IMPACT OF ELIMINATION OF TRADE TAXES ON POVERTY AND INCOME DISTRIBUTION IN GHANA

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Abstract: Ghana has adopted the Poverty Reduction Strategy, which emphasizes increased focus on poverty reduction in the design and implementation of its policies. Trade liberalization is one of the ways through which poverty could be reduced. However, trade liberalization results in decreased fiscal revenue of the government. There is a need to co-ordinate fiscal reforms with trade liberalization. The present study uses the CGE model and examines the impact of alternative fiscal reforms; in which lost tariff revenue is compensated by a lump-sum tax, on the poverty and income distributions of households. The study tests the hypothesis that elimination of trade related import taxes accompanied by an increase in VAT reduce the incidence, depth and severity of household poverty and improve the income distributions of households. On the other hand, the study tests the hypothesis that the elimination of export taxes accompanied by an increase in VAT increase the incidence, depth, severity of household poverty and worsens the income distributions of households.

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1.0 Introduction

1.1 Background

The persistence of poverty in a large number of developing countries that have been recipients of development assistance from the international community has led to increased emphasis on poverty reduction by the international community. The increased focus on poverty reduction was further motivated by the incidence, depth and severity of poverty, especially in Sub-Saharan Africa, where a large number of countries, including those that embraced the path of economic reforms and stabilization programs, continued to face declining living standards (De Maio, Stewart and Van Hoeven, 1999; Easterly, 2001; Hillman, 2002; Fofack, 2002). A deep analysis of poverty requires a better understanding of the constraints on poverty reduction, the transmission channels through which adjustment policies may affect the poor, and the possible trade-offs that poverty reduction may entail regarding the allocation of scarce resources and sequencing of policy reforms.

It is generally believed that expanded trade holds the key to prosperity for developing countries. According to this view, if the industrialised countries would eliminate their trade barriers, especially in apparel and agriculture, this would provide a basis for growth in developing countries, pulling hundreds of millions of people out of poverty. According to World Bank (2002), a reduction in world barriers to trade could accelerate growth, provide stimulus to new forms of productivity-enhancing specialization, and lead to a more rapid pace of job creation and poverty reduction around the world. Weisbrot and Baker (2002) have argued that most of the projected gains from trade liberalization do not come from the removal of trade barriers in the industrialized countries - rather the biggest source of gains to developing countries is the removal of their own barriers to trade. In principle, these gains would be available whether or not the industrialized countries also followed a path of trade liberalization. They also look at the reasons why developing countries may not choose to liberalize, in spite of the potential gains. The two most important considerations are the loss of revenue due to tariff reductions, and the economic and social disruptions caused by rapid displacement of workers from agriculture. This brings forth the question what type of fiscal reforms should be adopted by developing countries to liberalize their trade and reap the benefits of trade. According to Baker and Weisbrot (2001), this type of fiscal reform could be where the lost tariff revenue is replaced by non-distortionary lump sum taxes (Sales Tax or Value Added Tax).

One of the most common ways to examine the effects of fiscal reforms on poverty and income distribution is using Social Accounting Matrices (SAM) and Computable General Equilibrium (CGE) models. The SAM is a comprehensive, disaggregated, consistent and complete data system that captures the interdependence that exists within a socio-economic system. CGE models have been widely used to simulate the impact of

macroeconomic policies on income distribution and poverty. One can identify three types of CGE models that try to address this question. The first type considers only the representative agent and provides information on inequalities between groups without giving any results in terms of poverty. This strand of literature includes Adelman and Robinson (1979) for Korea; Dervis, de Melo and Robinson (1982) and Gunning (1983) for Kenya; Thorebecke (1991) for Indonesia; Morrisson (1991) for Morocco; Chia, Wahba and Whalley (1994) for Cote d'Ivoire, and Obi (2003) for Nigeria. The second type of modelling is grounded on the previous one but includes information on intra group income distributions and endogenises poverty. This strand of literature includes de Janvry, Sadoulet and Fargeix (1991), Decaluwe, Patry, Savard, and Thorbecke (1999); Azis and Thorbecke (2001); and Aka (2003). The third type of modelling is based on the second type but endogenises both the intra group income distributions and poverty. This strand of literature includes Cogneau and Robillard (1999) and Decaluwe, Dumont and Savard (1999). In the present paper, we adapt the approach of Decaluwe, Patry, Savard, and Thorbecke (1999) and Aka (2003).

1.2 Research Problem

Despite the adoption of trade related reforms and fiscal reforms in Ghana, growth has not accelerated and poverty remains widespread and pervasive particularly in the rural areas. Trade and fiscal reforms are recognised as a potent tool for enhancing growth, redistributing income and reducing poverty. The West African regional integration involves the creation of a Free Trade Area; the creation of a Borderless Zone; the creation of a Second Monetary Zone; Regional Infrastructure Projects; and the promotion of private sector cross-border investment ventures and activities. These measures are likely to result into the elimination of trade taxes within the Economic Community of West African States (ECOWAS) countries. Since Ghana's trade with the ECOWAS countries, especially Cote d'Ivoire, Nigeria and Togo has been increasing significantly, elimination of trade taxes will cause a substantial fall in the revenue of the government. This decrease in the revenue will worsen the budgetary deficit. Thus, trade liberalization needs to be co-ordinated with fiscal reforms.

It is necessary for government to find other avenues to compensate for the decrease in revenue. The government can consider various options. The first option is in which the government can combine the elimination of trade taxes with increases in non-distortion lump-sum taxes, so that the revenue of the government does not fall. The second option is to combine the elimination of trade taxes with a corresponding reduction in public consumption, so that the public savings do not fall. The third option is to combine elimination of trade taxes with increase in foreign savings, so that the investment is not reduced. All these reforms are likely to affect the poverty and income distribution of households. Households are important first as consumers affected by changes in prices and availability of consumer goods, then as suppliers of factors of production, particularly labor, and lastly as producers in the agricultural and non-agricultural sectors (McKay et al., 1999). Since the government is most likely to implement the first type of fiscal reform, it will be interesting to assess the impact of such type of reform on the

incidence, depth, and severity of poverty and income distributions of various categories of households.

1.3 Objectives

The basic objective of the study is to assess the impact of fiscal reform, which states that a cut in international trade taxes has to be followed by a change in tax policy, on the poverty and income distributions of various categories of households. This is achieved by considering alternative fiscal policy regimes. In the first fiscal policy regime, trade taxes on all imported goods are eliminated with a 100% increase in VAT (from 10% to 20%). In the second fiscal policy regime, taxes on all exported goods are eliminated with a 100% increase in VAT (from 10% to 20%).

1.4 Organisation of Study

Section 1.0 includes background, research problem, and objectives of study and organisation of study. Section 2.0 describes the features of the Ghanaian economy. This section is subdivided into two sub-sections. The first sub-section discusses the political economy. The second sub-section discusses the fiscal policy and poverty alleviation in Ghana. Section 3.0 reviews the relevant literature. Section 4.0 describes the model. Section 5.0 considers the structure and data of the SAM. This section is further divided into two sub-sections. The first sub-section analyses the macro SAM and data. The second sub-section analyses the micro SAM and data. The methodology is discussed in section 6.0. Section 7.0 presents the simulation results. Section 8.0 presents the main conclusions.

2.0 Features of the Ghanaian Economy

2.1 The Political Economy

After independence, Ghana began its march towards growth and development with emphasis on industrialisation. The Nkrumah regime embarked from 1961 to 66 on a highly ambitious strategy of import-substituting industrialisation via the establishment of state-owned enterprises. This had been financed partly by milking the cocoa sector and partly by contracting large external loans. In addition, foreign firms were allowed to operate large industrial enterprises, while smaller trading and manufacturing operations were reserved for Ghanaians. With increasing balance of payments problems, the government prohibited repatriation of profits in 1965. While the controls had the short-run effect of increasing Foreign Direct Investment (FDI), because companies were forced to reinvest their profits, the policy scared off many existing and potential investors. Owing partly to gross over manning and chronic mismanagement, the new state-owned industries nearly all proved unprofitable and became a huge burden on public finances (Seidman, 1978). When cocoa production fell during 1964-65 and was accompanied by a fall in world market prices, the Nkrumah government found itself with a chronic foreign-exchange problem and massive foreign debts. Instead of devaluing the national currency, the government resorted to a system of comprehensive import controls. Quantitative

restrictions were implemented through the issue of import licences that were not auctioned or resalable. There were three types of licences. The Open General Licence (OGL) allowed registered importers to import freely the item specified on the licence. The Specific Licence required prior authorization before the goods were brought in. The Special Licence allowed imports to be brought in by importers who had access to their own foreign exchange. Although the controlled system intended to give preference to essential capital or intermediate goods, corrupt bureaucrats to increase the import of consumer goods mismanaged this system. The foreign exchange crunch prompted the nation to make its maiden call on the International Financial Institutions (IFIs) that is, The World Bank and The International Monetary Fund (IMF) for assistance. Support from the IFIs suggested a non-inflationary borrowing and balanced budget. The Nkrumah regime did not listen to these suggestions. This led to the military overthrow of Nkrumah's regime on February 24,1966.

The National Liberation Council (NLC) was set up with Lt. General J.A. Ankrah as the leader and this military government succeeded Nkrumah's in 1966. This regime with the support of the IFIs sought to pursue a liberalised system, remove controls, devalue the currency and ensure tighter control over import licensing. It could be surmised that even though this regime sought to pursue a liberalised system it still pursued some form of controlled trade relation. The NLC government signed an agreement with the IMF in response to the balance of payments crisis in 1965/66, agreeing to devalue the cedi and rein in public expenditures. This agreement brought in increased foreign assistance; especially programme aid to support the balance of payments. Busia regime came into existence after winning the elections in 1969. This regime was more determinedly committed to liberalization and undertook the abolition of import controls. In addition, an export promotion package was introduced in 1969 to encourage an increase in manufactured exports. Some of the aid flows that Ghana received during the NLC government, particularly credits from the IMF, and rescheduled medium-term debts began to fall due in the early 1970s, reducing the net flow of resources. Any manufacturing investment required approval from the relevant government ministry. A fall in the world market price of cocoa resulted in the major balance of payments crisis in 1971. This resulted into the devaluation of the Cedi by 48.6 per cent in December 1971. Prices of consumable goods shot up and public lost confidence in the government, and in January 1972 Col. I. K. Acheampong overthrew the Busia regime.

In an attempt to justify the military coup, the Acheampong regime in February 1972 reversed the devaluation and revalued the cedi upward by 44 per cent. In 1972, most items were transferred to the Specific Licence lists and the importation of about 150 items were either restricted or banned. By the end of 1974, the OGL could be used only to import trade samples, gifts and personal effects. The Acheampong government's decision to repudiate some of Ghana's commercial debts because they were contracted irregularly brought a sharp response from bilateral donors in 1973 and 1974. Moreover, aid came more as multilateral loans than grants, so foreign debts grew substantially. This regime embarked on mobilisation of domestic resources since it came into power under the pretext of the previous regime succumbing to international pressure. The Acheampong nationalisations scared away the potential foreign investors. It

subsequently, launched a twin programme, Operation Feed Yourself (OFY) and Operation Feed Your Industries (OPI). This regime returned the state-led system employing about 70 –80 per cent of the labour force and a strict adherence to import controls. The adverse implication of this huge government expenditure and the revaluation exercise respectively led to inflation hitting a maximum of 54% and the emergence of a black market. The unrealistically fixed exchange rate conspicuously led to a parallel exchange rate market and flourishing illegal economic activities. There was complete stagnation and a virtual collapse of the economy.

Acheampong's regime was displaced on 5 July 1978 by a 'palace coup' led by Lt. General Fred Akuffo. This regime entailed another devaluation of the Cedi by 60 per cent, reduced the overall planned budget deficit, adopted the demonetisations exercise to mop-up excess liquidity and increased the cocoa price by 100 per cent per load. Between 1979 and 1982 political power within the Ghanaian economy changed hands on two occasions. On June 4, 1979, Flt. Lt. Jerry Rawlings was nominated as Chairman of the Armed Forces Revolutionary Council (AFRC). This regime tried forced sale of local and imported goods at controlled prices. The AFRC was in power far too briefly to be able to implement any distinctive macroeconomic policies. In the remarkably free and fair elections of June 1979, the People's National Party won an uninspiring victory. Rawlings handed over power to its victorious presidential candidate, Dr. Hilla Limann in September. The most pressing task facing the new administration was clearly to rescue the economy from further collapse. This regime sought to improve government finances by introducing new taxes and reducing expenditure. Moreover, it sought to attract increased foreign investment and large allotments of foreign aid, neither of which was forthcoming, given the state of the economy and the government's refusal to accede to IMF stabilization measures, including the demand for a substantial devaluation of the cedi. The regime of Dr. Limann was replaced by the regime of Jerry Rawlings on 31 December 1981 and regime was known as the Provisional National Defence Council (PNDC).

In the first phase of this regime, efforts were made to tighten the controls on prices of imported consumer items and locally produced food, rent, and transport fares. This regime unilaterally cancelled the external debts. Foreign companies were threatened with nationalisation. To combat inflation, and mop up excess liquidity, the government embarked on a confiscation of cedi 50.00 notes. Individual and company bank accounts deemed by the regime to be too high were frozen. The foreign exchange retention scheme was introduced in 1982. This allowed exporters of non-traditional exports to retain a percentage of their foreign earnings specifically to purchase machinery, equipment, spare parts and raw materials required in the production of exports. With the 1981-83 drought driving the economy to unimaginable lows, the PNDC agreed to an IMF programme that included a massive devaluation and a tightening of the budget deficit. Rawlings initiated the Economic Recovery Programme (ERP) in April 1983. The second and more sustained phase of economic policy reforms began roughly from late 1983. It involved the liberalization of foreign exchange with a series of devaluations of the local currency and establishment of forex bureaux. It also involved the removal of price controls, so that by 1991 only eight goods (imported rice, sugar, baby food, cement, textiles, drugs, matches

and soap) were subject to price regulations. In addition, imports were liberalized through the abolition of the previous system of import licensing, replaced by import declaration; the tariff structure was significantly simplified; some tariffs were reduced; and the level of protection was moderated. There was also liberalization of exports, including schemes under which exporters of timber and the so-called non-traditional commodities were allowed to retain part of the foreign exchange earned by their exports, in addition to receiving tax concessions. The state initiated privatisation programme in which a number of state-provided services were subcontracted to private operators and most of the country's over 300 parasatals were earmarked for divestiture. Finally, the government enacted relatively liberal investment and trading codes, aimed at attracting private investors. Public investment was concentrated on the rehabilitation of the physical structure, rather than on industries producing marketable output. It was therefore potentially complementary to private capital, rather than a competitor. An amended investment code was enacted in 1985 that together with fiscal incentives for eligible investors, allowed unrestricted repatriation of profits and debt-service payments and provided guarantees against expropriation. Legislation covering the mining industry underwent a major revision with the enactment of the 1986 mining law.

Ghana has faced important balance of payments at several times during the post-ERP period. With each crisis, there was the temptation to roll back some of the reforms, particularly those related to the foreign-exchange market and import decontrol, but the provision of aid helped prevent this. The sharp depreciation of the Cedi that accompanied the advent of the auction and the fall in cocoa prices that began in the 1987/8 are the most important examples. Foreign loan and grant inflows provided important support to the foreign -exchange auction introduced in 1986. Moreover, most of investment financing in Ghana in 1986 came from foreign sources. There was re-definition of import licence categories in 1986 when the new exchange rate system was introduced. The 'A' licence allowed the holder to bid for foreign exchange at the foreign-exchange auction and restrictions were put on the type of goods that could be imported using the licence. The second licence was the 'S' licence. Holders of this licence could not bid for foreign exchange at the auction. The third licence was issued to government organizations for the importation of essential goods and services. Liberalization of the trade regime continued in 1987 with the transfer to the auction of about 70% of the goods which were previously not eligible for the auction. The foreign exchange retention scheme was liberalized further in 1987 when the percentage of export earnings that could be retained was increased from 20% to 35%. Restrictions on the use of the retained earnings were also relaxed. When cocoa prices fell sharply and apparently, permanently in 1988, donors moved to fill the gap left in the balance of payments, thus avoiding both strong exchange rate movements and reductions in imports. The second World Bank Structural Adjustment credit (SAC) was signed in 1989 and it stressed the need to tackle long-term issues of poverty, rapid population growth and food security. In 1989, the import licensing system was abolished because it was considered redundant given the developments in the exchange rate system. A wholesale foreign-exchange auction replaced the retail auction in 1990 and which was replaced by an interbank market in 1992. The export retention scheme was phased out. Non-traditional exporters could receive their foreign exchange over the counter from any authorized commercial bank.

Ghana went back to civilian rule in 1992 with Rawlings as democratically elected President. Rawlings' victory resulted from the strength of his support in the rural areas, and this might be attributed to improved agricultural producer prices and to the focusing of development projects in rural rather than urban areas. The victory could also be because the two Rawlings regimes have moved Ghana closer to a 'development state' (Gyimah-Boadi, 1995). Apart from the government's sale of part of Ashanti Goldfields in 1993 and 1994 to foreign mining interests, the ERP has generated very little FDI. Investment regulations were further liberalized with the enactment of the Ghana Investments Promotion Centre Act in 1994. Foreign savings increased consistently, because of the foreign inflows that accompanied structural adjustment programmes. Analytically, whilst foreign saving should complement domestic savings to increase the volume of productive capacity; rising foreign inflows in Ghana have been associated with reduced national saving. Ghana's experience so far supports Griffin's empirical analysis that foreign inflows tend to displace rather than complement domestic saving (Griffin, 1970). Various fiscal policy instruments were adopted under the ERP and SAP to streamline the performance of the economy. The major instruments used to address fiscal imbalance were government-revenue augmenting through improvement in tax collection and government-expenditure reducing through retrenchment of workers on the government pay roll.

In 1996, President Rawlings was returned to power. His party, the National Democratic Congress ruled until December 2000. Ghana remained heavily dependent on cocoa, gold and timber for its foreign exchange earnings despite impressive growth in non-traditional export volumes, lower prices for these commodities since 1998 have had dehabilitating effects on the country's export revenues. The Rawlings Administration put heads together with both the political parties in opposition and the private sector, and held a National Economic Forum in September 1997, during which suggestions were made about how ti improve the country's economic performance. The consensus was that the budget deficit should be eliminated by the year 2001. In November 1999, Ghana hosted a meeting of the Consultative Group on Ghana, which is made up of countries such as Britain, France, the United states, Germany, the Netherlands and Japan as well as the World Bank, the IMF, the African Development Bank and some relevant United Nations specialised agencies. The Consultative Group after examining the facts on the ground pledged immediate assistance of US$ 200 million to cover Ghana's short-term financing gap and committed US$ 1 billion for long-term financing. Ghana has been trying to privatise its telecommunications, electricity, water and national airline.

Barely two years into the Rawling's regime, it was realised that the Trade and Investment Programme (TIP) had led to changes in government policies especially in the area of export promotion. Some of the remarkable changes in government policies included the removal of foreign exchange control that required non-traditional exporters to surrender most of their foreign exchange earnings to the monetary authorities and the elimination of price controls. As a sequel to TIP, the USAID and the Ghana government prepared another project called the Trade and Investment Reform Programme (TIRP), which was launched and implemented in 1998. The rationalization of the tariff regime was further

pursued close to the end of the 1990-decade by pursuing a tariff structure of four rates for imported duties and a 10 per cent value added tax on both imports and domestically produced goods and services. In July 2000, another dimension of policy change in revenue collection was the increase in the VAT by 2.5 per cent to specifically fund education.

In December 2000, His Excellency President John Agyekum Kuffour was ushered into power through a democratic election. The incumbency further pursued a liberalized foreign exchange market that reduced the gap between the Interbank and forex bureau exchange rate. In December 2001, Ghana was classified as a Heavily Indebted Poor Country (HIPC). The debt relief facility was to redeem the nation of its heavy debt position (external) that had been accrued over the years, especially in the last quarter of year 2000. A justification for Kuffour's regime opting for the HIPC initiative was substantiated by the fact that Ghana's external debt burden at the end of 2000 was US$ 6.1 billion, of which 76% was owed to multi-lateral creditors and 24% to bi-lateral creditors. This facility brought in increased aid inflows and reduced the payments of both the principal and interest on external debt. Financial resources, which would have been used to finance creditors, were retained to augment the county's spending on poverty reduction, and better provision of health, education, and water facilities. In view of the Millennium Development Goals, the incumbent government replaced the Accelerated Poverty Reduction Programme with the Ghana Poverty Reduction Programme (GPRS).
Under President's Special Initiative (PSI), two initiatives became operational in 2002, and these were the Cassava initiative and the Garment and Textile Initiative. The purpose of these initiatives was to stimulate private enterprise, improve productivity and create jobs in agricultural production and processing. Recently, health insurance levy of two and a half percent has been added to the value added tax. The objective of this levy is to replace the cash-and carry system by national health insurance scheme.

2.2 Fiscal Policy and Poverty Alleviation in Ghana

The fiscal position of the Ghanaian economy has been the major concern of both the immediate past government and the current government. The underpinning issue to contend with is the nation's ability to restrict its expenditure within the limits of its revenue capacity. The composition of tax revenue and non-tax revenue is presented in Table 1. Since the simulations in the CGE model are run for the year 1999, we have decided to discuss the data for the year 1999 instead of 2002. On the average, tax revenue contributes slightly above three quarters of the total revenue in Ghana with the non-tax (grants, income and fees and divestiture) contributing the remaining quarter. In 1999, the share of tax revenue in total revenue was 82.21% and that of the non-tax revenue to total revenue was 17.79%. The tax revenue comes from direct taxes, indirect taxes, and international trade taxes. The non-tax revenue comes from grants, income and fees, and divestiture of public enterprises. Direct taxes are levied on income and property of individuals and businesses. In 1999, direct taxes contributed about 29.72% to the total tax revenue. The major source of direct tax revenue was corporate tax followed by income tax. Indirect taxes comprise Value added tax (VAT) on both domestic and imported products, petroleum tax and other indirect taxes. In 1999, indirect taxes contributed 44.12% to the total tax revenue. The major source of indirect tax revenue was VAT

followed by petroleum tax. International trade taxes are levied on imports and exports. In 1999, international trade taxes contributed 26.16% to the total tax revenue. The major source of international trade tax revenue was import duties followed by export duty. Import duties contributed 17.94% and export duties contributed 8.22% towards the total revenue of the government. In 1999, grants accounted 8.04% of the total non-tax revenue. The elimination of trade taxes will reduce the revenue of the government by more than one-third (if tax base is not enlarged) and as a result, public savings will be reduced. This is also going to reduce the investment, which is not good for the economy. The government of Ghana is unlikely to implement such type of tax reform. The government can consider various other options. The first option is in which the government can combine the elimination of trade taxes with increases in non-distortion lump-sum taxes (VAT), so that the revenue of the government does not fall and this type of fiscal reform does not reduce investment. The second option is to combine the elimination of trade taxes with a corresponding reduction in public consumption, so that the public savings do not fall. This option is likely to increase poverty. The third option is to combine elimination of trade taxes with increase in foreign savings, so that the investment is not reduced. The implementation of this option requires continuous inflow of foreign resources, which may not be forthcoming in the near future. Thus in the present study, we implement the first option as suggested by Baker and Weisbrot (2001). Using the information from Social Accounting Matrix (SAM) for Ghana for 1999 and the Ghana Livings Standard Survey 4 (GLSS 4), we want to assess the impact of this fiscal reform on the incidence, depth, severity of poverty; and income distributions of five categories of households' chosen according to their main economic activity.

Table 1: Composition of Tax and Non-Tax Revenue, 1999-2002 (%)

Components	1999	2000	2001	2002
Direct Taxes (% of Total Tax Revenue	**29.72**	**31.93**	**32.39**	**32.70**
PAYE	33.81	34.97	31.90	33.23
Self Employed	6.63	5.46	5.36	6.18
Companies	53.95	50.42	45.51	41.55
State Enterprise	1.55	1.51	-	-
Others Direct Taxes	4.05	7.64	17.23	19.04
Indirect Taxes (% of Total Tax Revenue	**44.12**	**45.72**	**43.69**	**43.96**
VAT (Domestic and Import)	58.11	63.02	68.56	61.45
Petroleum Tax	30.15	26.35	22.57	28.70
Other Indirect Taxes	11.74	10.63	8.87	9.80
International Trade Taxes (% of Total Tax Revenue	**26.16**	**22.35**	**23.92**	**23.34**
Import Duties	68.56	81.88	80.87	81.51
Export Duties	31.44	18.12	19.13.	18.49
Grants (% of Total Non-Tax Revenue)	8.04	10.06	18.22	14.75

Source: Ministry of Finance

The composition of recurrent and capital expenditure is presented in Table 2. In 1999, recurrent expenditure accounted 62.7% and capital expenditure accounted 37.3% of the total government expenditure. The recurrent expenditure comprises non-interest and interest expenditure. The non-interest expenditure includes the expenditure on wages and salaries, administration and services, subventions, transfers, and utility price subsidies. The interest expenditure includes the expenditure incurred on the interest payment for domestic debt and the interest payment on foreign debt. Non-interest expenditure dominates recurrent expenditure with wages and salaries accounting for major spending category. In 1999, transfers accounted only 5.5% of the non-interest recurrent expenditure. The interest payment on domestic debt dominated the interest recurrent expenditure. Government expenditure has been biased in favour of recurrent expenditure the majority of which went into salaries. Spending on social programs for poverty reduction such as health and education has been low and constraining to poverty reduction. For instance, the levels of spending on health and education at 2.0% and 2.8% of GDP respectively are much lower than African averages with a disproportionate amount of the resources used for personnel emoluments and administration. Capital expenditure comprises domestically financed and foreign financed capital expenditure. In 1999, foreign financed capital expenditure accounted 21.5% and domestically financed capital expenditure accounted 15.8% of the capital expenditure. In Ghana, foreign resources have been used to finance capital expenditure. To overcome the poor flow of grants, the government may have to work harder to attract foreign direct investment to build the capital base of the economy. For this to happen, the private sector has to perceive a more attractive environment and greater consistency in the application of policies and regulations.

Table 2: Composition of Recurrent and Capital Expenditure, 1999-2002 (%)

Components	1999	2000	2001	2002
Recurrent Expenditure (% of Total Expenditure)	**62.70**	**69.90**	**58.14**	**76.60**
Non-Interest	41.40	39.90	35.39	53.13
Wages and Salaries	21.50	18.90	25.97	32.85
Administration and Services	9.00	9.30	7.02	11.37
Subventions	5.30	5.90	-	-
Transfers	5.50	5.70	2.40	5.39
Utility Price Subsides	-	-	-	3.52
Interest	21.30	27.00	22.75	23.47
Domestic	16.20	19.20	18.85	17.30
External	5.20	7.80	3.90	6.18
Capital Expenditure (% of Total Expenditure)	**37.30**	**33.10**	**41.86**	**23.40**
Domestic Financed	15.80	15.20	13.03	10.47
Foreign Financed	21.50	17.90	28.83	12.93

Source: Ministry of Finance

Poverty in Ghana has many dimensions. Poor communities are characterised by low-income, malnutrition, ill health, illiteracy, and insecurity. There is also a sense of powerless and isolation. These different aspects interact and keep households and communities in persistent poverty. Using the Ghana Living Standards Surveys data, the Ghana Statistical Service (2000) classified the incidence (including extreme poverty), the depth, and severity of poverty into two broad groups of rural and urban. Each of these groups was in turn subdivided into forest, coastal and savannah regions, with the capital, Accra, standing alone. It also gave the contribution of ecological zones to total poverty in the country. Both the Food Energy Intake and the Cost of Basic Needs Methods were used in determining the poverty lines used in the construction of the poverty profile. Upper and lower poverty lines were used, with the latter being used as the extreme or critical poverty line. A comparison was also made between poverty in 1991/92 and 1998/99. The overall trend in poverty during the 1990s has been broadly favourable in Ghana. Taking the upper poverty line of 900, 000 cedis, the percentage of the Ghanaian population defined as poor has fallen from almost 52% in 1991-92 to just under 40% in 1998-99. At the national level, the incidence of consumption poverty has fallen by 12.2% over this seven-year period. They found that poverty is substantially higher in rural areas than urban areas and is disproportionately concentrated in the rural savannah. The decline, however, is not evenly distributed according to ecological zones and regions.

This reduction in consumption poverty has been uneven geographically, with Accra and the forest ecological zone posting the highest declines. In some areas, poverty has fallen only very marginally, or has even increased. In some of these areas, notably in the Rural Savannah, the situation of the very poorest has worsened. Despite the fact that the incidence of poverty has fallen, the depth of poverty for those who remain poor has remained relatively stable. The declines in poverty have been concentrated mostly in Western, Greater Accra, Volta, Ashanti and Brong Ahafo regions. Some regions (Central, Northern, Upper East) have experienced increases in poverty. Upper West and Eastern regions showed only small decreases in poverty. Large poverty reductions have occurred among private sector employees in both the formal and informal sectors, and among public sector wage employees, but export farmers have experienced the largest reduction in consumption poverty. Poverty reduction among the large numbers of food crop farmers, on the other hand, has been smaller.

Poverty is a multi-dimensional phenomenon and consumption-based measures need to be supplemented by other welfare indicators. Poverty can be analysed in terms of household ownership of durable goods and housing characteristics (drinking water, toilet facilities, and use of electricity). Poverty can also be analysed in terms of human development indicators (health and education). The proportions of households owning most durable goods have shown large increases between 1991-92 and 1998-99, these increases being observed in both urban and rural areas. In addition, there have been significant improvements during this period in the number of households obtaining their drinking water from a safe source, using adequate toilet facilities and having access to electricity in both rural and urban areas. As far as the health services are concerned, compared to 1991-92, Ghanaians are less likely now to consult well-qualified health personnel, or to go to a hospital when they are ill or injured. As far as the education is concerned,

enrolment rates in primary and secondary school have improved quite sharply during this period. Now, more than four out of five Ghanaian children in the relevant age group are attending primary school. The increases in net enrolment rates at secondary level have been much bigger for girls than boys, but even still rates for girls remain below those for boys.

Traditionally, Ghana has largely relied on public savings and foreign loans, and grants to fund its development programs. For instance, largely public borrowing either from domestic or foreign sources financed the nation's Medium Term development Plan. Overlooked in all these financing endeavours has been the potential direct financing input from both the private sector and non-profit institutions. The financing strategy of the Ghana Poverty Reduction Strategy (GPRS) addresses this glaring omission by identifying innovative financing mechanisms that embrace the latter groups through a system of structured incentives and strategic partnerships. For the private sector, three schemes will be implemented. These are the tax-exempt GPRS private sector fund, long-term savings plan, and non-resident-Ghanaian fund for poverty reduction. The non-profit institutions should formulate GPRS-consistent action plans for poverty reduction and their tax-exempt status will be linked to poverty-related outputs specified in action plan. Partnerships between government and private sector entities for providing public goods and services such as infrastructure, community facilities and related services will be encouraged. The following types of partnerships will be encouraged: the public sector contracts with a private partner to operate and maintain a publicly owned facility (waste removal, road maintenance, etc.); and the private partner designs, finances and builds a facility and then leases such facilities to government for a specified time, after which ownership vests with government.

Ghana is likely to enjoy some goodwill from bilateral and multilateral partners that have endorsed the GPRS. The International Monetary Fund (IMF) has welcomed the GPRS and accordingly committed SDR 184.5 million under its Poverty Reduction and Growth Facility (PRGF) in support of the government's economic reform program for 2003-05. In addition, the IMF will provide interim assistance under the enhanced HIPC Initiative of SDR 15.15 million. These allocations of IMF aid are likely to be followed by other donors in support of the intended economic reforms.

3.0 Literature Review

CGE models have been used extensively to investigate the effects of policy change within an economy since they take into account interactions and interdependencies within the economy. Thorbecke (1991) has used a CGE model for Indonesia to analyse the impacts of stabilization and structural adjustment programs on income distribution. He observed that adjustment programs restore equilibrium and improve income distribution. Lambert, Schneider and Suwa (1991) have used a CGE model for Cote d'Ivoire to analyse the effects of public expenditures, export taxes and devaluation on poverty and income distribution. Their simulations show that reduction of public expenditures by cutting wages of public employees reduces inequality but were unable to efficiently reduce poverty. Devaluation reduces inequality and poverty in Cote d'Ivoire.

Some of the CGE models consider the impact of trade and exchange rate liberalization on income distribution and poverty. Sahn, Dorosh and Younger (1997), and Dorosh and Sahn, (2000) examined the impacts of trade and exchange rate liberalization on income distribution and poverty in Cameroon, Gambia, Madagascar and Niger, using SAMS for the period 1989 – 93. In the model, the authors disaggregated households into the urban non-poor, urban poor, rural non-poor and the rural poor. Four simulations were carried out in this study: simulation one consisted of setting implicit tariff on imports high enough to keep real exchange rate fixed. The second simulation was real exchange rate depreciation. The third was exchange rate depreciation and a reduction in government spending. The fourth simulation was maintaining government revenue through increased taxes. The finding of the studies indicates that trade and exchange rate liberalisation benefits poor households in urban and rural areas. Bautista and Thomas (1997) also investigated the impacts of import liberalization on poverty in Philippines using SAM for the period 1979. Five households were considered in this model – three were rural and the remaining two were urban. Experiments carried out in the study include import rationing, uniform surcharge on imports, tariff liberalisation, tariff reduction and 50% reduction in current account deficits. The results indicate favourable effects of import liberalisation on income and poverty in Philippines.

Other CGE models are developed to investigate the effects of external and internal shocks on income distribution and poverty. One such study is on Malawi by Lofgren, Chulu, Sichinga and Simtowe (2001). The authors used 1998 SAM with a highly disaggregated household. In all there were 14 households – 5 rural agriculture, 4 rural non-agricultural and 5 urban. The simulations carried out included changes in international prices of tobacco and petrol products and variation in real exchange rate. The findings indicate that lower tobacco price plus higher petrol prices penalise non-agricultural population, real depreciation affected the poor disproportionately and real appreciation benefited the urban population. Another study in this category is the one by Robilliard, Bourguignon and Robinson, (2001) for Indonesia. Using the 1995 SAM for the country and 10 households, 38 sectors and 15 factors of production, the authors carried out a number of simulations. These include real devaluation, domestic credit crunch, foreign credit crunch, El Nino, historical and macroeconomic counterfactuals, historical and food price subsidy, public wooks programme and targeted household transfers. The results of the study reveal that El Nino worsens household welfare more than credit crunch. Among food price subsidy, public works programme and targeted household transfers, the latter was found to be the most efficient to reduce poverty.

Decaluwe, Patry, Savard, and Thorbecke (1999) have used a CGE model for an archetype African developing economy to analyse the impact of a fall in the price of the export crop and an import tariff on poverty and income distribution. The model considered six sectors, six categories of households, and five primary factors of production. They have shown that the reductions in import tariffs are beneficial to the alleviation of social poverty. On the other hand, the three measures of poverty for the society rise with a decline in the world price of the country's export crop.

Aka (2003) has used a CGE model to analyze the effects of fiscal adjustment required to compensate for the drop in fiscal receipt because of the trade liberalization and adoption of external common tariff in WAEMU countries on income distribution and poverty in Cote d'lvoire. The author has used an aggregated SAM with 3 tradable branches and a non-tradable branch, nine groups of households based on the ENV 1998 survey data and 1993 Cote d'Ivoire national accounts. Three simulations were carried out in this study; the first consisted in the elimination of taxes on agricultural exports; the second consisted in elimination of taxes on agricultural imported goods and the third simulation consisted in elimination of taxes on industrial exports. The elimination of agricultural exports and import taxes leads to more poor households than in the pre-shock situation. The elimination of taxes on industrial exports reduces the number of households that are poor in comparison to the pre-shock situation.

Obi (2003) has used a CGE model to examine the potency of fiscal policy as a tool for redistributing income in Nigeria. The model is for five sectors, two factors of production and six categories of households. The author has used the SAM for 1999 and 1996 FOS household survey data. Three counterfactual scenarios are examined: transfers to the poor household, targeting of government expenditure and import tariff adjustment. The study observed that targeting of government expenditure seems to be the most potent tool for effective redistribution of income. Moreover, tariff adjustment tends to aggravate income disparity among households.

The study by Anderson and Evia (2003) looks at the macroeconomic and distributional impacts of foreign aid in Bolivia. Using the 1997 SAM for Bolivia, 6 households and 13 productive sectors, the authors carried out two main simulations. In the first scenario, the government spends all the extra money from aid on current spending and in the second simulation; the government invests all the money in public capital. One implicit assumption of the model is that public capital i. e. roads, electricity networks, justice system, research centres, etc., make private capital more productive. In both cases a positive impact of foreign aid on GDP growth rate was found, but in the case of pure current spending, the advantage is temporary, and the longer the influx of aid is maintained, the smaller the impact.

In terms of income distribution, the impacts differ considerably between the two extreme cases. In the case where more aid is used exclusively for current spending, the ones who benefit most are the skilled workers in urban areas, since these accounts for most of government spending. Those who lose most are rural workers and employers. Rural workers lose because they work in modern agriculture, an export sector that gets hurt by the real appreciation of the exchange rate following the influx of aid. The employers lose because their enterprises become less competitive due to the appreciation. In the case where foreign aid is converted fully into public capital, the distributional impact is completely different. The main winners are urban informals, employers, and skilled workers who are typically employed in public investment projects. The only group that loses in this scenario is rural workers, but they benefit in the end due to the higher level of productivity and incomes in the economy.

4.0 The Model

The general equilibrium model presented here is based on the works of Decaluwe, Patry, Savard, and Thorbecke (1999) and Aka (2003). This model represents a small open economy that has no influence on international markets. The model is developed in such a way that it is consistent with Social Accounting Matrix of Ghana for the year 1993 and Ghana Living Standard Survey 4 for the year 1999. The economy is assumed to have three production sectors (agriculture, industry, services), two factors of production (Labor and Capital) and five categories of households (Agricultural Farmers; Public Sector employees; Private Sector employees; Non-farm Self Employed; Non-Working). The model is presented in five blocks (production and trade; income, taxes, savings and investment; demand; price; and equilibrium conditions and macroeconomic closure). In the production block, the production process is a two-step nested structure. At the top level, primary inputs (labour and capital) are combined with a Cobb-Douglas technology to make up value added; this is combined within a fixed coefficient Leontief technology with intermediate inputs at the second level to give the output. At any set of prices, producers in each sector maximize profits subject to their technology constraint. This type of production process provides intermediate demand for goods, labor demand and capital demand. The double Armington assumption is used to distinguish imports and domestically produced goods, implying imperfect substitutability and to differentiate exports from goods for domestic use. The production possibility frontier of the economy is defined by a constant elasticity of transformation (CET) function between domestic supply and export and this yields the export supply function. We define a composite commodity made up of domestic demand and final imports, which is consumed by the households, firms and government. We assume constant elasticity of substitution (CES) between domestic demand and final import demand and this provides the import demand function. The parameters of CES and CET functions are exogenously determined.

The households receive their income from primary factor payments; net current transfers from firms, government and the rest of the world; and net capital transfer payments from households. The households pay income taxes and these are proportional to their incomes. The disposable income of the household is obtained after subtracting income tax paid from the total income of the household. Savings and total consumption of households are then specified as fixed proportions of their disposable incomes. Savings of households are converted into household investment. Firms receive their income because of remuneration from capital; net current transfers from households, government and the rest of world; and net capital transfers from households and government. The firms pay corporate tax to government and these are proportional to their incomes. The disposable income of the firm is obtained after subtracting corporate tax paid from its income. Savings of the firms are proportional to their disposable incomes. Firms' savings are converted into firms' investment. The savings of households and firms are known as private savings.

The income of the government is generated because of remuneration from capital; direct taxes collected from households and firms; indirect taxes (ad valorem tax on final sales) on goods and services; trade taxes on imports and exports; net current transfers from

households, firms, and the rest of world; and net capital transfers from government to firms. Indirect taxes are collected from the domestic output for domestic use and imports. Trade taxes on imports are proportional to the value of imports and trade taxes on exports are proportional to the value of exports. Savings of the government are proportional to the income of the government. Savings of the government are known as public savings. The public savings are converted into public investment. The tariffs alter the prices of imported goods for all sectors on which are applied influencing production as well as consumption. The impact on production is channelled through imported goods used as inputs into the production process as a component of the composite input. In addition, the imported good is also part of the composite good that enters into the households', firms' and government utility function. The foreign savings consist of the difference between net capital transfers from rest of world to households, firms, and government; and net lending abroad. The foreign savings are also converted into domestic investment. The total savings comprise household savings, savings of firms, public savings and foreign savings.

The Linear Expenditure System (Stone-Geary Function), a modification of the Cobb-Douglas and CES functions, introduces a minimum level of demand for each good and it is assumed to describe the household demand for consumer goods. This demand system implies that each socio-economic group has its own perception of the minimal commodity basket that it needs to satisfy, consistent with the socio-economic characteristics and the overall standard of living of the group. This minimum basket is bound to be different for different categories of households. Each group is assumed to behave lexicographically in such a way that it first satisfies its minimum consumption basket and if there is some discretionary income, it is spent on the purchases of additional quantities of these commodities. The poverty line is determined by a basket of goods reflecting the Basic Needs (BN) consistent with Ravallion's (1994) approach to estimating absolute poverty. The monetary poverty line is obtained by multiplying the BN commodity basket by their respective prices. Since commodity prices are endogenously determined, so is the nominal value of this basket, i.e. the poverty line.
The firms also consume goods and services. The firm maximizes a Cobb-Douglas utility function subject to its income constraint and this yields the firm's demand function for goods and services. The government is viewed as purchasing the various commodities. The government is assumed to maximise a Cobb-Douglas utility function subject to its income constraint and this yields the government demand function for goods and services. The investment in each sector depends on total investment and the price index of investment goods. The demand for investment good is determined by sectoral investment.

The value added price is determined from total production, its intermediate use, and value added. Since imports are subject to import duties and other indirect taxes, the import price is determined by import duties, other indirect taxes on imports, exchange rate and the world price of imports. The export price is determined by the world price of export, exchange rate and export tax. The price of composite good is determined by the domestic demand for domestic good, imports, and composite good. Market price of domestic goods is determined by the indirect taxes and the producer price of good. The price of

output is determined by the domestic supply of good, exports and the output of good. The rental on capital is influenced by monetary value of value added, demand for labor and capital, and wage rate. The wage rate is influenced by the monetary value of value added, demand for labor and capital, and rental on capital. The investment price index is determined by the price of composite good and goods share in total investment. The price index is determined by the value added price and the share of good in value added price.

The first equilibrium condition implies that the supply of composite goods must equal its demand (intermediate demand, households consumption demand, firms' consumption demand, government consumption demand, and investment demand). The second and third equilibrium conditions imply the equilibrium between the demand for primary factors and their supplies. The supplies of primary factors are fixed exogenously for any given year. Market clearing requires that total factor demand equal supply, and the equilibrating variables are the factor prices. The fourth and fifth equilibrium conditions describe macroeconomic equilibrium conditions for saving-investment balance and the balance of payments. The equilibrating variable in the external market is the exchange rate since foreign savings is fixed exogenously.

CGE models are generally over determined and the way to render the model mathematically solvable is referred to as the closure rule. Normally, the choice of closure rule has implications for the workings of the model and the qualitative interpretation of the simulation results (Drud, Grais and Pyatt, 1985). It is also important to recognise that the choice of model closure rule depends not only on the political and economic considerations but also on the nature of the problem at hand (Rattso, 1982; Decaluwe and Martens, 1988). The literature has brought forth three closure rules - external, government and macro-economic closure. The external closure defines how the domestic economy interacts with the rest of the world. Since the Ghanaian economy is a small open economy, it has no impact on international markets and therefore the world prices of import and export and exchange rate are treated as exogenous. The government closure, which determines the manner of government modelling, has been dictated by specific country conditions. In modelling the government sector, we have incorporated the direct, indirect and trade taxes; current and capital transfers that are exogenous; and endogenous government consumption. Regarding the macroeconomic closure, a choice has to be made between the Keynesian, Kaldorian, Johansen and Classical closure rules. The Keynesian closure allows for unemployment and a fixed nominal wage, while the Kaldorian closure assumes a flexible wage rate, which adjusts to ensure full employment. The Johansen closure is one with exogenous investments so consumption adjusts endogenously. The Classical closure rule assumes that real investment is endogenous and adjusts to total available savings. With regard to product market equilibrium, we adapt the Johansen closure rule.

The CGE model for Ghana is presented in Appendix A. In the CGE model, there are 48 basic equations, comprising ten equations for production and trade block; sixteen equations for Income, Taxes, Savings, and Investment block; eight equations for demand for commodities block; nine equations for prices; and five equations for equilibrium conditions and macroeconomic closures. Since there are three production activities and

five categories of households, the total numbers of equations to be solved are 140. There are 140 endogenous variables and 50 exogenous variables. The model is just identified containing as many endogenous variables as equations.

5.0 Structure and Data of the SAM

5.1 Macro-SAM and Data

The macro SAM for Ghana for the year 1999 is based on the SAM of Ghana for 1993. We start by considering a disaggregated SAM and then achieve a level of aggregation consistent with the objective of the study. The supply, intermediate use, and value added of agricultural sector are obtained after aggregating the cocoa; agriculture and livestock; forestry and logging; and fishing sub-sectors. The supply, intermediate use, and value added of industrial sector are obtained after aggregating the mining and quarrying; manufacturing; electricity and water; and construction sub-sectors. Moreover, the supply, intermediate use, and value added of services sector are obtained after aggregating the wholesale, retail trade, hotels and restaurants; transport, storage, and communication; finance, insurance, real estate, and business services; government services and private non-profit services; and community, social and personal services sub-sectors. Institutions have been grouped into four: households, firms, government, and rest of the world. Households comprise both rural and urban. Firms comprise non-financial corporations, financial corporations, and non-profit institutions serving households. Two categories of factors of production are considered, i.e., labor and capital. Labor comprises skilled and unskilled. Current and capital accounts of the institutions are considered. Since the structure of the Ghana economy is unlikely to change dramatically in the short or medium term, the SAM of Ghana for 1993 was updated for 1999 using the fixed proportion method. Since we are interested in the behavior of different categories of household, there was a need to integrate the GLSS 4 data with the SAM for 1999. The contribution of each category of household in the total income and expenditure was determined from the GLSS 4 data set (available on CD-rom). These proportions were used to reconstruct the household sector within the SAM of 1999. The integrated SAM for 1999 is presented in Appendix B. The data for other endogenous variables, which cannot be tracked from SAM, and exogenous variables are collected from International Financial Statistics, the State of the Ghanaian Economy, Annual Budget, and World Development Indicators.

5.2 Micro-SAM and Data

The household is an important entity in the analysis of micro-economic impact of trade liberalization. The household level data were obtained from the GLSS 4 for the year 1999. In Table 3, the composition of household income is related to its main activity. Labor is an important contributor in the earning of incomes of all categories of households. Capital income is the least source of income for all categories of households. Agricultural farmers receive more income from transfer payments than the other four categories of households.

Table 3: Factorial Source of Household Income (%)

Household Group	Number of Households	Labor Income	Capital Income	Income from Transfers	Total
Agricultural Farmers	49.2	87.9	1.6	10.5	100.0
Public Sector Employees	9.4	92.0	2.0	6.0	100.0
Private Sector Employees	7.9	93.3	1.7	5.1	100.0
Non-farm Self Employed	25.6	92.0	2.0	6.0	100.0
Non-Working	7.9	90.0	2.0	8.0	100.0

The income and demographic characteristics of households are presented in Table 4. The agricultural farmers have the highest mean income. The private sector employees have the least mean income, which was below the national mean annual household income of C2,267,000. Agricultural farmers followed by public sector employees obtained the maximum income. The maximum income varied between 24,000,000 and 44,000,000. The minimum income was observed for agricultural farmers. The range of minimum income was from 7,665 to 23,865 for agricultural farmers and non-farm self employed, respectively. As for the population shares, agricultural farmers are the largest group with 49.2% of the total population. The monetary poverty line of Cedis 665,300 was obtained from the consumption basket of the bottom 20% of the distribution of individuals by their standard of living, which provided 2900 kilocalories per equivalent adult per day. The commodities that were included in this consumption basket were about 120 that belong to agricultural, industrial and services sectors. Using this poverty line, we have observed that 21% of the non-farm self employed households are below this poverty line, followed by the non-working category with 20%.

Table 4: Income and Demographic Characteristics of Households

	Agricultural Farmers	Public Sector Employees	Private Sector Employees	Non-farm Self Employed	Non-Working
Mean income Cedis	2,765,729	2,534,159	2,206,560	2,360,109	2,398,446
Maximum income Cedis	44,000,000	39,000,000	24,000,000	24,000,000	27,000,000
Minimum	7,665	13,808	12,000	23,865	13,738

Income Cedis					
Population share	49.2%	9.4%	7.9%	25.6%	7.85%
% Below the poverty line (C665,300)	17.3%	19.3%	7.9%	21%	20%

Table 5 shows the distribution of components of household income as a percentage of GDP. The poorest households are the private sector employees, while the agricultural farmers are the richest. The highest share of capital income was observed for non-working, whereas the lowest share was for the private sector employees. The highest share of labor income in GDP was observed for agricultural farmers, whereas the least share of labor income went to private sector employees.

Table 5: Share of Components of Household Income in GDP (%)

Household Group	Share of Labor Income in GDP	Share of Capital Income in GDP	Share of Household Income in GDP
Agricultural Farmers	15.76	0.52	16.28
Public sector Employees	15.13	0.51	15.64
Private Sector Employees	13.34	0.43	13.77
Non-farm Self Employed	14.08	0.48	14.56
Non-Working	13.93	0.58	14.51
Total Households	72.24	2.52	74.76

6.0 Methodology

In this study, we use a static general equilibrium model to examine the impact of alternative fiscal reforms on the poverty and income distributions of households. The model is calibrated to 1999 data set. The GAMS software is used to check for the consistency of the data with the equilibrium conditions and to perform the simulations. The benchmark equilibrium must be replicated with the use of calibrated parameters and base year data. The pre-shock values for the variables are obtained from the solution of the specified model. The post shock effects of these simulations are used to find the effects on poverty line and the incomes of households. The DAD software is used to

evaluate the poverty measures and PCGIVE software is used to plot the income distributions of households before and after the exogenous shocks. The pre-shock and post-shock poverty levels are obtained using Foster, Greer and Thorbecke (FGT) poverty measures

$$POV_{k,h} = \int_0^z [(z - y_h)/z]^k f(y_h)\, dy_h, \quad k = 0,1,2$$

where y_h is the income of household h , k is a poverty-aversion parameter, z is the endogenously determined poverty line. The incidence of poverty is indicated by $k = 0$. The depth of poverty is indicated by $k = 1$,and the severity of poverty is indicated by $k = 2$.

Since CGE models are fully calibrated on the basis of an initial year SAM that provides a set of consistent initial conditions and the SAM does not contain information on intra socio-economic household group income distribution, it is advisable to generate the intra group income distributions in the same base year as that of the SAM to calibrate the general equilibrium model. Several approaches have been used in the literature to describe and define intra group distribution of income in a CGE framework. For example, de Janvry et al. (1991) have used both a lognormal and a Pareto distribution function to depict income distribution. Decaluwe, Patry, Savard, and Thorbecke (1999) and Aka (2003) have used the Beta distribution to represent the intra group income distributions. Unlike the lognormal, the Beta function is much more flexible when it comes to the asymmetric forms it can adopt. However, since we know very little about the probability density functions of the incomes of households, density functions may be interpolated to give a clearer picture of the implied distributional shape. To estimate the density functions without imposing too many assumptions about its properties, a non-parametric approach is used in PCGIVE based on a kernel estimator of density function $f(Y_h)$.

The Kernel estimator of the density f is defined by:

$$f(Y_h) = (1/Nu) \sum_{t=1}^{T} K\{(1/u)(Y_h - y_{ht})\}$$

where K{} is the kernel function and u is a 'window width' or smoothing parameter and corresponds to the width of histogram bars. The kernel K used is the Normal or Gaussian kernel. Following Siddiqui and Kemal (2002), we estimate the density functions for the incomes of households using the Kernel estimator.

7. 0 Simulation Results

In the first simulation, we eliminate the trade related import tariff on all imports and increase the VAT by 100%. In the second simulation, we eliminate the export tariff on all exports and increase the VAT by 100%. Table 6 indicates the effects of these simulations on macro economic variables.

Table 6: Simulation Results

Variables	Base level	Simulation 1: Elimination of import tariff and 100% increase in VAT(% change)	Simulation 2: Elimination of export tariff and 100% increase in VAT(% change)
Production of Agricultural Sector	1725.64	-1.99	11.90
Production of Industrial Sector	1817.12	1.76	-11.16
Production of Services Sector	849.82	-0.004	0.90
Income of Government	729.15	17.09	2.00
Household Income of Agricultural Farmers	338.74	1.31	-3.90
Household Income of Public Sector Employees	306.88	1.39	-4.04
Household Income of Private Sector Employees	266.74	1.40	-4.08
Household Income of Non-Farm Self Employed	285.76	1.39	-4.05
Household Income of Non-Working	293.40	1.36	-4.01
Exports of Agriculture Sector	645.85	-2.39	15.50
Exports of Industrial Sector	990.07	2.26	-13.80
Exports of Services Sector	.0481	-0.62	3.95
Imports of Agriculture Sector	192.92	10.05	-2.69
Imports of Industrial Sector	519.21	4.45	-5.77
Imports of Services Sector	646.13	0.24	-0.8
Labor Demand of Agriculture Sector	3.26	-1.96	12.7
Labor Demand of Industrial Sector	2.73	2.49	-15.2
Labor Demand of Services Sector	1.35	0.37	-1.62
Capital Demand of Agriculture Sector	3.96	-3.7	25.65
Capital Demand of Industrial Sector	83.74	0.62	-4.46
Capital Demand of Services Sector	3.18	-1.45	10.85
Composite Price of Agricultural Goods	0.63	-3.98	-4.46
Composite Price of Industrial	0.72	-3.77	-0.84

Goods			
Composite Price of Services	0.85	0	-2.11
Average Wage Rate	187.66	1.42	-3.90
Average Rental on Capital	4.89	3.39	-14.76

The first simulation leads to a reduction in the prices of imported goods and services. As a result, imports become cheaper and consumers substitute imported goods for the domestic goods. Depending on the elasticity substitution and imports' share in total consumption, demand for all imports increase. The reduction in domestic costs caused by the import tariff cut increase the profitability of the export sectors. This leads to the expansion of output and employment in the industrial sector. However, the increased inflow of imports is by no means enough to eliminate the import competing sectors, output decline in agriculture and services. Factors of production move from inefficient sectors towards sectors that are more productive due to a fall in the wage-rental ratio. The incomes of all types of households increase because of the reallocation of resources and higher factor prices. Even though VAT has increased by 100%, the prices of composite goods in agricultural and industrial sectors fall considerably. The fall in the prices of composite goods reduces the poverty line by 3.02%. The income of the government increases by 17.9%, which can be used to increase both public consumption and public investment. The increase in public consumption and public investment could help in the alleviation of poverty indirectly provided the resources are channeled to water, electricity, health, and education sub-sectors.

The second simulation makes the exports more competitive and as a result exports of agricultural goods and services increase. The output and employment in these sectors increase. Since the industrial sector is not very competitive on the internal market, the output and employment in this sector decline. Since the VAT has increased on domestic and imported goods, this makes the imports of goods and services to decrease. There is a movement of labor and capital from inefficient industrial sector to efficient export oriented agricultural and services sectors because of a fall in the wage-rental ratio. The incomes of all categories of households decrease because of the reallocation of resources and lower factor prices. In spite of an increase in VAT by 100% and elimination of export tariff, the prices of composite goods decline in all sectors. This fall in prices reduces the poverty line by 3.46%. However, this type of fiscal reform increases the income of government by only 2.00%, which can be used to increase both public consumption and public investment.

Table 7: Poverty Measures for the Base Year and Simulations

	Agricultural Farmers	Public Sector Employees	Private Sector Employees	Non-farm Self-Employed	Non-Working

k=0	Base	17.29%	19.28%	25.36%	21.04%	20.00%
	Simulation 1	16.38%	18.57%	24.10%	19.54%	19.15%
		(-0.91%)	(-0.71%)	(-1.26%)	(-1.50%)	(-0.85%)
	Simulation 2	17.50%	19.46%	25.58%	21.24%	20.21%
		(0.21%)	(0.18%)	(0.22%)	(0.20%)	(0.21%)
k=1	Base	7.15%	9.02%	9.85%	8.56%	7.99%
	Simulation 1	6.73%	8.56%	9.18%	8.03%	7.74%
		(-0.42%)	(-0.46%)	(-0.67%)	(-0.53%)	(-0.25%)
	Simulation 2	7.19%	9.08%	9.96%	8.64%	8.07%
		(0.04%)	(0.06%)	(0.11%)	(0.08%)	(0.08%)
k=2	Base	4.16%	5.30%	5.41%	4.96%	4.30%
	Simulation 1	3.91%	5.03%	5.03%	4.66%	3.99%
		(-0.25%)	(-0.27%)	(-0.38%)	(-0.30%)	(-0.31%)
	Simulation 2	4.19%	5.39%	5.47%	5.01%	4.35%
		(0.03%)	(0.09%)	(0.06%)	(0.05%)	(0.05%)
Mean Income	Base	2,765,729	2,534,159	2,206,561	2,360,109	2,398,446
	Simulation 1	2,801,900	2,632,115	2,237,528	2,392,847	2,431,153
		(1.31%)	(3.86%)	(1.40%)	(1.38%)	(1.36%)
	Simulation 2	2,660,362	2,431,679	2,116,457	2,264,594	2,302,067
		(-3.81%)	(-4.04%)	(-4.08%)	(-4.05%)	(-4.02%)
Poverty Line	Base	665,300	665,300	665,300	665,300	665,300
	Simulation 1	645,214	645,214	645,214	645,214	645,214
		(-3.02%)	(-3.02%)	(-3.02%)	(-3.02%)	(-3.02%)
	Simulation 2	642,300	642,300	642,300	642,300	642,300
		(-3.46%)	(-3.46%)	(-3.46%)	(-3.46%)	(-3.46%)

Table 7 presents information on the incidence (k=0), depth (k=1), and severity (k=2) of poverty for the base year and variations in these measures after the shocks. In the base year, the incidence, depth, and severity of poverty is the highest among the private sector employees. The least incidence, depth, and severity of poverty is prevalent among the agricultural farmers. In the first simulation, reduction in consumer prices reduces the poverty line and incomes of all households increase. This causes the incidence, depth, and severity of poverty for all categories of households to be reduced. The maximum reduction in the depth and severity of poverty is noticed for the private sector employees, whereas the maximum reduction in the incidence of poverty is observed for the non-farm self employed. This shows that elimination of trade related import taxes accompanied by an increase in VAT could reduce the incidence, depth, and severity of poverty in low-income countries. In the second simulation, reduction in consumer prices reduces the poverty line and incomes of all households decrease. These changes cause the incidence, depth, and severity of poverty for all categories of households to increase. The maximum increase in the incidence and depth of poverty is noticed for the private sector employees, whereas the maximum increase in the severity of poverty is observed for the public sector employees. The study shows that elimination of export taxes accompanied by an increase in VAT could not be used as a tool to reduce poverty in low-income countries.

The income distributions of the various categories of households for the base year and two simulations are presented in Figures 1 to 5. In simulation one, the density functions for all the categories of households shift to the right, with higher mean incomes and lower poverty lines. This causes a reduction of the population below the poverty line in each household group. In simulation two, the density functions for all the categories of households shift to the left, with lower mean incomes and lower poverty lines. This causes an increase of the population below the poverty line in each household group.

Figure 1: Density Functions (Agricultural Farmers)

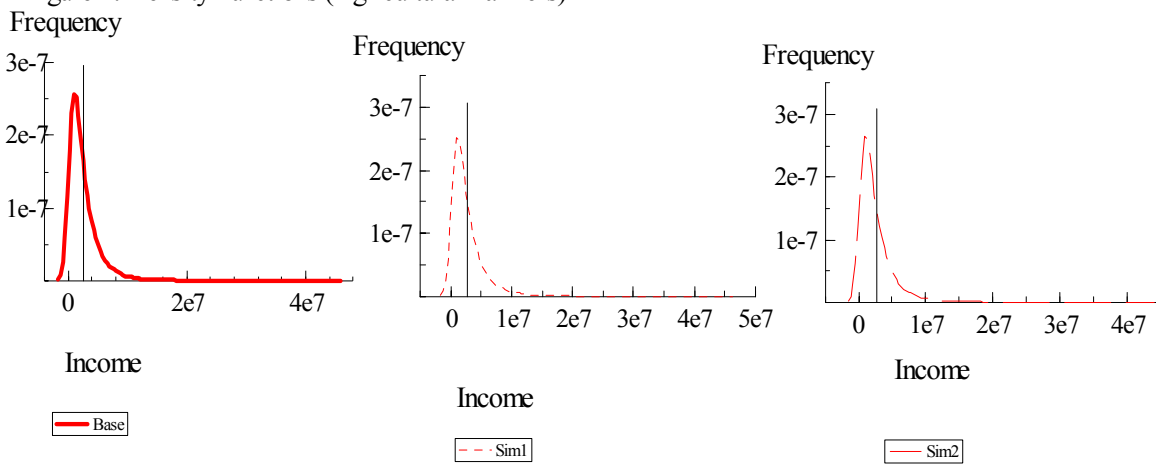


Figure 2: Density Functions (Public Sector Employees)

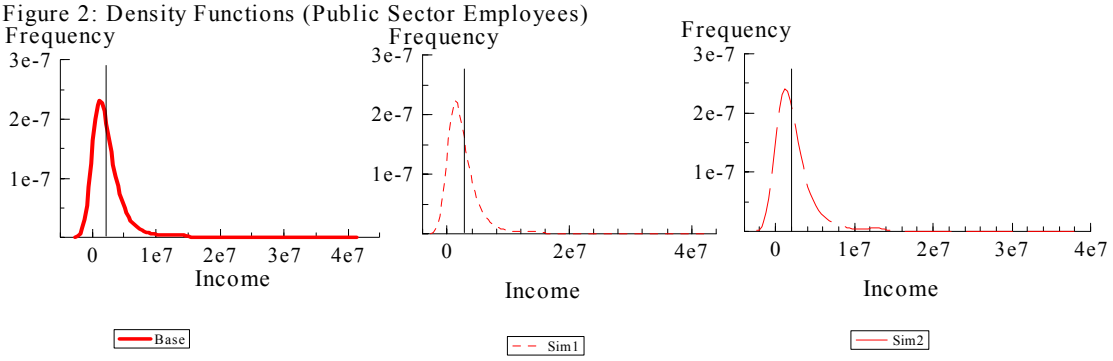


Figure 3: Density Functions (Private Sector Employees)

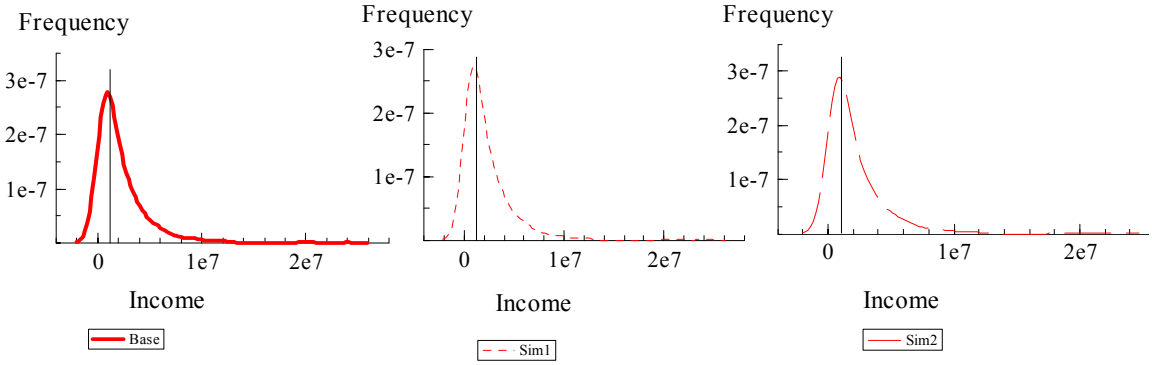


Figure 4: Density Functions (Non-farm self employed)

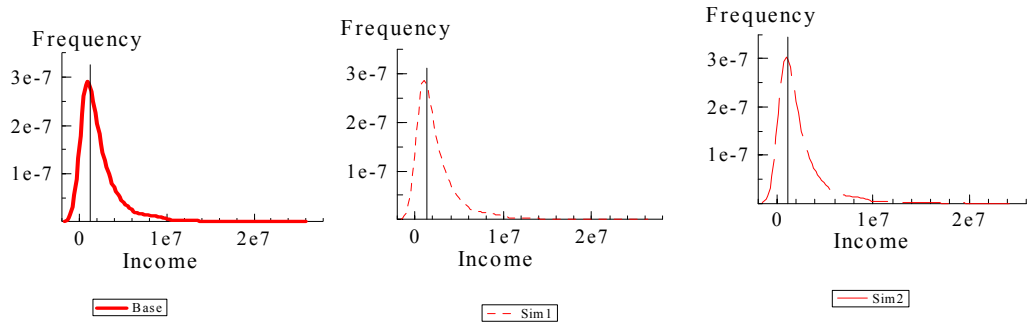
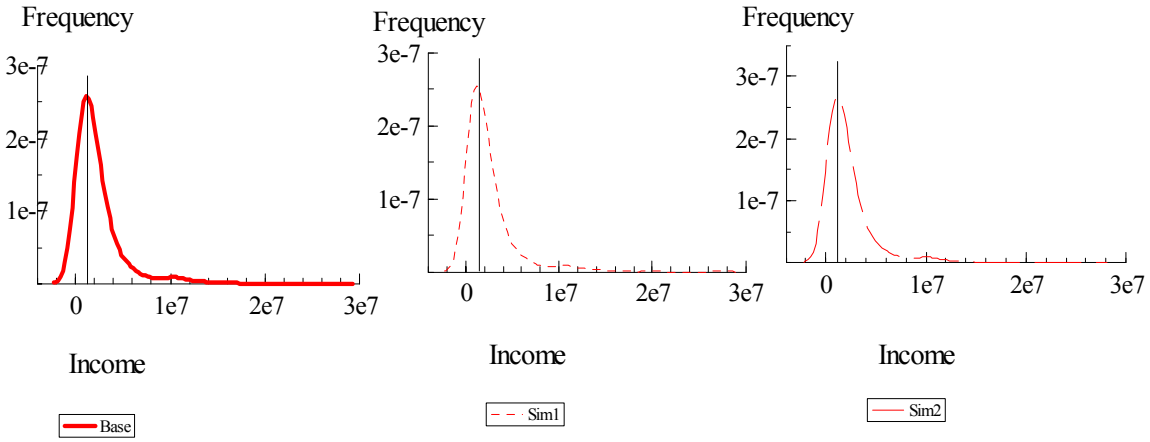


Figure 5: Density Functions (Non-working)



8.0 Conclusion

To analyze the impact of elimination of trade taxes accompanied by an increase in VAT on the incidence, depth, and severity of poverty and income distributions of households, the study has used the CGE framework. The study has updated the SAM of Ghana for

1993 to 1999 and integrated the GLSS 4 data for the year 1999 with this SAM. The study has analyzed the impact of two shocks on poverty and income distributions. The first shock takes the form of elimination of trade related import taxes accompanied by an increase in VAT by 100%. The second shock involves the elimination of export taxes accompanied by an increase in VAT by 100%. The study has shown that the first shock could be used to reduce the incidence, depth, and severity of poverty, and improve the income distributions of households in low-income countries. The study has also shown that the second type of shock increases the incidence, depth, and severity of poverty, and worsens the income distributions of households in low-income countries.

References

Adelman, I., and S. Robinson. (1979). "Income Distribution Policy: A Computable General Equilibrium Model of South Korea" in Adelman, I., The Selected Essays of Irma Adelman, Vol. 1. Dynamics and Income Distribution. Economists of the Twentieth Century Series, Aldershot, U. K., 256-89.

Aka, B. F. (2003). "Fiscal Adjustment, Poverty, Inequality and Welfare in Cote d'lvoire: A CGE Model Analysis", Final Report, AERC, Nairobi, Kenya.

Anderson, L. E., and J. Evia. (2003). "The Effectiveness of Foreign Aid in Bolivia", Research Paper, No. 10, Insttituto de Investigaciones Socio Economicas, Documento de Trabajo, Bolivia.

Azis, I. And E. Thorbecke. (2001). "Modelling the Socio-Economic Impact of the Financial Crisis: The Case of Indonesia", Mimeo, Cornell University.

Baker, D., and M. Weisbrot. (2001). "Will Trade Gains Make us Rich? An assessment of the Prospective Gains from New Trade Agreements', Center For Economic and Policy Research, Washington, D.C.

Bautista, R. and M. Thomas. (1997). "Income Effects of Alternative Trade Policy Adjustments on Philippine Rural Households: A General Equilibrium Analysis", TMD Discussion paper No. 22, International Food Policy Research Institute.

Chia, N., Wahba, S., and J. Whalley. (1994). "Poverty Reduction Targeting Programs: A General Equilibrium Approach", Journal of African Economies, Vol. 3, No. 2, 309-38.

Cogneau, D. and A. S. Robillard. (1999). "Income Distribution, Poverty and Growth in Madagascar: Micro simulations in a General Equilibrium Framework", Mimeograph.

Decaluwe, B., Dumont, J., and L. Savard. (1999). "Measuring Poverty and Inequality in a Computable General Equilibrium Model", CREFA, Working Paper 99-20, Department of Economics, University of Laval, Quebec, Canada.

Declauwe, B., and A. Martens. (1988). "CGE Modelling and Developing Economies: A Concise Empirical Survey of 73 Applications to 26 Countries", Journal of Policy Modelling, Vol.10, No. 4, 529-68.

Decaluwe, B., Party, A., Savard, L. and E. Thorebecke. (1999). "Poverty Analysis Within a General Equilibrium Framework", CREFA, Working Paper 99-09, Department of Economics, University of Laval, Quebec, Canada.

De Janvry, A., E. Sadoulet, and A. Fargeix. (1991). "Adjustment and Equity in Ecuador", OECD Development Center, Paris.

De Maio, L., Stewart, F., and R. Van Der Hoeven. (1999). "Computable General Equilibrium Models, Adjustment and the Poor in Africa", World Development, Vol. 27, No. 3, 453-70.
Dervis, K., DeMelo, J., and S. Robinson. (1982). General Equilibrium Models for Development Policy, Cambridge University Press, Cambridge, London.
Dorosh, P. A. and D. E. Sahn. (2000). "A General Equilibrium Analysis of the Effect of Macroeconomic Adjustment on Poverty in Africa", Journal of Policy Modelling, Vol. 22, No. 6, 753-76.
Drud, A., Grais W., and G. Pyatt. (1985). "An Approach to Macroeconomic Model Building Based on Social Accounting Principles", Discussion Paper No. 150, Development Research Department, The World Bank, Washington, DC.
Easterly, W. (2001). The Elusive Quest for Growth: Economist's Adventures and Misadventures in the Tropics, MIT Press, U.S.A.
Fofack, H. (2002). "The Nature and Dynamics of Poverty determinants in Burkina Faso in the 1990s", World Bank Policy Research Working Paper, No. 2847.
Ghana Statistical Service (1997). A Social Accounting Matrix for Ghana 1993. Accra.
Ghana Statistical Service (2000). Poverty Trends in Ghana in the 1990s. Accra.
Griffin, K. (1970). "Foreign Capital, Domestic Savings and Economic Development", Bulletin of Oxford University, Institute of Economics and Statistics, Vol. 32, No. 2.
Gunning, W. J. (1983). "Income Distribution and Growth: A Simulation Model for Kenya" in D.G. Greene. Growth and Structural Change, Vols 1 and 2, World Bank, Washington, DC, 487-621.
Gyimah-Boadi, E. (1995). "Explaining the Economic and Political Successes of Rawlings: The Strengths and Limitations of Public Choice Theories" in J. Harriss, C. Lewis and J. Hunter (eds). The New Institutional Economics and Third World Development, Routledge, London.
Hillman, A. (2002). "The World Bank and the Persistence of Poverty in poor Countries", European Journal of Political Economy, Vol. 18, 783-95.
Lambert, S., Schneider, H., and A. Suwa. (1991). "Adjustment and Equity in Cote d'Ivoire: 1980-86", World Development, Vol. 19, No. 11, 1563-76.
Lofgren, H., Chulu, O., Sichinga, O., Simtowe, F., Tchale, H., Tseka, R., and P.Wobst. (2001). "External Shocks and Domestic Poverty Alleviation: Simulations with a CGE Model of Malawi", IFPRI Working Paper, No. 71.
Morrisson, C. (1991). "Adjustment and Equity in Morocco", OECD Development Center, Paris.
Obi, B. P. (2003). "Fiscal Policy and Income Distribution: Some Policy Options for Nigeria". Final Report, AERC, Nairobi, Kenya.
Rattso, J. (1982). "Different Macro Closures of the Original Johansen Model and their Impact on Policy Evaluation", Journal of Policy Modelling, Vol. 4, No. 1, 55-97.
Ravallion, M. (1994). Poverty Comparisons, Harwood Academic Publisher.
Robilliard, A. S., Bourguignon, F. and S. Robinson. (2001). " Crisis and Income Distribution: A micro-macro model of Indonesia", Paper prepared for ESRC Development Economics/International Economics Conference, Nottingham University.
Sahn, D. E., Dorosh, P. A. and S.A.Younger.(1997). Structural Adjustment Reconsidered: Economic Policy and Poverty in Africa, Cambridge University Press, Cambridge.

Siddiqui,R., and A. Kemal. (2002). "Remittances, Trade Liberalization, and Poverty in Pakistan: The Role of excluded Variables in Poverty Change Analysis", Study No. 1, Department for International Development, U.K.
Silverman B.W. (1986). Density Estimation for Statistics and Data Analysis, London: Chapman and Hall.
Thorbecke, E. (1991). "Adjustment, Growth and Income Distribution in Indonesia", World Development, Vol. 19, No. 11, 1595-1614.
Weisbrot, M. and D. Baker. (2002). "The Relative Impact of Trade Liberalization On Developing Countries", Centre for Economic and Policy Research, Washington, D.C.
World Bank. (2002). Global Economic Prospects and the Developing Countries, Washington, D.C.

Appendix A : General Equilibrium Model For Ghana

I Sets definition

i 0 I = {AGR, IND, SER}, Goods (AGR: Agriculture, IND: Industry, SER: Services).

j 0 J = {AGR, IND, SER}, Production Sectors

h 0 H = {AGRF, PUBE, PRIE, NFSE, NW}, Households (AGRF: Agricultural Farmer, PUBE: Public Sector Employee, PRIE: Private Sector Employee, NFSE: Non-farm Self Employed, NW: Non-Woking).

II Parameters

Λ_j *Share of Value Added in Total Output*
c_j *Scale Coefficient of Cobb-Douglas Function*
$aij_:$ *Quantity of Good i used in the Production of Good j*
α_j *Elasticity Parameter of Cobb-Douglas Function*
$\sqrt{}_i$ *Scale Coefficient of CET Function*
γ_i *Distributive Parameter of CET Function*
$^R i$ *Transformation Parameter of CET Function*
$^{\eta}_i$ *Elasticity of Transformation*
λ_i *Scale Coefficient of CES Function*
δ_i *Distributive Parameter of CES Function*
$^{\rho}_i$ *Substitution Parameter*
$^{\sigma}_i$ *Elasticity of Substitution*
Ω_1 *Households Share in Total Capital*
Ω_2 *Firms Share in Total Capital*
ty_h *Tax Rate on Household h Income*
Ψ_h *Marginal Propensity to Save of h Household*

Ψ_f *Marginal Propensity to Save of Firms*
Ψ_g *Marginal Propensity to Save of Government*
ty_f *Tax Rate on Firm Income*
tm_i *Tax Rate on Import of good i*
te_i *Tax Rate on Export of good i*
tx_i *Indirect Tax Rate on good i*
β^c_{ih} *Share of Good i in household h consumption*
β^f_i *Share of Good i in Firm consumption*
β^g_i *Share of Good i in Government consumption*
$C^{MIN}_{i,h}$ *Household Minimum Consumption of Good i*
ϕ_j *Share of Sector j in Total Investment*
μ_i *Share of Good i in Total Investment*
Λ_{ij} *Share of Investment Good i in Sector j*
Γ_i *Share of Good i in Value Added Price*

III Endogenous Variables

XS_j	*Production of Sector j*	*3*
VA_j	*Value Added of Sector j*	*3*
PV_j	*Value Added Price of Sector j*	*3*
LD_j	*Labor Demand of Sector j*	*3*
KD_j	*Capital Demand of Sector j*	*3*
r_j	*Rate of Return to Capital in Sector j*	*3*
$DI_{i,j}$	*Intermediate Demand for Good i in Sector j*	*9*
DI_i	*Intermediate Demand for Good i*	*3*
E_i	*Export Supply of Good i*	*3*
DS_i	*Domestic Supply of Good i*	*3*
PE_i	*Domestic Export Price of Good i*	*3*
PL_i	*Producer Price of Domestic Good i*	*3*
Q_i	*Demand for Composite Good i*	*3*
PC_i	*Price of Composite Good i*	*3*
M_i	*Import Demand of Good i*	*3*
DD_i	*Domestic Demand of Good i*	*3*
PD_i	*Domestic Price of Good i*	*3*
PM_i	*Domestic Import Price of Good i*	*3*
YH_h	*Income of Household h*	*5*
YDH_h	*Disposable Income of Household h*	*5*
DTH_h	*Direct Taxes on Household h Income*	*5*

SH_h	*Savings of Household h*	*5*
SH	*Savings of Households*	*1*
YF	*Income of Firms*	*1*
DTF	*Direct Taxes on Firms Income*	*1*
YDF	*Disposable Income of Firms*	*1*
SF	*Savings of Firms*	*1*
TIM_i	*Indirect Taxes on Imports of Good i*	*3*
TIE_i	*Indirect Taxes on Exports of Good i*	*3*
TIO_i	*Other Indirect Taxes on Good i*	*3*
P_i	*Price of Aggregate Output of Good i*	*3*
YG	*Government Income*	*1*
SG	*Savings of Government*	*1*
CTH_h	*Total Consumption of Household h*	*5*
$C_{i,h}$	*Consumption of Good i of Household h*	*15*
CT_i	*Total Consumption of Good i*	*3*
CF_i	*Firm Consumption of Good i*	*3*
GC_i	*Government Consumption of Good i*	*3*
I	*Total investment*	*1*
S	*Total Savings*	*1*
I_j	*Investment of Sector j*	*3*
ID_i	*Investment Demand for Good i*	*3*
P_{INV}	*Investment Price Index*	*1*
PINDEX	*Price Index*	*1*
B	*Balance of Payments*	*1*
z	*Poverty Line*	*1*

Number of Endogenous variables **140**

IV Exogenous Variables **Number**

LS	*Labor supply*	*1*
KS	*Capital Supply*	*1*
w	*Average Wage Rate*	*1*
e	*Nominal Exchange Rate*	*1*
PWE_i	*World Price of Exports of Good i*	*3*
PWM_i	*World Price of Imports of Good i*	*3*
$NCTHF_h$	*Net Current Transfers from Household h to Firms*	*5*
$NCTHG_h$	*Net Current Transfers from Household h to Govt.*	*5*
$NCTHW_h$	*Net Current Transfers from Household h to ROW*	*5*
$NKTHH_h$	*Net Capital Transfers from Household h to Other Hous.*	*5*

$NKTHF_h$	*Net Capital Transfers from Household h to Firms*	*5*
NCTFH	*Net Current Transfers from Firms to Households*	*1*
NCTFG	*Net Current Transfers from Firms to Government*	*1*
NCTFW	*Net Current Transfers from Firms to ROW*	*1*
NCTGH	*Net Current Transfers from Govt. to Households*	*1*
NCTGF	*Net Current Transfers from Govt. to Firms*	*1*
NCTGW	*Net Current Transfers from Govt. to ROW*	*1*
NKTGF	*Net Capital Transfers from Govt. to Firms*	*1*
NCTWH	*Net Current Transfers from ROW to Households*	*1*
NCTWF	*Net Current transfers from ROW to Firms*	*1*
NCTWG	*Net Current Transfers from ROW to Government*	*1*
NKTWH	*Net Capital Transfers from ROW to Households*	*1*
NKTWF	*Net capital Transfers from ROW to Firms*	*1*
NKTWG	*Net Capital Transfers from ROW to Government*	*1*
NLA	*Net Lending Abroad*	*1*
FS	*Foreign Savings*	*1*

Number of Exogenous Variables 50

V Equations

Production and Trade	**Number**
1 $XS_j = VA_j / \Lambda_j$	*3*
2 $VA_j = c_j LD_j^{\alpha j} KD_j^{1-\alpha j}$	*3*
3 $DI_{i,j} = a_{ij} XS_j$	*9*
4 $DI_i = \sum_j DI_{i,j}$	*3*
5 $LD_j = \alpha_j PV_j VA_j / w$	*3*
6 $KD_j = (1-\alpha_j) PV_j VA_j / r_j$	*3*
7 $XS_i = \sqrt{}_i [\gamma_i E_i^{R} i + (1-\gamma_i) DS_i^{R} i]^{1/R}_i$	*3*
8 $E_i = DS_i [(PE_i / PL_i) \{(1-\gamma_i)/(\gamma_i)\}]^{\eta}_i$	*3*
9 $Q_i = \lambda_i [\delta_i M_i^{-\rho}_i + (1- \delta_i) DD_i^{-\rho}_i]^{-1/\rho}_i$	*3*

10 $M_i = DD_i\,[(\ PD_i / PM_i)\ \{\delta_i /(1-\ \delta_i)\}]^{\sigma_i}$ 3

Income, Taxes, Savings and Investment

11 $YH_h = \sum_j w\ LD_j + \Omega_1 \sum_j r_j\ KD_j + \ NCTHG_h + NCTHF_h + NCTHW_h$

$+ NKTHH_h\ + NKTHF_h$ 5

12 $DTH_h\ =\ ty_h\ \ YH_h$ 5

13 $YDH_h = \ YH_h(\ \ 1-\ ty_h\ )$ 5

14 $SH_h = \Psi_h\ YDH_h$ 5

15 $SH\ = \sum_h SH_h$ 1

16 $YF = \Omega_2\ \sum r_j\ KD_j + \ NCTFH + NCTFG + NCTFW$ 1

17 $DTF = \ \ ty_f\ \ YF$ 1

18 $YDF = YF\ (1-\ ty_f\ )$ 1

19 $SF = \ \Psi_f\ \ \ YDF$ 1

20 $TIM_i = \ \ tm_i\ e\ PWM_i\ \ M_i$ 3

21 $TIE_i = \ \ te_i PE_i\ \ E_i$ 3

22 $TIO_i = tx_i\ (P_i XS_i - \ PE_i\ E_i) + \{tx_i /(1+ tx_i)\}\ PM_i\ \ M_i$ 3

23 $YG\ \ = (1-\Omega_1 - \Omega_2)\sum_j r_j\ KD_j\ \ + \sum_i TIM_i + \sum_i\ TIE_i + + \sum_i\ TIO_i$

$+ \sum_h DTH_h + DTF + NCTGH + NCTGF + NCTGW + NKTGF$ 1

24 $SG = \ \Psi_g\ YG$ 1

25 $FS = \ NKTWH + NKTWF + NKTWG - NLA$ 1

$$26 \quad S = SH + SF + SG + FS \qquad 1$$

Demand for commodities

$$27 \quad CTH_h = YDH_h - SH_h \qquad 5$$

$$28 \quad PC_i C_{i,h} = PC_i C^{MIN}_{i,h} + \beta^c_{j,h} (CTH_h - \sum_i PC_i C^{MIN}_{i,h}) \qquad 15$$

$$29 \quad z = \sum_i PC_i C^{MIN}_{ih} \qquad 1$$

$$30 \quad CF_i = \beta^f_i (1 - \Psi_f) YDF / PC_i \qquad 3$$

$$31 \quad GC_i = \beta^g_i (1 - \Psi_g) YG / PC_i \qquad 3$$

$$32 \quad CT_i = \sum_h C_{i,h} + CF_i + GC_i \qquad 3$$

$$33 \quad I_j = [\phi_j I] / P_{INV} \qquad 3$$

$$34 \quad ID_i = \sum_j \Lambda_{ij} I_j \qquad 3$$

Prices

$$35 \quad PV_i = [P_i XS_i - \sum_j PC_i DI_{i,j}] / VA_i \qquad 3$$

$$36 \quad PM_i = PWM_i (1 + tm_i) (1 + tx_i) e \qquad 3$$

$$37 \quad PE_i = (PWE_i e) / (1 + te_i) \qquad 3$$

$$38 \quad PC_i = (PD_i DD_i + PM_i M_i) / Q_i \qquad 3$$

$$39 \quad PD_i = (1 + tx_i) PL_i \qquad 3$$

$$40 \quad P_i = (PL_i DS_i + PE_i E_i) / XS_i \qquad 3$$

41 $r_j = (PV_j\ VA_j - w_j LD_j)/KD_j$ 3

42 $P_{INV} = \prod_i [PC_i / \mu_i]^{\mu i}$ 1

43 $PINDEX = \sum_i \Gamma_i PV_i$ 1

Equilibrium Conditions and Macroeconomic Closure

44 $Q_i = DI_i + CT_i + ID_i$ 3

45 $LS = \sum_j LD_j$ 1

46 $KS = \sum_j KD_j$ 1

47 $I = S$ 1

48 $B = e \sum_i PWM_i\ M_i - e \sum_i PWE_i\ E_i + NLA - NCTWH - NCTWF$

$- NCTWG - NKTWH - NKTWF - NKTWG = 0$ 1

Number of Independent Equations **140**

Appendix B

SOCIAL ACCOUNTING MATRIX FOR GHANA 1999 AT CONSTANT 1993 PRICES (Billions of Cedis)

Receipts / Expenditure		Factors of Production			Current Account of Institutions								Production Sectors		
		Labor	Capital	ITP	AF	PUSE	PRSE	NFSE	NW	Firms	GOV	ROW	AGR	IND	SER
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Labor												1751.5	750.1	1079.4
2	Capital												55.7	480.5	290.4
3	Indirect Taxes on Production												74.4	469.7	5.1
4	Agricultural farmers	781.2	25.8		9.9					9.5	10.0	23.3			
5	Public Sector Employees	750.0	25.3			9.3				5.0	5.5	12.4			
6	Private Sector Employees	661.3	21.3				8.1			3.5	4.0	8.9			
7	Non Farm Self Employed	697.9	23.8					8.6		5.0	5.0	11.4			
8	Non-Working	690.8	28.8						8.8	6.5	7.0	15.9			
9	Firms		580.0		3.5	3.2	2.8	3.0	3.1	30.7	163.3	74.5			
10	Government		121.5	549.2	33.3	31.3	27.4	29.1	29.4	200.2	128.4	190.1			
11	Rest of the World				1.0	1.0	0.8	0.9	0.9				118.7	1301.9	252.6
12	Agriculture				466.8	438.4	383.9	408.1	411.2			289.1	283.1	169.1	
13	Industry				227.9	214.0	187.4	199.3	200.8			594.6	133.7	718.6	387.6
14	Services				150.6	141.4	123.9	131.7	132.7	110.5	732.3	9.8	222.7	189.2	569.0
15	Agricultural farmers				-33.4										
16	Public Sector Employees					-31.2									
17	Private Sector Employees						-27.2								
18	Non Farm Self Employed							-28.9							
19	Non-Working								-29.3						
20	Firms									493.0					
21	Government										284.8				
22	Row											447.6			
23	Investment														
	Total	3581.2	826.5	549.2	859.6	807.4	707.1	751.8	757.6	863.9	1340.3	1677.6	2639.8	4079.1	2584.1

SOCIAL ACCOUNTING MATRIX FOR GHANA 1999 AT CONSTANT 1993 PRICES (Billions of Cedis) cont'd

Receipts / Expenditure		Capital Account of Institutions								Changes in Assets and Liabilities	Total
		AF	PUSE	PRSE	NFSE	NW	FIRMS	GOV	ROW	INV	
		15	16	17	18	19	20	21	22	23	
1	Labor										3581.0
2	Capital										826.6
3	Indirect Taxes										549.2
4	Agricultural farmers										859.7
5	Public Sector Employees										807.5
6	Private Sector Employees										707.1
7	Non Farm Self Employed										751.7
8	Non-Working										757.8
9	Firms										864.1
10	Government										1339.9
11	Rest of the World										1677.8
12	Agriculture									-210.0	2639.7
13	Industry									1214.7	4078.6
14	Services									70.6	2584.4
15	Agricultural farmers	2.7								31.1	0.4
16	Public Sector Employees		1.4							30.0	0.2
17	Private Sector Employees			1.0						26.3	0.1
18	Non Farm Self Employed				1.3					27.7	0.1
19	Non-Working					1.8				27.7	0.2
20	Firms	1.0	0.5	0.4	0.5	0.7		32.2		545.1	1073.9
21	Government									504.9	789.7
22	Rest of the World									188.6	636.2
23	Investment	-3.3	-1.8	-1.3	-1.7	-2.3	1073.4	757.6	636.2		2456.8
	Total	0.4	0.1	0.1	0.1	0.2	1073.4	789.8	636.2	2456.7	