Income Distributional Effects of Economic Adjustment in Tanzania

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1. INTRODUCTION

1.1 Background

This study examines income distributional impacts of the economic adjustment policy measures that Tanzania has adopted since the early 1980s. The adjustment policies were in response to adverse shocks in the world economy and to undesirable domestic economic policies which tended to worsen economic performance and balance of payments deficits. Our focus is on structural adjustment policies. Since the adjustment policies have usually been in terms of packages, it is more appropriate to discuss about structural adjustment programmes.

A "structural adjustment programme" may be defined as a "set of policy measures that attempts to permanently change relative prices of tradable goods in the economy in order to reallocate, or help along reallocation of production factors in accordance with the new set of external and domestic conditions". (Edwards, S. and Wijnbergen, Van S. (1989), pg. 1482). The new economic conditions are the macroeconomic disequilibria which come as a result of a combination of exogenous or international shocks (such as the terms of trade shocks due to oil price hike in the late 1970s) and inconsistent domestic macroeconomic policies which provoke severe and unsustainable disequilibria in the long run.

As Streeten (1987) notes, among the objectives of structural adjustment are the reduction or elimination of balance of payments deficits, the resumption of higher rates of economic growth, and the achievement of structural changes that will prevent future payments and stabilisation problems.

Structural adjustment programmes can be grouped into two major categories, depending on what is considered to be the major source of the shocks: domestic policy failure or shocks emanating from the world economy. Thus, we can have adjustment policies that are implemented as a response to domestic (macro or micro) policies that become unsustainable or undesirable in the long run.

We begin with a brief discussion of foreign-disturbances- induced programmes. The most common exogenous shock has been terms of trade changes such as the oil price hike of the 1970s and the decline in primary
commodity prices in the 1980s. The other shock was the interest rate hike in the late 1970s and early 1980s.

Responses to international shocks differed across countries. In the case of the oil price hikes, some countries decided to reduce the rate of growth of oil consumption while others resorted to foreign borrowing and/or asking for more grants in order to maintain the pattern of consumption and finance new and on-going investments.

Apart from the adverse terms of trade shocks discussed above, there were also positive terms of trade disturbances. In Tanzania, this happened in 1976 where there was a coffee price boom. The analysis of economic consequences of a positive terms of trade shock is similar to what is referred to as the "Dutch Disease". However, the discussion of the Dutch Disease is outside the scope of this study. The Dutch Disease model abstracts from the role of government in changing the relative prices and allocating resources in an economy. Given the nature and levels of government intervention in Tanzania, the application of the Dutch Disease model in the country becomes less relevant and in appropriate.

The second type of structural adjustment programmes is a response to domestic policies that become unsustainable or undesirable in the long run. We may further subdivide this broad group of adjustment programmes into those which are in response to balance of payments crises and those which aim at reducing microeconomic distortions or impediments to trade. The policy measures for correcting balance of payments deficits have usually included devaluation of the domestic currency and removal or reduction in (trade) taxes. These policy measures affect not only the domestic relative prices but also the levels and distribution of household incomes. The discussion on the general macroeconomic policies, including devaluation and tariffs, is presented in Section 2. Per capita household incomes are discussed in Section 3.

Apart from changing domestic relative prices and the structure of household incomes, the economic policies Tanzania has adopted also affected the performance of the economy in terms of production and private final consumption expenditure. This then prompts us to examine the performance of the overall economy and how household incomes have changed over time. The focus of the analysis is on macroeconomic and trade policies during the time period 1976-1990.
In an attempt to guarantee that gains of trade occur to the domestic economy, countries (both developed and developing) find themselves titillated to impose tariffs and quantitative restrictions on imports. In Tanzania, the role of tariffs and quantitative restrictions as trade policy instruments has been changing ever since the country gained independence in 1961. As Ndulu and Semboja (1992) noted, tariff protection was dominate prior to 1970 but was overshadowed by the prominence of quantitative restrictions during the mid-1970s up to the mid-1980s. With more liberal policies since the mid-1980s which introduced other economic policy instruments including own-funds import scheme, open general license scheme (OGL) facility, price decontrol and exchange rate adjustments reduced the importance of non-tariff barriers to trade and enhanced the role of tariffs in influencing prices and providing protection to domestic industries. However, the importance of tariffs as a policy instrument is being dampened by duty evasions and exemptions. In 1986, for example, duty exemptions (measured as the difference between actual collections and what should have been collected if no exemptions were granted) exceeded actual collections by 88 percent. Because of the high tariff rates (of 100% or above) on "luxury" goods, these goods were either not declared as being imported or declared only after exemption had been guaranteed. In 1986, tariff collection on this category of imports was only 10 percent. However, tariff rate measured as the ratio of actual tariff revenue collected to total imports for each sector was, on average, only 6% in the year 1976. (See Table 6.1 in Section 6 of this study).

The liberalization policies introduced in the mid-1980s called for reforms in the tariff structure as well. Tanzania's tariff structure was very complex during the years up to 1988. There were 18 different rate categories with tariff rate ranging from 0% to 200%. However, beginning mid-1988, the number of rate categories and tariff rates started to be reduced. Imports of intermediate and capital goods were charged at a basic rate of 60% and higher rates were applicable to "luxury" goods. In June 1990, the number of rate categories were reduced to five, namely, 0%, 20%, 30%, 40% and 60%. The tax rate categories were further reduced to three in the 1992/93 budget. Thus as from mid-1992, the new tariff categories were 0%, 10% and 30%, the latter being the maximum rate. (URT (1992), Speech by the Minister for finance).

The effects of tariffs and tariff-equivalent quantitative restrictions are well known in the trade and welfare literature. (See for example, Dervis et al. (1982): 197-200). Tariffs have several desirable and undesirable effects. While the government collects tariff revenue, the change in relative prices due
to the tariff will have a production effect whereby producers shift away from the production of exportables to the production of importables. A tariff also has the effect of reducing the volume of trade as the quantity demanded of imports is reduced due to higher domestic import prices.

Tariff and tariff-equivalent quantitative restrictions tend to reduce welfare as the community moves to lower indifference curve. The welfare loss can be decomposed into two components; a production effect and a consumption effect. The production effect indicates the cost to the society of producing inefficiently while the consumption effect (or reduced consumption) is the result of consumption at distorted prices.

The welfare effects of tariffs and quantitative restrictions is the subject matter of this thesis. In examining the welfare effects of the trade and trade related policies in Tanzania, it is important to also consider the effects on the performance of the economy over time.

Tanzania experienced rapid economic growth during the mid-1960s to mid-1970s during which time the overall Gross Domestic Product (GDP) was growing at an average of 4.7% while the per capita GDP grew at 1.5 % in constant prices. (World Bank (1991), Vol. I pg. 3). The economy began to slow down in the second half of the 1970s when the growth of both the overall and per capita GDP declined. During 1976-80, the overall GDP was growing at an annual average rate of 2 % while the per capita GDP grew at -0.3 percent. The one and a half decade after 1976 was also marked with severe balance of payments problems. The current account deficit as a percentage of GDP was, on average, only 1.3% during 1973-75 but rose to more than 10 percent during 1978-80. As we shall see in the next Section, the current account deficit has been increasing since 1977 when it was at its minimum relative to GDP and grew to eight times the 1977 level in 1980 while reaching a peak in 1988 when it was eleven times the 1977 level.

The economic decline was due to a combination of external shocks and bad weather (droughts and floods) coupled with inadequate policy responses to the shocks. The external shocks included terms of trade shocks due to the fourfold increase in the price of oil during 1973-1974 and the other oil price rise in 1979-1980 and due to the decline in primary commodity prices in the mid-1980s. The positive shock on coffee prices during 1975-78 were squandered in a massive increase in the government sector which registered an all time
high growth rate of more than 12% per annum in 1978 and 1979 in constant prices. (URT (1991): 30)

The policy responses to the shocks have more often than not been at the behest of and pressure from the donor community, especially the International Monetary Fund (IMF) and the World Bank. (Bagachwa, M.S.D. (1991): 47). The common policy prescriptions have included depreciating the real exchange rate and reducing distortional trade taxes. Depreciating the real exchange rate (or devaluation) may enable the country adjust to an adverse terms of trade shock while the reduction in trade taxes will enhance economic efficiency and competitiveness in the world market.

As already noted above, the poor performance of the economy and the government's macroeconomic policies also affected household incomes. The study on trends in real self-employment incomes in Tanzania done by Bevan, et al. (1988) indicated an alarming downward trend in incomes and living standards of both the rural and the urban populations consequent to the malfunctioning of the economy.

In comparing household budget surveys of 1969, 1976/77, 1979/80 and 1982/83 Bevan et al. (1988) found that there was a drastic decline in the rural living standards attributable to a decline in cash incomes from farm sources. Between 1976/77 and 1982/83 real per capita rural incomes halved. They also found that in the rural areas subsistence farming tended to replace cash farming while non-farm earned incomes tended to replace wage employment. This implies that farming and wage employment had become less rewarding in the rural areas. According to the same study again, it is claimed that Tanzania's urban real per capita incomes fell by between 43-54 % during 1969-1984. The fall in real wages forced the urban households to increasingly engage themselves in self employment (farming, trading and informal manufacturing) so as to supplement their real wages. Should we trust the story by Bevan et al. (1988). Their findings are too pessimistic to be trustworthy.

According to the study by Bevan et al. (1988), per capita rural incomes in 1976/77 were TSHs 2974.00 in 1982/83 prices using official consumer price index. During 1982/83 per capita incomes in rural Tanzania were TSHs 1549.00 (Bevan et al. (1988): 71-72). This would imply that between 1976/77 and 1982/83 the growth of the rural incomes was -10.30 % per annum! Such a growth rate is amazing and incredible. It is difficult to see how one can trust such results while national accounts reveal that the annual
growth of the overall real per capita GDP between 1976/77 and 1982/83 was, only -1.73 % (rather than anywhere closer to the -10.30 % reported by Bevan et al. (1988). Coming to urban incomes, Bevan et al. (1988) found that real per capita incomes in urban Tanzania during 1983/84 were TSHs 4141.00 in 1982/83 prices using the official CPI. The corresponding incomes for 1976/77 were TSHs 7305.00 (Bevan et al. (1988): 76-77).

This then would imply that real income in urban Tanzania were growing at an annual rate of -9.03 %! Needless to say, such a growth rate is nowhere closer to the annual growth of -1.73 % for the overall real per capita GDP.

These findings on per capita incomes throws a challenge to us to examine whether there has been any change in household incomes since the early 1980s. We shall compare the findings from our household surveys for 1989/90 with those by Bevan et al. (1988 & 1989).

In order to improve the performance of the economy, the Government introduced a number of macro-economic adjustment policies. These policies included the National Economic Survival Programme (NESP) and the Structural Adjustment Programme (SAP) launched in 1981 and 1982 respectively. The NESP and SAP were followed by two Economic Recovery Programmes (ERP I and ERP II) launched in 1986 and 1989 respectively. The policy instruments employed by the Government have included devaluation, tariffs, foreign exchange and import quotas. The adjustment policies exercised by Tanzania have had different impacts on the volume of trade (imports and exports), domestic production and consumption.

1.2 Statement of the Problem

The problem that this study addresses itself to is to analyse the effectiveness of macroeconomic policies and changes in relative prices in improving economic performance and household incomes in Tanzania.

There is evidence from several studies (such as those) reviewed above that the Tanzanian economy has been worsening since the late 1970s. Production, real per capita private consumption, wages and incomes have been fluctuating and declining. The balance of payments has also been in crisis as shown by, among others, the negative trade and current account balances. The economic crisis the country is facing requires an empirical study, which will analyse the
workings of the economy and suggest how the performance of it can be improved.

1.3 Significance of the Study

The significance of this study lies in the fact that the utmost objective of any economic activity (in Tanzania) should be to improve the welfare of the people and maintain it to the highest possible level. This, as may well be expected, requires a well functioning economy in the sense of achieving the balance between demand and supply both at the micro or household levels and the macro level as well as reducing balance of payments deficits. Policy intervention may adversely affect the economy and welfare of the people. This study is thus a positive contribution in the efforts to analyse the economic crisis the country is facing and suggest ways of how to improve the welfare of the people.

1.4 Objective of the Study

The general objective of this study is to examine the welfare implications of macroeconomic policies in Tanzania. Specifically, we want to examine the impact of trade liberalization (that is, the reduction of tariffs and quantitative restrictions) on sectoral production, per capita consumption and (the distribution of household) incomes.

1.5 Hypotheses

Our hypotheses in this study are two:

1. The reduction of import tariffs and tariff-equivalent quantitative restrictions leads to welfare gains in the economy. The welfare gains are in terms of an improvement in both production and private consumption.

2. Changes in relative prices due to trade and the overall macroeconomic policies affect the distribution and levels of household incomes. If the prices change in favour of agriculture (which is the main source of income for the majority of the poor) relative to other sectors, incomes of the poorer section of the population will increase and thus leading to more equitable income distribution in the country.
The two hypotheses will be tested using the tradable-nontradable model as well as a trade-focused computable general equilibrium (CGE) model to be described below. We shall also use household survey data to shed light on changes in rural and urban household incomes.

1.6 Outline of the Study

After this introductory Section, Section 2 describes the structure of the Tanzanian economy and uses a tradable-nontradable model to analyse the macroeconomic and sectoral impacts of the adjustment policy instruments in the country. In Section 3 we present a description and analysis of rural and urban household incomes. In Section 4 we construct and describe a trade-focused multisector computable general equilibrium (CGE) model the data for the implementation of which is provided in Section 5 which also gives the social accounting matrix (SAM) of Tanzania. In Section 6 we discuss simulation results of the Tanzania CGE model. Finally, in Section 7, we provide the summary of the main results and conclusions of our study.

2. MACROECONOMIC POLICIES AND ECONOMIC PERFORMANCE IN TANZANIA

2.1 Introduction

For economic and political reasons, Tanzania and many other countries have instituted economic policies which become unsustainable in the long run. Such policies have included the use of trade taxes or import tariffs and quantitative restrictions to trade. Trade and the general macroeconomic policies affect not only production, consumption and the volume of trade, but also change the domestic relative prices. Changes in relative prices, in turn, may affect the distribution of incomes among households.

In this Section, we shall review the macroeconomic policies Tanzania has adopted and examine the macroeconomic and sectoral impacts of the policies. The focus is on the economic impacts of the country's trade policies.
Issues of trade policies (or protection) are closely linked with industrialization and overall development strategies. In Tanzania, trade policies have been part of the long-term strategic statements: the Long-Term Plan: 1964-1980 and the Basic Industrialization Strategy (URT (1964) & (1976) respectively). These policy statements were latter translated into five-year plans for operational purposes. The three five-year plans: 1964-1969, 1969-1974 and 1976-1981, emphasized, among others, import substitution industrialization as well as pre-export processing.

It is widely accepted that liberal and outward trade policies are more beneficial to an economy than restrictive, inward-oriented policies. Despite this view, doubts about liberalization remain strong in many circles (Havrylyshyn, O. (1990): 1-24). The pessimism on the gains from trade liberalization results from, among others, the dearth of empirical research to quantify the efficiency and welfare gains from trade liberalization. While studies based on partial equilibrium models seem to suggest weak relationship between trade policy and welfare gains, general equilibrium models show a higher relationship between the two. The partial equilibrium models for developing countries include those by Harrison (1989) for Cote d'Ivoire, Chen (1977) for East Asia, Elias (1978) for Latin America and World Bank (1987) for 12 countries. The results form these studies are mixed - some suggesting a weak and others a stronger relationship between trade liberalization on the one hand, and capacity and efficiency utilization on the other.

Estimates of welfare costs of trade policies has been mostly done using general equilibrium (CGE) models. CGE models are perhaps the most comprehensive methodology for analyzing the economic effects of trade policies. Bertola and Faini (1987), for example, found for Morocco that without the existing tariff barriers, imports might have been 10 to 20 percent higher than the levels with the tariffs (Havrylyshyn, (1990): 18-19).

Some of the skepticism about liberal, outward looking trade policies is due to political and ideological view that the short-term cost of adjustment may be too high to sustain politically. This political skepticism on trade liberalization may not be justifiable if tariffs and quantitative restrictions result in acute shortages of both consumer and producer goods that the people demand.

Along with the industrialization strategies in Tanzania went the policy of infant industry protection. The protection was first through import tariffs in order to discourage competitive imports. With the growth of government
(public enterprises) participation in the industrialization and other economic activities, protection was further extended to include duty exemption on imported raw materials, machinery and spare parts (Ndulu and Semboja (mimeo)).

The protectionist policies coupled with (the resulting) inefficiencies in the production process and poor macroeconomic performance prompted the Tanzanian government to design and implement adjustment programmes in an attempt to alleviate the economic crisis. The adjustment programmes adopted by the government were the National Economic Survival Programme (NESP) and the Structural Adjustment Programme (SAP) launched in 1981 and 1982 respectively. These were later followed by two Economic Recovery Programmes (ERP I and ERP II) launched in 1986 and 1989 respectively. The adjustment programmes were done in consultation with and under pressure from the International Monetary Fund (IMF), the World Bank and donor community (Bagachwa, M.S.D. (1991): 47).

Trade liberalization is a policy strongly advocated in the economic recovery programmes. The reduction of tariffs and quantitative restrictions went along with other policy measures such as adjustments in the exchange rate, own fund import scheme, open general license facility (OGL), export promotion policies and tariff reforms. Tariffs and tariff reforms in Tanzania were discussed in the introductory Section.

2.2 Macroeconomic Performance During 1977-1990

The economy of Tanzania has been in crisis since the late 1970s. There were, however, some signs of recovery in the late 1980s and early 1990s. The crisis manifests itself in, among others, fluctuating and falling real per capita gross domestic product (GDP) as well as increasing balance of payments deficits as depicted in Tables 2.1 and Table 2.2 respectively.

Looking at some macroeconomic indicators in Table 2.1, we see that despite the declining trends in overall and per capita GDP in real terms, money supply has virtually always been increasing and at a rate higher than the growth in the GDP. It was only in 1984 that there was a decline in money supply. The growth in money supply was accompanied with increasing rates of inflation.

In Table 2.1, it is also shown that inflation has been increasing at a fast rate; from a minimum annual growth of less than 10% during 1977-78 to a
maximum of 36.1% in 1984 and thereafter steadily declining to 25.9% and 19.7% in 1989 and 1990 respectively. In that table, we also see that actual interest rates were, except for 1977 and 1978, always below the increase in price levels. This means that there was incentive for agents to borrow more. This, in turn, tended to increase credit and, therefore, money supply. Nominal wages were increasing during 1977-90, but in real terms the wages were falling except in 1978 and 1988 when inflation increased at a slower rate than the growth in nominal wages.

As can be seen in Table 2.3, although exports as a percentage of GDP increased during economic recovery programmes, the ability of exports to pay for the import bill has been declining. Exports as a percentage of GDP declined from 17% in 1977 to a mere 4% in 1985. However, with far reaching economic reforms introduced in the mid 1980s, export performance showed a comeback, rising from 13% in 1986 to 20 and above percent in the late 1980s and early 1990s. The export-to-import ratio declined from an all-time peak of 83% in 1977 to a stagnating and fluctuating level of around 30% in the late 1980s and early 1990s. This seems to suggest that most of the import bill in the country has tended to be financed by foreign aid or depleting the country’s foreign reserves. The failure of the country to pay for its import bill using its own foreign reserves and export earnings plunges the country to mounting debts the consequence of it being even worse balance of payments deficits over time.
Table 2.1: Money Supply, Prices and Gross Domestic Product in Tanzania (Percentage Growth)

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic Credit</th>
<th>Credit to government</th>
<th>Money Supply</th>
<th>Overall GDP&lt;sub&gt;fc&lt;/sub&gt;</th>
<th>Per capita GDP&lt;sub&gt;fc&lt;/sub&gt;</th>
<th>Consumer Price Index</th>
<th>Interest rates&lt;sub&gt;b&lt;/sub&gt;</th>
<th>Nominal Wages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>5.56</td>
<td>-10.42</td>
<td>19.71</td>
<td>0.40</td>
<td>0.61</td>
<td>11.61</td>
<td>8.25</td>
<td>11.44</td>
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<tr>
<td>1978</td>
<td>46.41</td>
<td>59.51</td>
<td>6.69</td>
<td>1.21</td>
<td>-1.29</td>
<td>6.60</td>
<td>9.50</td>
<td>14.68</td>
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<tr>
<td>1979</td>
<td>37.90</td>
<td>72.93</td>
<td>52.86</td>
<td>3.42</td>
<td>0.23</td>
<td>12.85</td>
<td>9.50</td>
<td>12.24</td>
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<tr>
<td>1980</td>
<td>24.16</td>
<td>36.87</td>
<td>27.89</td>
<td>2.92</td>
<td>-0.84</td>
<td>30.26</td>
<td>9.75</td>
<td>15.78</td>
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<td>1981</td>
<td>22.80</td>
<td>27.75</td>
<td>15.40</td>
<td>-0.50</td>
<td>-3.52</td>
<td>25.65</td>
<td>10.00</td>
<td>13.94</td>
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<td>-2.56</td>
<td>28.95</td>
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<td>-5.34</td>
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<td>36.14</td>
<td>9.50</td>
<td>14.00</td>
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<td>31.97</td>
<td>23.05</td>
<td>2.63</td>
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<td>33.29</td>
<td>10.00</td>
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<td>41.71</td>
<td>3.26</td>
<td>0.77</td>
<td>32.42</td>
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<td>9.50</td>
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<td>1989</td>
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<td>1.66</td>
<td>25.85</td>
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<td>3.59</td>
<td>4.09</td>
<td>19.70</td>
<td>9.50</td>
<td>30.50</td>
</tr>
</tbody>
</table>

Notes:
- a = GDP figures are in real terms, in 1976 prices
- b = Figures are the actual commercial bank medium and long term lending rates

Source:
- Bank of Tanzania, *Economic and Operations Report*, various issues
- URT, *Economic Survey*, various issues
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Exports (f.o.b)</td>
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<td>495.0</td>
<td>573.0</td>
<td>505.8</td>
<td>553.7</td>
<td>415.4</td>
<td>379.7</td>
<td>388.3</td>
<td>285.6</td>
<td>347.6</td>
<td>353.2</td>
<td>380.2</td>
<td>395.2</td>
<td>407.8</td>
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<tr>
<td>Imports (c.i.f)</td>
<td>648.7</td>
<td>1186.5</td>
<td>1090.1</td>
<td>1218.6</td>
<td>1161.0</td>
<td>1112.8</td>
<td>814.5</td>
<td>874.0</td>
<td>999.2</td>
<td>1047.5</td>
<td>1150.0</td>
<td>1192.4</td>
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<td>-517.1</td>
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<td>-607.3</td>
<td>-434.8</td>
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<td>-713.6</td>
<td>-699.9</td>
<td>-796.8</td>
<td>-812.2</td>
<td>-834.8</td>
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<tr>
<td>Services (net)</td>
<td>78.2</td>
<td>28.3</td>
<td>37.2</td>
<td>19.0</td>
<td>69.9</td>
<td>38.8</td>
<td>24.2</td>
<td>43.2</td>
<td>68.1</td>
<td>85.1</td>
<td>99.1</td>
<td>196.1</td>
<td>-219.1</td>
<td>-162.8</td>
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<tr>
<td>Transfers (net)</td>
<td>115.2</td>
<td>171.5</td>
<td>176.0</td>
<td>128.7</td>
<td>130.2</td>
<td>119.3</td>
<td>163.3</td>
<td>366.7</td>
<td>475.0</td>
<td>585.0</td>
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<td>-303.9</td>
<td>-565.1</td>
<td>-407.2</td>
<td>-359.3</td>
<td>-307.3</td>
<td>-369.4</td>
<td>-413.0</td>
<td>-312.0</td>
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<td>-758.0</td>
<td>-401.7</td>
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<td>208.0</td>
<td>35.7</td>
<td>-50.5</td>
<td>-49.4</td>
<td>-7.0</td>
<td>36.6</td>
<td>32.3</td>
<td>137.2</td>
</tr>
<tr>
<td>Exceptional Financing</td>
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<td>16.8</td>
<td>16.6</td>
<td>122.9</td>
<td>90.8</td>
<td>177.1</td>
<td>153.5</td>
<td>49.4</td>
<td>60.0</td>
<td>83.0</td>
<td>47.1</td>
<td>96.1</td>
<td>143.7</td>
<td>20.3</td>
</tr>
<tr>
<td>Errors and Omissions</td>
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<td>75.5</td>
<td>37.9</td>
<td>37.3</td>
<td>-44.0</td>
<td>59.5</td>
<td>-190.7</td>
<td>125.9</td>
<td>10.9</td>
<td>-78.2</td>
<td>-6.5</td>
<td>-22.8</td>
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<tr>
<td>Overall Balance</td>
<td>137.0</td>
<td>-257.7</td>
<td>-24.0</td>
<td>-178.1</td>
<td>-101.7</td>
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<td>-356.6</td>
<td>-281.7</td>
<td>-628.9</td>
<td>-248.5</td>
<td>-276.3</td>
</tr>
</tbody>
</table>

**Notes:** The net overall balance is financed by changes in gross reserves, the net position vis a vis the IMF and others, including debt rescheduling.

**Source:** Bank of Tanzania, Economic and Operations Report, Various issues
URT, Economic Survey, various issues.
Table 2.3: Tanzania Balance of Payments as Percentage of GDP

<table>
<thead>
<tr>
<th>Year</th>
<th>Exports as % of GDP</th>
<th>Export/Import Ratio (%)</th>
<th>Trade Balance Deficit as % of GDP</th>
<th>Current Account Deficit as % GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>17</td>
<td>83</td>
<td>4</td>
<td>2</td>
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<tr>
<td>1978</td>
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<td>1980</td>
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<td>1981</td>
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<tr>
<td>1982</td>
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<tr>
<td>1983</td>
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<td>1988</td>
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<td>1989</td>
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<tr>
<td>1990</td>
<td>20</td>
<td>30</td>
<td>47</td>
<td>21</td>
</tr>
</tbody>
</table>

Source: Computed from Table 2.2

Looking at the performance of Tanzania's balance of payments we see that it has not been impressive since mid-1970s. This is not surprising given the export performance described above. During 1977-90 imports have always exceeded exports causing a trade balance deficit ranging form 4 % to 48% of GDP in 1977 and 1989 respectively (See Table 2.3). The current account deficit was, however, of a lesser magnitude than the trade deficit as a percentage of GDP. The overall balance in the balance of payments was financed through, among others, changes in reserves, the net position vis a vis the IMF and debt rescheduling.

A number of factors contributed to the economic and balance of payments crisis described above. Among them were the two oil crises in 1973-74 and 1979-80, and fluctuating or falling international prices for traditional export commodities, the break-up of the East African Community and the war against Idi Amin's Uganda in 1978-79 as well as natural factors such as variable weather conditions. The falling world commodity prices coupled with increased import prices led to the deterioration in the international commodity terms of trade as shown in Table 2.4. The cost of the 1978-79 war for Tanzania is estimated at US$ 500 million, which is an equivalent of the country's one year's export earnings (Bagachwa and Maliyamkono (1990): 4). The break-up of the East African Community meant that Tanzania had to incur new costs to start up infrastructures for civil aviation and telecommunications. As for the natural disasters, droughts in 1973-74, 1981-
82, and 1983-84 coupled with occasional floods led to massive food imports at the cost of US$1.5 billion or an equivalent of three years Tanzania's export earnings (Bagachwa and Maliyamkono (1990): 5).

The combination of the external and natural factors mentioned above together with inadequate policy response to deal with the crises coupled with inefficient institutional and productive structure of key sectors of the economy worsened the economic crisis which culminated into severe balance of payment deficits as described above.

2.3 Economic Adjustment Programme

The earlier major efforts by the government to redress the ailing economy was the introduction of the National Economic Survival Programme (NESP) and the Structural Adjustment Programme (SAP) launched in 1981 and 1982 respectively. The NESP, in particular, was hastily prepared in order to ease the foreign exchange crisis and improve capacity utilization. The NESP was, however, not a comprehensive programme as such but just a set of incoherent targets and could achieve none of its targets. A year later, NESP was abandoned in favour of the SAP (Bagachwa and Maliyamkono (1990)). The SAP, on the other hand, was designed so as to improve both the internal and external balances by introducing, among other things, trade liberalization measures such as reducing internal and external trade restrictions as well devaluing the TSh. Generally speaking, both the NESP and SAP had limited impact on the economy for lack of resources to support them since no agreement had yet been reached with the IMF (Eriksson (1991): 9). The two earlier adjustment programmes were later followed by an agreement between the Tanzanian government and the IMF. This then opened the door for massive inflow of external funds (loans and grants) from international donor community (Eriksson (1991): 9). It is the implementation of the economic recovery programmes that has resulted into the comprehensive economic reforms including the more liberal trade and other economic policies.

2.4 Theoretical Framework

In the wake of the economic crisis that the country experienced, the Tanzanian government resorted to the use of a number of policy instruments to regulate the economy. The instruments used have included the exchange rate, export taxes,
import tariffs and/or quantitative restrictions, as well as money supply and or the budget deficit.

Macroeconomic policies have to be consistent with each other so as to minimize undesirable effects on the economy. In this sense, the policies are said to be "compatible". With compatible policies, the economy can achieve a sustainable equilibrium, though not necessarily an optimal one (Bevan et al. (1990): 7).

In order to analyse trade liberalization in Tanzania, we introduce a macroeconomic trade policy model. The model is based on and is fully described in Bevan et al. (1990). The focus of our analysis is on relative prices.

The standard macroeconomic model for open economies is the Salter (1959) model, which treats exportable and importable goods as single commodity, "tradable". In that model trade policy is assumed away. The relative price to be analysed is then the ratio of tradables and non-tradables prices, a price commonly known as the real exchange rate. This definition of real exchange rate is not applicable to developing countries where trade restrictions are prevalent. In this case we have to disaggregate the composite commodity tradables into its two components, exportables and importables. These two commodities together with non-tradables give rise to three relative prices, two of which are independent.

The domestic price for importables, $P_m$, is determined by the exogenous world market Prices, $P_m^*$, the export taxes, $t_x$, and the exchange rate. By definition, no-tradable goods have no world demand or price $P_x/P_m$ is the domestic terms of trade while the corresponding international relative price, $P_x^*/P_m^*$, is the international terms of trade. The difference between the domestic and the international terms of trade is thus due to domestic trade policy.

Trade liberalization is the reduction of trade taxes and quantitative restrictions which may also be accompanied by devaluation and the consequent increases in export producer prices. In our model, a devaluation affects only the relative prices of non-tradables to the two tradable goods. In the domestic terms of trade that is, $P_x/P_m$), however, the exchange rate cancels out.
Having discussed what trade liberalization is, it remains to be seen how it has been in practice and what impact of it has been on the relative prices, production and private final consumption in Tanzania.

2.5 Trade Liberalization in Practice

2.5.1 Changes in Relative Prices and Macroeconomic Outcomes

One way to estimate the impact of trade liberalization is to measure changes in domestic relative prices of exportables to importables, \( \frac{P_x}{P_m} \), of non-tradables to importables, \( \frac{P_n}{P_m} \), and of exportables to non-tradables, \( \frac{P_x}{P_n} \).

Changes in these relative prices (as a result of devaluation, trade policy and macroeconomic policy in general) is an important mechanism through which the macroeconomic policies are transmitted to the sectoral and micro levels. The impact of trade liberalization on sectoral output is the subject of the next subsection while the effect on household income structures is the focus of the next Section. In this section we focus on changes in relative prices and its macroeconomic outcomes.

Looking through Table 2.4 below, we can identify two major phases of trade liberalization covering the years 1977-90. The phases are identified on the basis of the degree of trade liberalization as indicated by domestic terms of trade, or the \( \frac{P_x}{P_m} \) relative price. The first phase covers the years 1977-84 and is characterized by the relative \( \frac{P_x}{P_m} \) lying below 100 percentage level. This implies that there was high level of tariff and quantitative restrictions to trade during this phase. The period 1977-84 is also characterized by a relatively rigid nominal exchange rate and declining terms of trade. Hence, trade restrictions were kept high despite declines in the international terms of trade which would otherwise suggest a more liberal trade policy to stimulate production and exports. The protectionist policy began to be abandoned after 1981 with the adoption of macroeconomic adjustment policies. The domestic terms of trade, \( \frac{P_x}{P_m} \), then rose from 68 percentage point in 1981 to 99 percentage point in 1984.
### Table 2.4: Price, GDP and Consumption Indices (1977=100)

<table>
<thead>
<tr>
<th>Year</th>
<th>$P_x$</th>
<th>$P_m$</th>
<th>$P_n$</th>
<th>$P_x/P_m$</th>
<th>$P_n/P_m$</th>
<th>$P_x/P_n$</th>
<th>TOT</th>
<th>EXR</th>
<th>GDP per capita</th>
<th>Consumption per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<td>100</td>
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<tr>
<td>1978</td>
<td>96</td>
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<td>93</td>
<td>99</td>
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<td>70</td>
<td>58</td>
<td>100</td>
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<td>1982</td>
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<td>776</td>
<td>110</td>
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<td>1990</td>
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<td>92</td>
<td>62</td>
<td>2372</td>
<td>96</td>
<td>96</td>
</tr>
</tbody>
</table>

**Definitions:**
- $P_x =$ prices of exportables = Prices of major export crops - coffee, cotton, cashewnuts, sisal, tea, and tobacco
- $P_m =$ prices of importables = GDP deflator for domestic manufacturing used as a proxy for importables prices.
- $P_n =$ prices of non-tradables = GDP deflator for construction, wholesale and retail trade, as well transport and communication is used as a proxy for non-tradables prices.
- TOT = International (commodity) terms of trade.
- EXR = Nominal exchange rate defined as TShs/1USS.
- Consumption per capita is private consumption expenditure in 1976 prices.
- Consumption in current prices was deflated using consumer price index.
- GDP per capita is in 1976 prices.

**Sources:**
- BOT (1990), Economic and Operations Report
- World Bank (1991), 135, Table 2

The second phase of trade liberalization covers the years 1984-90 during which time the domestic relative price $P_x/P_m$ was generally speaking above 100 percentage level, rising from 99 in 1984 to 142 in 1990. This was the period of more comprehensive macroeconomic recovery programmes and more drastic trade liberalization which was brought about in the first and second economic recovery programmes (ERPI and ERPII).
The changes in relative price in Tanzania during 1977-90 seem to have favoured the non-tradable sector. Looking at the $P_n/P_m$ relative price, we see that it has been greater than 100 almost throughout the period, except for 1978, 1981 and 1987. The price indices for importables and non-tradables, indicate that the prices had always been increasing throughout 1977-1990, with the increase in non-tradables prices exceeding that in the importables. This means that trade liberalization in the country has not gone far enough to allow enough imports to dampen inflation. This would suggest that there was a shift of resources away from the production of importables into that of non-tradables.

The $P_x/P_n$ domestic relative price was less than 100 percentage points throughout 1977-90 except during 1986-87. This would suggest that macroeconomic policy in the country was not contractionary enough to reduce inflation and that the liberalization and devaluation policies did not go far enough to make exportables more attractive to producers than the non-tradables were. However, part of the explanation of the declining trend in the $P_x/P_n$ is the declining international terms of trade brought about by falling world export prices and increasing international import prices.

As far as the exchange rate is concerned, we see that there have been massive devaluations in the late 1980s, especially beginning in 1986 (see Table 2.4). Despite the devaluations, the price continued to increase contrary to what advocates of devaluations would predict. This implies that there is not much reason to expect that devaluation in Tanzania can change relative prices and improve the trade balance and balance of payments.

As Edwards and Wijnbergen [(1989):1519] point out, normal devaluations can only be successful if they are accompanied by demand management policies. If, however, macroeconomic policies remain inconsistent, devaluations cannot achieve the expected objectives of generating a real devaluation (increase in the relative price of tradables to non-tradables) or the improvement in the international competitiveness. With inconsistent macroeconomic policies, devaluations cannot be expected to lead to an improvement in the devaluing country's current account and the balance of payments.
The ineffectiveness of devaluation in Tanzania may be due to the lack of inconsistent macroeconomic policies. The devaluation in 1986, for example, was accompanied with an all time high rate of growth in the money supply since 1977 if we exclude 1979.6

What, then, were the welfare impacts of trade liberalization? To answer this question, we consider production and consumption gains. In examining the performance of the overall GDP and private final consumption, we may use the indices shown in Table 2.4 above. The absolute figures for real GDP and private final consumption expenditure are shown in Table A2.1 in the Appendix.

In Table 2.4 it is shown that real per capita GDP and real per capita private consumption expenditure during the 1980s were lower than the levels in the late 1970s. The index for the real per capita GDP declined from 100 in 1977 to 87 during 1983-84 after which it started to increase reaching 96 percentage point in 1990. The index for real per capita consumption showed an increase from 100 in 1977 to 118 in the following year and thereafter declined to 70 percentage point during 1984-85 and 1987. During 1988-90, real per capita consumption showed a comeback.

Given the performance of real per capita GDP and private consumption, we may say that trade liberalisation and the general macroeconomic policies in Tanzania have succeeded in halting the decline in welfare. Welfare started to increase in the late 1980s due to the more comprehensive liberal trade and macroeconomic policies.

2.5.2 Impact on Sectoral Output

Having considered the impact of trade liberalisation at the macro level we now turn our attention to the sectoral outcomes. Our focus is on the performance of real sectoral GDP measured in 1976 prices. The sectors under consideration are agriculture, manufacturing, commercial services and public administration. These sectors constitute more than 90% of total GDP at factor cost in 1976 prices (See Table A2.1 in the Appendix). We are also interested in examining the growth rates of real per capita GDP.
In Table 2.5 we provide percentage annual growth rates of sectoral and per capita real GDP. The high level of trade restrictions during 1977-82 seem to have worst affected the manufacturing sector which was declining at an average annual rate of 2.7 per cent. During this time, real per capita GDP was falling at an average rate of 1.6 per cent. The sector which registered the highest growth was public administration which was growing at annual rate of 7.3 per cent. Commercial services and the agricultural sectors were growing at, respectively, 1.6 and 1.1 percentage points.

Table 2.5: Annual Rate of Growth of Real GDP at 1976 Prices (Percentages)

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Manufacturing</th>
<th>Commercial Services</th>
<th>Public Administration</th>
<th>Per capita GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977-1982</td>
<td>1.05</td>
<td>-2.69</td>
<td>1.61</td>
<td>7.33</td>
<td>-1.61</td>
</tr>
<tr>
<td>1982-1986</td>
<td>4.64</td>
<td>-3.58</td>
<td>2.44</td>
<td>-2.41</td>
<td>-0.75</td>
</tr>
<tr>
<td>1986-1990</td>
<td>4.09</td>
<td>6.77</td>
<td>4.03</td>
<td>2.45</td>
<td>1.89</td>
</tr>
<tr>
<td>1977</td>
<td>1.15</td>
<td>-6.05</td>
<td>-0.56</td>
<td>6.62</td>
<td>0.61</td>
</tr>
<tr>
<td>1978</td>
<td>-1.66</td>
<td>3.37</td>
<td>2.77</td>
<td>12.01</td>
<td>-1.29</td>
</tr>
<tr>
<td>1979</td>
<td>0.76</td>
<td>3.33</td>
<td>1.60</td>
<td>12.44</td>
<td>0.23</td>
</tr>
<tr>
<td>1980</td>
<td>3.88</td>
<td>-4.89</td>
<td>4.83</td>
<td>1.37</td>
<td>-0.84</td>
</tr>
<tr>
<td>1981</td>
<td>0.99</td>
<td>11.22</td>
<td>-3.27</td>
<td>11.39</td>
<td>-3.55</td>
</tr>
<tr>
<td>1982</td>
<td>1.35</td>
<td>-3.27</td>
<td>2.29</td>
<td>0.14</td>
<td>-2.56</td>
</tr>
<tr>
<td>1983</td>
<td>2.85</td>
<td>-8.72</td>
<td>-2.29</td>
<td>-0.25</td>
<td>-5.24</td>
</tr>
<tr>
<td>1984</td>
<td>4.01</td>
<td>2.66</td>
<td>2.96</td>
<td>0.06</td>
<td>0.17</td>
</tr>
<tr>
<td>1985</td>
<td>6.00</td>
<td>-3.89</td>
<td>1.56</td>
<td>1.89</td>
<td>1.56</td>
</tr>
<tr>
<td>1986</td>
<td>5.73</td>
<td>-4.05</td>
<td>7.80</td>
<td>-10.81</td>
<td>0.77</td>
</tr>
<tr>
<td>1987</td>
<td>4.40</td>
<td>4.52</td>
<td>3.24</td>
<td>0.56</td>
<td>0.68</td>
</tr>
<tr>
<td>1988</td>
<td>4.48</td>
<td>7.06</td>
<td>3.51</td>
<td>3.08</td>
<td>1.18</td>
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<tr>
<td>1989</td>
<td>4.58</td>
<td>7.68</td>
<td>5.44</td>
<td>3.95</td>
<td>1.66</td>
</tr>
<tr>
<td>1990</td>
<td>2.91</td>
<td>7.84</td>
<td>3.96</td>
<td>2.24</td>
<td>4.09</td>
</tr>
</tbody>
</table>

Source: Computed using national accounts data from URT(1991), *National Accounts of Tanzania 1976-1990*

The introduction of trade liberalisation policies during 1982-1986 boosted agricultural production and the commercial services sector. During this period, agriculture grew at an average annual rate of 4.6 per cent while commercial services grew at 2.4 per cent. The manufacturing sector, continued to decline, growing at negative 3.6 per cent while public administration was declining at 2.4 per cent. The decline in per capita GDP observed during the previous period was
virtually arrested by the mid 1980s. Real per capita GDP was declining at the rate of only 0.8 per cent during 1982-1986.

The period 1986-1990 was one of drastic liberalisation policies. This was marked with positive growth rates in virtually all the sectors. The highest growth this time was recorded in the manufacturing sector which was growing at an average rate of 6.8 per cent and was followed by agriculture and commercial services which grew at 4.1 and 4.0 respectively. After the declines in the 1982-86 period, public administration was now growing at an average rate of 2.5 during 1986-90. Per capita income also increased, growing at an average annual rate of 1.9 per cent.

The analysis in this Section has shown that with more liberal economic policies since mid-1980s, there has been a general tendency for real per capita GDP and private final consumption expenditure to increase. The liberal macroeconomic policies were also associated with improved performance or growth in sectoral production and per capita income. This then seems to confirm our hypothesis that there are welfare gained associate with trade liberalisation. It remains to be seen what has been the impact of trade liberalisation on the level and structure of household incomes in the country. We take up this question in the next Section.

3. THE IMPACT OF TRADE AND MACROECONOMIC POLICIES ON RURAL AND URBAN HOUSEHOLD INCOMES

3.1 Introduction

Studies on household incomes and income distribution in Tanzania show inconclusive evidence as regards the reduction of inequality in the country. Among such studies are those by Wagao (1981), ILO (1982), Semboja (1983), Bevan et al. (1988 & 1989) and Bukuku (1988). The study by Wagao and Bukuku used the Gini coefficients to compare income distribution between 1969-1976 and found that the Gini coefficient for Mainland Tanzania increased. The ILO (1982), however, tended to suggest that the Gini coefficient declined, implying that inequality in income distribution increased between the two years.
virtually arrested by the mid 1980s. Real per capita GDP was declining at the rate of only 0.8 per cent during 1982-1986.

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The analysis in this Section has shown that with more liberal economic policies since mid-1980s, there has been a general tendency for real per capita GDP and private final consumption expenditure to increase. The liberal macroeconomic policies were also associated with improved performance or growth in sectoral production and per capita income. This then seems to confirm our hypothesis that there are welfare gains associated with trade liberalisation. It remains to be seen what has been the impact of trade liberalisation on the level and structure of household incomes in the country. We take up this question in the next Section.

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The study by Bevan et al. (1988 & 1989) used relative incomes by quintiles and concluded that income distribution in rural Tanzania during 1982/83 was highly skewed, with the quintile real per capita income being four times the mean income while the bottom two quintiles were only less than 30% of the overall mean income for the four sample regions. The picture during the late 1980s and early 1990s does not seem to differ much from what Bevan et al. (1989) found in terms of the distribution of incomes.

The objective of this Section is to shed light on both the levels and the distribution of incomes during the 1980s with special emphasis on 1989/90, the year of our household survey. We shall also describe the link between macroeconomic policies in general and changes in real household incomes in the rural and urban Tanzania. Particular attention is paid to trade liberalisation policies. The macro-micro link is provided through the use of the tradable/non-tradable model described in the previous Section. The intention is to see how changes in domestic relative prices brought about by changes in tariffs and tariff equivalent quantitative restrictions affect the structure and levels of household real incomes. Changes in the levels of households' real incomes also has an impact on income distribution.

It is worth noting here that the majority of the poor in Tanzania are in the rural areas and depend on agriculture as their main source of income. This means that trade liberalization may be an important policy instrument in alleviating poverty and increase equity in income distribution if trade liberalization consequently increases real incomes from agriculture relative to other income sources. It is the change in relative (not absolute) incomes that is important in changing the pattern of income distribution. This implies that the absolute levels of real incomes may increase with or without changing the pattern of its distribution. It is our interest to examine as to what has been the trend in both the structure and distribution of real per capita incomes in Tanzania in the past decade.

3.2 Data and Data Reliability

Our study is based on rural and urban household survey conducted in 1990. The rural survey was done for four regions; Dodoma, Iringa, Kilimanjaro and
Ruvuma. The urban survey was done for Dar es Salaam only. The sample size was 799 rural households and 287 urban households.\(^8\)

The concept "household" is taken to refer to a person or group of persons generally bound by ties of kinship and who normally reside together under a single roof or under several roofs within a single compound and are answerable to the same head and share a common source of food. For practical purposes we also listed guests who had been staying in the house for two or more weeks and were sharing meals with the other household members.

In order to build confidence on our results, we compare our survey results with those from other similar studies and with the official per capita GDP wherever appropriate.

### 3.3 The Structure of Household Per Capita Incomes During 1989/90

#### 3.3.1 Rural Incomes

The general picture that emerges from the structure of rural incomes is that the distribution of income is fairly skewed. This is true not only at the regional aggregates, but also within each region, including Dar-es-Salaam.

In Table 3.1 we present the structure of rural incomes by quintile. In that table, it is indicated that the relative income level of the fifth quintile is 2.8 times the mean per capita income for the four rural regions: Dodoma, Iringa, Kilimanjaro and Ruvuma. The fourth quintile mean per capita income is almost equal to the overall mean while the other quintiles fall below the average by between 88 and 35 percentage points.

A glance at Table 3.1 shows that farm incomes are an important source of rural incomes, accounting for 75.8% of total incomes. Of these farm incomes, 52% is subsistence, 40% cash crops and 8% is livestock incomes. Of the remaining 24.2% non-farm incomes, own business is the dominant one constituting 48% of non-farm incomes while wages and remittances constitute 29% and 23% of the same respectively.
The mean per capita income during 1989/90 was TShs 13669, while the median income was TShs 8913 in current prices. The nominal per capita GDP for the four regions during 1989/90 was TShs 11318 (URT (1991) National Accounts of Tanzania, Table 19 pg. 26). Thus, our mean and median per capita income deviate by about 21% from the regions' per capita GDP. The difference could be due to methodology and definition of concepts. However, this is not to claim that one study is superior to the other.

Looking through Table 3.1, we also see that the proportion of income derived from farm subsistence cash crops declines as income increases. Cash crops constituted 58% of total incomes accruing to the first quintile while for the second to the fourth quintiles it constituted about 35% and in the fifth it was only 27% of the total incomes.

Table 3.1: Income Structure of Rural Tanzania During 1989/1990 by Quintile (Percentages, unless otherwise stated)

<table>
<thead>
<tr>
<th>Income Category</th>
<th>Quintile 1</th>
<th>Quintile 2</th>
<th>Quintile 3</th>
<th>Quintile 4</th>
<th>Quintile 5</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm subsistence</td>
<td>103.3</td>
<td>49.0</td>
<td>38.0</td>
<td>39.0</td>
<td>36.0</td>
<td>39.7</td>
</tr>
<tr>
<td>Crop cash</td>
<td>58.0</td>
<td>35.7</td>
<td>35.7</td>
<td>32.5</td>
<td>26.5</td>
<td>30.5</td>
</tr>
<tr>
<td>Livestock cash</td>
<td>-90.0</td>
<td>1.8</td>
<td>4.6</td>
<td>4.6</td>
<td>11.5</td>
<td>5.6</td>
</tr>
<tr>
<td>Wages</td>
<td>13.6</td>
<td>5.8</td>
<td>7.0</td>
<td>8.5</td>
<td>6.6</td>
<td>7.1</td>
</tr>
<tr>
<td>Own business</td>
<td>12.1</td>
<td>8.3</td>
<td>10.1</td>
<td>11.4</td>
<td>12.5</td>
<td>11.6</td>
</tr>
<tr>
<td>Remittances</td>
<td>3.0</td>
<td>3.0</td>
<td>3.9</td>
<td>4.0</td>
<td>6.9</td>
<td>5.5</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Per capita income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(TShs, current prices)</td>
<td>1626</td>
<td>5912</td>
<td>8913</td>
<td>14031</td>
<td>37863</td>
<td>13669</td>
</tr>
<tr>
<td>Relative income level</td>
<td>11.9</td>
<td>43.3</td>
<td>65.2</td>
<td>102.6</td>
<td>277.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Own survey, 1990.

The poorest first quintile seem to depend on subsistence income more heavily than any of the upper quintiles. The proportion of incomes derived from livestock, however, seems to increase as income increases. The bottom two quintiles experienced negative incomes from livestock, probably because of the precarious nature of livestock keeping. It seems that the relatively richer households were more capable of maintaining the livestock and thus realised positive incomes from the business.
Dependence on wages and own business seems to be evenly distributed among all the quintiles with the exception of the first quintile which seems to rely more on wages than the remaining four quintiles. The proportion of income derived from remittances, however, is more pronounced in the top fifth quintile with remittances constituting almost 7% of the total incomes while in the lower quintiles remittances constitutes 4 or less percentages.

The structure of rural incomes by regions is shown in Table 3.2 below. From the table we see that farm incomes are most pronounced in Ruvuma where they account for 86.2% of the total income, while in the other regions they account for less than 70 per cent. Wage incomes were, however, most pronounced in Kilimanjaro, accounting for 20.8% while in the other three regions wages constituted less than 5%. Own business constituted 25.3% in Dodoma while it accounted about 10% in each of the other regions. As for remittances, they were most important in Iringa constituting about 18% of total incomes while in Kilimanjaro, Dodoma and Ruvuma regions remittances formed, respectively, 6.9, 3.5 and 0.9% of the total incomes.

The regional aggregates indicate that of the four sample regions, Ruvuma had the highest median per capita income (of TShs 20380) followed by Iringa (TShs 6542), Kilimanjaro (TShs 5498) and Dodoma (TShs 3232). Relative to the average median income for the four regions, Ruvuma is 128.7% above the median while Iringa, Kilimanjaro and Dodoma regions are, respectively, 26.6, 38.3, and 63.7% below the median income for the four regions. In terms of household incomes, the position of Dodoma is still at the bottom of the four. However, due to its relatively higher household size, the position of Dodoma is slightly improved.
Table 3.2: The Structure of Rural Incomes by Region During 1989/1990 (Percentages, unless otherwise stated)

<table>
<thead>
<tr>
<th>Income Category</th>
<th>Dodoma</th>
<th>Iringa</th>
<th>Kilimanjaro</th>
<th>Ruvuma</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm subsistence</td>
<td>55.5</td>
<td>56.7</td>
<td>37.8</td>
<td>30.7</td>
<td>39.7</td>
</tr>
<tr>
<td>Crop cash</td>
<td>1.0</td>
<td>3.4</td>
<td>19.6</td>
<td>51.9</td>
<td>30.5</td>
</tr>
<tr>
<td>Livestock cash</td>
<td>10.5</td>
<td>8.9</td>
<td>5.1</td>
<td>3.6</td>
<td>5.6</td>
</tr>
<tr>
<td>Wages</td>
<td>4.2</td>
<td>3.4</td>
<td>20.8</td>
<td>2.8</td>
<td>7.1</td>
</tr>
<tr>
<td>Own business</td>
<td>25.3</td>
<td>10.0</td>
<td>9.8</td>
<td>10.1</td>
<td>11.6</td>
</tr>
<tr>
<td>Remittances</td>
<td>3.5</td>
<td>17.6</td>
<td>6.9</td>
<td>0.9</td>
<td>5.5</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Median income per capita (TShs, current prices)</td>
<td>3232</td>
<td>6542</td>
<td>5498</td>
<td>20380</td>
<td>8913</td>
</tr>
<tr>
<td>Relative income level</td>
<td>36.3</td>
<td>73.4</td>
<td>61.7</td>
<td>228.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Household size</td>
<td>6.9</td>
<td>4.5</td>
<td>5.0</td>
<td>5.7</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Notes: * = (number of people)
Source: Own survey, 1990.

Looking at income distribution by region, we see that inequality in income distribution is quite pronounced both at individual regional level and at an aggregate level. As is shown in Table 3.3 and 3.4, the aggregate top fifth quintile received per capita income which was more than four times the aggregate median income. At the level of individual regions, we see that incomes were less skewed in Ruvuma region and most skewed in Dodoma.

One of the measures of income inequality is the inequality ratio which is the ratio of the income received by the bottom 40% to the income received by the top 20% of the population or the sample households (Todaro, M.P. (1989): 147). The closer to one the inequality ratio is, the more equitable the distribution of income is. However, the inequality ratio for our four sample regions does not suggest equitable income distribution in Tanzania. The overall inequality ratio in 1989/90 was 0.20 while the ratios for the individual regions were 0.04, 0.06, 0.17, and 0.36 for Dodoma, Kilimanjaro, Iringa and Ruvuma regions respectively. Thus, income distribution was most unequal in Dodoma and relatively more equal in Ruvuma Region.
Table 3.3: Rural Relative Incomes During 1989/1990 By Quintile and Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Quintile Percentage</th>
<th>Inequality Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
</tr>
<tr>
<td>Dodoma</td>
<td>-34.2</td>
<td>55.9</td>
</tr>
<tr>
<td>Iringa</td>
<td>13.2</td>
<td>59.5</td>
</tr>
<tr>
<td>Kilimanjaro</td>
<td>-3.9</td>
<td>51.1</td>
</tr>
<tr>
<td>Ruvuma</td>
<td>34.2</td>
<td>74.3</td>
</tr>
<tr>
<td>Overall</td>
<td>18.2</td>
<td>66.3</td>
</tr>
</tbody>
</table>

Source: Computed from Table 3.4.

Table 3.4: Rural Quintile Per Capita Incomes During 1989/1990 (By Region, TShs in current prices)

<table>
<thead>
<tr>
<th>Region</th>
<th>Quintile</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
<td>Q5</td>
</tr>
<tr>
<td>Dodoma</td>
<td>-1105</td>
<td>1808</td>
<td>3232</td>
<td>6655</td>
<td>17868</td>
</tr>
<tr>
<td>Iringa</td>
<td>861</td>
<td>3895</td>
<td>6542</td>
<td>10777</td>
<td>27961</td>
</tr>
<tr>
<td>Kilimanjaro</td>
<td>-213</td>
<td>2808</td>
<td>5498</td>
<td>8792</td>
<td>44582</td>
</tr>
<tr>
<td>Ruvuma</td>
<td>6962</td>
<td>15135</td>
<td>20380</td>
<td>29899</td>
<td>61041</td>
</tr>
<tr>
<td>Overall</td>
<td>1626</td>
<td>5912</td>
<td>8913</td>
<td>14031</td>
<td>37863</td>
</tr>
</tbody>
</table>

Source: Own survey, 1990.

3.3.2 Urban Incomes During 1989/90

The structure of urban per capita incomes during 1989/90 is shown in Table 3.5 and 3.6. The mean urban per capita income was TShs 22785. GDP per capita for Dar-es-Salaam during 1989/90 was TShs 29101 (For GDP by region, see URT (1991), Table 19, pg. 26).

As indicated in Table 3.5, farm incomes in urban areas (or Dar-es-Salaam in our case) constituted less than one per cent of total incomes during 1989/90. Wages constituted about 38% while own business constituted about 62% of the total incomes. This would seem to confirm the widely accepted view that wage incomes in (urban) Tanzania are so low that workers have to supplement their wages with non-wage incomes such as farming activities, petty trade and manufacturing activities.
Income distribution in urban areas is, however, highly skewed. In 1989/90 the top 20% of the urban population received incomes which were more than 17 times the median income. The inequality ratio for urban Tanzania was 0.04 suggesting that urban incomes are more unevenly distributed than rural incomes.

Table 3.5: Urban Income Structure During 1989/1990 (Percentages)

<table>
<thead>
<tr>
<th>Income Category</th>
<th>By Quintile</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
</tr>
<tr>
<td>Farm subsistence</td>
<td>1.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Farm cash</td>
<td>0.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Wages</td>
<td>80.1</td>
<td>62.0</td>
</tr>
<tr>
<td>Own business</td>
<td>18.1</td>
<td>36.1</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Relative income level</td>
<td>20.7</td>
<td>51.5</td>
</tr>
<tr>
<td>Inequality Ratio</td>
<td>0.04</td>
<td></td>
</tr>
</tbody>
</table>

Source: Computed from Table 3.6.

Table 3.6: Income Structure of Urban Tanzania During 1989/1990
(TShs, current prices)

<table>
<thead>
<tr>
<th>Income category</th>
<th>By Quintile</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
</tr>
<tr>
<td>Farm subsistence</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Farm cash</td>
<td>8</td>
<td>43</td>
</tr>
<tr>
<td>Wages</td>
<td>872</td>
<td>1678</td>
</tr>
<tr>
<td>Own business</td>
<td>197</td>
<td>979</td>
</tr>
<tr>
<td>Per capita income</td>
<td>1089</td>
<td>2710</td>
</tr>
<tr>
<td>Household size</td>
<td>6.4</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Source: Own survey, 1990.

3.4 Changes in Relative Prices and Structure of Household Incomes

In the previous Section we provided an analysis of the trend in relative prices for the period 1977 to 1990. The analysis was in terms of three activities: exportable goods, importables, non-tradable goods. In order to fit our analysis of our household incomes into the three goods categorisation, it is worth noting that the production of exportables in Tanzania is mostly concentrated in the rural agricultural sector while importables (or manufacturing) is mainly an urban sector.
activity. Non-tradables production is, however, dominant both in the rural and urban sector.

It is difficult to classify the components of household incomes in terms of exportables and importables. We, instead, use urban own business as a proxy to importables and rural farm (crop and livestock) cash incomes as a proxy for exportables. Non-tradables in rural sector is proxied by incomes derived from subsistence activities, own business and remittances. In the urban sector, nontradable production is proxied by farm (both cash and subsistence) incomes, wages and remittances. Income structures according to this categorization are shown in Table 3.7.

As discussed in the previous Section, the $P_x/P_m$ relative price (or domestic terms of trade) was generally in favour of importables during 1977-84 and in favour of exportables during 1985-90. This would suggest that during 1977-84 the proportion of incomes derived from importables (or own business in urban areas) would be growing faster than incomes derived from exportables (or rural farm cash incomes) and the reverse trend during 1985-90 when the relative price was in favour of exportables.

Table 3.7: Trends in Household Income Structures in Tanzania

<table>
<thead>
<tr>
<th>Income Category</th>
<th>1976/77</th>
<th>1982/83</th>
<th>1989/90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exportables (crop and livestock cash incomes)</td>
<td>19</td>
<td>21</td>
<td>36</td>
</tr>
<tr>
<td>Nontradables (Crop and livestock cash incomes)</td>
<td>81</td>
<td>79</td>
<td>44</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Urban</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Importables (own business)</td>
<td>20</td>
<td>39*</td>
<td>62</td>
</tr>
<tr>
<td>Nontradables (Total farm incomes and wages)</td>
<td>80</td>
<td>61*</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Notes: * = the figures refer to the year 1983/84

An examination of the trends in household income structure in Table 3.7 seems to confirm the relationship between the incomes and the $P_x/P_m$ relative price during the late 1970s and the early 1980s. Contrary to what the theory of relative prices would predict, during the late 1980s and early 1990s, the proportion of income derived from importables increased while that from exportables declined. The explanation for this lies in the third sector, the non-tradables. Given the high inflation rate (of 18 per cent during 1989/90), rural households were forced to depend more on subsistence activities while urban businessmen got the incentive to increase the production of the importables to take advantage of the higher prices for their products.

It was noted in Section 2 that, except for three years (1978, 1981 and 1987), the relative price $P_n/P_m$ was generally in favour of the non-tradables throughout the 1977-90. This suggests that incomes from nontradable activities would constitute a higher proportion of the total incomes received by a single household. While this was always the case for rural household incomes, in the urban sector non-tradables constituted a declining proportion of total incomes. As can be seen from Table 3.7, there was a drastic shift away from non-tradables into importables (or own business) in the urban sector during the early 1990s. While the proportion of income derived from non-tradables in urban areas was more than 60% in the late 1970s to early 1980s, it fell to less than 40% during the late 1980s and the early 1990s. In the rural sector, however, non-tradables continued to constitute a dominant proportion of more than 60% of total incomes.

The urban households thus seem to respond more to international market conditions than to domestic macroeconomic policies. This is underscored by the fact that as international terms of trade decline, that is, import prices rising faster than export prices, the urban sector responds by increasing the production of import competing goods. Attempts by the government to liberalize imports through reducing tariffs were offset by devaluations and thus leaving import prices relatively higher than prices for non-tradables. This means that producing import competing commodities was relatively more profitable than producing non-tradables. It is thus not surprising to see that the proportion of income derived from urban own business (the importables) was highest in the late 1980s and early 1990s relative to incomes from nontradable activities.
The relative price $\frac{P_x}{P_n}$ affects mostly the rural sector. Again, it was observed in the previous Section that, except during 1986-87, this relative price was generally in favour of non-tradables throughout 1977-90. This would suggest that the proportion of incomes derived from nontradable activities would be higher than incomes from exportables. This hypothesis seems to be confirmed by the figures given in Table 3.7 where it is shown that non-tradables in rural Tanzania had always yielded a higher proportion of incomes than the exportables activities.

3.5 Trends in Rural Income Structure During 1976/77-1989/90

Changes in the structure of rural incomes may be seen from an examination of Table 3.8. In that table it is shown that during 1976/77 and 1989/90, the proportion of income derived from subsistence activities has been consistently falling, from 53.2 in 1976/77 to 39.7 in 1989/90. Farm sales increased from below 20% in 1976/77 and 1982/83 to 36.1% in 1989/90. The proportion of wages in total rural household incomes seems to have been fairly constant during 1976/77-1989/90.

Own business income in rural areas has been fluctuating between 11.6% in 1989/90 and 26.3% during 1982/83. With the monetization of the rural sector and more liberal trade and general macroeconomic policies, less of rural incomes was derived from subsistence activities and more rural income was derived from either farm sales or own business.

Table 3.8: Trends in Rural Income Structure During 1976/1977-1989/1990 (Percentages)

<table>
<thead>
<tr>
<th>Income Category</th>
<th>1976/77</th>
<th>1982/83</th>
<th>1989/90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsistence</td>
<td>53.2</td>
<td>44.9</td>
<td>39.7</td>
</tr>
<tr>
<td>Farm Sales</td>
<td>19.4</td>
<td>17.5</td>
<td>36.1</td>
</tr>
<tr>
<td>Wages</td>
<td>6.4</td>
<td>6.4</td>
<td>7.1</td>
</tr>
<tr>
<td>Own business</td>
<td>19.0</td>
<td>26.3</td>
<td>11.6</td>
</tr>
<tr>
<td>Remittances</td>
<td>2.0</td>
<td>4.8</td>
<td>5.5</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Bevan et al. (1989); Own survey, 1990
3.6 Trends in Rural and Urban Real Per Capita Household Incomes

The study by Bevan et al. (1988) on household incomes in Tanzania indicate that there was a "spectacular" and "disturbing" decline in real incomes in both rural and urban Tanzania during 1969-1983 (See Bevan et al. (1988): 61-83). The study compared household surveys for the years 1969, 1976/77, 1979/80 and 1982/83 for rural Tanzania while the urban survey incomes were for the years 1969, 1976/77 and 1983/84. The real incomes according to Bevan et al.(1988) study are presented in Table 3.9 below.

Table 3.9: Rural and Urban Real Per Capita Household Incomes During 1969-1983/1984 (In 1982/83 prices)

<table>
<thead>
<tr>
<th>Year</th>
<th>Rural Incomes</th>
<th>Urban Incomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>2194</td>
<td>10567</td>
</tr>
<tr>
<td>1976/77</td>
<td>2974</td>
<td>8997</td>
</tr>
<tr>
<td>1979/80</td>
<td>1527</td>
<td></td>
</tr>
<tr>
<td>1982/83</td>
<td>1549</td>
<td></td>
</tr>
<tr>
<td>1983/84</td>
<td>4141</td>
<td></td>
</tr>
</tbody>
</table>

Notes: * = Nominal Rural Incomes were deflated using official CPI while urban incomes were deflated using adjusted CPI.

If we should trust the findings by Bevan et al.(1988), then we should also believe that between 1969-1976/77 real per capita incomes in rural Tanzania grew at a positive annual rate of 3.8 per cent but during 1976/77-1982/83 the growth in the rural per capita real incomes was -10.30 per cent! Again, according to the same study, real per capita incomes in urban areas would have increased at an annual rate of -1.99% during 1969-1976/77 while during 1976/77-1983/84 the corresponding growth rate would have been -10.49 per cent! Such a pattern of growth rates is both amazing and incredible. While real per capita incomes reported in the 1969 and 1976/77 surveys are reasonable (yielding growth rates of 3.88 and -1.99 per cent for rural and urban incomes respectively), the levels of incomes reported in the other surveys are not reliable and cannot be used to make any sensible conclusion about the trends in real per capita incomes in Tanzania.

It is worth comparing the growth rates as would have been reported in the study by Bevan et al. (1988) with those reported in the National Accounts of Tanzania (URT (1991) for National Accounts Statistics). According to the national
accounts statistics, real per capita GDP in 1976 prices during 1976/77-1983/84 grew at an annual rate of -1.87% which is, needless to say, nowhere closer to -10.00% (or so) which Bevan et al. (1988) would like us to believe.

Since the levels of per capita household incomes reported in Bevan et al. (1988 & 1989) studies are incredible, it is not appropriate to compare the levels of our survey incomes with theirs. Suffice it to say that our household survey incomes are much closer to the incomes reported in the national accounts than are the incomes reported in the Bevan et al. (1988 & 1989) study.

3.7 Conclusion

From the discussion of household incomes above, there is no strong reason to believe that income distribution in Tanzania has tended to be more equitable. Per capita incomes were, perhaps, as highly skewed during 1989/90 as they were during the early 1980s. The levels of real per capita incomes have been declining over time but not as exaggerated as in the Bevan et al. (1988 & 1989) studies.

The composition of incomes has been changing over time, with subsistence incomes constituting a declining share of total household incomes, while more of the incomes seem to be derived from own business and farm cash incomes.

From the analysis of the household incomes, we may say that economic adjustment in Tanzania was not (primarily) geared towards the reduction of inequality. What the economic crises an adjustment to them has meant is that households had to increase their participation in the market economy and away from subsistence activities.

4. A TRADE-FOCUSED CGE MODEL OF TANZANIA

4.1 Introduction

The purpose of this paper is to analyse the economic impact of trade policies in Tanzania. The focus is on tariffs and tariff equivalent quantitative restrictions to trade. The analysis will be carried out using a trade-focused computable general...
equilibrium (CGE) model. In building the model we shall show how the model is related to a social accounting matrix (SAM) which, in turn, provides the basic data for implementing the model.

The performance of the Tanzanian economy is largely affected by changes in the world economy as well by its own domestic economic policies. The country has experienced a number of external shocks. One of the shocks has been terms of trade shocks as reflected by the sudden falls in international terms of trade from year to year (See Table 2.4 in Section, pg. 26). The terms of trade shock was mainly due to increases in oil prices in 1973-1974 and due to decline in world prices of primary commodities in the mid-1980s. Domestic trade policies also contribute to the shocks. Tariffs on imports tend to protect the domestic production of importables and thus make the economy less competitive in world markets as well as drawing resources away from the production of exportables to the inefficient production of importables. The tariffs also have other effects. Apart from being a source of government revenue, import tariffs tend to reduce the volume of trade as imports become more expensive in the domestic market. The imposition of import tariffs also has welfare effects as consumption is reduced to a lower indifference curve. One should expect, then, that as tariffs are lowered welfare increases. This is one of the hypotheses of this study.

Various policies have been proposed and implemented in attempts to adjust to the economic shocks. One of the policies employed has been to devalue the domestic currency so as to adjust to an adverse terms-of-trade shock or to a cutback in capital inflow. The impact of the devaluation policies in Tanzania was discussed in Section 2.

The other policy response has been the reduction in import tariffs so as to increase economic efficiency and thus make domestic production more competitive in the world economy. Our interest is to see to what extent these policy responses are effective in achieving the desired objectives of economic adjustment. However, through changes in relative prices, devaluation and tariff reduction may also have an impact on the distribution of income.

As far as the distribution of income is concerned, we distinguish between the "personal" or "size" distribution and the "functional" or "distributive factor share" distribution. In our study and the model to be described below, personal income
distribution considers the distribution of income among (capital owning and labour) households and the government. Functional income distribution considers the distribution of income among the factors: capital, rural and urban labour factors.

In Section 4.2 we describe the equations of the core CGE model for the Tanzanian economy. The data and social accounting matrix for the implementation of the model is provided and discussed in Section 5.

The CGE model is solved using GAMS (General Algebraic Modelling System) which is a computer programme developed by the World Bank. The results from the implementation of the Tanzania CGE model are discussed in Section 6.

4.2 A Multisector CGE Model of Tanzania

The multisector CGE model presented here is based on the Cameroon model by Devarajan (1987 & 1991). The full GAMS presentation of the CGE model of Tanzania is presented in Appendix A6.

4.2.1 Sector Classification

We have aggregated the sectors presented in the 1976 input-output table of Tanzania into six main categories. The sectors are listed below:

1) Agricult = Agriculture
2) Consugds = Consumer goods: mining, food and beverages, textiles and wood
3) Intgoods = Intermediate goods: chemicals, petrol, construction, and intermediate imports
4) Capitgds = Capital goods: non-metals, metals, transport equipments and energy
5) Commerse = Commercial services: transport and communication, commerce, and financial institutions
The justification for this classification is that the impact of external shocks and the corresponding policy responses are likely going to differ according to how much the sector is linked to world economy or how much it imports/exports. The government is unlikely to impose a flat import tariff rate to all sectors but would rather tax intermediate and capital goods differently from, say, consumption goods.

4.2.2 Equations of the CGE Model

As will be described in the next Section, a social accounting matrix describes a circular flow of income in the economy. Income is derived from production activities and the sales of commodities. This income accrues to the factors of production and institutions and then flows back to activities and commodities. We now want to describe this circular flow of income in terms of an equation system describing the prices, quantities, incomes, and expenditures as well as market clearing conditions and macroeconomic closure.

4.2.2.1 Price Equations

Equations (1) and (2) describe the domestic prices of imports and exports respectively. On the import side we make the "small" country assumption, that is the economy is a price taker in the world market. Domestic import prices, $P_{i,m}$, are linked to world prices by

$$P_{i,m} = PW_i (1+t_{i,m})R \text{ (1)}$$

where $PW_i$ are the exogenously fixed world import prices and $t_{i,m}$ is the tariff rate on imports. The world prices are converted into domestic currency through $R$, the exchange rate.

On the export side we retain the small country assumption only for some of the sectors while for others we assume a downward demand curve. Hence, world export prices ($pw_{i,e}$ and $PW_{i,e}$) are exogenous for the former and endogenous for the later. Agricultural exports, for example, may be considered to face exogenous
world prices while mining (which in our model is part of) consumer goods exports may be considered as facing endogenous world prices. The link between domestic and world export prices is given by

\[ P_{i}^e = PW_{i}^e (l + t_i^e)R \] (2)

where \( t_i^e \) is an export subsidy if positive and a tax if negative.

We define \( Q_i \) as a sectoral composite commodity comprising of the corresponding sectoral imports (\( M_i \)) and domestic goods (\( D_i \)) supplied to domestic market. The prices of these three goods are, respectively, \( P_{i}^q \), \( P_{i}^m \), and \( P_{i}^d \). Equation (3) describes \( P_{i}^q \), the price of the composite commodity.

\[ P_{i}^q = \left( P_{i}^d * D + P_{i}^m * M \right) / Q \] (3)

Equation (4) describes \( P_{i}^x \), the price of the other composite commodity, \( X \), which comprises of domestic gross output that is sold in the domestic market \( D \) and that which is exported, \( E \). Equation (5) defines the sectoral unit value added or "net" price \( P_{i}^v \) which is the unit output price less the corresponding indirect taxes and costs of intermediate inputs per unit output.

\[ P_{i}^x = \left( P_{i}^d * D + P_{i}^e * E \right) / X \] (4)

\[ P_{i}^v = P_{i}^x \left( 1 - t_i^x \right) - \sum P_{j}^q * a_{ij} \] (5)

Equation (6) gives \( P_{i}^k \), the price of capital installed each sector. In this model, we assume that capital heterogeneous and its composition differs across sectors. Capital is heterogeneous and its composition differs across sectors.

\[ P_{i}^k = \sum P_{j}^q * b_{ij} \] (6)

Capital used in one sector is of different composition than that in another. The composition of capital installed in agriculture, example, may have more machinery and fewer buildings as compared to, say the manufacturing sector.
Given the differences in the sectoral composition of capital, the price of capital, $p_k$, also differ across sectors. The difference in sectoral composition of capital is described in $b_{ij}$, the capita composition matrix, the columns of which sum to unity.

The assumption of heterogeneity of capital deserves further comment. In a static economy-wide model the heterogeneity assumption is of less importance since within the single period the capital stock is fixed exogenously. Such a model does not generate savings nor investment or the demand for capital goods in dynamic models, however, the heterogeneity assumption become of importance and may affect the properties of different growth paths.

The last price equation describes PINDEX, the aggregate price index, which is defined as the GDP deflator. The GDP deflator is given by

$$\frac{PINDEX}{RGDP}$$

which is the ratio of the nominal GDP or GDPVA to real GDP or RGDP. The GDP deflator provides the numeraire price level against which all other relative prices in the model are measured.

### 4.2.2.2 Quantity Equations

Quantity equations explain the supply side of the model. Demand side is will be considered in the expenditure equations. In our model, real value added $X_i$ is a Cobb-Douglas function of primary factors (capital and labour) given by equation (8).

The demand for the primary factors is according to equation (9) while demand for intermediate inputs, INTP, is given by equation (10) in the form of a Leontief fixed input-output coefficient function. Each intermediate input is, in turn, a constant elasticity of substitution [CES] aggregation of imported and domestic goods as will be described in equation (14).

$$X_i = a_i^{D} \prod_{r} FDSC \ a_{ir}^{if}$$

$$X_i = a_i^{D} \prod_{r} FDSC \ a_{ir}^{if}$$
\[ WF_f \cdot \text{wfdist}_{if} = P_i^{v} \cdot \alpha_{if} \cdot X_i \quad \text{(9)} \]

\[ \text{INTP}_i = \sum a_{ij} \cdot X_j \quad \text{(10)} \]

In the three equations above, \( \text{FDSC}_{if} \) refers to the primary factors where \( \text{FDSC}_{i1} \) and \( \text{FDSC}_{i2} \) are capital stock and labour respectively. \( WF_f \) is the average rental or wages which is the same across all sectors. However, primary factor prices in developing countries differ from sector to sector and, hence, we need to correct the prices by multiplying \( WF_f \) by a factor price distortion parameter, \( \text{wfdist}_{if} \). If there are no factor price distortions in all sectors, the parameter \( \text{wfdist}_{if} \) is unity.

Domestic production is defined by a constant elasticity of transformation of the produce supplied to domestic (D) and foreign (E) markets (11) below. Equation (12) defines exports as a function of \( e/p \) while equation (13) describes the world export demand in which the economy is assumed to have some market power, a downward sloping demand curve.

\[ X_i = a_i^T \left[ \gamma E_i^p + (1 - \gamma) D_i^p \right] p_i^{T-1} \quad \text{(11)} \]

\[ E_i = D_i \left[ \frac{E_i^p \left( 1 - \gamma_i \right)}{p_i^{d}} \right] p_i^{T-1} \quad \text{(12)} \]

\[ E_i = \text{econ}_i \left[ \frac{\text{PW}_{w_i}^e}{p_{w_i}} \right] \quad \text{(13)} \]

Equation (14) describes the supply of the composite good, as a CES aggregation of imports \( (M_i) \) and domestic product \( (D_i) \) while equation (15) gives the import demand function as a function of relative prices \( p_i^d / p_i^m \).

\[ Q_i = a_i^c \left[ \delta_i M_i^c p_i^c + (1 - \delta_i) D_i^c p_i^c \right] p_i^c \quad \text{(14)} \]
It is worth noting here that although the three "goods" (X, D, and E) have the same sectoral classification, they are all distinct and with separate own prices. The other composite good, Qi, is also distinct from its imports (M) and domestic good (D) components and each of them has its own price. This treatment of exports and imports avoids the extreme dichotomy between traded goods (where domestic and foreign products are perfect substitutes) and non-traded goods. The model thus provides for partial insulation of the domestic price system from changes in world prices of sectoral substitutes since a sector can simultaneously export and import some of the sector's substitutes. This is a more realistic presentation of the behaviour of developing economies.

4.2.2.3 Income Equations

Income equations provide a sort of a transfer, mechanism by which income from factors of production or value added flows to institutions (that is, the households and government).

Equation (16) defines factor income, \( Y_f^F \), which is the sum of rentals and wages. These incomes are, in turn, distributed to capital and labour in the manner described in equations (17) and (18) where \( Y_{\text{cap}}^H \) and \( Y_{\text{lab}}^H \) are capital and labour factor incomes respectively.

\[
Y_f^F = \sum_i WF_i \cdot FDSC_{if} \cdot wfdist_{if} \quad (16)
\]

\[
Y_{\text{lab}}^H = \sum_f Y_f^F \quad (18)
\]

\[
Y_{\text{cap}}^H = Y_f^F - \text{DEPREC} \quad (17)
\]
Equations (19) to (23) determine the government tax revenues. The government receives revenue from tariffs (TARIFF), indirect taxes (INDTAX), and household or income taxes (HHTAX),

\[ \text{TARIFF} = \sum p_i \cdot m_i \cdot t_i \cdot R \]  \hspace{1cm} (19)

\[ \text{INDTAX} = \sum p_i \cdot X_i \cdot t_i \]  \hspace{1cm} (20)

\[ \text{HHTAX} = \sum Y_i \cdot t_i \]  \hspace{1cm} (21)

\[ \text{EXPSUB} = \sum p_i \cdot E_i \cdot t_i \]  \hspace{1cm} (22)

\[ \text{GR} = \text{TARIFF} + \text{INDTAX} + \text{HHTAX} - \text{EXPSUB} \]  \hspace{1cm} (23)

as well as from negative export subsidies (EXPSUB). Positive EXPSUB is an export subsidy while a negative one is a tax. Total government revenue is given by equation (23) as the sum of the tax revenues defined in equations (19) to (22).

Equations (24) to (27) describe the components of savings which include: depreciation (DEPREC), household saving (HHSAV), government saving (GOVSAV) and total savings (SAVING).

\[ \text{DEPREC} = \sum \text{depr}_i \cdot P_i \cdot \text{FDSC}_i \]  \hspace{1cm} (24)

\[ \text{HHSAV} = \sum Y_i \cdot (1 - t_i) \cdot \text{mps}_i \]  \hspace{1cm} (25)

\[ \text{GOVSAV} = \text{GR} - \sum P_i \cdot \text{GD}_i \]  \hspace{1cm} (26)

\[ \text{SAVING} = \text{HHSAV} + \text{GOVSAV} + \text{DEPREC} + \text{FSAV} \cdot R \]  \hspace{1cm} (27)
Depreciation in a given sector is defined as the product of the depreciation rate \( (\text{depr}_i) \), the price of capital \( (P_i^k) \), and the capital stock \( (\text{FDSC}_{it}) \). Household saving is the product of household disposable income and marginal propensity to save. Government saving is the government budget deficit or surplus, that is, government revenue \( (\text{GR}) \) less government expenditure. Total saving (equation 27) is the sum of the three domestic savings (HHSAV, GOVSAV, and DEPR) and foreign savings expressed in domestic currency \( (\text{FSAV}^\ast \text{R}) \). Foreign saving is, the current account balance which represents the capital inflow that is required to balance international payments.

4.2.2.4 Expenditure Equations

The expenditure equations complete the circular flow of income by determining demand for goods by various actors in the economy.

Equation (28) describes real private consumption \( (\text{CD}_i) \) which is the sum of households' incomes less household taxes and savings times household expenditure shares \( (B^H_{ij}) \) deflated by \( P_i^q \).

\[
\text{CD}_i = \sum_h [\beta^H_{ih} \ast Y^H_h \ast (1 - \text{mp}_h) \ast (1 - t^H_h)] / P_i^q
\]

(28)

\[
\text{GD}_i = \beta^G_i \ast \text{gdtot}
\]

(29)

Government demand for final good is given by equation (29) as a product of government expenditure shares \( (\beta^G_i) \) and real government consumption \( (\text{gdtot}) \).

\[
\text{DST}_i = \text{dstr}_i \ast X_i
\]

(30)

\[
\text{FXDINV} = \text{INVEST} - \sum P_i^q \ast \text{DST}_i
\]

(31)

\[
P_i^k \ast D_k^i = \text{kshr}_i \ast \text{FXDINV}
\]

(32)

\[
\text{Id}_i = \sum \text{b}_{ij} \ast \text{DK}_j
\]

(33)
Inventory demand or changes in stocks ($DST_i$) is given by equation (30) where $dstri$ is inventory investment ratio. Fixed capital investment ($FXDINV$), on the other hand, is given by equation (31) as total investment ($INVEST$) less inventory accumulation (the sum of $P_jq^q * DST_j$), where $DST_j$ is inventory investment by sector of destination ($Dkj$) using an investment destination share ($kshr_j$). The sum of $kshri$ over all sectors is unity. The investment by sector of destination ($Dkj$) is translated into demand for capital goods by sector of origin ($Idj$) using the capital composition matrix as described in equation (33).

Equation (34) defines GDP in market prices ($GDPVA$) while real GDP is given by equation (35). The nominal and real GDP are used to calculate the GDP deflator which we specified in equation (7) as the numeraire price to which all relative prices in the system are compared.

\[
GDPVA = \sum_{i} P_i^V \cdot X_i + INDTAX + TARIFF \tag{34}
\]
\[
RGDP = \sum_{i} (CD_i + GD_i \cdot ID_i + DST_i + E_i - PW_i^m \cdot M_i \cdot R) \tag{35}
\]

4.2.2.5 Market Clearing Conditions and Macroeconomic Closure

The final step in building a general equilibrium model is to define the set of constraints that the model economy must satisfy. This requires a description of the market clearing conditions in which prices adjust to clear each market as well matching each of the equilibrium conditions with an “equilibrating variable”. The model must satisfy Walras’ Law.

Equilibrium in the product market is given equation (36) in which the sectoral supply of the composite commodity ($Q_i$) is equal to the corresponding sector’s demand for intermediate,

\[
Q_i = INP_i + CD_i + GD_i + ID_i + DST_i \tag{36}
\]
private and government goods as well as final demand for investment goods and inventory investment demand. The equilibrating variable for the product market are the sectoral prices. There are nine sectoral prices: \( \Delta p^d, \Delta p^e, \Delta p^k, \Delta p^m, \Delta p^v, \Delta p^x, \Delta p^{w_i}, \Delta p^{w_v} \). Of these nine, only \( \Delta p^d \) is free to adjust while others depend on some combination of taxes, the exchange rate and world market conditions.

Factor market equilibrium is described by equation (37) in which demand for primary factors (FDSC_{ij}) equals supply of the factors (fS_{tj}).

\[
\sum_{i} F D S C_{i j} = f S_{t j} \tag{37}
\]

The supply of factors is fixed exogenously. In our model, sectoral capital stock (FDSC_{ij}) is fixed while labour (FDSC_{ij}) is intersectorally mobile. This is a common assumption in empirical application to developing countries. The equilibrating variable for factor markets are the factor prices. But since we have fixed sectoral capital stock, factor prices are relevant only to labour markets. The aggregate supply and demand for capital factor are automatically equal and the market clearing condition in equation (37) for capital is redundant and can be dropped. since capital is intersectorally immobile, sectoral rentals will not be the same across sectors and cannot be made to conform to a pattern of distortions explained by wfdist_{it}. This means that wfdist_{it} parameters become endogenous variables.

The macroeconomic equilibrium condition for the balance of payments is defined by equation (38) whereby the value of imports (\( \Delta W_{i}^m \ast M_i \)) equals the sum of exports (\( \Delta W_{i}^e \ast E_i \)) and foreign savings (FSAV). The exchange rate - which is included in the definition of exports (\( E_i \)) via \( P_{ie} \) - is fixed and the equilibrating variable for foreign exchange market is foreign savings (FSAV) which is left to adjust. This is a realistic presentation of the Tanzanian economy where the exchange rate is virtually fixed (sometimes at an overvalued level) and is only deviated after some months (if not years). Foreign savings in the economy thus adjusts to both domestic and external macroeconomic and policy conditions.

\[
\Delta W_{i}^m \ast M_i = \Delta W_{i}^e \ast E_i + F S A V \tag{38}
\]
Equation (39) specifies “neoclassical closure” whereby aggregate investment is the endogenous sum of all the savings

$$\text{SAVING} = \text{INVEST} \quad (39)$$

components: private savings, government savings and foreign savings. The model is thus savings driven.

Given our choice of closures in which wfdistil parameters became endogenous, we now have an extra equation for this “new” endogenous variable. Thus, rather than having 39 equations and variables, we, instead, have 40 and 39 equations and variables respectively. Despite this fact, the core CGE model satisfies Walras’ Law and the market clearing conditions are not all independent. We can drop any of them without affecting the solution of the model. In implementing the model we drop the savings-investment equation.

Having presented the Tanzania CGE model, we are now ready to discuss the social accounting matrix and the data necessary for the model implementation. We do so in the next Section.

5. SOCIAL ACCOUNTING MATRIX OF TANZANIA AND DATA FOR THE CGE MODEL

5.1 Introduction

In Section 4, we presented a trade-focused general equilibrium model of Tanzania. In this Section, we describe the data used in applying the model to the economy.

It should be noted right from the beginning that there is no social accounting matrix (SAM) for Tanzania to date. The SAM presented in this study was compiled by the author using the 1976 input-output table and the country’s national accounts. Some of the cell entries could only be derived residually since in a SAM each row sum must equal its corresponding column sum.
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(39)

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5.2 A Schematic SAM

In building a CGE model, it is useful to show how the model is linked with a social accounting matrix (SAM) for the economy. A SAM is an organizing framework which presents in one unified set of accounts a picture of the "circular flow" of a market economy. The SAM provides a consistent picture of the flow-of funds accounts of the separate institutions or "actors" in an economy that one may wish to distinguish. The SAM is a square matrix, the corresponding row and column sums of which are equal. The defining characteristic of a SAM is that each row and column reflects a separate account for which expenditures and receipts must balance. The focus is thus on the nominal flow of funds, with the rows representing receipt or income accounts and the columns expenditure or use accounts.

A SAM is built on double entry bookkeeping principle that incomings (or income) must balance with outgoings (or expenditure) for each sector or account.

The major usefulness of a social accounting matrix is that it brings together the accounts of each of the various economic actors whose behaviour is to be modelled into a consistent framework. Such a data set, at least for a base year, is required for the implementation of such a model. The SAM provides a framework that requires the expanded set of data to be consistent. This consistency property provides a useful check in reconciling data from disparate sources.

The presentation of a SAM depends on what the model is about. This will, in turn, determine both the choice and level of disaggregation of the various actors in the economy to be studied as well as whether asset holding or flow of funds are to be modelled. It will be recalled that our Tanzanian model is trade-focused and is specified in terms of only current flows and flow-equilibrium conditions. In that model "there are no assets, no asset markets, no money, no expectations, and no dynamics". [Devarajan (1990): 642]. This implies that the SAM for such a model does not need to include assets and financial markets.

A note of emphasis is in order. As de Melo et al. (1982) [p. 162] note, "it should be emphasized that there is a yet no such a thing as a "standard" SAM. The definition of the different accounts, the degree of disaggregation, and the
accounting conventions used reflect the particular model and set of issues that are being considered.

A social accounting matrix consists of various accounts is shown in the schematic aggregated SAM in Table 5.1 and 5.2.

Starting reading from the "activity" row we see that income is derived from domestic sales and exports. This income from gross sales is all spent on inputs into the production process: on intermediate inputs, value added and indirect taxes. The column sum of the "activity" account gives the economy’s total costs or gross output. The "commodity" column shows total absorption which is the sum of domestic sales, imports and import tariffs. The "commodity" row shows the demand for this composite commodity for intermediate inputs, private consumption, government consumption and investment.

Table 5.1 A Schematic Social Accounting Matrix (SAM)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Commodity</th>
<th>Factors</th>
<th>HHLDS</th>
<th>GOVERNT</th>
<th>CAPITAL</th>
<th>Rest of world</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Domestic sales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Exports</td>
</tr>
<tr>
<td>Commodity</td>
<td>Intermediate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>inputs</td>
<td></td>
<td>Private</td>
<td>Government</td>
<td>Investment</td>
<td></td>
</tr>
<tr>
<td>Factors</td>
<td>Value added</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HHLDS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governt</td>
<td>Indirect taxes</td>
<td></td>
<td>Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>tariffs</td>
<td></td>
<td>taxes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td></td>
<td>Depreciation</td>
<td>Private savings</td>
<td>Government</td>
<td>Foreign savings</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>savings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rest of world</td>
<td>Imports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


The "factors" account shows that income is derived from value added (row sum) which is then allocated to households via the "allocation matrix". The "households account" shows that households receive income from the factors they own through the allocation matrix as well government transfers and divide this total income between private consumption, income taxes and private savings. The government, on the other hand, receives its revenues from indirect taxes, import tariffs and income taxes and spends it on consumption, transfer payments to households and savings. The row sum of the "government" account thus gives
total government revenue while its corresponding column sum gives total government expenditure. The "capital" account gives the sum of private, government and foreign savings (row sum) which is equal to investment (column sum). The "rest of the world" account gives the equality between imports (row sum) and the sum of exports and foreign savings (column sum).

5.3 A 1976 Social Accounting Matrix of Tanzania

In order to collect all the relevant economic data for the model implementation, we have constructed a consistent data base in the form of a social accounting matrix. The reference year is 1976.

The choice of 1976 as the base or reference year has been dictated by the availability of the latest input-output table which provides most of the data needed for the construction of a SAM.

In order to get a general picture of the most crucial aspects of the economy, we present an aggregated SAM of Tanzania in Table 5.2. Most of the aggregate entries in the SAM are as given in the input-output table. However, savings, income taxes and the distribution of income by households were not given and had to be supplemented using other sources such as the national accounts and household survey data.

Table 5.2: A 1976 Aggregated Data SAM of Tanzania (million TShs, current prices)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Commodity</th>
<th>Factors</th>
<th>HHOLDS</th>
<th>Govern</th>
<th>Capital</th>
<th>Rest of world</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>36881.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41866.62</td>
</tr>
<tr>
<td>Commodity</td>
<td>15415.15</td>
<td>17004.60</td>
<td>5447.20</td>
<td>5054.60</td>
<td>4984.80</td>
<td>42920.55</td>
<td></td>
</tr>
<tr>
<td>Factors</td>
<td>24344.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24344.37</td>
</tr>
<tr>
<td>HHOLDS</td>
<td></td>
<td>23095.97</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23095.97</td>
</tr>
<tr>
<td>Government</td>
<td>2108.10</td>
<td>360.53</td>
<td>1395.90</td>
<td></td>
<td></td>
<td></td>
<td>3864.53</td>
</tr>
<tr>
<td>Capital</td>
<td></td>
<td>1248.40</td>
<td>4695.47</td>
<td>-1582.67</td>
<td></td>
<td></td>
<td>5054.60</td>
</tr>
<tr>
<td>Rest of world</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5678.20</td>
</tr>
<tr>
<td>Total</td>
<td>41866.62</td>
<td>42920.55</td>
<td>23095.97</td>
<td>3864.53</td>
<td>5054.60</td>
<td>5678.20</td>
<td></td>
</tr>
</tbody>
</table>

Source: URT(1986), Input-Output Table of Tanzania.
URT(1991), National Accounts of Tanzania.
Own estimates of various shares and distributions.
A detailed social accounting matrix of Tanzania is shown in Appendix A5. The detailed SAM contains six sectors which are an aggregation of the 73 sectors given in the 1976 input-output table of Tanzania. The SAM also has six commodities distinguished by the corresponding sector of origin. The six sectors (or activities) and commodities are: agriculture, consumer goods, intermediate goods, capital goods, commercial services, and public administration and other services.

We have distinguished three kinds of factors of production: rural labour, urban labour and capital. The distribution of income or value added among these factors constitute functional distribution of income in the reference year, 1976. However, not much can be said about or concluded from the figures in the table since most of the (income) figures had to be adjusted (or were derived residually) in order to balance the SAM. Household survey incomes would provide a better picture. In our SAM, we consider three institutions: labour household, capital owning households and the government. Using our household survey incomes, we defined labour households as the poorest 60% of the sample households while the richer 40% were the capital owning households. These percentages were worked out using our own 1990 household surveys for rural and urban Tanzania.

Finally, we also have savings (or capital) and the rest of the world accounts. The definition of each of the cell in the SAM was provided in Section 4 when describing the various equations.

Having constructed the social accounting matrix for Tanzania, we can now proceed with the implementation of the CGE model described in Section 4. The base year solution and tariff experiment results are discussed in the next Section.

6. RESULTS FROM THE APPLICATION OF THE TANZANIA CGE MODEL

6.1 Introduction

In this Section we present simulation results from the application of the Tanzania trade-focused CGE model presented in Section 4. The data for the running of the
model was presented in Section 5 where we also discussed the 1976 social accounting matrix of Tanzania.

Our concern is to analyse the economic impact of the adjustment policies the country can adopt. The policy instruments considered in this study are import tariffs and tariff-equivalent quantitative restrictions to trade. The theoretical implications of tariffs were discussed in Section 2 and 4. In theory, the reduction in tariff rates will increase welfare in terms of production and consumption. However, we wish to see if tariff reduction may, in practice, result in any visible welfare gains. We test this for the Tanzanian case by doing tariff reduction experiment.

6.2 The Structure of Trade and Output in Tanzania during 1976

One of our objective in this study is to analyse the response of exports, imports, domestic production and prices to the reduction of tariffs and government expenditure. Given this objective, it is important to describe the structure of the economy during the base year of the study. We do this with the help of Table 6.1 which is based on 1976, the reference year for our CGE model.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Domestic output (x)</th>
<th>Exports (E)</th>
<th>Imports (M)</th>
<th>Domestic output (D)</th>
<th>Exp./ Output (E/X)</th>
<th>Imp./ Output (M/X)</th>
<th>Imp./ D.Sup (M/D)</th>
<th>Tariff Rates (m)</th>
<th>Armington elasticity (rho) *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>11284.73</td>
<td>1308.94</td>
<td>254.24</td>
<td>9975.79</td>
<td>11.6</td>
<td>2.3</td>
<td>2.5</td>
<td>6.6</td>
<td>2.0000</td>
</tr>
<tr>
<td>Consumer goods</td>
<td>5971.06</td>
<td>1011.49</td>
<td>984.29</td>
<td>4959.57</td>
<td>16.9</td>
<td>16.5</td>
<td>19.8</td>
<td>12.0</td>
<td>0.6100</td>
</tr>
<tr>
<td>Intermediate</td>
<td>3361.66</td>
<td>222.59</td>
<td>1636.25</td>
<td>3139.07</td>
<td>6.6</td>
<td>48.7</td>
<td>52.1</td>
<td>3.2</td>
<td>0.6225</td>
</tr>
<tr>
<td>Capital goods</td>
<td>1597.52</td>
<td>105.45</td>
<td>875.05</td>
<td>1492.07</td>
<td>6.6</td>
<td>54.8</td>
<td>58.6</td>
<td>9.0</td>
<td>0.2820</td>
</tr>
<tr>
<td>Commerce</td>
<td>11955.91</td>
<td>2059.17</td>
<td>774.11</td>
<td>9896.74</td>
<td>17.2</td>
<td>6.5</td>
<td>7.8</td>
<td>2.3</td>
<td>0.2500</td>
</tr>
<tr>
<td>Public services</td>
<td>7695.74</td>
<td>277.16</td>
<td>1514.79</td>
<td>7418.58</td>
<td>3.6</td>
<td>19.7</td>
<td>20.4</td>
<td>5.1</td>
<td>0.2500</td>
</tr>
<tr>
<td>Total</td>
<td>41866.62</td>
<td>4984.80</td>
<td>6038.73</td>
<td>36881.82</td>
<td>11.9</td>
<td>14.4</td>
<td>16.4</td>
<td>6.3</td>
<td>0.2500</td>
</tr>
</tbody>
</table>

Notes: 1 = The sectors are: Agriculture (agriculture); Consugds (consumer goods); Intgoods (intermediate goods); Capitgds (capital goods); commerse (commercial Services);
2 = Domestic supply is defined as \( X_i - E_i \).
* = \( \rho \) is the CES substitution elasticities between (domestic sales of) domestic output and imports.

Source: Computed from the social accounting matrix in Appendix A5
We have categorized the Tanzanian economy into six sectors, all of which are tradable to some degree. The degree of openness\textsuperscript{10} was lowest in agriculture, where it is about 14\% and highest in capital goods sector where it was about 61\%.\textsuperscript{11} Some sectors were net exporters and others net importers. The sectors which were net exporters were agriculture, consumer goods, and commercial services. The public administration, intermediate and capital goods sectors were net importers.

The CES elasticity of substitution is high (or greater than one) in agriculture while in the rest of the sectors it is less than one. This implies that there is less reason to expect trade policies (or tariffs) to have a significant impact on the demand for imports.

6.3 Base Run Solution

The base run solution for our CGE model is the social accounting matrix described in the previous Section plus all the other base year data inputs for the model implementation. In order to check if or data consistency, the parameter SAM (generated by the model using the input data) should be virtually the same as the input data SAM.

The base run results gave the same social accounting matrix as the input SAM and as was expected. This then allowed us to perform the policy analysis we intended to. These analyses are presented below.

6.4 Macroeconomic Implications of Lower Imports Tariffs

The macroeconomic impacts of lowering tariff rates are presented in Table 6.2. As noted in the introductory Section, tariffs in the tariff rates categories were up to 200 \% for the years before 1988. With this information in mind, we thus make a "significant" tariff reduction experiment by lowering the rates by 90 per cent.

A quick look at Table 6.2, shows that there is virtually no impact on the macroeconomic variables. The percentage change of the selected variables from their respective base year levels is virtually zero. Thus, at the macro level, there is not much to be expected from lowering tariff rates. This may not be surprising.
given the low substitution elasticities and high levels of tax exemption and evasions in Tanzania.

Table 6.2: Macroeconomic Implication of Lower Tariffs (Tariff Reduction by 90%)

<table>
<thead>
<tr>
<th></th>
<th>Base levels</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP Deflator (PINDEX)</td>
<td>1.00</td>
<td>6.56E-5</td>
</tr>
<tr>
<td>Tariff Revenue (TARIFF)</td>
<td>360.53</td>
<td>1.56E-5</td>
</tr>
<tr>
<td>Indirect Tax Revenue (INDTAX)</td>
<td>2108.10</td>
<td>6.86E-5</td>
</tr>
<tr>
<td>Household Tax Revenue (HHTAX)</td>
<td>1395.90</td>
<td>6.92E-5</td>
</tr>
<tr>
<td>Total Revenue (GR)</td>
<td>3864.53</td>
<td>6.39E-5</td>
</tr>
<tr>
<td>Government Expenditure (GDTOT)</td>
<td>5447.20</td>
<td>0</td>
</tr>
<tr>
<td>Real GDP (RGDP)</td>
<td>26813.01</td>
<td>1.170</td>
</tr>
<tr>
<td>Nominal GDP (GDPVA)</td>
<td>26812.98</td>
<td>6.73E-5</td>
</tr>
</tbody>
</table>

6.5 Sectoral Implications of Tariff Reduction

Table 6.3 summarizes the sectoral implications of lowering tariff rates. The experiment was, again, to reduce tariff rates by 90%. The table indicates that lowering tariff rates does not produce visible results. Although there is an “increase” in imports and domestic absorption consequent to the tariff reduction, the “increases” are only “theoretical”. The increases are less than one hundredth fraction of one per cent.

Table 6.3: Sectoral Impact of Tariff Reduction by 90 Per cent

<table>
<thead>
<tr>
<th>Sector</th>
<th>X_i (%)</th>
<th>M_i (%)</th>
<th>Q_i (%)</th>
<th>P^1_i</th>
<th>P^m_i</th>
<th>P^e_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>-6.6E-7</td>
<td>+1.2E-4</td>
<td>+9.1E-6</td>
<td>+5.3E-5</td>
<td>0</td>
<td>5.5E-5</td>
</tr>
<tr>
<td>Consumer goods</td>
<td>-6.9E-6</td>
<td>+4.2E-5</td>
<td>+6.0E-6</td>
<td>+6.1E-5</td>
<td>0</td>
<td>5.9E-5</td>
</tr>
<tr>
<td>Intermediate goods</td>
<td>-4.8E-7</td>
<td>+4.5E-5</td>
<td>+1.7E-5</td>
<td>+6.6E-5</td>
<td>0</td>
<td>4.6E-5</td>
</tr>
<tr>
<td>Capital goods</td>
<td>-9.9E-6</td>
<td>+1.1E-5</td>
<td>+1.4E-6</td>
<td>+6.6E-5</td>
<td>0</td>
<td>4.4E-5</td>
</tr>
<tr>
<td>Commercial services</td>
<td>+8.8E-6</td>
<td>+3.3E-4</td>
<td>-1.2E-5</td>
<td>+8.8E-5</td>
<td>0</td>
<td>9.7E-5</td>
</tr>
<tr>
<td>Public administration</td>
<td>-6.6E-7</td>
<td>+1.7E-5</td>
<td>+2.7E-6</td>
<td>+6.5E-5</td>
<td>0</td>
<td>5.6E-5</td>
</tr>
</tbody>
</table>

Notes: 1 = The quantities are Xi (domestic output), Mi (imports) and Qi (composite goods supply).

2 = The prices are P^1_i, P^m_i, and P^e_i corresponding to X_i, M_i, and Q_i, respectively.
As already noted previously, although tariff rates were quite high during the 1970s, the effectiveness of tariffs as a trade policy instrument was offset by high levels of tax evasion and exemptions. Quantitative restrictions were the major means of trade barriers during that time.

6.6 Welfare Gains from Tariff Reduction: A Comparison with Other Studies

Results from empirical studies on welfare implications of tariff and non-tariff barriers to trade in developing countries are mixed, some suggesting a strong while the majority seem to suggest a weaker relationship (See, for example, Havrylyshyn (1990) and Krueger, A. (1984)).

In a study of ten Pacific Basin countries by Harrison Kimberley (1985), it is shown that welfare gains from tariff reduction ranges from -1.75 to 2.65 per cent of GDP while for non-tariff barriers welfare gains are between -0.38 and 4.81 per cent of GDP. The welfare change was measured by Hicksian equivalent variation between the reference (or base) year equilibrium and the various equilibria after (trade) policy change. Welfare for some developing countries (Indonesia, Philippines, and Thailand) declined as a consequence of reducing import tariffs.

The trade policy experiments in the Harrison and Kimber study indicated that the reduction of non tariff barriers to trade yielded greater benefits than tariff liberalization to each of the countries except the U.S.A. (Harrison & Kimberly (1985): 164-165).

In a study for Chile, Taylor and Black (1974) found that the overall changes in consumption (which can be regarded as a measure of welfare) were generally small. The experiment was to reduce tariffs by 10 and 20%. The highest increase was 0.84 % of GDP from the levels before the tariff reduction.

6.7 Summary, Policy Relevance and Conclusion

Given the results of our study for Tanzania, it is clear that there are possibilities of increasing welfare in terms of both improved sectoral production and increased consumption if trade taxes are reduced. Although the gains from tariff reduction
in the country are small, this should not be an excuse for the government to stop or slow down the liberalization measures currently being implemented. The policy of reducing barriers to trade, especially quantitative restrictions, should be continued and even accentuated.

7. SUMMARY AND CONCLUSIONS

7.1 Summary

The Tanzanian economy has been in crisis since the late 1970s. The crises were due to both external factors and domestic policies which tended to be unsustainable over time due to the consequent worsening of the performance of the economy. In order to redress the economy, the Government embarked on a series of economic adjustment programmes which included the National Economic Survival Programme, the Structural Adjustment Programme, and the Economic Recovery Programme I & II.

Among the policy measures implemented were the devaluation of the domestic currency and trade reforms in the sense of reducing import tariffs and non-tariff barriers to trade. The general macroeconomic policies and trade liberalization measures also affect domestic relative prices of exportables, importables and nontradables. Changes in relative prices may, in turn, affect the levels and structure of production or incomes and the distribution of incomes among households.

The objective of this study was to examine the impact of the economic adjustment policies on the performance of the economy and household per capita incomes. Our interest in household incomes was on the levels, the structure and on the distribution of real per capita household incomes.

The findings of this study are that, with more liberal economic and trade policies, there has been a general tendency for real per capita incomes and consumption to increase in the late 1980s. This is reflected in the indices shown in Table 2.4 for prices, GDP and private consumption expenditure. The growth rates for some of the variables are shown in Table 2.5 where it is indicated that during 1986-90,
real per capita GDP increased by 1.9% per annum while the annual growth of real GDP by sector was also positive, ranging from 2.5% in public administration to 6.8% in manufacturing.

The analysis of household per capita incomes does not suggest an equitable distribution of income in Tanzania. The inequality ratio for rural Tanzania was 0.20 while for urban Tanzania was 0.04 during 1989/90. For an equitable distribution, the inequality ratio should be closer to 1. There were, however, changes in the structure of household incomes. With more liberal economic policies, there has been a tendency for a shift away from subsistence into cash income generating activities. Subsistence incomes have been constituting a declining share of total household incomes while more of the incomes are being derived from farm cash and own business activities.

Results from the application of the CGE model of Tanzania indicate weak welfare gains from trade liberalization. This could be due to the choice of the base year and low substitution elasticities between domestic and imported goods. The reference year was 1976. However, tariff was not an important trade policy instrument. The effectiveness of tariffs as a trade policy instrument was dampened by the prevalence of non-tariff restrictions, tax evasions and exemptions. The analysis of the household survey data and relative prices, however, yielded better results than the CGE model.

7.2 Conclusion

The review of the theoretical and empirical literature reveals that there are potential welfare gains from liberal trade and general economic policies. In order to realize such gains, it is necessary to co-ordinate all economic policies in a consistent manner. A devaluation, for example, can only be successful in its objectives if it is accompanied by demand management policies.

Given the potential for welfare gains from liberal economic policies, the Government of Tanzania should continue and sustain the drive for a more liberal, market oriented economy.
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Definitions:
- **Agric** = Agriculture, Forestry, Fishing and Hunting
- **Minf** = Mining and Quarrying
- **Manuf** = Manufacturing
- **Elect** = Electricity and Water
- **Const** = Construction
- **Sales** = Wholesale and Retail Trade, Hotels and Restaurants
- **Trans** = Transport and Communication
- **Finas** = Finance, Insurance, Real Estate and Business Services
- **Publo** = Public Administration and Other Services
- **GDPf** = Gross Domestic Product at Factor Cost

Source: URT (1990), National Accounts of Tanzania 1976-1990, Table 1, 4, & 5, Bureau of Statistics, Dar es Salaam
Table A2.2: Gross Domestic Product by Kind of Economic Activity at 1976 Prices (Percentage)

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Source: computed from Table A2.1
APPENDIX A4

GAMS REPRESENTATION OF THE TANZANIA TRADE-FOCUSED CGE MODEL

$Title 1976 Tanzania Model: Base and Tariff experiment
$Offsymlist Offsymxref Offupper


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F    Factors of production / Capital / Capital stock / rurlab / Rural labour / urblab / Urban labour

HH   Household Type / lab / Labor households / cap / Capital owning households

*## subsets Defined Below: “Define Indexes”

IAG (I) AG Sectors / agricult /
IAGN (I) Non AG Sectors
IE(I) Export Sectors
IED(I) Sectors with Export Demand EQN
IEDN(I) Sectors with No Export Demand EQN
IM(I) Import Sectors
IMN(I) Non Import Sectors

ALIAS (I,J);

*## for SAM
SET ISAM categories / ACTIVITY, COMMODITY, FACTORS, HOUSEHOLDS, GOVT, KACCOUNT, WORLD, TOTAL /
/TOTAL/
PARAMETERS

READ IN PARAMETERS AS RATES, SHARES, ELASTICITIES

DEPR (i ) DEPRECIATION RATES
DSTR (i ) RATIO OF INVENTORY INVESTMENT TO GROSS OUTPUT
ETA (i ) EXPORT DEMAND PRICE ELASTICITY
GLES (i ) GOVERNMENT CONSUMPTION SHARES
KSHR (i ) SHARES OF INVESTMENT BY SECTOR OF DESTINATION
RHOC (i ) ARMINGTON FUNCTION EXPONENT
RHot (i ) CET FUNCTION EXPONENT
TE (i ) EXPORT SUBSIDY RATES
TH (hh) HOUSEHOLD TAX RATE
TM (i ) TARIFF RATES ON IMPORTS
TX (i ) INDIRECT TAX RATES
*# READ IN TABLE OF PARAMETERS
* TABLE B(i,f) CAPITAL COMPOSITION MATRIX
* TABLE A(i,f) INPUT-OUTPUT COEFFICIENTS
* TABLE CLES(i,j) HOUSEHOLD CONSUMPTION SHARES

**## COMPUTED PARAMETERS FOR INITIALIZATION OF VARIABLES

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**## TABLES USED FOR LOADING VARIABLE RESULTS

* TABLE SCALRES (*) AGGREGATE RESULTS
* TABLE SECTRES (*,i) SECTORAL PRICE AND QUANTITY RESULTS
* TABLE FCTRES1(i,f) FACTOR DEMAND RESULTS
**TABLE A(i,j)** IMPLICIT-OUTPUT COEFFICIENTS

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<td>consugsds</td>
<td>0.000000</td>
<td>0.112431</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>intgoods</td>
<td>0.000000</td>
<td>0.014270</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>capitgds</td>
<td>0.779687</td>
<td>0.037009</td>
<td>1.000000</td>
<td>0.000000</td>
<td>1.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>commerce</td>
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<td>0.147249</td>
<td>0.000000</td>
<td>0.000000</td>
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<td>0.000000</td>
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<tr>
<td>paoservs</td>
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<td>0.001741</td>
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<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

**TABLE FCTRES1 (i,f) FACTOR DEMAND BY SECTOR**

<table>
<thead>
<tr>
<th></th>
<th>capital</th>
<th>rurlab</th>
<th>urblab</th>
</tr>
</thead>
<tbody>
<tr>
<td>agricult</td>
<td>8829.44</td>
<td>60546</td>
<td>68276</td>
</tr>
<tr>
<td>consugsds</td>
<td>1151.20</td>
<td>31725</td>
<td>35775</td>
</tr>
<tr>
<td>intgoods</td>
<td>3005.54</td>
<td>19345</td>
<td>21814</td>
</tr>
<tr>
<td>capitgds</td>
<td>286.8</td>
<td>26308</td>
<td>29667</td>
</tr>
<tr>
<td>commerce</td>
<td>5814.73</td>
<td>44650</td>
<td>50350</td>
</tr>
<tr>
<td>paoservs</td>
<td>1481.85</td>
<td>51196</td>
<td>57731</td>
</tr>
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</table>

**TABLE FCTRY (i,f) FACTOR INCOME BY SECTOR IN MILLION TSHS**

<table>
<thead>
<tr>
<th></th>
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<th>urblab</th>
</tr>
</thead>
<tbody>
<tr>
<td>agricult</td>
<td>9282.47</td>
<td>132.08</td>
<td>396.22</td>
</tr>
<tr>
<td>consugsds</td>
<td>1145.61</td>
<td>198.90</td>
<td>596.70</td>
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</tbody>
</table>
### HOUSEHOLD PARAMETERS

**TABLE CLES(i,hh) PRIVATE CONSUMPTION SHARES**

<table>
<thead>
<tr>
<th></th>
<th>lab</th>
<th>cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>agriculture</td>
<td>0.420965</td>
<td>0.420764</td>
</tr>
<tr>
<td>consugds</td>
<td>0.225071</td>
<td>0.224965</td>
</tr>
<tr>
<td>intgoods</td>
<td>0.040778</td>
<td>0.041239</td>
</tr>
<tr>
<td>capitgds</td>
<td>0.007971</td>
<td>0.007966</td>
</tr>
<tr>
<td>commerce</td>
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<td>0.200382</td>
</tr>
<tr>
<td>paoservs</td>
<td>0.104734</td>
<td>0.104684</td>
</tr>
</tbody>
</table>

* NOTE, MPS(cap) AND TH(cap) are recomputed below from value data
* CLES(lab) IS ALSO RECOMPUTED

**TABLE HHPAR(*,hh) MISCELLANEOUS HOUSEHOLD PARAMETERS**

<table>
<thead>
<tr>
<th></th>
<th>lap</th>
<th>cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>TH</td>
<td>0.0607638</td>
<td>0.0602805</td>
</tr>
<tr>
<td>MPS</td>
<td>-0.1221555</td>
<td>0.3817124</td>
</tr>
</tbody>
</table>

### PRODUCTION SECTOR PARAMETERS

**TABLE SECTRES(*,l) SECTORAL QUANTITIES AND PRICES**

<table>
<thead>
<tr>
<th></th>
<th>agricult</th>
<th>consugds</th>
<th>intgoods</th>
<th>capitgds</th>
<th>commerce</th>
<th>paoservs</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>11284.73</td>
<td>5971.06</td>
<td>3361.66</td>
<td>1597.52</td>
<td>11955.91</td>
<td>7695.74</td>
</tr>
<tr>
<td>E</td>
<td>1308.94</td>
<td>1011.49</td>
<td>222.59</td>
<td>105.45</td>
<td>2059.17</td>
<td>277.16</td>
</tr>
<tr>
<td>M</td>
<td>254.24</td>
<td>984.29</td>
<td>1636.25</td>
<td>875.05</td>
<td>774.11</td>
<td>1514.79</td>
</tr>
<tr>
<td>PX</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>PE</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>PM</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>PQ</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>PD</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>PK</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* NOTE, TAXES ARE MAGNITUDES AND RATES ARE COMPUTED

**TABLE TAXR(*,l) SECTORAL TAXES**
<table>
<thead>
<tr>
<th>agriculture</th>
<th>consugds</th>
<th>intgoods</th>
<th>capitgds</th>
<th>commerce</th>
<th>paoservs</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX</td>
<td>512.27</td>
<td>303.57</td>
<td>204.49</td>
<td>103.30</td>
<td>586.05</td>
</tr>
<tr>
<td>TE</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>TM</td>
<td>16.76</td>
<td>117.88</td>
<td>52.05</td>
<td>79.03</td>
<td>17.88</td>
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</table>

**TABLE PARM(*,i) MISCELLANEOUS PARAMETERS**

<table>
<thead>
<tr>
<th>agriculture</th>
<th>consugds</th>
<th>intgoods</th>
<th>capitgds</th>
<th>commerce</th>
<th>paoservs</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPR</td>
<td>0.039753</td>
<td>0.121004</td>
<td>0.018100</td>
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<td>0.10120</td>
</tr>
<tr>
<td>DSTR</td>
<td>0.007665</td>
<td>-0.001290</td>
<td>0.011839</td>
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</tr>
<tr>
<td>GLES</td>
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<td>0</td>
<td>0.002882</td>
<td>0</td>
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<tr>
<td>KSHR</td>
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</table>

**PARAMETER SCALRES(*) /**

*#### MACRO TOTALS*

<table>
<thead>
<tr>
<th>EXR</th>
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</thead>
<tbody>
<tr>
<td>PINDEX</td>
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<td>GDTOT</td>
<td>5447.20</td>
</tr>
<tr>
<td>INVEST</td>
<td>5054.60</td>
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</table>

*#### TAX *

| HHTAX       | 1395.90 |

*#### SAVE *

<table>
<thead>
<tr>
<th>HHSAV</th>
<th>4695.47</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOVSAV</td>
<td>-1582.67</td>
</tr>
<tr>
<td>FSAV</td>
<td>83.301</td>
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</table>

**TABLE ELASTICITY(*,i) SECTORAL ELASTICITIES**

<table>
<thead>
<tr>
<th>agriculture</th>
<th>consugds</th>
<th>intgoods</th>
<th>capitgds</th>
<th>commerce</th>
<th>paoservs</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHOC</td>
<td>2.000</td>
<td>0.6100</td>
<td>0.6225</td>
<td>0.2820</td>
<td>0.2500</td>
</tr>
<tr>
<td>RROT</td>
<td>2.000</td>
<td>0.6100</td>
<td>0.6225</td>
<td>0.2820</td>
<td>0.2500</td>
</tr>
<tr>
<td>ETA</td>
<td>2.000</td>
<td>2.5000</td>
<td>3.0000</td>
<td>3.0000</td>
<td>2.0000</td>
</tr>
</tbody>
</table>

*------------------------------------------------------------------*

*END PARAMETER ASSIGNMENT*  

*SPECIFY PARMETERS FROM TABLE VALUES*  

*PARAMETERS FROM SCALRES(*)*
## OTHER TABLE VALUES OF PARAMETERS

EO(i) = SECTRES("E", i)
ECON(i) = SECTRES("E", i)
MO(i) = SECTRES("Mo", i)
PDO(i) = SECTRES("PDO", i)
PEO(i) = SECTRES("P", i)
PKO(i) = SECTRES("PK", i)
PMO(i) = SECTRES("PM", i)
PQO(i) = SECTRES("PQ", i)
PXO(i) = SECTRES("PX", i)
XO(i) = SECTRES("X", i)

## NORMALIZE SHARE PARAMETERS TO CORRECT FOR ROUNDOFF ERROR

* These parameters (cles, b, kshr, and gles) can be read in as values and converted to shares here.

SUMHHSH(hh) = SUM(i,hh));
CLES(i,hh) = CLES(i,hh)/SUMHHSH(hh);
SUMMMSH(i) = SUM(i,B(i,j));
B(i,j) = B(i,j)/SUMMMSH(i);
SUMSH = SUM(i,KSHR(i));
### DEFINE INDEXES BASED ON READ IN DATA

- $IAGN(i) = \text{not } IAG(i)$
- $IE(i) = \text{yes} \\cdot EO(i)$
- $IED(i) = \text{yes} \\cdot ETA(i)$
- $IEDM(i) = \text{not } IED(i)$
- $IEN(i) = \text{not } IE(i)$
- $IM(i) = \text{yes} \\cdot MO(i)$
- $IMN(i) = \text{not } IM(i)$

### SPECIFY PARAMETERS WHICH DEPEND ON DEFINED INDEX IN OR IE

- $TM(imn) = 0.0$
- $TM(im) = \frac{TAXR(\text{"TM"}, im)/(PMO(im) \cdot MO(im)) - TAXR(\text{"IM"}, im)}{1}$
- $TE(ien) = 0.0$
- $TE(ie) = \frac{TAXR(\text{"TE"}, ie)/(PEO(ie) \cdot EO(ie)) - TAXR(\text{"TE"}, IE}){1}$

### COMPUTE FROM INIATIAL DATA

- $DO(i) = XO(i) - ED(i)$
- $INTO = SUM(i, A(j,i) \cdot PQO(j)) - TX(i)$
- $PVO(i) = PXO(i) - SUM(j, A(j,i) \cdot PQO(j)) - TX(i)$
- $PWEO(i) = \frac{PEO(i)/(1 + TM(i) \cdot EXRO)}{1}$
- $PWM(i) = \frac{PMO(i)/(1 + TM(i) \cdot EXRO)}{1}$
- $TM_REAL(i) = TM(i) \cdot PWM(i) \cdot EXRO$
- $VARO(i) = PVO(i) + TX(i)$

### CALIBRATION OF PARAMETERS FROM DATA

#### FACTOR MARKET PARAMETERS

- $FSO(f) = SUM(i, FCTRES1(i,f))$
- $YFCTRO(f) = SUM(i, FCTRY(i,f))$
- $YFSECTO(i) = SUM(f, FCTRY(i,f))$
- $WFO(f) = YFCTRO(f)/FSO(f)$
- $WFDISTO(i,f)\cdot FCTRES1((i,f)) = (FACTRU(i,f)/FCTRES1(i,f)) / WFO(f)$
- $WFDISTO(i,f)\cdot FCTRES1((i,f)) = EQ O = 0.0$

### HOUSEHOLD INCOME, TAX RATE, AND SAVING RATE

#### INCOME FLOWS USE THE FOLLOWING FOUR COMPONENTS OF INCOME

- $DEPRECO = SUM(i, DEPR(i) \cdot PRO(i) \cdot FCTRES1(i, \text{"capital"}))$
- $INDTAXO = SUM(i, TX(i) \cdot PXO(i) \cdot XO(i))$
- $EXPSUBO = SUM(i, TE(i) \cdot EO(i) \cdot PWEO(i) \cdot EXRO$
- $TARIFFO = SUM(im, PWM(im) \cdot MO(im) \cdot TM(im) \cdot EXRO$
*## NOTE, HOUSEHOLD INCOME IS FROM FACTORS YHCTRO
YHO("cap") = YFCTRO("capital") - SUM (i, DEPR(i)*FCTRESI(i, "capital"));
YHO("lab") = YFCTRO("urblab") + YFCTRO("rurlab");

*## COMPUTE HT(urban) GIVEN OTHER HH TAX RATES AND HHTAXO
*## WHERE, HHTAXO = SUM (hh, MPSO(hh)*YHO(hh)*(1.0 - TH(hh)))
TH("cap") = (HHTAXO - TH("lab")*YHO("lab"))/YHO("cap")

*## COMPUTE MPSO(urban) GIVEN OTHER HH TAX RATES AND HHTAXO
*## WHERE, HHSAVO = SUM(hh, TH(hh)*YHO(hh))*(1.0 - TH(hh))
MPSO("cap") = (HHSAVO - MPSO("lab")*YHO("lab")*(1.0 - TH("lab")))/(YHO("cap")*(1.0 - TH("cap")));

DISPLAY WFDISTO, WFO, FSO, YFSECTO, YFCTRO;
DISPLAY YHO, MPSO, TH;

*#### CALIBRATION OF SHIFT AND SHARE PARAMETERS ######

*## FOR IMPORTS-DOMESTIC COMPOSITE
*## get delta from costmin, xo from absorption, ac from armington
DELTA(i) = (PMO(i)/PDO(i))*(MO(i)/DO(i)**(1+RHOC(i)));
DELTA(i) = DELTA(i)/(1.0 + DELTA(i));
QO(i) = (PRO(i)*DO(i) + (PMO(i)*MO(i)*Sim(i))/PQO(i);
RMD(i) = MO(i)/DO(i);
AC(i)*SIM(i) = QO(i)/(DELTA(i)*MO(i)**(RHOC(i))
+ (1 - DELTA(i))*DO(i)**(-RHOC(i))**(-1/RHOC(i));
AC(i)*SIMN = 1.0;
DISPLAY DELTA, AC, RMD;

*## FOR EXPORTS
*## GET GAMMA FROM ESUPPLY
GAMMA(ie) = 1/(1 + PDO(ie)/PEO(ie)*(ED(ie)/DO(ie)**(RHOT(ie)-1));
*## GET AT FROM CET
AT(ie) = XO(ie)/(GAMMA(ie)*ED(ie)**RHOT(ie) + (1-GAMMA(ie))*DO(ie)**RHOT(ie)**(1/RHOT(ie)));
display GAMMA, AT;

*## FOR FACTOR DEMAND
*## GET ALPHA FROM PROFIT MAX (ALPHA FOR EACH i SHOULD SUM TO 1)
ALFA(i,f) = (WFDISTO(i,f)*WFO(i)*FCTRES1(i,f)/YFSECTO(i):
DISPLAY GAMMA, AT;

*## get AD from output and FDO from profitmax
QD(i) = PROD(f, FCTRES1(i,f)*ALPHA(i,f);
AD(i) = XO(i)/QD(i);
FDO(f) = SUM(i, XO(i)*PVO(i)*ALPHA(i,f)/(WFDISTO(i,f)*WFO(i))$WFDISTO(i,f));
**## SPECIFY WEIGHTS FOR PRODUCER PRICE INDEX**

\[ PWTS(i) = \frac{XO(i)}{\sum X(j)O(j)} \]

**#### END OF CALIBRATION ####**

**DISPLAY XO, SQO, DO;**
**DISPLAY PVO, PDO, PEO, PWEO, PMO, PWM, TM, TX, TE, PWTS;**

**VARIABLES**

#### VARIABLE DECLARATION ####

**## PRICE BLOCK**

- `EXR` EXCHANGE RATE
- `PD(i)` DOMESTIC PRICES
- `PE(i)` DOMESTIC PRICE OF EXPORTS
- `PINDEX` GDP DEFLATOR
- `PK(i)` PRICE OF CAPITAL GOODS BY SECTOR OF DESTINATION
- `PM(i)` DOMESTIC PRICE OF IMPORTS
- `PQ(i)` PRICE OF COMPOSITE GOODS
- `PV(i)` VALUE ADDED PRICE
- `PWE(i)` WORLD PRICE OF EXPORTS
- `PX(i)` AVERAGE OUTPUT PRICE

**## PRODUCTION BLOCK**

- `D(i)` DOMESTIC SALES
- `E(i)` EXPORTS
- `M(i)` IMPORTS
- `Q(i)` COMPOSITE GOODS SUPPLY
- `X(i)` DOMESTIC OUTPUT

**## FACTOR BLOCK**

- `FDSC(i,j)` FACTOR DEMAND BY SECTOR
- `FS(f)` FACTOR SUPPLY
- `WF(f)` AVERAGE FACTOR PRICE
- `WFDIST(f)` FACTOR PRICE SECTORAL PROPORTIONALITY RATIO
- `YFCTR(f)` FACTOR INCOME

**## INCOME AND EXPENDITURE BLOCK**

- `CD(i)` FINAL DEMAND FOR PRIVATE CONSUMPTION
- `DEPREC` TOTAL DEPRECIATION EXPENDITURE
- `DK(i)` VOLUME OF INVESTMENT BY SECTOR
- `DST(i)` INVENTORY INVESTMENT BY SECTOR
- `FSAV` NET FOREIGN SAVINGS
- `FXDINV` FIXED CAPITAL INVESTMENT
**FINAL DEMAND FOR GOVERNMENT CONSUMPTION (1976 '00 TSHS)**

- **GDTOT**
- **GOVSAV**
- **GR**
- **HHSAV**
- **ID(i)**
- **INDTAX**
- **INT(i)**
- **INVEST**
- **MPS(hh)**
- **EXP SUB**
- **SAVING TOTAL**
- **TARIFF**
- **HHTAX**
- **YH(hh)**

**GOVERNMENT SAYING TOTAL**

**TOTAL VOLUME OF GOVERNMENT CONSUMPTION**

**GOVERNMENT SAVINGS**

**GOVERNMENT REVENUE**

**TOTAL HOUSEHOLD SAVINGS**

**FINAL DEMAND FOR PRODUCTIVE INVESTMENT**

**INDIRECT TAX REVENUE**

**INTERMEDIATES USES**

**TOTAL INVESTMENT**

**MARGINAL PROPENSITY TO SAVE BY HOUSEHOLD TYPE**

**EXPORT SUBSIDY PAYMENTS**

**TOTAL SAVINGS**

**TARIFF REVENUE**

**HOUSEHOLD TAX REVENUE**

**HOUSEHOLD INCOME**

**REAL GDP**

**VALUE ADDED IN MARKET PRICES GDP**

### VARIABLE INITIALIZATION

- **EXR.L** = EXR0;
- **FSAV.L** = FSAV0;
- **GDTOT.L** = GDTOTO;
- **GOVSAV.L** = GOVSAVO;
- **INVEST.L** = INVESTO;
- **PINDEX.L** = PINDEXO;
- **MPS.L(hh)** = MPSO(hh);
- **E.L(i)** = EO(i);
- **M.L(i)** = MO(i);
- **PD.L(i)** = PDO(i);
- **PE.L(i)** = PEO(i);
- **PM.L(i)** = PMO(i);
- **PQ.L(i)** = PQO(i);
- **PX.L(i)** = PXO(i);
- **X.L(i)** = XO(i);
- **FDSC.L(i,f)** = FCTRES1(i,f);
- **YFCTR.L(i)** = SUM(i,f);

### OUTPUT AND PRICE

- **D.L(i)** = X.L(i) - E.L(i);
- **Q.L(i)** = (PD.L(i)*D.L(i) + (PM.L(i)*M.L(i))SIM(i)/PQ.L(i);
- **PK.L(i)** = SUM(i, PQ.L(i)*b(i,i));
GOVERNMENT FINAL DEMAND FOR CONSUMPTION (1976 '00 TSHS)

TOTAL VOLUME OF GOVERNMENT CONSUMPTION (1976 '00 TSHS)
GOVERNMENT SAVINGS (1976 '00 TSHS)
GOVERNMENT REVENUE (1976 '00 TSHS)
TOTAL HOUSEHOLD SAVINGS (1976 '00 TSHS)
FINAL DEMAND FOR PRODUCTIVE INVESTMENT (1976 '00 TSHS)
INDIRECT TAX REVENUE (1976 '00 TSHS)
INTERMEDIATES USES (1976 '00 TSHS)
TOTAL INVESTMENT (1976 '00 TSHS)
DIRECT TAX REVENUE (1976 '00 TSHS)
TOTAL SAVINGS (1976 '00 TSHS)
GOVERNMENT SUBSIDIES (1976 '00 TSHS)
TOTAL INVESTMENT (1976 '00 TSHS)
MARGINAL PROPENSITY TO SAVE BY HOUSEHOLD TYPE (1976 '00 TSHS)
EXPORT SUBSIDY PAYMENTS (1976 '00 TSHS)

TOTAL GOVERNMENT CONSUMPTION

GOVERNMENT REVENUE - INDIRECT TAX REVENUE

TOTAL INVESTMENT

INPUT TOTAL INVESTMENT

MARGINAL PROPENSITY TO SAVE BY HOUSEHOLD TYPE

EXPORT SUBSIDY PAYMENTS

TOTAL SAVINGS

## GDP CALCULATIONS

REAL GDP

VALUE ADDED IN MARKET PRICES GDP

## VARIABLE INITIALIZATION

**## USE INITIAL VALUES OF VARIABLES (FROM PARAMETER SPECIFICATION)**

**## COMPUTE INITIAL VALUES FOR OTHER VARIABLES**

**## OUTPUT AND PRICE**
PWE.L(i) = PE.L(i)/((1.0 + TE(i))*EXR.L)
PWSE(i) = PWE.L(i)
PV.L(i) = PX.L(i) - SUM(j, pq.L(i)*j) - TX(i)

*## VALUE ADDED AND THE FLOW OF FACTOR INCOME

FS.L(f) = SUM(i, FDSC.L(i,f))
WF.L(f) = YFCTR.L(f)/FS.L(f)
WFDIST.L(i,f) = WFDISTO(i,f)
EXPSUB.L = SUM(i, EXPSUB(i)*PWE.L(i)*EXR.L)
TARIFF.L = SUM(i, TARIFF.M.L)*M.L(im)*TM(im)*EXR.L
INDTAX.L = SUM(i, INDTAX.M.L)*PWE.M.L*EXR.L
DEPREC.L = SUM(i, DEPRE(i)*PK.L(i)*FDSC.L(i,“capital”))

YH.L(“cap”) = YFCTR.L(“capital”) - DEPREC.L
YH.L(“lab”) = YFCTR.L(“lab”) - YFCTR.L(“urblab”)

HHTAX.L = SUM(hh, HHTAX.M.L)*YH.L(hh)
HHSAV.L = SUM(hh, HHSAV.M.L)*YH.L(hh)

*## FINAL DEMAND

CD.L(i) = SUM(ie, E.L(ie)*X.L(ie)) - SUM(im, (1.0 - TMREA.M.im)*M.L(im))
GD.L(i) = EXP.VA.L + INDTAX.L + TARIFF.L

FXDINV.L = INVEST.L - SUM(i, DST.L(i)*PQ.L(i))

DK.L(i) = (KSHR(i)*FXDINV.L)/PQ.L(i)
ID.L(i) = TARIFF.L + INDTAX.L + HHTAX.L - EXPSUB.L

SAVING.L = HHSAV.L + GOVSAV.L + DEPREC.L + FSAV.L*EXR.L

*## OBTAIN CONSUMPTION AS RESIDUAL, AND RECALCULATE CLES

CD.L(i) = Q.L(i) - INT.L(i) - GD.L(i) - ID.L(i) - DST.L(i)
CLES(i, “lab”) = (CD.L(i)*PQ.L(i) - CLES(i, “cap”))

SUMHHSH(hh) = SUM(i, CD.L(i)*CLES(i, hh))
CLES(i, hh) = CLES(i, hh)/SUMHHSH(hh)

*## GDP

GDPVA.L = SUM(i, PV.L(i)*X.L(i)) + INDTAX.L + TARIFF.L
RGDP.L = GDPVA.L/RGDP.L

PINDES.L = GDPVA.L/RGDP.L
* PINDEX.L = SUM(i, pwts(i)*PX(i));
DISPLAY YFCTR.L, YH.L, GDPVAL.L, RGDP.L, PINDEX.L;
DISPLAY INT.L, CD.L, GD.L, ID.L, DST.L, DK.L;

*######################################################## END VARIABLE SPECIFICATION ########################################################

*#### TO CHECK FOR DATA CONSISTENCY, DISPLAY INITIAL SAM

*######################################################## SOCIAL ACCOUNTING MATRIX ########################################################

SAM("ACTIVITY", "COMMDTY") = SUM (i, (PD.L(i)*DL.L(i)));
SAM("ACTIVITY", "WORLD") = SUM (i, (EXR.L*PWE.L(i)*E.L(i)));
SAM("COMMDTY", "ACTIVITY") = SUM (i, (PO.L(i)*INT.L(i)));
SAM("HOUSEHOLDS", "ACTIVITY") = SUM (i, (PO.L(i)*CD.L(i)));
SAM("GOVT", "ACTIVITY") = SUM (i, (PO.L(i)*(DST.L(i)+ID.L(i))));
SAM("GOVT", "COMMDTY") = SUM (f, YFCTR.L(f));
SAM("GOVT", "HOUSEHOLDS") = SUM (hh, YH.L(hh));
SAM("HOUSEHOLDS", "FACTORS") = INDTAX.L;
SAM("FACTORS", "ACTIVITY") = TARIFF.L - EXPSUB.L;
SAM("FACTORS", "KACCOUNT") = HHTAX.L;
SAM("FACTORS", "KACCOUNT") = DEPRECL.L;
SAM("GOVT", "FACTORS") = HHSAV.L;
SAM("KACCOUNT", "FACTORS") = GOVSAV.L;
SAM("KACCOUNT", "GOVT") = FSAV.L*EXR.L;
SAM("KACCOUNT", "HOUSEHOLDS") = SUM(i, ((PWM(i)*EXR.L)*M.L(i)));
SAM("TOTAL", "COMMDTY") = SUM(isam2, SAM(isam2, "ACTIVITY"));
SAM("TOTAL", "FACTORS") = SUM(isam2, SAM(isam2, "COMMDTY"));
SAM("TOTAL", "FACTORS") = SUM(isam2, SAM(isam2, "FACTORS"));
SAM("TOTAL", "HOUSEHOLDS") = SUM(isam2, SAM(isam2, "HOUSEHOLDS"));
SAM("TOTAL", "GOVT") = SUM(isam2, SAM(isam2, "GOVT"));
SAM("TOTAL", "KACCOUNT") = SUM(isam2, SAM(isam2, "KACCOUNT"));
SAM("TOTAL", "WORLD") = SUM(isam2, SAM(isam2, "WORLD"));
SAM(isam3, "TOTAL") = SUM(isam2, SAM(isam3, isam2));

OPTION DECIMALS=2
DISPLAY SAM;
OPTION DECIMALS=3;

*######################################################## EQUATION DECLARATION ################################################################

#### PRICE BLOCK
PMDEF(i)
PEDEF(i)
ABSORPTION(i)
SALES(i)

DEFINITION OF DOMESTIC IMPORT PRICES
DEFINITION OF DOMESTIC EXPORT PRICES
VALUE OF DOMESTIC SALES
VALUE OF DOMESTIC OUTPUT
ACTP(i)  DEFINITION OF ACTIVITY PRICES
PKDF(i)  DEFINITION OF CAPITAL GOODS PRICE
PINDEXDEF  DEFINITION OF GENERAL PRICE LEVEL

*## PRODUCTION BLOCK
ACTIVITY(i)  PRODUCTION FUNCTION
PROFITMAX(i, f)  FIRST ORDER CONDITIONS FOR PROFIT MAXIMUM
INTEQ(i)  TOTAL INTERMEDIATE USES
CET(i)  CET FUNCTION
CET2(i)  DOMESTIC SALES FOR NONTRADED SECTORS
ESUPPLY(i)  EXPORT SUPPLY
EDEMAND(i)  EXPORT DEMAND FUNCTIONS
ARMINGTON(i)  COMPOSITE GOOD AGGREGATION FUNCTION
ARMINGTON2(i)  COMPOSITE GOOD AGG. FOR NONTRADED SECTORS
COSTMIN(i)  F.O.C. FOR COST MINIMIZATION OF COMPOSITE GOOD

*## INCOME BLOCK
YFDEF(f)  FACTOR INCOME
YHKDEF  CAPITAL HOUSEHOLD INCOME
YHLDEF  LABOR HOUSEHOLD INCOME
TARIFFDEF  TARIFF REVENUE
INDTAXDEF  INDIRECT TAXES ON DOMESTIC PRODUCTION
EXPUSUBDEF  EXPORT SUBSIDY PAYMENTS
HHTAXDEF  TOTAL HOUSEHOLD TAXES COLLECTED BY GOVT.
DEPREQ  DEPRECIATION EXPENDITURE
HHSAVEQ  HOUSEHOLD SAVINGS
GREQ  GOVERNMENT REVENUE
GDPY  TOTAL SAVINGS

*## EXPENDITURE BLOCK
CDREQ(i)  PRIVATE CONSUMPTION BEHAVIOR
GDEQ1(i)  GOVT CONSUMPTION OF COMMODITIES
GRUSE  GOVERNMENT SAVINGS
DSTEQ(i)  INVENTORY INVESTMENT
FIXEDINV  FIXED INVESTMENT NET OF INVENTORY
PRODINV(i)  INVESTMENT BY SECTOR OF DESTINATION
IEQ(i)  INVESTMENT BY SECTOR OF ORIGIN

*## MARKET CLEARING
EQUIL(i)  GOODS MARKET EQUILIBRIUM
FMEQUIL(f)  FACTOR MARKET EQUILIBRIUM
CAEQ  CURRENT ACCOUNT BALANCE (BILL DOLLARS)
WALRAS  SAVINGS INVESTMENT EQUILIBRIUM

*The WALRAS equation is redundant, given that the model satisfies Walras' Law.
*In this case, we drop the Savings-Investment balance equation.

*## GROSS NATIONAL PRODUCT
GDPY  TOTAL VALUE ADDED INCLUDING INDTAX
GDPR  REAL GDP
*## PRICE BLOCK

PMDEF(im) .. PM(im) =E= PWM(im)*EXR*(1 + TM(im));

PEDEF(ie) .. PE(ie) =E= PWE(ie)*EXR*(1 + TE(ie));

ABSORPTION(i) .. PQ(i)*Q(i) =E= PD(i)*D(i) + (PM(i)*M(i)$im(i);

SALES(i) .. PX(i)*X(i) =E= PD(i)*D(i) + (PE(i)*E(i)$ie(i);

ACTP(i) .. PV(i) =E= PX(i)*(1.0 - TX(i)) - SUM(j, a(j,i)*PQ(j));

PKDEF(i) .. PK(i) =E= SUM(J, PQ(j)*b(j, I));

*## PRODUCTION BLOCK

ACTIVITY(i) .. X(i) =E= AD(i)*PROD(fSALPHA(i, f),

PROFTMAX(i,f)$WFDISTO(i,f) .. WF(f)*WFDIST(i, f)*FDSC(i,f) =E= X(i)*PV(i)* ALPHA(i,f);

INTEQ(i) .. INT(i) =E= SUM(J, A(i, j)*X(j));

CET(ie) .. X(ie) =E= AT(ie)*(GAMMA(ie)*E(ie)**RHOT(ie)+

GAMMA(ie)*D(ie)**RHOT(ie)**(1/RHOT(ie));

CET2(ien) .. X(ien) =E= D(ien);

ESUPPLY(ie) .. E(ie) =E= D(ie)*((PE(ie)/PD(ie))*((1 - GAMMA(ie))

/ GAMMA(ie))**(1/(RHOT(ie) - 1));

EDEMAND(ied) .. E(ied) =E= ECON(ied)*((PWE(ied)/PWSE(ied))**(-ERA(ied)));

ARMINGTON(im) .. Q(im) =E= AC(im)*(DELTA(im)*M(im)**(-RHOC(im)) +

(1 - DELTA(im))*D(im)**(-RHOC(im))**(-1/RHOC(im));

ARMINGTON2(imN) .. Q(imn) =E= D(imn);

COSTMIN(im) .. M(im)/D(im) =E= ((PD(im)/PM(im))*(DELTA(im)/

(1 - DELTA(im)))**(1/1 +

RHOc(im)));

*## INCOME BLOCK

YFDEF(f) .. YFCTR(f) =E= SUM(i, WF(f)*WFDIST(i,f)*FDSC(i,f));
YHKDEF = YH("cap") - E = YFCTR("capital") = DEPREC;
YHLDEF = YH("lab") - E = YFCTR("urlab") + YFCTR("urlab");
TARIFFDEF = E = SUM(im, TM(im)*M(im)*PWM(im))*EXR;
INDTAXDEF = E = SUM(i, TX(i)*PX(i)*X(i));
EXPSUBDEF = E = SUM(ie, TE(ie)*E(ie)*PWE(ie)*EXR;
HHTAXDEF = E = SUM(hh, TH(hh)*YH(hh));
DEPREQ = E = SUM(i, DEPR(i)*PK(i)*FDSC(i, "capital"));
HHSAVEQ = E = SUM(hh, MPS(hh)*YH(hh)*(1 - TH(hh)));
GREQ = E = TARIFF + INDTAX + HHTAX - EXPSUB;
SAVING = E = HHSAVEQ + GOVSAV + DEPREQ + FSAV*EXR;

*## EXPENDITURE BLOCK
CDEQ(i) = PQ(i)*CD(i) = E = SUM(HH, CLES(i, HH)*H(i)
MPS(hh)*YH(hh) *(1 - TH(hh)));
GDEQ(i) = GD(i) = E = GLES(i)*GDTOT;
GRUSE = GR = E = SUM(i, PQ(i)*GD(i)) + GOVSAV;
DSTEQ(i) = DST(i) = E = DSTR(i)*X(i);
FIXEDINV = FXDINV = E = INVEST - SUM(i, DST(i)*PQ(i));
PRODINV(i) = PK(i)*DK(i) = E = KSR(i)*FXDINV;
IEQ(i) = ID(i) = E = SUM(J, BE(i, h)*DK(i));

*## MARKET CLEARING
EQUIL(i) = Q(i) = E = INT(i) + CD(i) + GD(i) + ID(i) + DST(i)
FMEQUIL(F) = SUM(i, FDSC(i, f)) = E = FS(i);
CAEQ = SUM(im, PWM(im)*M(im) = E = SUM(ie, PWE(ie)*E(ie)) +
FSAV;
*WALRAS = SAVING = E = INVEST;
**## GROSS NATIONAL PRODUCT
GDYPV = GDPV = E = SUM(i, PV(i)*X(i)) + INDTAX + TARIFF;
GDPR = RGDP = E = SUM(i, CD(i) + DST(i) + ID(i) + GD(i))
 = SUM(i, CD(i)) + INDTAX + TARIFF + RGDP;
R = INVEST - SUM(i, DST(i)*PQ(i));

*## ADDITIONAL RESTRICTIONS CORRESPONDING TO EQUATIONS
*# PMDEF, PEDEF, EDEMAND, ESUPPLY, COSTMIN, AND PROFITMAX
*# FOR NON-TRADED SECTORS AND SECTORS WITH FIXED WORLD EXPORT

PM.FX(irn) = PMO(irn); PE.FX(ien) = PE0(ien);
P.WE.FX(iedn) = PWE.L(iedn); E.FX(ien) = 0;
M.FX(irn) = 0; FDSC.FX(i,f)$((WFDISTO(i,f) EQ 0) = 0;

*#### VARIABLE BOUNDS
These are included to improve algorithm performance. They are not necessary for model specification.

\[ \begin{align*}
\text{PQ.LO}(i) &= 0.0; \\
\text{PD.LO}(i) &= 0.0; \\
\text{PK.LO}(i) &= 0.0; \\
\text{PX.LO}(i) &= 0.0; \\
\text{X.LO}(i) &= 0.0; \\
\text{M.LO}(im) &= 0.0; \\
\text{Q.LO}(i) &= 0.0; \\
\text{E.LO}(ie) &= 0.0; \\
\text{WF.PO}(f) &= 0.0; \\
\text{INT.LO}(i) &= 0.0; \\
\text{E.LO}(ie) &= 0.0; \\
\text{FDSC.LO}(i,F)(\text{FDSC.L}(i,f) \neq 0) &= 0.0; \\
\text{PV.LO}(i) &= 0.0; \\
\end{align*} \]

### MODEL CLOSURE

#### NUMERAIRE PRICE INDEX

In this case, the GDP deflator.

\[ \text{PINDEX.FX} = \text{PINDEX.L}; \]

#### FOREIGN EXCHANGE MARKET CLOSURE

In this version, the balance of trade (current account balance) and the exchange rate are fixed exogenously. PINDEX is the equilibrating variable.

\[ \begin{align*}
\text{EXR.FX} &= \text{EXR.L}; \\
\text{FSAV.FX} &= \text{FSAV.L}; \\
\end{align*} \]

#### INVESTMENT-SAVINGS CLOSURE

This version specifies neoclassical closure. Aggregate investment is determined by aggregate savings, model is savings driven.

\[ \begin{align*}
\text{MPS.FX}(hh) &= \text{MPS.L}(hh); \\
\text{INVEST.FX} &= \text{INVEST.L}; \\
\end{align*} \]

#### EXOGENOUS GOVT EXPENDITURE AND GOVT CLOSURE RULE

Real government spending (GDTOT) is fixed exogenously. The government deficit (GOVSAV) is determined residually.

\[ \begin{align*}
\text{GDTOT.FX} &= \text{GDTOT.L}; \\
\text{GOVSAV.FX} &= \text{GOVSAV.L}; \\
\end{align*} \]

#### FACTOR MARKET CLOSURE

Capital stocks in this version are fixed. Commented equations in capital stock section allow mobile capital version to be chosen.

Commented equations in the labor blocks allow a version with fixed wage for each labor type, with employment endogenous.

\[ \begin{align*}
\text{FS.FX}(\text{"rurlab"}) &= \text{FS.L}(\text{"rurlab"}); \\
\text{WFDIST.FX}(i, \text{\"urblab\")} &= \text{WFDIST.L}(i, \text{\"urblab\")}; \\
\text{WF.FX}(\text{\"unskill\")} &= \text{WF.L}(\text{\"unskill\")}; \\
\text{FS.LO}(\text{\"unskill\")} &= \text{-inf}; \\
\end{align*} \]

75
S.UP("unskill") = +inf;
FS.FX("urblab") = FS.L("urblab");
WFDIST.FX(i, "urblab") = WFDIST.L(i, "urblab");
WF.FX("unskill") = WF.L("unskill");
FS.LO("unskill") = -inf;
FS.UP("unskill") = +inf;
FS.FX("capital") = FS.L("capital");
WFDIST.FX(i, "capital") = WFDIST.L(i, "capital");
WFDIST.FX("paoservs", "capital") = WFDIST.L("paoservs", "capital");
FDSC.FX(i, "capital") = FDSC.L(i, "capital");
FS.LO("capital") = -inf;
FS.UP("capital") = +inf;

END OF MODEL

MODEL TANZANIA

SOLVE TANZANIA MAXIMIZING RGD P USING NLP;

*** SOLUTION REPORTS AND OUTPUT
*** THREE REPORT AND OUTPUT BLOCKS
*** 1) TABLES OF RESULTS FOR VARIABLE IN MODEL
*** 2) TABLES OF RESULTS FOR DISPLAY
*** 3) TABLES OF RESULTS FOR COMPARISON BETWEEN BASE AND EXPERIMENT

*** 1) TABLES OF RESULTS FOR VARIABLES IN THE MODEL

*** MACRO AGGREGATE RESULTS
SCALRES("EXR") = EXR.L;
SCALRES("INDEX") = INDEX.L;
SCALRES("RGDP") = RGDP.L;
SCALRES("GDPVA") = GDPVA.L;
SCALRES("INVEST") = INVEST.L;
SCALRES("FIXDINV") = FIXDINV.L;
SCALRES("GDPTOT") = GDPTOT.L;
SCALRES("GR") = GR.L;
SCALRES("TARIFF") = TARIFF.L;
SCALRES("INDTAX") = INDTAX.L;
SCALRES("HHTAX") = HHTAX.L;
SCALRES("EXPSUB") = EXPSUB.L;
SCALRES("SAVING") = SAVING.L;
SCALRES("DEPREC") = DEPREC.L;
SCALRES("HHSAV") = HHSAV.L;
SCALRES("GOVSAV") = GOVSAV.L;
SCALRES("FSAV") = FSAV.L;

*** FACTOR OF PRODUCTION RESULTS
FCTRES1(i, f) = FDSC.L(i, f);

*** TABLE FCTRES2(*, f) MISCELLANEOUS FACTOR VARIABLE RESULTS;
SET IFVAR /WF, FS, YFCTR/;
PARAMETER FCTRES2(ifvar, f) MISCELLANEOUS FACTOR VARIABLE RESULTS;
FCTRES2("WF", f) = WF.L(f);
FCTRES2("FS", f) = FS.L(f)
FCTRES2("YFCTR", f) = YFCTR.L(f);

*** SECTORAL PRICE AND QUANTITY RESULTS
SECTRES("PQ", i) = PQ.L(i);
SECTRES("PD", i) = PD.L(i);
SECTRES("PE", i) = PE.L(i);
SECTRES("PK", i) = PK.L(i);
SECTRES("PM", i) = PM.L(i);
SECTRES("PV.L", i) = PV.L(i);
SECTRES("PWE", i) = PWE.L(i);
SECTRES("PX", i) = PX.L(i);
SECTRES("Q", i) = Q.L(i);
SECTRES("X", i) = X.L(i);
SECTRES("D", i) = D.L(i);
SECTRES("E", i) = E.L(i);
SECTRES("M", i) = M.L(i);
SECTRES("INT", i) = INT.L(i);
SECTRES("CD", i) = CD.L(i);
SECTRES("GD", i) = GD.L(i);
SECTRES("ID", i) = ID.L(i);
SECTRES("DST", i) = DST.L(i);
SECTRES("DK", i) = DK.L(i);

*** HOUSEHOLD RESULTS
*** TABLE HHRES(*, hh) MISCELLANEOUS HOUSEHOLD RESULTS
SET HHVAR /MPS, YH/;
PARAMETER HHRES (hhvar, hh) MISCELLANEOUS HOUSEHOLD RESULTS;
HHRES("MPS", hh) = MPS.L(hh);
HHRES("YH", hh) = YH.L(hh);

Option decimals = 6;
DISPLAY SCALRES, FCTRES1, FCTRES2, SECTRES, HHRES;
Option decimal = 3;

*## DEFINE SETS FOR SOLUTION REPORT TABLES ##*

* For GDP Tabulations

SET igdp rows /consumpt, Investment, Inventory, Government, Exports, Imports, GDP/
  igdp1(igdp) /GDP/ 
  igdp2(igdp) 
  jgdp columns /nominal
    real 
    nomshare 
    realshare 
    deflator /
  itar categories /valueadd
    tariffs 
    totalgdp /
  igdp2(igdp) = NOT igdp1(igdp);

PARAMETER gdptab(igdp, jgdp) GDP ACCOUNTS;
PARAMETER gdptab2(i, jgdp) SECTORAL VALUE ADDED;
PARAMETER sumgdp(itar, jgdp) AGGREGATE GDP;
PARAMETER gdpratio GDP VALUE ADDED CORRECTION FACTOR;

* for ABSORB
set rar rows / ag, non-ag, total /
PARAMETER ABSORB(rar, rac) ABSORPTION TABLE (REAL);

* for FACTORS

set rf / yf, yfcap, profit, rental, rdist, wdcap, yfurlab, wdrurlab, yfurblab, wdurblab, pint, intinp /
PARAMETER FACTORS(i rf) FACTOR RETURNS DISTRIBUTIVE PARAMETERS;

* for COEFFS (shift and share coefficients)
  set rc / ALPHAR.ALHAU, ALPHAS, ALPHAC, RMD, DELTA, AD /
PARAMETER COEFFS(i, rc) SHIFT, SHARE AND DISTRIBUTIVE PARAMETERS;

*## DEFINE EXTRA PARAMETERS FOR SOLUTION REPORT TABLES ##*
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
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</thead>
<tbody>
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<td>agtotfd</td>
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<td>ag terms of trade world export price</td>
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<td>ag terms of trade world import price</td>
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<td>holds value for end calculation</td>
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<td>government saving share of investment</td>
</tr>
<tr>
<td>shpsav</td>
<td>private saving share of investment</td>
</tr>
<tr>
<td>valadd(i)</td>
<td>value added at market price</td>
</tr>
<tr>
<td>sectory(i)</td>
<td>value added at factor cost</td>
</tr>
</tbody>
</table>
\[ wtd(i) \text{ base year wt domestic in total domestic sales} \]
\[ wtm(i) \text{ base year wt of imports in total trade} \]
\[ wtx(i) \text{ base year wt of exports in total trade} \]
\[ yf(i, f) \text{ factor income} \]

**### AG TERMS OF TRADE ###**

\[ \text{pagind} = \frac{\sum(iag, px.l(iag)*x.l(iag))}{\sum(iag, x.l(iag))} \]
\[ \text{pnagind} = \frac{\sum(iagn, px.l(iagn)*x.l(iagn))}{\sum(iagn, x.l(iagn))} \]
\[ \text{agtotf} = 100*\text{pagind}/\text{pnagind} \]
\[ \text{pagingd} = \frac{\sum(iag, PV.L(iag)*x.l(iag))}{\sum(iag, x.l(iag))} \]
\[ \text{pnagind} = \frac{\sum(iagn, PV.L(iagn)*x.l(iagn))}{\sum(iagn, x.l(iagn))} \]
\[ \text{agtotva} = 100*\text{pagind}/\text{pnagind} \]

**### MACRO BALANCES ###**

\[ \text{ncdtot} = \frac{\sum(i, cd.l(i)*pq.l(i))}{\sum(i, pq.l(i))} \]
\[ \text{ngdtot} = \frac{\sum(i, gd.l(i)*pq.l(i))}{\sum(i, pq.l(i))} \]
\[ \text{ngdp} = \sum(i, pq.l(i)*(cd.l(i) + dst.l(i) + id.l(i) + gd.l(i)) + pc.l(i)*e.l(i) - pwm(i)*exr.l*m.l(i)) \]
\[ \text{nex} = \sum(i, e.l(i)*exr.l*pwe.l(i)) \]
\[ \text{nim} = \sum(i, m.l(i)*exr.l*pwm(i)) \]
\[ \text{bot} = \text{nex-nim} \]
\[ \text{botr} = \sum(i, e.l(i)) - \sum(i, m.l(i)) \]
\[ \text{esum} = \sum(i, e.l(i)) \]
\[ \text{msum} = \sum(i, m.l(i)) \]
\[ \text{psav} = \text{invest.L - fsav.L - govsav.L} \]
\[ \text{shbot} = 100*\text{ncdtot}/\text{gdva.L} \]
\[ \text{shfsav} = 100*\text{fsav.L}/\text{invest} \]
\[ \text{shin} = 100*\text{nim}/\text{gdva.L} \]
\[ \text{shinvest} = 100*\text{invest.L}/\text{gdva} \]
shgdtot = 100*ngdtot/gdpva.L;
shgsav = 100*govsav.L/invest.L;
shpsav = 100*psav/invest.L;

DISPLAY bot, botr, nex, esum, nim, msum, shconsump, shinvest, shgdtot, shex, shim, shbot, shsav, shgsav, shpsav;

*## INDEXES ##*
* Note that cost of living index (COLIND) is the simple average over households.
* CARD(hh) is the "cardinal" function which counts number of entries in the set hh.*

COLIND = SUM(i, pq.l(i)*(SUM(hh,cles(i,hh))*100/CARD(hh));
WTD(i) = DO(i)/SUM(j,DO(j));
WTM(i) = MO(i)/SUM(j,(MO(j)+EO(j)));
WTX(i) = EO(i)/SUM(j,(MO(j)+EO(j)));
EXRIND = SUM(i, WTD(i)*pd.L(i));

pdind = SUM(i,DO(i)*pd.L(i)/SUM(j,DO(j))*100;
peind = SUM(i,e0(i)*pe.L(i))/SUM(j,e0(j))*100;
pind = SUM(i,q0(i)*pq.L(i))/SUM(j,q0(j))*100;
pm0ind = SUM(i,m0(i)*pm.L(i))/SUM(j,m0(j))*100;
pw0ind = SUM(i,m0(i)*pwe.L(i))/SUM(i,m0(i))*100;
pw0mind = SUM(i,m0(i)*pwm(i))/SUM(i,m0(i))*100;
pxind = SUM(i,pwts(i)*px.L(i))*100;

DISPLAY colind, exrind, ngdp, pdind, pind, peind, pm0ind, pweind, pwm0ind, pxind;

*### SPECIFY SOLUTION REPORT TABLES ###*

* GDP Tables *
* Note treatment of tariffs.
* In U.S. NIPA, tariffs are included in the service sector.
* In the U.N. SNA, tariffs are treated separately.
* Treatment below follows U.N. SNA practice.
* Note also that real GDP from expenditure side provides the control total.
* And sectoral real value addeds are adjusted to match total using gdpratio.

Gdptab("consumpt", "nominal") = SUM(i, pq.l(i)*cd.L(i));
gdptab("consumpt", "real") = SUM(i,cd.L(i));
gdptab("investment", "nominal") = SUM(i,pq.L(i)*id.L(i));
gdptab("investment", "real") = SUM(i,id.L (i))
gdptab("inventory", "nominal") = SUM(i,pq.L(i)*dst.L(i));
gdptab("inventory", "real") = SUM(i,dst.L(i));
gdptab("government", "nominal") = SUM(i,pq.L(i)*gd.L(i));
gdptab("government", "real") = SUM(i,ga.led(i));
gdptab("exports", "nominal") = SUM(i,pe.L(i)*e.L(i));
gdptab("exports", "real") = SUM(i,e.L(i));
gdptab("imports", "nominal") = SUM(i,pm.L(i)*m.L(i));
gdptab("imports", "real") = SUM(i,m.L(i));
gdptab(“imports”, “real”) = -SUM(i.pwm(i)*exr.L*m.L(i));
gdptab(“gdp”, “nominal”) = SUM(i,(1.0 - tmreal(i))*m.L(i));
gdptab(“gdp”, “real”) = SUM(igdp2gdptab(igdp2, “nominal”));
gdptab(igdp, “nomshare”) = 100.*gdptab(igdp, “nominal”)

/gdptab(“gdp”, “nominal”):
gdptab(igdp, “reashare”) = 100.*gdptab(igdp, “real”)

/gdptab(“gdp”, “real”);
gdptab(igdp, “deflator”) = 100.*gdptab(igdp, “nominal”)

/gdptab(igdp, “real”);
gdptab2(i, “nominal”) = PV.L(i)*x.L(i) + tx(i)*px.L(i)*x.L(i);
gdptab2(i, “real”) = var(i)*x.L(i);
sumgdp(“valueadd”, “nominal”) = SUM(i, gdptab2(i, “nominal”));
sumgdp(“tariffs”, “normal”) = tariff.L;
sumgdp(“valueadd”, “real”) = SUM(i, gdptab2(i, “real”));
sumgdp(“tariffs”, “real”) = SUM(i, tmreal(i)*m.L(i));
sumgdp(“totalgdp”, jgdp) = sumgdp(“valueadd”, jgdp) + sumgdp(“tariffs”, jgdp);
gdpratio = gdptab(“gdp”, “real”)/sumgdp(“totalgdp”, “real”);
gdptab2(i, “real”) = gdptab(“gdp”, “real”)/sumgdp(“totalgdp”, “real”);
sumgdp(“valueadd”, “real”) = SUM(i, gdptab2(i, “real”));
sumgdp(“tariffs”, “real”) = SUM(i, gdptab2(i, “real”));
sumgdp(“totalgdp”, “real”) = SUM(i, gdptab2(i, “real”));
sumgdp(“tariffs”, “nominal”) = sumgdp(“tariffs”, “real”);
sumgdp(“totalgdp”, “nominal”) = sumgdp(“totalgdp”, “real”);
sumgdp(“valueadd”, “nominal”) = SUM(i, gdptab2(i, “nominal”));
sumgdp(“valueadd”, “real”) = SUM(i, gdptab2(i, “real”));
sumgdp(“totalgdp”, “nominal”) = SUM(i, gdptab2(i, “nominal”));
sumgdp(“tariffs”, “nominal”) = SUM(i, gdptab2(i, “real”));
sumgdp(“tariffs”, “nominal”) = SUM(i, gdptab2(i, “nominal”));

DISPALY GDPTAB, GDPTAB2, SUMGDP, GDPRATIO ;

*** REPORT ABSORPTION ***

absorb(“ag”, “c”) = SUM(iag, CD.L(iag));
absorb(“non-ag”, “c”) = SUM(iagn, CD.L(iagn));
absorb(“total”, “c”) = SUM(i, CD.L(i));
absorb(“ag”, “i”) = SUM(iag, ID.L(iag));
absorb(“non-ag”, “i”) = SUM(iagn, ID.L(iagn));
absorb(“total”, “i”) = SUM(i, ID.L(i));
absorb(“ag”, “g”) = SUM(iag, GD.L(iag));
absorb(“non-ag”, “g”) = SUM(iagn, GD.L(iagn));
absorb(“total”, “g”) = SUM(iag, GD.L(iag));
*### calculate and report selected parameters and coefficientshest Innovation = sum(i, A(i,j)*X. L(j)); INTINPNO = sum(i, PQ. L(i)*A(i, j)*x. L(j)); PROFIT(i) = (WFDIST. L(i, "capital")*WF. L("capital")*FDSC. L(i, "capital"); IFDSC. L(i, "capital") 
  
  FSC. L(f)*FS. L(f); RENTAL(i) = (pV. L(i)+(TX(i)*PX. L(i))*X. L(i); = (pV. L(i))*X. L(i); M. L(i)/D. L(i); DISPLAY AVGWF, AVGPROFIT, VALADD, SECTORY; FACTORS(i, "YF") = SUM(f,YF(i, f)); FACTORS(i, "YFCAP") = PROFIT(i); FACTORS(i, "RENTAL") = RENTAL(i); FACTORS(i, "RDIST") = WFDIST. L(i, "CAPITAL"); FACTORS(i, "WDCAP") = YF(i, "rurlab"); FACTORS(i, "YFRURLAB") = YF(i, "rurlab");
FACTORS(i, "WDRURLAB") = WFDIST.L(i, "rurlab");
FACTORS(i, "YFURBLAB") = YF(i, "urblab");
FACTORS(i, "WDURBLAB") = WFDIST.L(i, "urblab");
FACTORS(i, "PINT") = PINT(i);
FACTORS(i, "INTINP") = INTINP(i);
COEFFS(i, "ALPHAR") = ALPHA(i, "urblab");
COEFFS(i, "ALPHAU") = ALPHA(i, "urblab");
COEFFS(i, "ALPHAC") = ALPHA(i, "capital");
COEFFS(i, "RMD") = RMD(i);
COEFFS(i, "DELTA") = DELTA(i);
COEFFS(i, "AD") = AD(i);

DISPLAY FACTORS, COEFFS;

*####################################################
### 3) TABLES OF RESULTS FOR COMPARING BASE AND EXPERIMENT

*### DEFINE SETS FOR TABLES ####
* for SCALRES1, SCALRES2, SCSCALE

SET pds /BASE, EXPERIMENT, CHANGE /
SET sc /EXR, PINDEX, RGDP, GDPVA, INVEST, FXDINV, ODTOT,
    GR, TARIFF, INDTAX, HHRAX, EXPSUB, SAVING, DEPREC,
    HHSAV, GOVSAV, FSAV, WF-RURLAB, WF-URBLAB /

PARAMETER SCALRES1(sc, pds)
AGGREGATE VARIABLES;

* for PRICES

PARAMETER PRICES1(rp, i, pds) PRICE RESULTS BY SECTOR;

*### SPECIFY TABLES FOR REPORTS ####

PRICES1("PX", i, "base") = PX.L(i);
PRICES1("PV", i, "base") = PV.L(i);
PRICES1("PE", i, "base") = PE.L(i);
PRICES1("PWE", i, "base") = PWE.L(i);
PRICES1("PM", i, "base") = PM.L(i);
PRICES1("PWM", i, "base") = PWM(i);
PRICES1("PD", i, "base") = PD.L(i);
PRICES1("PQ", i, "base") = PQ.L(i);
PRICES1("PROFIT", i, "base") = PROFIT(i);
PRICES1("RENTAL", i, "base") = RENTAL(i);
PRICES1("PINT", i, "base") = PINT(i);
QUANTRES1("X", i, "base")
QUANTRES1("PROFIT", i, "base")
QUANTRES1("SECTOR", i, "base")
QUANTRES1("E", i, "base")
QUANTRES1("S", i, "base")
QUANTRES1("rurlab", i, "base")
QUANTRES1("urblab", i, "base")
QUANTRES1("CAPITAL", i, "base")
QUANTRES1("Q", i, "base")
QUANTRES1("D", i, "base")
QUANTRES1("DK", i, "base")

### MACRO AGGREGATE RESULTS

SCALRES1("EXR", "base")
SCALRES1("PINDEX", "base")
SCALRES1("RGDP", "base")
SCALRES1("GDPVA", "base")
SCALRES1("INVEST", "base")
SCALRES1("FXDINV", "base")
SCALRES1("GDTOT", "base")
SCALRES1("GR", "base")
SCALRES1("TARIFF", "base")
SCALRES1("INDTAX", "base")
SCALRES1("HHTAX", "base")
SCALRES1("EXPSUB", "base")
SCALRES1("SAVING", "base")
SCALRES1("DEPREC", "base")
SCALRES1("HHSAV", "base")
SCALRES1("GOVSAV", "base")
SCALRES1("FSAV", "base")
SCALRES1("WF-RURLAB", "base") = AVGWF("rurlab")
SCALRES1("WF-URBLAB", "base") = AVGWF("urblab")

### Social Accounting Matrix

SAM("ACTIVITY", "COMMDTY")
SAM("ACTIVITY", "WORLD")
SAM("COMMDTY", "ACTIVITY")
SAM("COMMDTY", "GOVT")
SAM("COMMDTY", "KACCOUNT")
SAM("FACTORS", "ACTIVITY")
SAM("HOUSEHOLD", "FACTORS")

= SUM(i,(PD.L(i)*D.L(i)))
= SUM(i,(EXR.L*PWE.L(i)))
= SUM(i,(PQ.L(i)*CD.L(i)))
= SUM(i,(PQ.L(i)*GD.L(i)))
= SUM(i,(PQ.L(i)*(DST.L(i)+ID.L(i))))
= SUM(i, YFCTR.L(i))
= SUM(hh, YH.L(hh))
option decimals=2;
DISPLAY SAM ;

*#THE END#*

*COMPARATIVE STATICS EXPERIMENT*
*TARIFF EXPERIMENT: TARIFF REDUCTION BY 90%*

GR.FX = 3864.53 ;
TARIFF.LO = - INF ;
TARIFF.UP = + INF ;
INDTAX.LO = 0.0 ;
HHTAX.UP = + INF ;
EXPSUB.LO = - INF ;
EXPSUB.UP = + INF ;

TARIFF.L = SUM(im, PM(im)*M.L(im)*.10*TM(im)*EXR.L ;
INDTAX.L = SUM(ie, TX(ie)*PX.L(i)*X.L(i)) ;
EXPSUB.L = SUM(ie, TE(ie)*E.L(ie)*PWE.L(ie)*EXR.L ;
HHTAX.L = SUM(hh, TH(hh)*YH.L(hh)) ;

SOLVE TANZANIA MAXIMIZING RGDP USING NLP ;

*SPECIFY TABLES FOR REPORTS#

PINT(i) = SUM(J.A(j,i)*PQ.L(j) ;
\[
\text{PROFIT}(i) = (\text{WFDIST}.L(i, \text{"capital"}) \times \text{WF}.L(\text{"capital"}) \times \text{FDSC}.L(i, \text{"capital"})) \\
\quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \text{\text{(FDSC}.L(i, \text{"capital"}) \times \text{PK}.L(i))} \\
\text{RENTAL}(i) = (\text{WFDIST}.L(i, \text{"capital"}) \times \text{WF}.L(\text{"capital"}) \times \text{FDSC}.L(i, \text{"capital"})) \\
\quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \text{\text{(FDSC}.L(i, \text{"capital"}) \times \text{PK}.L(i))} \\
\text{VALADD}(i) = (\text{PV}.L(i) + (\text{TX}(i) \times \text{PX}.L(i))) \times \text{X}.L(i) \\
\text{SECTORY}(i) = (\text{PV}.L(i) \times \text{X}.L(i) \\
\text{AVGWF}(f) = \text{VFCTR}.L(f) / \text{FS}.L(f) \\
\text{PRICRESI}(\text{"PX"}, i, \text{"expmnt"}) = \text{PX}.L(i) \\
\text{PRICRESI}(\text{"PV"}, i, \text{"expmnt"}) = \text{PV}.L(i) \\
\text{PRICRESI}(\text{"PE"}, i, \text{"expmnt"}) = \text{PE}.L(i) \\
\text{PRICRESI}(\text{"PWE"}, i, \text{"expmnt"}) = \text{PWE}.L(i) \\
\text{PRICRESI}(\text{"PM"}, i, \text{"expmnt"}) = \text{PM}.L(i) \\
\text{PRICRESI}(\text{"PWM"}, i, \text{"expmnt"}) = \text{PWM}(i) \\
\text{PRICRESI}(\text{"PROFIT"}, i, \text{"expmnt"}) = \text{PROFIT}(i) \\
\text{PRICRESI}(\text{"RENTAL"}, i, \text{"expmnt"}) = \text{RENTAL}(i) \\
\text{PRICRESI}(\text{"PRINT"}, i, \text{"expmnt"}) = \text{PRINT}(i) \\
\text{QUANTRESI}(\text{"PX"}, i, \text{"expmnt"}) = \text{X}.L(i) \\
\text{QUANTRESI}(\text{"PV"}, i, \text{"expmnt"}) = \text{VALADD}(i) \\
\text{QUANTRESI}(\text{"PE"}, i, \text{"expmnt"}) = \text{SECTORY}(i) \\
\text{QUANTRESI}(\text{"PWE"}, i, \text{"expmnt"}) = \text{E}.L(i) \\
\text{QUANTRESI}(\text{"PM"}, i, \text{"expmnt"}) = \text{M}.L(i) \\
\text{QUANTRESI}(\text{"PWM"}, i, \text{"expmnt"}) = \text{FDSC}.L(i, \text{"rurlab"}) \\
\text{QUANTRESI}(\text{"PD"}, i, \text{"expmnt"}) = \text{FDSC}.L(i, \text{"urblab"}) \\
\text{QUANTRESI}(\text{"PQ"}, i, \text{"expmnt"}) = \text{FDSC}.L(i, \text{"capital"}) \\
\text{QUANTRESI}(\text{"PROFIT"}, i, \text{"expmnt"}) = \text{Q}.L(i) \\
\text{QUANTRESI}(\text{"RENTAL"}, i, \text{"expmnt"}) = \text{D}.L(i) \\
\text{QUANTRESI}(\text{"PRINT"}, i, \text{"expmnt"}) = \text{DK}.L(i) \\
\]

*### MACRO AGGREGATE RESULTS*

\[
\text{SCALRESI}(\text{"EXR"}, \text{"expmnt"}) = \text{EXR}.L \\
\text{SCALRESI}(\text{"PINDEX"}, \text{"expmnt"}) = \text{PINDEX}.L \\
\text{SCALRESI}(\text{"RGDP"}, \text{"expmnt"}) = \text{RGDP}.L \\
\text{SCALRESI}(\text{"GDPVA"}, \text{"expmnt"}) = \text{GDPVA}.L \\
\text{SCALRESI}(\text{"INVEST"}, \text{"expmnt"}) = \text{INVEST}.L \\
\text{SCALRESI}(\text{"FXDIVN"}, \text{"expmnt"}) = \text{FXDIVN}.L \\
\text{SCALRESI}(\text{"GDTOT"}, \text{"expmnt"}) = \text{GDTOT}.L \\
\text{SCALRESI}(\text{"GR"}, \text{"expmnt"}) = \text{GR}.L \\
\text{SCALRESI}(\text{"TARIFF"}, \text{"expmnt"}) = \text{TARIFF}.L \\
\text{SCALRESI}(\text{"INDTAX"}, \text{"expmnt"}) = \text{INDTAX}.L \\
\text{SCALRESI}(\text{"HHTAX"}, \text{"expmnt"}) = \text{HHTAX}.L \\
\text{SCALRESI}(\text{"EXPSUB"}, \text{"expmnt"}) = \text{EXPSUB}.L \\
\]
SCALRES1(“SAVING”, “expmnt”) = SAVING.L;
SCALRES1(“DEPREC”, “expmnt”) = DEPREC.L;
SCALRES1(“HHSAV”, “expmnt”) = HHSAV.L;
SCALRES1(“FSAV”, “expmnt”) = VSAV.L;

SCALRES1(“WF-RURLAB”, “expmnt”) = AVGWF(“rurlab”);
SCALRES1(“WF-URLAB”, “expmnt”) = AVGWF(“urblab”);

SCALRES1(sc, “change”) = 100*(SCALRES1(sc, “base”) - 1.0)
QUANTRES1(rq, i, “change”) = 100.*(QUANTRES1(rq, “expmnt”) / QUANTRES1(rq, “base”) - 1.0);
PRICRES1(rp, i, “change”) = 100.*(PRICRES1(rp, “expmnt”)/PRICRES1(rp, “base”) - 1.0);

DISPLAY PRICRES1;
DISPLAY QUANTRES1;
DISPLAY SCALRES1;
## APPENDIX A5

### A DETAILED 1976 SOCIAL ACCOUNTING MATRIX OF TANZANIA

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>agricult</th>
<th>consuact</th>
<th>intgdact</th>
<th>capitact</th>
<th>comeseact</th>
<th>paoseact</th>
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<td>TOTAL</td>
<td></td>
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<td></td>
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</table>

| ACTIVITY | agricult | | | | | |
| | consuact | | | | | |
| | intgdact | | | | | |
| | capitct | | | | | |
| | comeseact | | | | | |
| | paoseact | | | | | |
| COMMODITY | agricult | | | | | |
| | congdso | | | | | |
| | intgdso | | | | | |
| | capgdso | | | | | |
| | comeseco | | | | | |
| | paosevco | | | | | |
| FACTORS | rurlabor | | | | | |
| | urblabor | | | | | |
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| | capgdso | | | | | |
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| | paosevco | | | | | |
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| INSTITUTIONS | labourhh | | | | | |
| | capitlh | | | | | |
| | governmt | | | | | |
| SAVING | capital | | | | | |
| REST OF WORLD | world | | | | | |
| TOTAL | | | | | | |

- **APPENDIX AS**
- **A DETAILED 1976 SOCIAL ACCOUNTING MATRIX OF TANZANIA**
- **(in million Tshs)**

### Table Data

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Source: Compiled using data from the 1976 Input Output Table of Tanzania and various issues of Economic Surveys and National Accounts.
APPENDIX A6

QUESTIONNAIRE

FOR

HOUSEHOLD SURVEY OF RURAL AND URBAN TANZANIA

1990

REGION: .................................................................

VILLAGE: ...............................................................

HOUSEHOLD NUMBER: ...............................................

NAME OF CELL LEADER: ............................................

NAME OF HOUSEHOLD HEAD NOW: ............................

1. Household Composition

Members who are resident. List all members of the household who are living in the house at the time of the interview. Include any guests who have been staying for more than 2 weeks and who share meals.

1.1: Serial number of household member

1.2: Name of household member

1.3: Relation to household head..... (a) ( 1 = head; 2 = wife; 3 = son; 4 = daughter; 5 = father; 6 = mother; 7 = other relative; 8 = a non-relative)

1.4: Sex ( 1 = male; 2 = female)

1.5: Age (number of years)

1.6: Education [ Type = ...... (b); Standard = ...... (c)]

(b) ( 0 = none; 1 = primary; 2 = govt. secondary; 3 = private secondary; 4 = university; 5 = adult literacy; 6 = other (specify)

(c) ( 0 = not applicable; 1 = Standard/Form 1; 2 = Standard/Form 2; 3 = Standard/Form 4; 5 = Standard/Form 5; 6 = Standard/Form 6; 7 = Standard 7; 8 = Standard 8;
APPENDIX A6

QUESTIONNAIRE

FOR

HOUSEHOLD SURVEY OF RURAL AND URBAN TANZANIA

1990

REGION: .............................................................................

VILLAGE: ..........................................................................

HOUSEHOLD NUMBER: .........................................................

NAME OF CELL LEADER: ....................................................... 

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1.4: Sex (1 = male; 2 = female)

1.5: Age (number of years)

1.6: Education [Type =........ (b); Standard =........ (c)]
(b) (O = none; 1 = primary; 2 = govt. secondary; 3 = private secondary; 4 = university; 5 = adult literacy; 6 = other(specify)
(c) (O = not applicable; 1 = Standard/Form 1; 2 = Standard/Form 2; 3 = Standard/Form 3; 4 = Standard/Form 4; 5 = Standard/Form 5; 6 = Standard/Form 6; 7 = Standard 7; 8 = Standard 8;
1.7: Does he/she read and write?

1.8: Occupation [Main (d); Any other job? (d)]
1=farmer on family farm; 2=Labourer on other shambas; 3=Labourer on estate (target); 4=employee working for rural private employer; 5=employee working for an urban private employer; 6=employee working for government, or parastatal (rural).

(e) (1 = read and write; 2 = read only; 3 = neither read nor write).

1.9: Have any of these people ever left to seek work (for at least a season?)
Where did he/she go? (a) 1 = another village; 2 = agricultural estate; 3 = Local town; 4 = major town (specify); 5 = Dar-es-Salaam; 6 = outside the country.
Year of departure
Year of return
Did you get work? YES/NO
Nature of work [See 1.8(d)]
How much did they earn in cash value or goods in kind? TShs per month
How much did you send back? (TShs/month or value of goods in kind)

1.10: Are there spouses, sons and daughters of the head of the household who are now living elsewhere?
Relation to household head [See 1.3(a)]
Sex ................ Male/Female
Age ................ Years
Education: Type .................. Standard/Form ............... [See 1.6 (b), (c)]
Where is he/she living now? [See 1.9(a)]
When did he/she leave the household? Year ................
Have they been given land by this household? If so, how much?
(he) ................
Why did he/she go? (f) 1 = to took for work; 2 = to take up a job offer; 3 = marriage; 4 = land shortage; 5 = other (specify)
About how much does he earn in his present occupation?
(TShs/month)
Does he send money back to the household? .............. YES/NO.
Do you send money to him/her? If so, how much? ....... (TShs/month)
How often does he visit the household and how long are these visits? (stay (days)) times a year; average
Does he take decisions about the shamba? .... (g) 0 = no; 1 = choice of crops planted only; 2 = purchase of inputs only; 3 = both planting and purchases of inputs
Do you expect he will return to live in this household? if so, when and why? .... (h) 0 = no; 1 = on retirement; 2 = if he loses job; 3 = when they inherit land; 4 = when they have saved enough
Do you receive any remittance from anyone other than your spouse or children? If yes, how much? .......... TShs/month

2. Work (Members who are resident only)
2A: Did any household members work in off-farm wage employment in the last 12 months? Did he need qualifications/experience/training education in order to get it?
(a) For how many years has he worked for the employer?
How much did he earn per month? TShs
How many days per month did he do this work?
How far away was this work?
(b) If still doing this work, for how long does he expect to continue in wage employment? Year

2B: Did any household member work on other people's shamba in the last 12 months? (list them)
Typically, how many days per month?........................
How many hours a day? ........................
How many hours a day? ........................
How was he paid? ........................
(d) What was the value of this payment per day? TShs
How far away is the holding where he worked (kilometres)

2C: Has any household member done any work as his own boss in the last year, other than working on the shamba? Examples are handicrafts, business market stall, bar, setting food.
Typically how many days a month does he work on the business?
How many hours a day?
Type of business
(e) What were the sales of the business last year? TShs
What were the costs of the business last year? (TShs) of which labour costs were...
and all other costs were TShs....

2D: Has any household member worked on estate, commercial farm or state farm in the last 12 month Typically how many days per month?
How many hours a day?
How much did he earn per day? TShs
How far away is the estate or farm on which he worked? .........................
(kilometres)

2E: Did any household member work on the communal shamba in the last 12 months?
Typically how many days per month?
How many hours a day?
How much did he earn from this work? (include value of payments in kind) TShs.............

2F: Did any household member work on any communal non-shamba activities in the last 12 months?
Typically how many days per month?
How many hours a day?
How much did he earn from this work? (include value of payments in kind) TShs.............

2U. FOR URBAN HOUSEHOLDS ONLY
(ub) 1 = grain milling; 2 = bread making; 3 = tailoring; 4 = brewing; 5 = shoe repair/making;
6 = furniture making; 7 = basket making; 8 = carving (wood/stone); 9 = soap making;
10 = brick making; 11 = building; 12 = car mechanic; 13 = hawking; 14 = kiosk or stall;
15 = duka, restaurant; 16 = shoe-shine; 17 = transport (mikokoteni); 18 = transport (dala-dala);
19 = professional services (e.g. consultancies); 20 = others (specify).

(uc) 1 = maize; 2 = rice; 3 = cassava; 4 = beans; 5 = bananas; 6 = oranges; 7 = sweet potatoes;
8 = groundnuts; 9 = other.

2U.1: Has any household member done any work as his own boss in the last year?
Typically how many days a month does he work on the business?
How many hours a day?
Type of business (ub)
What were the sales of the business last year? TShs
What were the costs of the business last year? (TShs) of which labour costs

2U.2: Do you have a shamba nearby on which you grow crops or keep livestock?
YES/NO. If YES,
How far is the shamba? ...................... km
How big is the shamba? ...................... ha
When did you acquire it? Year
Did you have to pay for it? YES/NO ......... ; If yes, how much? .................. TShs
When did you start farming it? Year
List the main crops grown Last year:
Crop type (uc)
Own consumption (qty).
Sales (qty)............. Revenue............. (TShs)

2U.3: Do you keep any livestock in the shamba? YES/NO
Ownership (number) Own
Now One year ago
Consumption Net Sales
(number) [Qty.(no.)]
Total value (TShs)
Hens
Pigs
Goats
Cattle
Eggs (dozens)
Milk (litres)
Other

2U.3: What were the costs of running the shamba during last year? TShs..............
How many hours per week do the household members typically spend in looking after the shamba?

3. The Shamba

(a) 1 = allocated by Village Council (not held before operation Sogeza): block farm;
2 = allocated by Village Council (not held before operation Sogeza): non-block farm/holding;
3 = held by household before Operation Sogeza; 4 = borrowed from another household;
5 = acquired by exchange for land or goods with another household

(b) O = no; 1 = yes, (owned); 2 = yes, (hired)

(c) 1 = local maize; 2 = hybrid maize; 3 = beans; 4 = millet; 5 = sorghum; 6 = cassava;
7 = groundnuts; 8 = wheat; 9 = rice; 10 = yams; 11 = sweet potatoes; 12 = peas; 13 = mchicha;
14 = other vegetables; 15 = coffee; 16 = bananas; 17 = tea; 18 = tobacco; 19 = cotton;
20 = pyrethrum; 21 = cashew nuts; 22 = coconuts; 23 = sesame; 24 = sunflower; 25 = castor seed;
26 = sugar cane; 27 = onions; 28 = other;

(d) 1 = cash; 2 = payment in kind; 3 = meat, pombe at the place of work; 4 = use of plough;
5 = a combination of the above payments (specify)

(e) O = no contact; 1 = visit of extension worker to this shamba; 2 = no visit, but I attended a demonstration; 3 = both visit(s) and I attended a demonstration; 4 = attended Farmers Training Centre

(f) O = no contact; 1 = only once; 3 = two or three times a year; 4 = more than three times a year.

(g) O = not applicable; 1 = others were doing it; 2 = more profitable; 3 = because the government wanted me to change

(h) 1 = traditional method (from father); 2 = from demonstration; 3 = from extension visit;
4 = by try-and-err-method; 5 = from neighbours; 6 = from relatives; 7 = others

(i) 1 = yes; 2 = no

3A: Area and Tenure

How many parcels of land does the household operate?
How big is each parcel? (ha.): 1st Parcel ............. 2nd Parcel ............ 3rd Parcel
................................ Other Parcel

Tenure of each parcel: (a) 1st Parcel .......... 2nd Parcel .......... 3rd Parcel ............
Other Parcel

96
How far is the Parcel from the house?(km): 1st Parcel ......2nd Parcel......
3rd Parcel .............. Other Parcel
Use of Land owned by the household:
for homestead only (ha.):
for crops (ha.)
for grazing (ha.)
unused, suitable for crops (ha.)
unused, suitable for grazing only (ha.)
Not suitable for either (including woodland) (ha.)
Does the household own any land which it tends to other households? If YES, how much? .......... (ha.)
Do you use a tractor? (b) Have you ever been a member of a co-operative society?......... YES/NO

3B: What crops were produced on (each of) the holding in the last year?
First crop (c)
Second crop (c)
Output (kg.)
How was hired labour paid? (d)......... Value of payment per man-day
TShs.................

3D: Knowledge of Techniques
How did you learn about the knowledge you are using? (h)
Have you changed your method in the last 5 years? (i)
If YES, why? (9)
Have you ever received any extension advice about the crop or livestock?......
YES/NO
Nature of extension contact (e)
Frequency of contact (f)

3E: Inputs
Own produced inputs; value, TShs: (i)Seeds (ii) Others
Purchased inputs; value, TShs:(i) Seeds (ii) Fertilizer (iii) Others

3F: What crops were marketed "Mwaka Jana" (Last year)?
Crop type (c)
official sales: quantity (kg)..........price(TShs/kg)..........Revenue: TShs
Delay in payments: months..............Amount not yet paid (TShs)
Unofficial sales: quantity (kg)..............price(TShs/kg)
Revenue:Tshs

4. LIVESTOCK

4A: Stock now owned: (i) Local breed Number: Total value, (ii) "Mifugo bora" (hybrids)
Number: Total value

Bulls........................................................................................................
Steers........................................................................................................
Cows
Sheep
Goats
Oxen
Pigs
Hens
Other

4B: Changes during last year

Received
Purchases

Given to
Births

Deaths & Sales

Given out as gifts Slaughtered Labour
Thefts

incld. bride price

4E: Livestock products

Own consumption

Sales

Quantity
Milk
Eggs
Meat
Hides (etc.)

Value

Quantity

Value

4F: Inputs used for livestock during last year (indicate quantity and/or value)
Purchased feed

Own produced feed (if stall fed)

Other cash expenses

Notes

1. Economic adjustment policies can be broadly categorized into two components: stabilization and structural adjustment. Stabilization policies are aimed at reducing expenditure, principally by using fiscal and monetary policies. The second component (or structural adjustment) is concerned with supply-side, growth-oriented, expenditure and production switching policies.
2. The "Dutch Disease" describes the impact of resource discoveries (or a boom in export prices or aid inflows) in an economy which produces both traded and non-traded goods. It is a trend of events describing a process of de-industrialization [Corden and Neary (1982)]. When traded goods comprise both a booming (coffee or other cash crops) and non-booming (manufacturing) sectors, the shift in prices brings about a reallocation of resources from the non-booming to the booming sector and thus leading to de-industrialization.

3. Tanzania is a republic formed by the 1964 union of the mainland, then Tanganyika, which gained its independence in 1961, and the isles or Zanzibar.

4. Computed from GDP data in URT (1991), National Accounts of Tanzania, Table 1.

5. Current account deficit as percentage of GDP during 1977-1990 is shown in Table 2.3 in the next Section while for the 1973-75 period it was computed from International Financial Statistics, Vol. XXXIII, No. 12.

6. The high rate of growth in money supply in 1979 was most likely due to the need to finance the war with Amin's Uganda. The growth in money supply is shown in Table 2.1.

7. The Gini coefficient between 1969 and 1976/77 for Mainland Tanzania increased from 0.45 according to Wagao (1981) and from 0.39 to 0.44 according to Bukuku (1988). The corresponding figures of the 1982 study were 0.57 and 0.51 for rural and urban Tanzania respectively during 1969 while during 1976/77 the coefficients were 0.49 and 0.44 for rural and urban Mainland Tanzania.

8. The exact number of households surveyed by region is as follows:

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9. The inequality ratio for rural Tanzania was 0.20.

10. The degree of openness may be defined as the ratio of the sum of absolute exports and imports to domestic production, that is $C(E+M)/(X)\times100$.

11. The degree of openness for all the sectors is as follows:

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<td>Degree of openness (%)</td>
<td>14</td>
<td>33</td>
<td>55</td>
<td>61</td>
<td>24</td>
<td>23</td>
<td>26</td>
</tr>
</tbody>
</table>

12. The study by Harrison & Kimberley (1985) used a computable general equilibrium model for ten countries: Australia, Canada, Indonesia, Malaysia, the Philippines, Singapore, Thailand, Korea, Japan the U.S.A, and EEC.
REFERENCES


