) or total value of firm's total production during previous year; raw material Costs (RAWMAT) materials used in producing firm output per period; indirect costs of production (MISC) that include rent, utilities, transport, security, maintenance and other overhead costs but excluding labor or capital costs. Other variables were labor costs (LABCOST) including wages (WAGES) and allowances (ALLOW), capital Stock (CAP, which represented the replacement value of the firm's total stock of plant and equipment (excluding land and buildings), and total employment (EMP) which was total number of firm employees, including the owner, managers and both full and part-time workers, but excluding seasonal workers. These values were obtained from monthly or weekly figures or annualized reporteds of the sample firms. During the survey, where there was a missing observation, output was set as the value of firm's total sales in the previous year. All variables are in the 1992 constant price.

The linear programming model in Equation (11) and the corresponding other three models were used to calculate the components of Equation (10) and then used to calculate the MTFPI for the textiles and garments sector and the aggregated industry that combined data for the food processing, textiles and garments, wood products and furniture, metal products and machinery sectors. The dataset has two shortcomings. First, due to exit and new entries or replacements, each wave has a different set of firms with relatively few firms appealing in all waves. Second, there are either missing data (especially on inputs) for some firms or due to small size some expenditure on inputs are zero. To create a balanced dataset and to avoid missing data problem (since we are using DEA), the data was aggregated into four major groups: micro firms (EMP<6); small firms (EMP 6<20); medium firms (21-75); and larger firms (EMP >74). The grouping is similar to that of Harding, Söderbom and Teal (2002). The averages of each group (by year) were used to estimate MTFPI for the textile and garments sector and for all sectors. Due to missing data in the labor cost variables, the miscellaneous cost variable was combined with labor cost variable. Table 7 presents the descriptive statistics of all variables used to estimate the MTFPI. The complete data set is presented in Appendix.. High replacement cost can be associated with liberalization of the 1990's. Firms were replacing old with new machinery and equipments under new management.

RESULTS AND DISCUSSION

ESTIMATED MALMQUIST PRODUCTIVITY INDEX

In this section, we examine the results of the estimated Malmquist factor productivity index and its components for the textile and garments industry and for the manufacturing industry in general. Technical efficiency changes (ΔEFFC) and the MTFPI results from 1992 to 1997 are presented in Table 8. Since ΔEFFC is equal to one in both cases, and MTFPI is a product of technical efficiency change and a change in technological process (ΔTECH) as shown in Equation (10), therefore, for the period under study, changes in MTFPI was only due to changes in technology used in production. For all sectors, the estimated MTFPI revealed that the medium firms recorded the highest productivity growth that rose by 15% from 1992 to 1998. In the same period, the larger farms recorded about 2% in terms productivity growth. Micro firms experienced technological regressiveness for all period. On the year-by-year bases, highest technological progress among small, medium, and larger firms was recorded in 1994, which increased by 85%, 104%, and 112%, respectively. Except for medium firms in 1995, the firms were not able to maintain the attained improvement in subsequent years (i.e., from 1995 to 1998.

For the textile and garments sectors, the highest technological progress was recorded by the medium firms in 1994 that rose by 31%. This is followed by the large firms were the technological progress rose by 24% in 1996. For Micro firms, the highest recorded technological progress was 17% in 1997 and for the small firms was 4% in 1997. Whereas the trend of technological growth in the textile and garment industry is relatively positive, in the aggregated data (all sectors), with the exception of the medium firms, there is an indication of technological regressiveness towards 1997. Figure 6 shows trend in factor productivity growth in the garments and textile industry and the aggregated manufacturing sectors for all sizes.

SIMULATION AND RESULTS OF THE STATIC CGE MODEL

This section presents the simulation results of the static model. The static model captures the short-run effects of AGOA through either gain in efficiency or resource allocation. The focus is on the cotton production and processing sector, and textile and leather industry, which are directly affected by AGOA. Based on the 2001 SAM data, cotton production amounted to 133 billion Tshs, and textile and leather production amounted to 428 billion Tshs. Exports of cotton products (including yarns), and finished textile and leather products were, respectively, 42 and 17 billions Tshs. In the first experiment the economy-wide consequences of a reduction in export marketing margin is examined (i.e., reduction in export tariff and search cost). This is achieved by reducing the export transaction costs for cotton and textile by 20%. In the base year, export transaction costs for cotton and textile amounted to 11.9 and 5.9 billion Tshs, respectively. It is assumed that guaranteed marked reduces export transaction cost among exporters from about 12.31% to 9.85% for raw cotton and cotton yarn, and from 5.99% to 4.80% for textile and leather products exports.

The second experiment was used to examine the impact of increasing the capacity of producing fabric for export and increasing the use of domestically produced fabric to produce textile products for export. This is achieved by increasing payments from both the cotton processing and textile sectors to the cotton production sector, and payment from the textile to the cotton-processing sector by 20% (i.e., increase intermediate input demand for cotton and fabrics). In the base year (2001), the cotton-processing sector paid 2 billion Tshs to the cotton production sector. The textile industry paid 65 billion Tshs to the cotton production sector, and 5 billion Tshs to the cotton-processing sector. In addition, the textile and leather industry spent 17 billion Tshs to purchase intermediate inputs within the industry itself. With this experiment, it is assumed that AGOA gives an incentive to export value added products rather than raw cotton and unfinished products, which increases demand of domestically produced cotton and cotton yarns and other fabrics.

Experiment three combines experiments one and two. The fourth experiment is conducted to examine the overall impact of reducing domestic, export, and import transaction costs within the cotton production and processing sectors, and textile and leather industry. This is to allow a smooth flow of capital in the production and processing sectors, and provision of marketing and transportation services. This is also achieved by reducing the export, domestic and import transaction cost by 20% from the average of 11.76% to 9.41%. In 2001, total domestic marketing margins for the cotton production and processing sector was 5.9 billion Tshs. For the textile and leather industry, the amount was 3.3 billion Tshs. The import transaction cost for the textile and leather industry also amounted to 3.3 billion Tshs.

The results of the four experiments on household's consumptions are presented in Table 9. In the table, the base column represents the level of household's consumption in 2001, which include marketed output, imports, and all commodities produced and consumed at home. In the table, percentage changes indicate deviations from the base-case consumption value, given the proposed changes in the marketing margins in the cotton production sector, and the textile and leather industry. In all cases, on average, there is a reduction in level of consumption among rural households. The most affected group included rural households living below poverty lines, followed by rural non-poor household where the head of households did not finish primary schools. There is a gain for non-poor rural household where a head of households had at least a primary school education. These results are disturbing given the fact that most policies are aimed to help the poor. Resource shift increase prices of food crops consumed by poor households such as sorghum, millet and cassava. Reduction in marketing margins does not benefits rural households who largely depend on own produced goods. Nonpoor rural households gain as a large proportion of consume goods are from the market. Except for non-poor urban households where a head had at least secondary school education, there are increased levels of consumption for all other urban households. This is due to reduced marketing margins, which makes price of domestically produced and processed goods relatively cheap in urban areas. Reduced consumption associated with urban-nonpoor-head finished secondary school, can be attribute to downsizing in marketing and transportation sectors as will be explained below.

Table 10 shows the earned income by factor of production. The subsistence factor represents a composite subsistence land, labor and capital used in the production of own household consumption. For experiment 1 and 2, there is a relative decrease in factor income across the board. The mostly affected in the order of magnitude are the female labor, income from agricultural capital and agricultural land. For experiment 3 and 4 notice an increase in income for child labor. In addition, there is an increase in income for male labor with secondary or higher education and income from non-agricultural capital for experiment 4. Cotton is produced in a relatively fertile land and using different capital stock when compared to other crops produced in the Tanzania cotton belt. A production shift may lender some land and capital stock absolute. Child labor is relatively cheap as compared to adult labor. Increase in cotton production may increase demand for child labor and thus a relative increase in child labor wages and income, which is not socially desirable. An increase in processing activities will obviously increase income to non-agricultural capital through direct expansion of the non-capital stock.

Table 11 shows the welfare losses/gains for all experiments expressed as percentage changes in the equivalent variation index. The calculation of welfare losses/gains combines both quantity and price changes and the index shows how much economic wellbeing changes with simulation. In general, in rural area, there is a welfare loss for rural households living below or just above the poverty line and households were the head had not finished primary school. There was a relatively welfare gain for households were the head have at least a primary educations. This can be explained as follows. First, as agricultural resources shift from producing food crops to producing cotton, it is more likely that some rural households will lose their jobs. An increased investment in the processing sector increases demand for skilled labor. Most cotton ginneries are located in rural areas; it is likely that jobs for skilled laborer will be created.

Welfare gains by urban households can be associated with low prices of domestically produced goods and imports associate with lower marketing margins. However, higher marketing and transportation margins are associated with higher number of firms providing these services and more jobs. Likewise, lower marketing and transportation margins are associated with fewer marketing and transportation firms and fewer jobs. With a decrease in marketing margins, it is also likely that some skilled jobs will be lost due to downsizing. Marketing and transportation firms are mostly based in urban areas. Downsizing will decrease demand for skilled labor and income of urban households, especially for households were a head has at least primary school. The results in Table 9 to 11 show that a decreases in marketing margins and an increase in demand of intermediate inputs produced domestically increased export volume and price of cotton and textile and leather products, but also decreased the production of food crops especially sorghum, millet, and cassava. With limited resources, especially land and capital stock, an increase in cotton production entails shifting resources from other crops or livestock production and the short-run effects may be or may not be welfare improving.

SIMULATION AND RESULTS OF RECURSIVE DYNAMIC CGE MODEL

This section the results of the simulated recursive dynamic model are presented. As stated before the recursive dynamic CGE model has a major advantage of accounting for capital accumulation effects, which makes them adequate to study the transition path of the economy. In order to explore the temporal impact of AGOA it is assumed that the long-run effects are transmitted through changes in the productivity of intermediate inputs and overall capital accumulation in the cotton production sector and the textile industry. Both growth in technical efficiency of intermediate inputs and a shift in capital stock from one period to the next was update exogenously using Equation (1) and (7). The technical change parameter in Equation (1), λ, and the capital shift parameter in Equation (7), $\upsilon_{g,f,t}$, for both cotton production and textile industry were respectively set to 1.05 and 1.1 in the counterfactual models, indicating a 5% increase in productivity of intermediate inputs used to produce cotton and textile products and 10% increase in capital accumulation within the cotton production sector and textile industry. Two periods are considered: from 2006 to 2015 to reflect the potential impact of AGOA I; and from 2006 to 2020 to reflect the potential impact of AGOA II. From 2002 to 2005 period is considered a planning period.

Table 12 presents the simulation results on changes in aggregate output. Natural economic growth represents growth without a change in productivity and capital accumulation is only through household's savings. The simulation is made with respect to the static model and the economy is allowed to grow in the absence of any economic shock. Whereas there are growths on aggregate output in all scenarios for 2002/20, the output is likely to increase by more than 2% under natural economic growth, 5% under AGOA I, 11% under AGOA II. The net increase is therefore 3% under AGOA I and 9% under AGOA II. Increase in productivity and capital accumulation within the cotton production sector and the textile industry have positive effects on other production sectors.

The increase in productivity and available capital has no dramatic increase in aggregate production in the cotton production sector and the textile industry as compared to other sectors. While aggregate production within the cotton production sector and textile industry grew at an average of 1%, cereal production under AGOA I grew at an average of 9% per year. The second and the third beneficiary of AGOA I effects were, respectively, the manufacturing industry and roots and tubers production that grew by 9% and 8%. Apart from mining and quarrying that grew at less than 1%, on, average, other sectors were growing at more than 5%. Increased productivity and available capital in the cotton production sector and the textile industry are likely to lead to increased availability of quality intermediate inputs and factor of production for competing production activities. For example, increase in capital stock in cotton production may releases excess labor for cereal production thus increasing both cotton and cereal production. Relatively lower levels of increased aggregate cotton and textile production under AGOA I and II policy scenarios may be related to low levels of reference production technology in the base year (as compared to other sectors), a legacy of three decades of sectoral neglect.

The simulation results on the export growth are presented in Table 13. Increased production as reported in Table 12 is likely to increase exports. Under natural economic growth, average export increased by less than 1%. There is a net increase in export by 2% and 6% under AGOA I and AGOA II, respectively. Under natural economic growth, only exports from three sectors that include: legumes, oilseeds, and vegetables; agro-processing industries and manufacturing increased by more than 1%. For both AGOA I and II, the best three performers in terms of export growth are cash crops, agro-processed products and manufacturing. However, legumes, oilseeds and vegetables, livestock, forestry and hunting, and trade, construction and other services feature prominently under AGOA I and II. This is important for Tanzania economic growth and sustainability where increased value of export is equally important to export diversification.

The increase in aggregate production and exports as driven by increased productivity and capital accumulation will have positive effects in factor demand and remunerations. As shown in Table 14, under the three scenarios, increase in income is relatively higher among rural households than among urban households. Under natural economic growth, on average, income grew by 4%. Poor households recorded income growth of about 5%, which was the highest. For households were the head has secondary school education recorded the lowest income growth among rural households, which was about 3%. In urban areas, the income growth was about 3%. The range of changes in income under natural economic growth was from about 3 to 5%, the analogous value for AGOA I was 11 to 15%, and for AGOA II was 27 to 31%.

Despite the difference in the magnitude of percentage change in household's income for the three policy scenarios, the ranking in terms of household's income change was similar. For example, rural households living below poverty line recorded the highest changes in household income for the tree cases and households were a head has a secondary education recorded highest income changes among urban households. This can be attributed to two facts. First, change in factor productivity or capital accumulation does not alter the ownership structure of factor of production across households. Any change in income will be proportionately increased across households. Second, by model construction, household's disposable income is driven by household's propensity to save, which is constant. The marginal propensity to save will also determines the level of investment and investment profitability in the future. Therefore, the share of national income among households is likely to remain the same as in the original SAM.

Table 15 indicates that increase in productivity and capital accumulation even in specific sectors has an overall positive economic effect on economic growth. Whereas GDP grew at 4% under natural economic growth, the economy grew by 12% and 27% under AGOA I and II, respectively. If Tanzania has to take all opportunities offered by AGOA and AGOA delivers expected outcome (i.e., increase in productivity through quality intermediate inputs and management and capital accumulation through new capital investment, net economic growth will be more than 8% for AGOA I and more than 22% for AGOA II.

A crucial point to note is that CGE models do not simulate how an economy will respond to a policy-induced shock, but instead show how the economy of the base year would have been different, had the policy change taken place some time ago. The magnitude of the simulated variables may have no economic meaning, but the trend is important for comparison purposes. The results presented in Tables 12 to 15 show that increase in intermediate inputs productivity and increased availability of production capital will have a positive impact on both economic growth and sustainability. Economic growth is achieved through increased aggregate output and exports and higher remuneration for factors of production. Economic sustainability is achieved through export diversification. These results are only true if the incentives provided by AGOA will stimulate American firms or the third party nations to invest in both physical and human capital in the cotton production sector and/or the textile and leather industry in Tanzania.

POVERTY ANALYSIS RESULTS

In this section the implication of AGOA on poverty alleviation are presented. The analysis is based on the general growth path generated by the recursive dynamic model in the absence of any economic shock and the one generated after imposing the potential effects of AGOA. Table 16 presents the variables that were used for poverty analyses (base case scenario) as calculated from the 2001 SAM data. Other sources of information are Thurlow and Wobst (2003) and (NBS, 2002).

The results in Table 16 indicate that in rural areas, per capital income of about 42% households were below the mean income of 188,082 Tshs. In urban areas, per capita income of 25% households were below the mean income of 352,516 Tshs. In rural areas about 34% of the households lived below the poverty line and about 14% of the households in urban areas lived below the poverty line. On average, under 2001 price level, households in rural and urban areas needed an additional of about 6 and 4 percent of their income, respectively, to jump over the poverty line.

SUMMARY AND IMPLICATIONS FOR POLICY

The African Growth and Opportunity Act (AGOA) allow eligible Sub-Saharan African countries exporting to the U.S. some listed goods subject to zero import duty. Tanzania qualified for its preferential treatment for cotton, leather, and textiles in 2002. In response to this policy, Tanzania had launched a program to increase cotton production and domestic use of cotton lint, and to increase production of leather and textile products for the export market. It is anticipated that AGOA will guarantee the export of textile and leather products, while reducing export-marketing margins and increasing domestic use of cotton lint.

In this paper, potential welfare effects of AGOA on household's consumption and income are analyzed. Four experiments are considered: reduction in export margins for both cotton lint, and textile and leather products, increase in domestic use of cotton, combining both reduction in export margins and increase in domestic use of cotton, and combining the three scenarios while reducing domestic marketing margins. A 2001 Tanzania's Social Accounting Matrix was used to develop a Computable General Equilibrium Model. The model was then used to stimulate the Tanzania open economy, adapted to these scenarios. Exogenous improvement in household's consumption and income are considered as important sources of welfare gains. In all four experiments, on average, there is a reduction in level of consumption and income among rural households. The most affected groups are rural households living below or just above the poverty line. Except for non-poor urban households where a head had at least secondary school education, there are increased levels of consumption for all other urban households. Reduced consumption associated with urban-nonpoor-head finished secondary school, can be attribute to downsizing in marketing and transportation sectors.

This study has shown that the welfare impact of AGOA on small economies such as Tanzania is not well defined. In this case, whereas AGOA creates incentives for exporters, rural households lose due to increased price of food crops and fall in income. However, in the long-run and due to low producers prices, AGOA policies have a potential of developing internal markets for domestically produced goods and increasing export of traditional cash crops. Overall, the simulation of the Tanzania CGE model shows two things. First, there is no simple economic strategy to achieve the so-called Pareto optimality. For example, a fall in price of domestically produced goods and imports are not strong enough to upset income loses associated with increased food price among rural households. Second, for a small economy, a production incentive in one sector, will just cause a resource shifts to that sector with little or no welfare improvement. It is important to note that in Tanzania, the major regions that produce cotton are also important in producing other food crops such as sorghum, millet and cassava. Increase in cotton production without improving productivity will just shift resources from other crop enterprises, which may be detrimental to the whole economy.

To take full advantages that are offered by AGOA, Tanzania should not only focus on reducing marketing margin, which include export, domestic, and import transactions costs but also identify policies that will limit resource limit. This will create incentive for exporters and Tanzania goods will be cheaper in the world market. Policies that will minimize resource shift from food crops to cash crop are important in removing the negative and regressive effects of low AGOA. This can be achieved by attracting more foreign capital into the country. Foreign capital will increase available capital stock for investment, and limit the resource shifts.

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Biographical Sketch and Acknowledgement

Dr. Aloyce Kaliba is the Economics Professor, College of Business, Department of Economics and Finance, Southern University and A&M College. Dr. Kaliba has published several articles related to adoption and profitability of new agricultural enterprises, economic impact of agricultural research and extension, sustainability of development programs and use of CGE models for poverty analysis. The study was sponsored by USAID through Strategies and Analysis for Growth and Access (SAGA) Project, administered by Clark Atlanta University and Cornell University. However, the ideas expressed do not necessarily reflect the views of the sponsors. The authors are responsible for all shortcomings.

Table 1 Structure of 2001 Gross Domestic Production

	Value in Billions	
	Tshs	$
Production for home consumption	1,949.5	2.2
Private consumption	4,953.7	5.6
Government consumption	513.9	0.6
Fixed investments	1,318.7	1.5
Exports	1,305.7	1.5
Imports	-2,007.5	-2.3
GDP at market price	8,034.0	9.2
Net indirect taxes	-457.7	-0.5
GDP at factor cost	7,576.3	8.6

Source: Calculated from the 2001 SAM.

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Table 2 Tanzania Production Structure in 2001 (Billion Tshs at producer price)

	Total	**Direct Export**	**For own Use**	**Domestic Marketed**	**Export-output Ratio**
Cotton production	132	37	0	95	0.24
Textile and leather processing	426	16	0	410	0.11
Cereal Production	1,446	4	580	862	0.03
Roots and tubers	155	0	108	47	0.00
Legumes, oilseeds, and vegetables	962	33	293	635	0.22
Cash crops	711	247	5	459	1.63
Livestock, forestry, and fishing	1,004	74	191	739	0.49
Mining and quarrying	146	19	0	127	0.12
Agro-processing	1,738	22	98	1,619	0.15
Manufacturing	512	20	0	492	0.13
Trade and services	7,949	792	612	6,545	5.22
Total	15,181	1,264	1,886	12,031	8.32

Source: Calculated from the 2001 SAM.

Table 3 Disposable income among Tanzania households in 2001[1]

	Income	Number	Share	Per capita income	
	Billion Tshs	1000	%	Tshs	U.S. $
Rural households					
Below poverty line	377	5,072	16	74,277	85
Between basic needs poverty line	505	4,603	15	109,699	125
Nonpoor head with non education	714	3,507	11	203,613	232
Nonpoor head without primary education	823	3,507	11	234,794	268
Nonpoor head without secondary education	1,974	7,796	25	253,133	289
Nonpoor head finished secondary school	336	658	2	511,424	583
Total Rural	4,729	25,143	80	188,082	214
Urban households					
Below poverty line	88	689	2	128,411	146
Between basic needs poverty line	170	720	2	235,939	269
Nonpoor head with non education	166	438	1	379,629	433
Nonpoor head without primary education	241	689	2	349,926	399
Nonpoor head without secondary education	978	2,474	8	395,421	451
Nonpoor head finished secondary school	530	1,159	4	457,906	522
Total Urban	2,174	6,168	20	352,516	402
All Households (total population)	6,903	31,311	100	220,476	251

The average daily exchange rate in 2001 was 877 Tshs per 1 U.S. $ (BoT, 2004).

Source: Calculated from the 2001 SAM.

Table 4 Major Sources of income to household (%) [1].

Type of Households	SBF	CLL	FML	MLL	Capital	Land	Firms	SBY	RMT	Total
Rural										
Below poverty line	43.7	0.3	6.3	14.2	22.2	9.4	3.0	1.0	0.0	100
Between basic needs	45.5	0.2	5.8	13.4	19.7	8.4	6.4	0.7	0.0	100
No education	51.7	0.8	6.1	6.6	16.8	7.0	6.1	1.3	3.7	100
Not finished primary school	42.5	0.3	6.0	21.0	15.7	6.6	3.9	1.0	3.0	100
Not finished secondary school	22.8	0.1	10.7	14.3	8.4	3.8	35.6	0.8	3.5	100
Finished secondary school	6.9	0.0	7.8	29.5	2.1	0.9	39.9	0.7	12.4	100
Average (rural)	35.5	0.3	7.1	16.5	14.2	6.0	15.8	0.9	3.8	100
Urban										
Below poverty line	5.4	0.0	10.8	15.0	7.5	3.2	57.0	1.1	0.0	100
Between basic needs	4.2	0.5	9.4	11.4	2.1	1.0	70.9	0.5	0.0	100
Head with non education	7.0	0.5	9.2	6.0	2.2	1.1	64.9	1.1	8.1	100
Not finished primary school	7.8	0.4	10.5	25.0	2.2	1.1	46.3	0.7	6.0	100
Not finished secondary school	6.8	0.2	15.3	19.8	1.6	0.8	49.2	0.5	5.9	100
Finished secondary school	10.4	0.5	21.8	39.8	1.8	0.8	7.3	0.5	17.2	100
Total Urban	6.9	0.3	12.8	19.5	2.9	1.3	49.3	0.7	6.2	100
All Households	21.2	0.3	10.0	18.0	8.5	3.7	32.5	0.8	5.0	100

[1] SBF Factor is the subsistence factor; FML is female labor, MLL is male labor; SBY is subsidy; and, RTM is remittance from abroad.

Source: Calculated from the 2001 SAM.

Table 5 Marketing margins and tax rates in 2001 (%).

	Marketing Margin	Value-Added Tax	Import Tax	Indirect Tax
Growing of cotton	1.12	0.00	0.00	1.96
Textile and leather products	1.81	0.28	17.37	13.93
Cereal production	1.20	0.06	5.11	0.53
Roots and tubers	0.50	0.00	0.00	2.36
Legumes, oilseeds, and vegetables	1.11	0.00	0.00	2.06
Cash Crops	0.75	0.12	3.72	5.10
Livestock, forestry, and fishing	1.14	0.00	0.00	2.25
Mining and quarrying	0.71	0.00	15.62	3.94
Agro-processing	1.31	0.12	12.57	6.35
Manufacturing	0.61	0.04	6.44	6.20
Business and other services	0.00	0.00	0.00	0.00
Trade, tourism and other services	0.00	0.23	0.00	0.00

Source: Calculated from the 2001 SAM.

Table 6 Aggregate Macro SAM for Tanzania (2001 Billion Tshs) [1].

	Expenditure										
Receipt	A	C	M	F	E	H	G	TA	TR	I	**Total**
A		12,098				1,950					14,047
C	6,450		356			4,954	514		1,306	1,319	14,898
M		356									356
F	7,576										7,576
E				2,269							2,269
H				5,265	2,172		61		403		7,900
G					1			666			667
TA	21	436		18	96	94					666
TR		2,008		25							2,033
I						903	91		324		1,319
Total	14,047	14,898	356	7,576	2,269	7,900	667	666	2,033	1,319	

Source: Thurlow and Wobst (2003).

[1] The alphabets in Table 6 represent, respectively, activities (A), commodities (C), marketing margins (M) factors of production (F), enterprise or corporation (E), households (H), government (G), taxes (TA), trade (TR), and Investment (I) accounts.

Table 7 Average Inputs and Output per Worker per Year for Tanzania Manufacturing Sector (1992/98) in Real Tshs

SIZE	Output	Raw Material	Other Cost	Capital	Number of Employee
Micro Firms (< 6 employees)					
Food processing	10,792	5,421	756	1,693	3
Textile and garments	4,487	2,307	355	1,270	3
Wood products and furniture	5,477	2,928	863	2,022	5
Metal products and machinery	8,321	4,080	1,203	20,369	4
Small Firms (6-20 employee)					
Food processing	30,465	16,984	3,329	40,687	14
Textile and garments	4,748	2,734	601	24,681	17
Wood products and furniture	9,023	3,717	930	10,897	14
Metal products and machinery	17,357	8,533	1,231	22,512	14
Medium Firms (21-75 employee)					
Food processing	27,978	13,893	3,751	44,898	49
Textile and garments	12,969	8,194	1,632	25,943	63
Wood products and furniture	10,131	5,764	1,279	19,446	50
Metal products and machinery	18,545	11,557	2,370	32,168	59
Large Firms (> 75 employee)					
Food processing	94,343	33,200	15,222	141,288	702
Textile and garments	18,721	11,098	2,713	42,876	408
Wood products and furniture	6,617	2,577	1,177	25,730	249
Metal products and machinery	21,186	12,096	3,273	81,364	239

Table 8 Estimate Malmquist Productivity Index (1992/1998)

Size of Firms	Year	Textile and Garments		All sectors	
		ΔEFF	MTFPI	ΔEFF	MTFPI
Micro firms (< 6 Employee)	92	1.00	0.20	1.00	0.91
	93	1.00	0.79	1.00	0.91
	94	1.00	1.12	1.00	0.68
	95	1.00	0.81	1.00	0.76
	96	1.00	1.13	1.00	0.88
	97	1.00	1.17	1.00	0.89
Average (micro firms)		1.00	0.87	1.00	0.84
Small firms (6-20 employee)	92	1.00	0.31	1.00	0.78
	93	1.00	1.02	1.00	0.85
	94	1.00	1.00	1.00	1.85
	95	1.00	1.02	1.00	0.97
	96	1.00	0.90	1.00	0.61
	97	1.00	1.04	1.00	0.92
Average (small firms)		1.00	0.88	1.00	1.00
Mediums firms (21-75 employee)	92	1.00	0.38	1.00	0.84
	93	1.00	0.89	1.00	0.79
	94	1.00	1.31	1.00	2.04
	95	1.00	0.54	1.00	1.25
	96	1.00	0.79	1.00	0.72
	97	1.00	1.05	1.00	1.23
Average (medium firms)		1.00	0.83	1.00	1.15
Larger firms (>75 employee)	92	1.00	0.48	1.00	0.93
	93	1.00	0.96	1.00	0.79
	94	1.00	1.00	1.00	2.12
	95	1.00	0.58	1.00	0.42
	96	1.00	1.24	1.00	0.97
	97	1.00	0.96	1.00	0.91
Average (large firms)		1.00	0.87	1.00	1.02

Table 9: Household Consumption (Billion Tanzania Shillings (Tshs))

Type of Household	Base income	Experiments (% Change)			
		1	2	3	4
Rural Households:					
Below food poverty line	379	-5.44	-5.40	-5.40	-5.33
Between basic needs poverty line	504	-3.31	-3.28	-3.28	-3.21
Nonpoor head with non education	712	-3.00	-2.97	-2.97	-2.91
Nonpoor head below primary school	824	-4.08	-4.03	-4.03	-3.94
Nonpoor head below secondary school	1,974	0.00	0.04	0.04	0.07
Nonpoor head finished secondary school	335	2.8	2.93	3.00	3.11
Urban Households:					
Below food poverty line	87	5.99	6.02	6.02	6.03
Between basic needs poverty line	169	4.86	4.90	4.90	4.90
Nonpoor head with non education	165	4.88	4.92	4.92	4.92
Nonpoor head below primary school	241	1.63	1.68	1.68	1.72
Nonpoor head below secondary school	980	1.16	1.19	1.19	1.20
Nonpoor head finished secondary school	530	-0.31	-0.33	-0.33	-0.33

Table 10: Factor Income (Billion Tanzania Shillings (Tshs))

Type of Factor	Base Income	Experiments (% change) 1	2	3	4
Subsistence factor	1,949	-6.73	-5.37	-3.16	-0.39
Child labor age 10 to 14	22	-5.81	-3.22	0.98	3.86
Female Labor					
With no formal education	69	-7.62	-7.95	-8.58	-9.76
Nonfinished primary school	83	-5.82	-6.24	-7.01	-8.38
Nonfinished secondary school	531	-5.69	-6.18	-6.94	-8.1
Secondary or higher education	153	-4.1	-3.93	-3.4	-2.38
Male Labor					
With no formal education	83	-4.09	-4.35	-4.86	-5.74
Nonfinished primary school	265	-4.24	-4.31	-4.45	-5.01
Nonfinished secondary school	677	-3.62	-3.65	-3.5	-3.34
Secondary or higher education	419	-2.82	-2.01	-0.56	1.53
Capital					
Agricultural capital	725	-5.91	-5.71	-5.6	-6.09
Non-agricultural capital	2,288	-0.47	-0.4	-0.26	0.07
Agricultural land	309	-6.77	-6.6	-6.53	-7.04

Table 11: Percent Changes in Equivalent Variation

Type of Households	Experiments (% Change)			
	1	2	3	4
Rural Households:				
Below food poverty line	-1.5	-2.2	-3.3	-4.8
Between basic needs poverty line	-1.6	-2.2	-3.1	-4.5
Nonpoor head with non education	-1.7	-2.2	-3.1	-4.4
Nonpoor head not finished primary school	-1.4	-2.0	-2.9	-4.3
Nonpoor head not finished secondary school	0.9	0.0	-1.3	-3.0
Nonpoor head finished secondary school	2.2	1.9	1.5	1.0
Urban Households:				
Below food poverty line	2.6	1.5	-0.1	-2.1
Between basic needs poverty line	3.6	2.7	1.6	-0.1
Nonpoor head with non education	3.1	2.4	1.4	0.1
Nonpoor head below primary school	2.1	1.2	-0.3	-2.3
Nonpoor head below secondary school	2.2	1.3	-0.1	-2.0
Nonpoor head finished secondary school	0.4	0.1	-0.1	-0.2

Table 12 Simulation Results on Percent Changes in Aggregate Output

Commodities [1]	Period				
	2002/05	2006/10	2011/15	2016/20	Average
Natural Economic Growth					
Cotton production	0.11	0.28	0.41	0.56	0.34
Textile and leather production	0.08	0.21	0.34	0.48	0.28
Cereal production	3.01	4.6	5.32	6.11	4.76
Roots and tubers	2.80	4.24	4.84	5.50	4.35
Legumes, oilseeds, and vegetables	2.28	3.22	3.51	3.84	3.21
Cash Crops Production	0.97	2.16	3.00	3.93	2.52
Livestock, forestry, hunting and fishing	1.57	2.49	2.93	3.42	2.60
Mining and quarrying	0.01	0.09	0.20	0.33	0.16
Agro processing	1.11	2.12	2.79	3.54	2.39
Manufacturing	0.21	0.92	1.74	2.65	1.38
Trade, construction and other services	0.98	2.11	3.10	4.19	2.60
Average	1.19	2.04	2.56	3.14	2.23
AGOA I (2005/2010)					
Cotton production	0.70	1.11	1.33	1.57	1.18
Textile and leather production	0.64	1.00	1.21	1.44	1.07
Cereal production	6.17	9.08	10.27	11.57	9.27
Roots and tubers	5.41	7.98	8.97	10.05	8.10
Legumes, oilseeds, and vegetables	3.58	5.08	5.58	6.12	5.09
Cash Crops Production	4.70	7.42	8.81	10.34	7.82
Livestock, forestry, hunting and fishing	3.50	5.25	5.98	6.78	5.38
Mining and quarrying	0.53	0.79	0.98	1.19	0.87
Agro processing	4.14	6.36	7.47	8.71	6.67
Manufacturing	4.01	6.06	7.42	8.92	6.60
Trade, construction and other services	5.49	8.29	9.93	11.73	8.86

Average	3.53	5.31	6.18	7.13	5.54
AGOA II (2005/2020)					
Cotton production	1.67	2.47	2.83	3.23	2.55
Textile and leather production	1.56	2.28	2.62	3.00	2.37
Cereal production	11.46	16.62	18.59	20.76	16.86
Roots and tubers	9.80	14.27	15.91	17.72	14.43
Legumes, oilseeds, and vegetables	5.76	8.21	9.03	9.93	8.23
Cash Crops Production	10.95	16.27	18.58	21.13	16.73
Livestock, forestry, hunting and fishing	6.75	9.90	11.11	12.45	10.05
Mining and quarrying	1.40	1.95	2.26	2.60	2.05
Agro processing	9.19	13.45	15.30	17.35	13.82
Manufacturing	10.31	14.60	16.85	19.34	15.28
Trade, construction and other services	13.02	18.64	21.35	24.34	19.34
Average	7.44	10.79	12.22	13.80	11.06

1 Cereal production includes maize, paddy, sorghum and millet, wheat; cash crop include coffee, tobacco, tea, cashew nuts, sisal, and sugarcane; agro processing include mead and dairy products processing, grain milling, food processing, beverages and tobacco products, and wood paper printing; and manufacturing includes manufacturing of basic industrial chemicals, fertilizer and pesticides, rubber plastic, glass and cement, iron steel and metal products, all equipments and petroleum refineries.

Table 13 Simulation Results on Export Growth per Year

Commodities 1	Period				
	2002/05	2006/10	2011/15	2016/20	Average
Natural Economic Growth					
Cotton products	0.07	0.19	0.32	0.46	0.26
Textile and leather products	0.06	0.17	0.30	0.43	0.24
Cereal products	0.09	0.31	0.56	0.82	0.45
Legumes, oilseeds, and vegetables	0.19	0.65	1.13	1.66	0.91
Cash Crops	0.24	0.81	1.41	2.08	1.14
Livestock, forestry, hunting and fishing	0.13	0.47	0.83	1.23	0.67
Mining and quarrying	0.05	0.16	0.28	0.41	0.23
Agro processed products	0.22	0.79	1.39	2.05	1.11
Manufacturing	0.22	0.79	1.39	2.05	1.11
Trade, construction and other services	0.13	0.47	0.83	1.23	0.67
Average	0.14	0.48	0.84	1.24	0.68
AGOA I					
Cotton products	0.67	1.01	1.22	1.45	1.09
Textile and leather products	0.63	0.96	1.16	1.39	1.04
Cereal products	1.19	1.82	2.22	2.66	1.97
Legumes, oilseeds, and vegetables	2.40	3.67	4.47	5.35	3.97
Cash Crops	3.00	4.59	5.59	6.69	4.97
Livestock, forestry, hunting and fishing	1.79	2.73	3.33	3.99	2.96
Mining and quarrying	0.60	0.91	1.11	1.33	0.99
Agro processed products	2.99	4.55	5.55	6.64	4.93
Manufacturing	2.99	4.55	5.55	6.64	4.93
Trade, construction and other services	1.79	2.73	3.33	3.99	2.96
Average	1.81	2.75	3.35	4.01	2.98

AGOA II					
Cotton products	1.68	2.39	2.74	3.13	2.49
Textile and leather products	1.59	2.27	2.61	2.98	2.36
Cereal products	3.03	4.33	4.99	5.72	4.52
Legumes, oilseeds, and vegetables	6.09	8.71	10.04	11.50	9.09
Cash Crops	7.61	10.89	12.54	14.37	11.35
Livestock, forestry, hunting and fishing	4.55	6.50	7.49	8.58	6.78
Mining and quarrying	1.52	2.17	2.50	2.87	2.27
Agro processed products	7.58	10.83	12.48	14.30	11.30
Manufacturing	7.58	10.83	12.48	14.30	11.30
Trade, construction and other services	4.55	6.50	7.49	8.58	6.78
Average	4.58	6.54	7.54	8.63	6.82

Table 14 Simulation Results on Changes in Households' Income (2002/20)

Type of Households [1]	Period				
	02/05	06/10	11/15	16/20	Average
Natural Economic Growth					
Below poverty line (R)	2.12	4.58	6.09	7.77	5.14
Between basic needs poverty line (R)	2.09	4.53	6.05	7.72	5.10
Nonpoor head with non education (R)	2.07	4.49	6.00	7.66	5.06
Nonpoor head not finished primary school (R)	2.03	4.42	5.92	7.58	4.99
Nonpoor head not finished secondary school (R)	1.32	3.13	4.50	6.01	3.74
Nonpoor head finished secondary school (R)	0.78	2.17	3.43	4.83	2.80
Below poverty line (U)	1.05	2.65	3.96	5.42	3.27
Between basic needs poverty line (U)	0.77	2.15	3.41	4.81	2.79
Nonpoor head with non education (U)	0.84	2.26	3.54	4.95	2.90
Nonpoor head not finished primary school (U)	1.23	2.98	4.33	5.82	3.59
Nonpoor head not finished secondary school (U)	0.90	2.38	3.66	5.09	3.01
Nonpoor head finished secondary school (U)	1.25	3.00	4.35	5.84	3.61
Average	1.37	3.23	4.60	6.13	3.83
AGOA I (2006/10)					
Below poverty line (R)	8.78	14.16	16.68	19.45	14.77
Between basic needs poverty line (R)	8.74	14.10	16.61	19.38	14.71
Nonpoor head with non education (R)	8.70	14.02	16.52	19.28	14.63
Nonpoor head not finished primary school (R)	8.64	13.91	16.40	19.15	14.53
Nonpoor head not finished secondary school (R)	7.48	11.81	14.08	16.59	12.49
Nonpoor head finished secondary school (R)	6.59	10.21	12.31	14.63	10.94
Below poverty line (U)	7.07	11.05	13.24	15.66	11.76
Between basic needs poverty line (U)	6.63	10.25	12.36	14.69	10.98
Nonpoor head with non education (U)	6.72	10.43	12.56	14.91	11.16
Nonpoor head not finished primary school (U)	7.37	11.60	13.85	16.33	12.29
Nonpoor head not finished secondary school (U)	6.81	10.59	12.73	15.10	11.31

Nonpoor head finished secondary school (U)	7.29	11.48	13.72	16.19	12.17
Average	7.57	11.97	14.26	16.78	12.64
AGOA II (2006/2020)					
Below poverty line (R)	19.94	30.27	34.46	39.08	30.94
Between basic needs poverty line (R)	19.88	30.16	34.33	38.95	30.83
Nonpoor head with non education (R)	19.78	29.98	34.14	38.73	30.66
Nonpoor head not finished primary school (R)	19.73	29.87	34.02	38.61	30.56
Nonpoor head not finished secondary school (R)	17.79	26.37	30.15	34.33	27.16
Nonpoor head finished secondary school (R)	16.32	23.71	27.22	31.10	24.59
Below poverty line (U)	17.08	25.07	28.72	32.75	25.91
Between basic needs poverty line (U)	16.34	23.72	27.23	31.10	24.60
Nonpoor head with non education (U)	16.48	23.98	27.52	31.43	24.85
Nonpoor head not finished primary school (U)	17.63	26.05	29.81	33.95	26.86
Nonpoor head not finished secondary school (U)	16.71	24.39	27.97	31.93	25.25
Nonpoor head finished secondary school (U)	17.57	25.98	29.73	33.86	26.79
Average	17.94	26.63	30.44	34.65	27.42

[1] R is rural and U is urban.

Table 15 Simulation Results on the Growth of GDP as Compared to the Base Year

Policy	Period				
	2002/05	**2006/10**	**2011/15**	**2016/20**	**Average**
Natural economic growth (%)	1.28	3.14	4.5	6.01	3.73
AGOA with rapid investment (%)	7.36	11.73	13.99	16.49	12.39
AGOA with persistent and gradual investment (%)	17.49	26.1	29.86	34.01	26.87

Table 16 Variables used for Poverty Analysis and Base Case Poverty Measures

Income and poverty level	Households	
	Rural	**Urban**
Mean income in Tshs (all households)	188,082	352,516
Mean income in Tshs (poor households)	74,277	128,411
Minimum income in Tshs	7,427	12,841
Maximum income in Tsh	971,706	870,021
Parameter P (Equation 8)	0.22	0.32
Parameter Q (Equation 8)	0.27	0.13
I(w:P,Q)	0.42	0.25
Base case poverty level		
Head count	33.93%	14.20%
Poverty gap	6.22%	4.11%
Poverty intensity	1.14%	1.19%

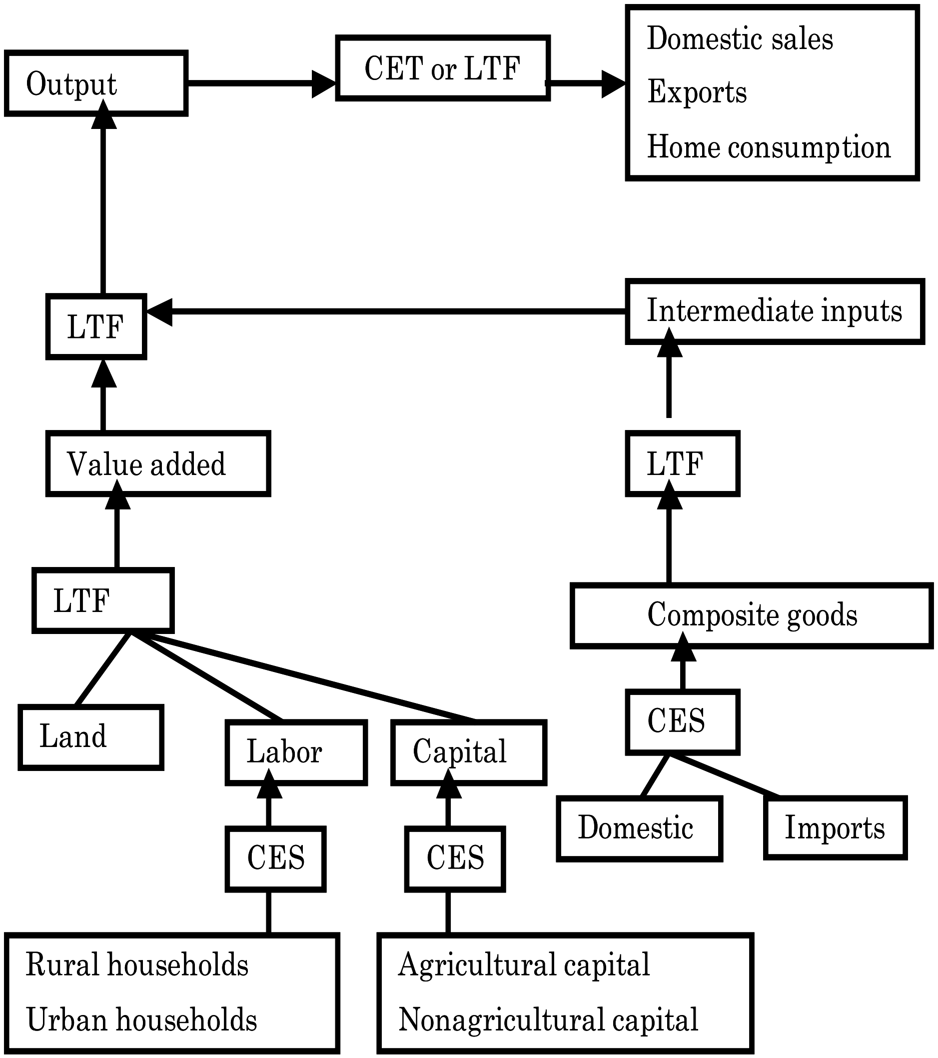
Basic needs poverty line (in per capital term) for rural household was 90,948 Tshs/year ($104/year) and basic needs poverty line for urban household was 99,566 Tshs/year ($114/year). The beta function parameters (P and Q) were estimated using the matching moment procedure.

Table 17 Poverty Analysis Results

Type of Household	Natural Economic Growth			AGOA 1			AGOA II		
	2005	2015	2020	2005	2015	2020	2005	2015	2020
Mean per capital income (000 Tshs)									
Rural poor	92.34	88.04	85.83	153.24	145.80	142.31	255.23	243.05	237.14
Rural between basic needs poverty line	136.01	129.62	126.39	225.57	214.81	209.70	375.94	357.96	349.27
Urban below food poverty line	138.09	131.51	128.95	230.16	219.87	214.31	384.03	365.76	356.88
Urban between basic needs poverty line	244.05	232.91	227.57	407.59	388.18	378.71	679.32	646.65	630.61
Poverty lines (000 Tshs)									
Rural poor	113.08	137.84	152.19	186.82	227.73	251.43	310.06	377.96	417.30
Rural between basic needs poverty line	112.80	137.50	151.81	186.34	227.15	250.80	309.24	376.96	416.20
Urban below food poverty line	113.02	137.78	152.12	186.74	227.64	251.33	310.00	377.89	417.22
Urban between basic needs poverty line	112.80	137.50	151.81	186.34	227.15	250.80	309.24	376.96	416.20
Incidence of poverty (%)									
Rural poor	35%	34%	34%	40%	39%	39%	45%	45%	44%
Rural between basic needs poverty line	38%	38%	38%	44%	43%	43%	51%	50%	50%
Urban below food poverty line	17%	16%	16%	21%	20%	20%	26%	25%	25%
Urban between basic needs poverty line	21%	21%	20%	27%	26%	26%	37%	36%	35%
Poverty gap (%)									
Rural poor	6%	12%	15%	7%	14%	17%	8%	16%	19%
Rural between basic needs poverty line	-8%	2%	6%	-9%	2%	7%	-11%	3%	8%
Urban below food poverty line	-4%	1%	2%	-5%	1%	3%	-6%	1%	4%
Urban between basic needs poverty line	-24%	-14%	-10%	-32%	-18%	-13%	-44%	-25%	-18%
Intensity of poverty (%)									

Rural poor	1%	4%	6%	1%	5%	7%	1%	6%	8%
Rural between basic needs poverty line	2%	0%	1%	2%	0%	1%	2%	0%	1%
Urban below food poverty line	1%	0%	0%	1%	0%	0%	1%	0%	1%
Urban between basic needs poverty line	28%	10%	5%	38%	13%	7%	53%	18%	9%
Poverty vulnerability (%)									
Rural poor	0%	0%	-1%	5%	4%	4%	11%	10%	10%
Rural between basic needs poverty line	4%	3%	3%	9%	9%	8%	16%	15%	15%
Urban below food poverty line	2%	2%	2%	6%	5%	5%	11%	11%	10%
Urban between basic needs poverty line	6%	6%	6%	12%	11%	11%	22%	21%	20%

Figure 1 Production Technology and Preference Structure



CES is the constant elasticity of substitution function, CET is the constant elasticity of transformation function, and LTF is the Leontief function.

Figure 2 Commodity Flows and Consumption Preferences

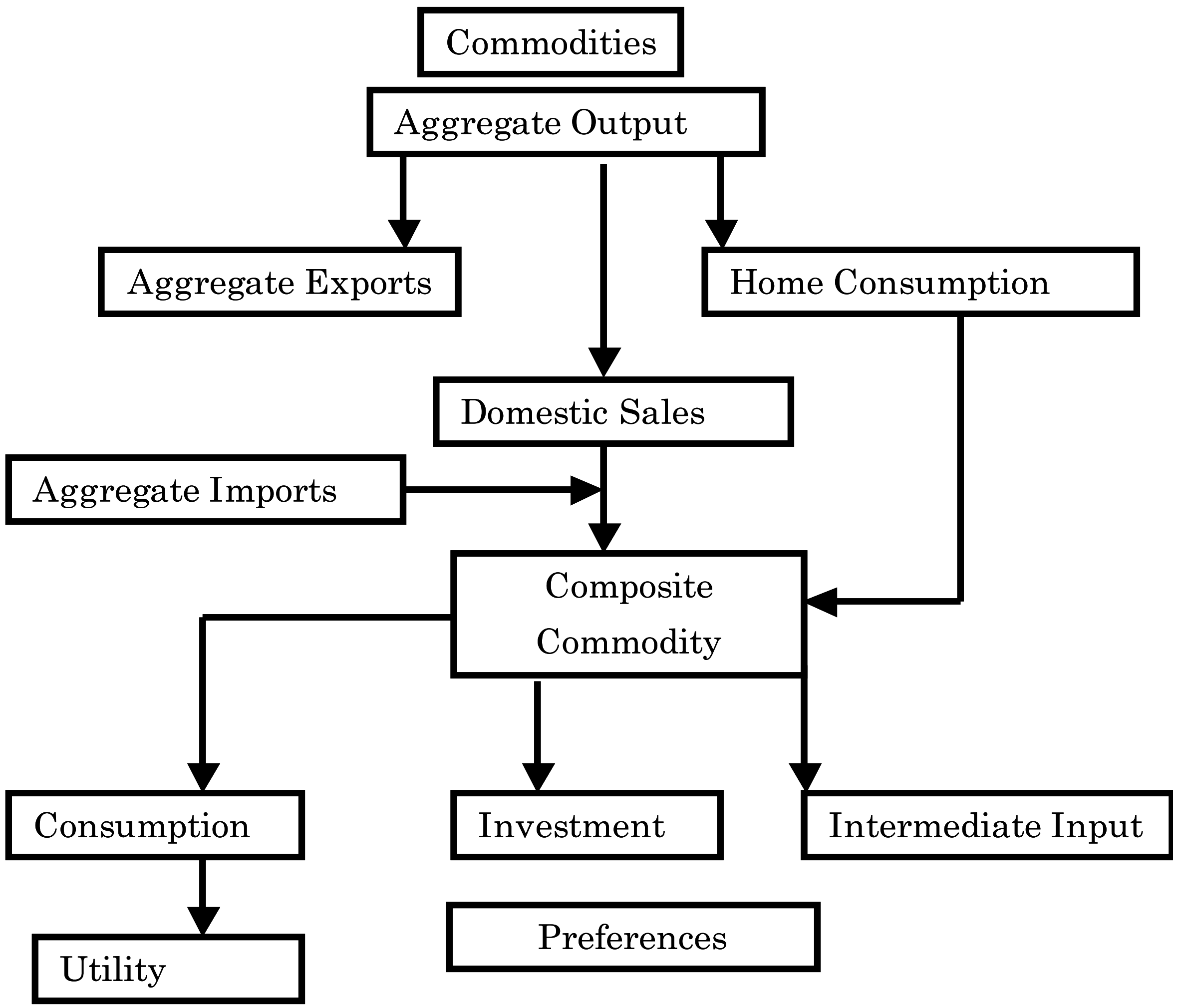


Figure 3 Income distribution and commodity demand by institutions

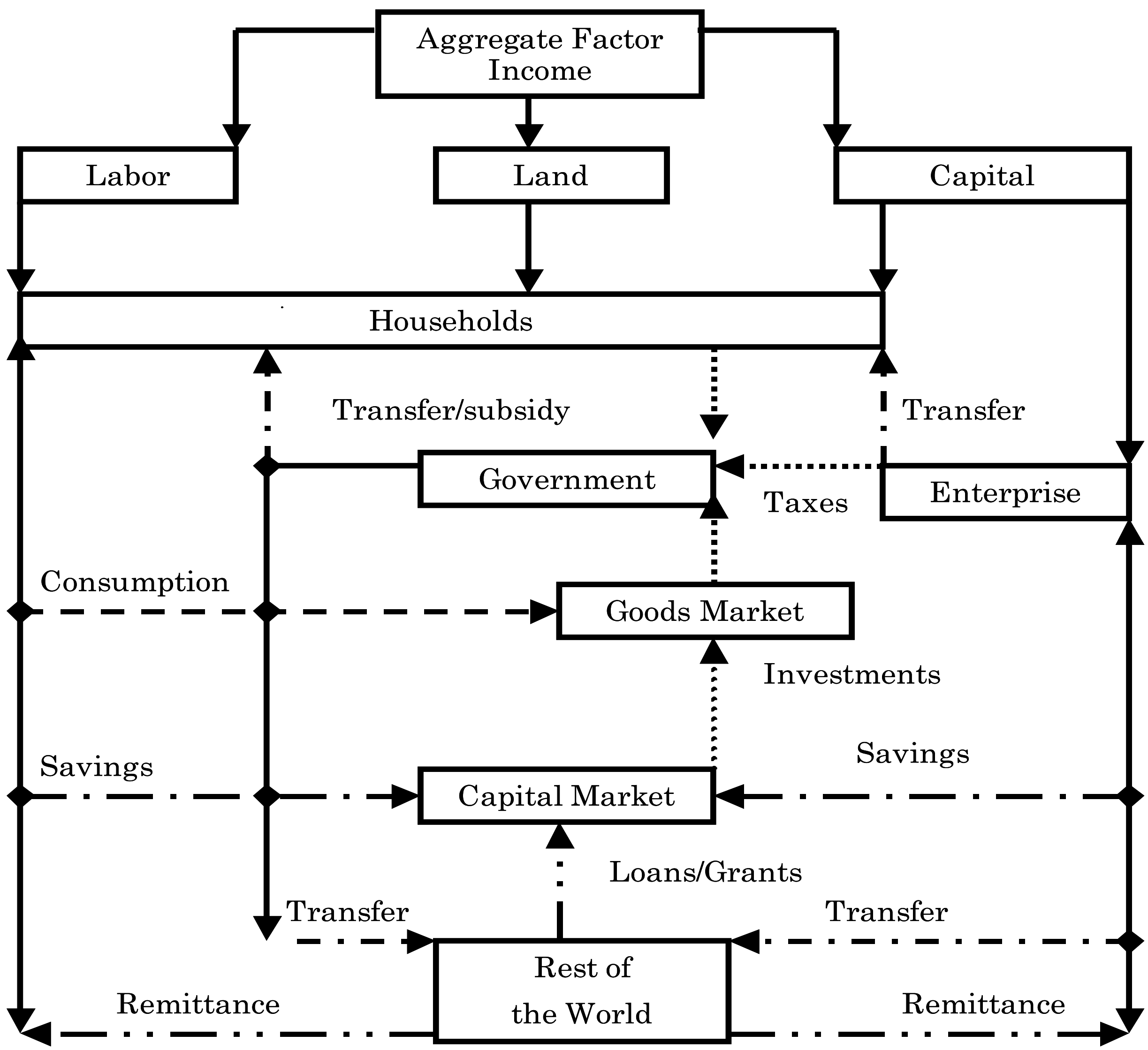


Figure 4 Basic Structure of the Tanzania CGE Model

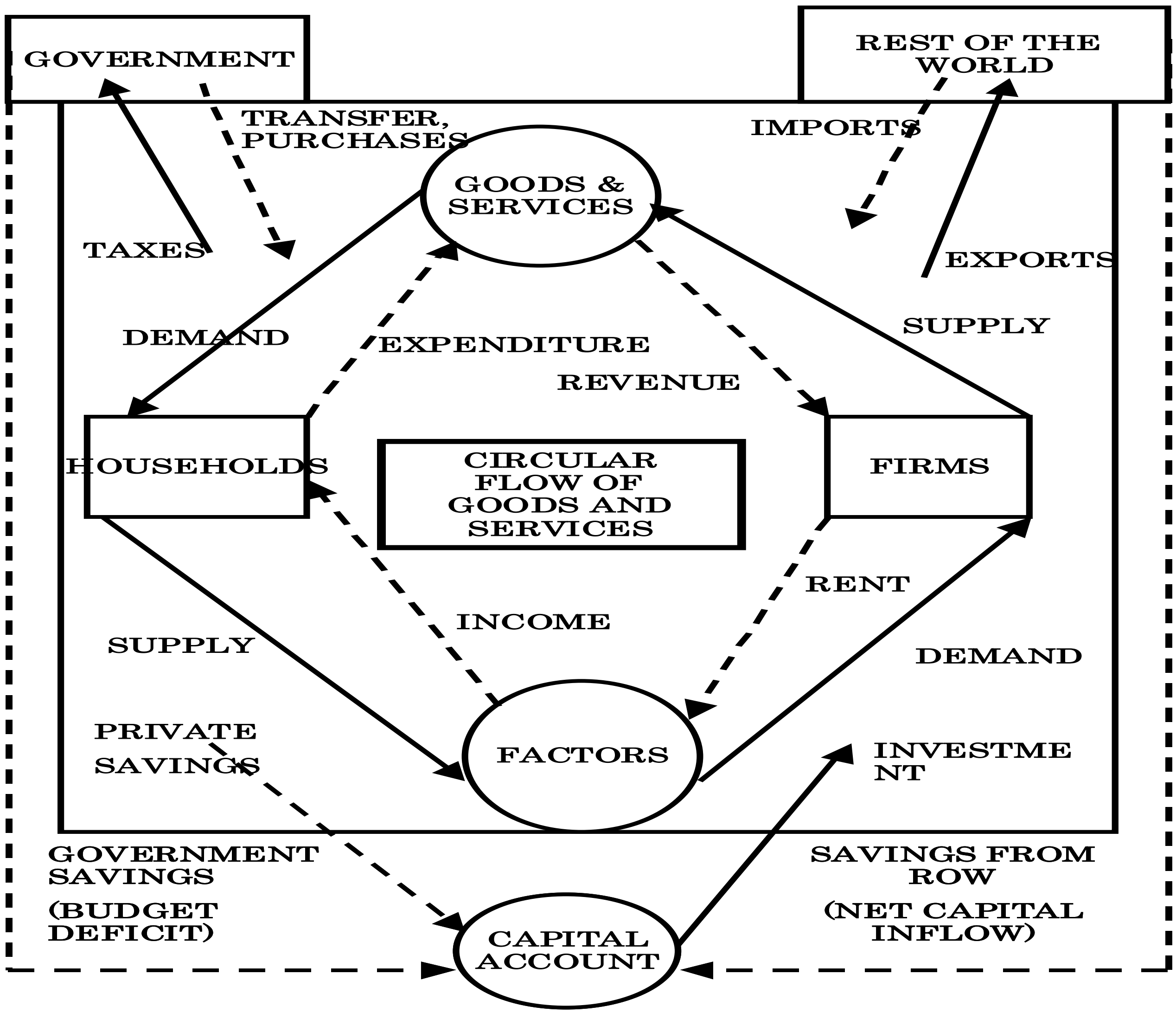


Figure 5 Impact of External Economic Shock on Income Distribution.

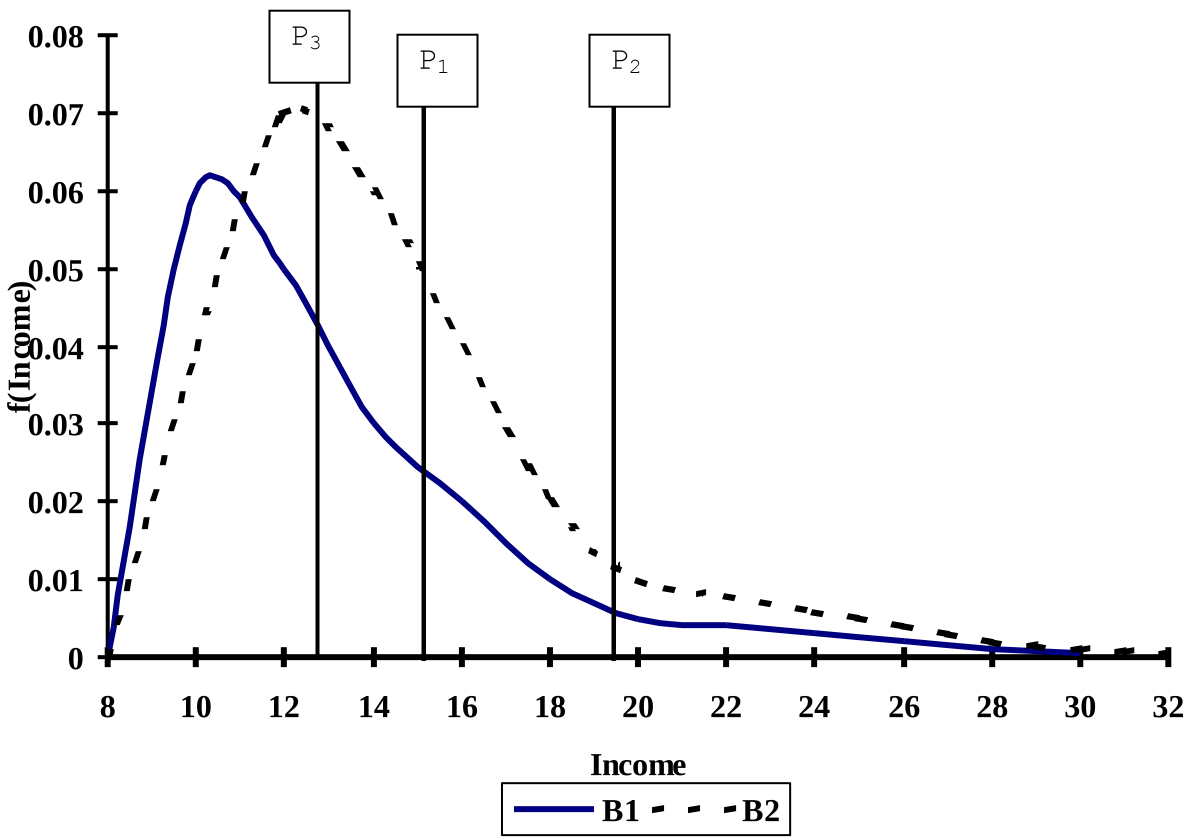


Figure 6 Average Trend in Productivity Procress