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ECONOMIC LINKAGES AND POLICY SHOCKS IN ETHIOPIA: SOCIAL ACCOUNTING MATRIX (SAM)-BASED MULTIPLIER ANALYSIS

BY

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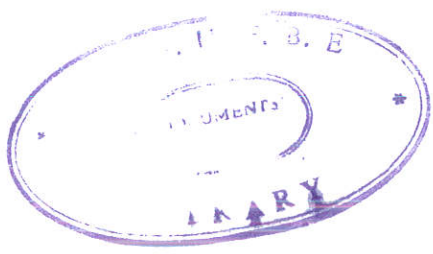

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Abstract

The objective of this study is to examine the magnitude of sectoral linkages and the potential impact of policy-induced changes on the Ethiopian economy. To carry out this, social accounting matrix (SAM)-based multiplier is used. The social accounting matrix consists of fifteen production activities, two factors of production (labor and capital), three institutions, namely, rural households, urban households, and government, one combined capital account, and the rest of the world.

This study indicated that the direct interdependence of the Ethiopian economy is limited. When general equilibrium effects are taken into consideration, agriculture is found to be superior, through income and consumption linkages, in terms of stimulating economic growth in the country. Of the industrial subsectors, food processing, metals, beverage, and textile have strong linkages with the rest of the economy.

The study pointed out that targeting rural areas is important to eliminate rural and urban poverty simultaneously. The study also showed that complete elimination of fertilizer subsidy has brought a decline in sectoral output, household income, and private savings. The study indicated that sectoral investment programmes, particularly investments in agriculture have stimulated sectoral output and household income. It also indicated that increasing coffee exports have substantial impacts on stimulating growth and household incomes.

It follows that to bring long-term development, emphasis should be directed towards the transformation of the rural areas in general and agricultural sector in particular and selective promotion of industrial subsectors. It is also crucial to reconsider the implication of fertilizer subsidy elimination.

CHAPTER ONE

Introduction

The effects of macroeconomic adjustment and subsequent policy design have traditionally been measured in terms of the behavior of key macroeconomic variables as current account deficit, inflation, GDP, employment etc. These variables, however, hide a multitude of changes since the various sectors of the economy react in quite different ways to policy-induced or any exogenous changes so that the macroeconomic average can hide large shifts. In order to improve the living standard of the population and attain development through well designed strategies, the inclusion of distributional variables during the process of policy design together with other macroeconomic variables is crucial. Thus an in-depth treatment of the real interaction among production activities, factors of production and decision-making units is a paramount importance for the short-term analysis of demand management and policy design. This is so because it is only through the understanding of the microeconomic behaviors of the different social institutions that a proper picture of the functioning of the economy as a whole is obtained. As such, the analysis of these types of interconnections among sectors and institutions, such as the effects of exogenous changes on the economy requires the specification of an economic model. However, the country has no such comprehensive analytical model, which takes into account the interdependence of the various sectors of the economy. In other words, the interactions of the different sectors of the economy have not been measured in the country to date. This study is designed to bridge this

gap. This is obviously essential for more insightful macroeconomic as well as sectoral policy design for Ethiopia.

In order to accomplish the stated mission, this study is structured in the following way. The second chapter deals with literature review both theoretical as well as empirical; chapter III concerns with method of analysis. Finally, chapter IV discusses empirical results as well as conclusions and policy implications.

1.1 BACKGROUND

In the mid 1970s, Ethiopia had shifted from a regime with mixed economic system to the one which was more centrally planned that pushed the economy to a downward trend which resulted in the deterioration of the entire economy and well being of the society. It has been documented that the per capita income was Birr 211.7 in 1973/74 and fell down to the level of Birr 180.3 in 1990/91(MOPED, 1993). In terms of growth rates, the average annual growth rates of real GDP was about 1.5% during the period under review. Population, on the other hand, had been growing at about 2.9 % during the same period implying a 1.4% fall in per capita income per annum which resulted in the impoverishment of the living standard of the society at large.

The poverty situation in the country is among the worst in the world. According to the recent study, 50% of the population in the country can not afford the minimum food requirement

(MEDaC, 1999). It is indicated in the same document that 52% and 36% of rural and urban population are unable to meet the minimum food requirement, respectively. In other words, food poverty in rural areas is higher than in urban areas. Further more, 47% of the rural population and 33% of the urban population are found in absolute poverty. And also the poverty gap, the gap which would allow households to fulfill the minimum requirements between rural and urban households are13% and 10%, respectively.

Further more, gross domestic saving was averaged to be 14% of GDP in 1973/74 and this figure was between 2.8% and 12.5% of GDP during the entire period of the military era. Public spending had been 19% of GDP in 1973/74 and this figure rose to 44% of the same in 1990/91. The debt became a huge burden on the economy reaching USD 8.6 billion in 1990/91. At this magnitude, the per capita burden was calculated to be about USD172 or Birr 356.04, which was greater than the per capita income of the country (MOPED, 1993).

With regard to the structure of employment, the recent labor force survey indicate that about 88.5% and 11.5% of the entire labor force is currently employed in rural and urban areas, respectively (Central Statistical Authority, 1999). The sectoral structure of labor force shows that agriculture, industry, and services absorb 79.6%, 9.0%, and 11.4% of the total currently employed persons, respectively. The agricultural sector absorbed a significant proportion of the labor force in the country, followed by services.

The unpleasant performance of the economy was due to mismanagement, growing internal

instability and recurrent drought and consequently the poor performance of the dominant sector, agriculture, which happened to be a bottleneck to other sectors. The annual growth rate of this sector, which largely determines the overall growth of the economy, was averaged to be less than 1.5% during the period under consideration. As a result, the agricultural sector had not become immune to the worsening of the economic crisis and that it was totally incapable of cushioning the collapse in the level of economic activity. It, for instance, registered a negative growth rate of 3.6%, 12.4% and 20.7% in 1981/82, 1983/84, and 1984/85, respectively. Hence, this sector, let alone pulling the rest of the economy up, had failed to immune the aggregate economic downturn of the time.

Thus, the performance of the Ethiopian economy had been progressively declined during the Dergue regime. This downward trend calls for substantial reforms in macroeconomic policies. In order to lift the economy from its low level of development caused by both natural catastrophe and rigid macrocosmic policies, the then Transitional Government of Ethiopia (TGE) adopted Stabilization and Structural Adjustment Programme (SAP) that calls for significant policy reforms as propounded by the two sister institutions, IMF and World Bank. Stabilization policies emphasize on reducing government budget deficit, controlling credit to the economy and the like. Structural adjustment policies focus on removing constraints on the supply side and pay a close attention to the production of export crops through a depreciation of the real exchange rate and other incentives. These policies, expenditure-reducing (ER) and expenditure- switching (ES) policies, which are components of demand management, as a whole, are expected to reduce aggregate demand.

Therefore, macroeconomic policies have had an impact on the different sectors of the economy, incomes of the various institutions such as households as well as their consumption structure. The real interactions among macroeconomic policies, sectoral outputs, and institutional incomes can be captured by a Social Accounting Matrix (SAM)-based economic model. SAM is a way of presenting socioeconomic information system in a consistent manner. In other words, it is a general equilibrium data set that shows the interrelationships between activities, factors of production, and institutional accounts. SAM can also serve as a base year information for a wide range of modeling purpose, such as linear equilibrium and computable general equilibrium models. The former is also known as fixed-coefficient macroeconomic model since it assumes linear relationships between variables and the coefficients are fixed. More over, some variables are determined exogenously. In the latter models, however, the basic assumptions of the linear equilibrium models are relaxed.

1.2 Objective of the study

The central objective of the study is to establish a quantitative relationship between factors of production, production activities, and institutions and thereby to decompose these relationships into separate effects. In other words, to determine by multiplier analysis the effects of changes in the exogenous variables on the whole set of endogenous variables which obviously constitute the target variables of the decision-makers. Hence, the objectives of this study are dual in nature. First, to (a) extend and update the only available social accounting matrix (SAM) which had been constructed for Grain Marketing Policy Modeling with base

year 1987. (b) Develop a workable SAM-based fixed-coefficient linear equilibrium macroeconomic model. This model would be used to measure the direct and indirect impacts of a wide-ranges of macroeconomic policies on many aspects of the economy. Subsumed in the main objective are the following specific objectives. These are to:

(a) look into the distribution of income and the consumption structure of rural and urban households.

(b) measure the direct and indirect effects of an exogenous change

(i) in the incomes of households on the sectoral production structure, demand for factors of production, and household incomes themselves

(ii) in the production activities on the sectoral production structure themselves, factors of production, and household incomes.

(iii) in the production factors, on the sectoral production structure, household incomes, and factors of production themselves.

(c) undertake simulation experiments.

(d) pass some suggestions based on the findings of the study.

1.3 Significance of the study

It is pretty obvious that in a country like ours where no attempt has been made to investigate the interdependence of the economic system, this study will be an important starting point to capture the stylized features of the Ethiopian economy. Therefore, the study is significant in that:

(a) It serves as a well-organized socioeconomic information system. In other words, it gives a static picture about the structure of the economy for the year 1995/96.

(b) the degree of intersectoral linkage is crucial for the design and formulation of macroeconomic as well as sectoral policies.

(c) information about the interrelationship of the various sectors and the effects of different policies is useful for prioritizing investment programmes.

(d) knowledge about the distribution of income and consumption structure of institutions is important in designing growth with distribution strategies.

(e) it will initiate further research in the area using more elaborated macro models such as Computable General Equilibrium models.

1.4 Policy Making and Macroeconomic Trends in Ethiopia

1.4.1 Policy Making

It was during the Emperor Haile Selassie I that a planned approach to development was started. During the late 1950s and early 1970s, three consecutive medium term plans[1] with the objective of accelerating economic growth were introduced. In this regard, the First Five-Year Development Plan (1957-1962) was focused on enhancing economic growth and

[1] For review of plans in Ethiopia, refer Tesfay Assefaw (1992) and Stephanos Ogbasellasie (1999).

constructing physical infrastructure in the country (Stephanos, 1999). The plan identified agriculture as a leading sector. Latter, the Second Five-Year Development Plan (1963-1967) had been introduced giving due emphasis on large-scale modern farms and promotion of export crops. Despite these development plans, the leading sector failed to feed the growing mouth. In view of this, donor agencies of worldwide recommended the government to boost the agricultural sector through the package approach and this led to the emergence of a well articulated agricultural development strategy of the Third Five-Year Development Plan (1968-1973). However, these all development plans gave large emphasis on agriculture and less to other sectors. Moreover, the plans were formulated on ad hoc basis and/or through past history of aggregate economic variables and thus policy-makers were not armed with any policy instrument. Hence, the plans were not well articulated in terms of capturing intersectoral linkages and distributional implications of alternative plans. Given the existing weak institutional setups, lack of skilled human resources and consequently dearth of well-established database, planning was done on intuitive basis.

After over throw of the emperor regime, a group of military officers, Dergue, assumed power in 1974. The Dergue then declared socialism as the official economic as well as social policy of the country. The economic policy that followed allowed the government to intervene in all spheres of the economy. The size and degree of intervention has increased through time with the objective of expanding the public sector. Under the socialist ownership of the means of production, the management and development of the national economy requires central planning and guidance. For this reason, the National Revolutionary and Central Planning

Supreme Council was established in 1978 (PMGE, 1984). Latter, the Central Planning Supreme Council renamed as the Office of the National Committee for Central Planning (ONCCP). The primary objective of this commission, among others, was to allocate all the available resources in the various sectors of the national economy. It was in 1984 that a comprehensive Ten-Year Perspective Plan (1984-1993) was introduced with the objective of transforming the economy via development of productive forces and thereby raising the living standard of the masses. The plan was assumed to be implemented in a series of three medium-term plans, namely Two-Year Plan (1984-1985), Three-Year Plan (1986-1988), and Five-Year Plan (1989-1993). These plans clearly identified industry as a leading sector based on the import substitution strategy industrialization and acknowledged agriculture as the cornerstone of the entire economy (PMGE, 1984). The import substitution strategy is oriented towards the needs of the domestic market.

In order to achieve the economic as well as social development objectives, planners usually establish a system of overall sectoral targets in terms of production, investment and resource requirements. The primary role of the Ten-Year Perspective Plan, for example, was to achieve the targeted real annual GDP growth rate of 6.5% and all sectoral targets were set to achieve this end (PMGE, 1984: 23). In formulating policies or plans of such sort, simple forecasting techniques have been employed to set a target growth rate. No economy-wide models have been used for policy formulation and hence policies and strategies were not based on an in-depth studies and analysis of the interactions of various sectors. In all of these plans, the growth rate of GDP was taken as a means of evaluating the performance of the

economy. Hence, issues of income distribution and intersectoral dependencies during policy or plan formulation were not given due attention- no well articulated and furnished policy instruments have been used.

After the over throw of the military regimen in 1991, the then Transitional Government of Ethiopia (TGE) backed by World Bank and IMF, adopted an economic policy in order to transform the country from a command economy to a market-oriented one. In other words, the economic policy replaces the command economy by an economic system driven by the forces of the market. The strategy being used in this policy framework is termed as agricultural development-led-industrialization (ADLI) which emphasizes on the development of peasant agriculture, that is, making the agricultural sector the driving force of the national economy (MOPED, 1993). At the heart of this strategy lies, the attainment of food self-sufficiency, increase and diversify production of raw materials and thereby promote the linkage of the agricultural sector with the industrial sector. The ADLI strategy also emphasizes the export-led strategy as promoting the export subsector that typically intimately links an engine of economic growth by promoting the export subsector that with the development of the agricultural sector. In this economic policy, agriculture is given special attention and strong efforts have been and are being put in place to push it ahead. However, the growth of the national economy is being evaluated by the growth of GDP. Moreover, though intersectoral linkages, particularly between agriculture and industry, have been stressed, policies and strategies are not based on economy wide models and consistent data set. In this regime too, plans are formulated by using simple forecasting methods to attain a

certain targeted growth rate. The question of income distribution is not integrated during policy as well as plan formulation.

Having said the policy-making tradition in the country, the performance of the economy in the context of the last two regimes will be outlined in the following subsection.

1.4.2 Macroeconomic Trends

Measured by economic as well as social indicators of development, Ethiopia has been categorized as one of the poorest of the poor countries on God's earth. This is partly because it has suffered from the economic crisis of the past two decades or so. The causes of this include, among other things, rigid macroeconomics policies, protracted war, and recurrent drought, which drained huge amount of the country's resources and hostile external environment. The problem of drought has been the most important of all, which time and again attacked the economy for a long period of time. According to Jemmal, as quoted in Mulu (1999), although the degree and extent of drought vary from period to period, drought and famine had occurred at least nine times during the period 1960 and 1992. This is so since the economy is significantly influenced by the size and magnitude of rainfall, the twin disaster (too little or excessive of it is bad). The giant sector of the economy, agriculture, (in terms of value added, employment opportunity, and export earnings) is highly susceptible to changes in weather conditions. Hence, the economic performance for the last three decades was disastrous. For Ethiopia, it can be claimed that, these periods have been lost decades.

The tempo of economic growth over the last three decades was unsatisfactory. Regardless of the policy regimes, real total GDP, agricultural GDP, industrial GDP, and service GDP grew on average by 2.97%, 1.42%, 4.51%, and 5.20% per annum, respectively, during the period 1963/64-1998/99. On the other hand, population had been growing on average by 2.91% during the same period implying a 0.06% annual growth rate per capita income. This shows that the economy has stagnated for the last three decades or so. Table 1.1 below shows the growth trends of the economy for the two different periods, namely, before and after the recent economic reform program launched by the then Transitional Government of Ethiopia. The rates of growth of real GDP, on average, were 2.0% and 1.7% for the periods 1980/81 - 1990/91 and 1980/81-1991/92, compared with 5.5% in 1991/92 - 1998/99, showed good performance of the economy. Looking at sectoral growth rates reveals that the rate of growth of major sectors was disappointing in the 1980s. As indicated in the same table, the rates of growth of Agriculture, Industry, and Services were 1.2%, 1.3% and 3.6% for the period 1980/81-1990/91 and 1.4%, 0% & 2.8% for the period 1992/93-1998/99, respectively, compared with 3.4%, 7.3% and 7.7% in 1992/93-1998/99 according to their order. All sectors revealed major improvement during the post-reform period of the 1990s. This might be attributed to policy measures undertaken in these sectors in the first half the 1990s. Thus, the 1980s have been a period of stagnation or decline. The reasons for the stagnation have been various and multidimensional. During the 1980s, the prices of key primary commodities remained relatively unfavorable, the debt - service ratio continued to rise, foreign exchange scarcities continued to create sever under utilization of productive

capacities and the skill base remained virtually underdeveloped.

Table 1.1: Growth Trends, 1980/81 - 1998/99(in % per year)

Sector/Year	1980/81-1990/91	1991/92-1998/99
GDP at constant factor cost	2.0	5.5
Agriculture	1.2	3.4
Industry	1.3	7.3
Services	3.6	7.7

Source: Own calculation from MEDaC data, 1998

A look at the sectoral mix of GDP shows that agriculture still maintains its position over the period under consideration. The available documents show that the shares of agriculture, industry and services were 60.6%, 13.6%, and 25.8%, respectively, during the period spanning 1961-1974 (Mulu, 1999). Table 1.2 below shows the sectoral structure of GDP during the Dergue era and present government.

Table 1.2: Sectoral Composition of GDP (annual averages in %)

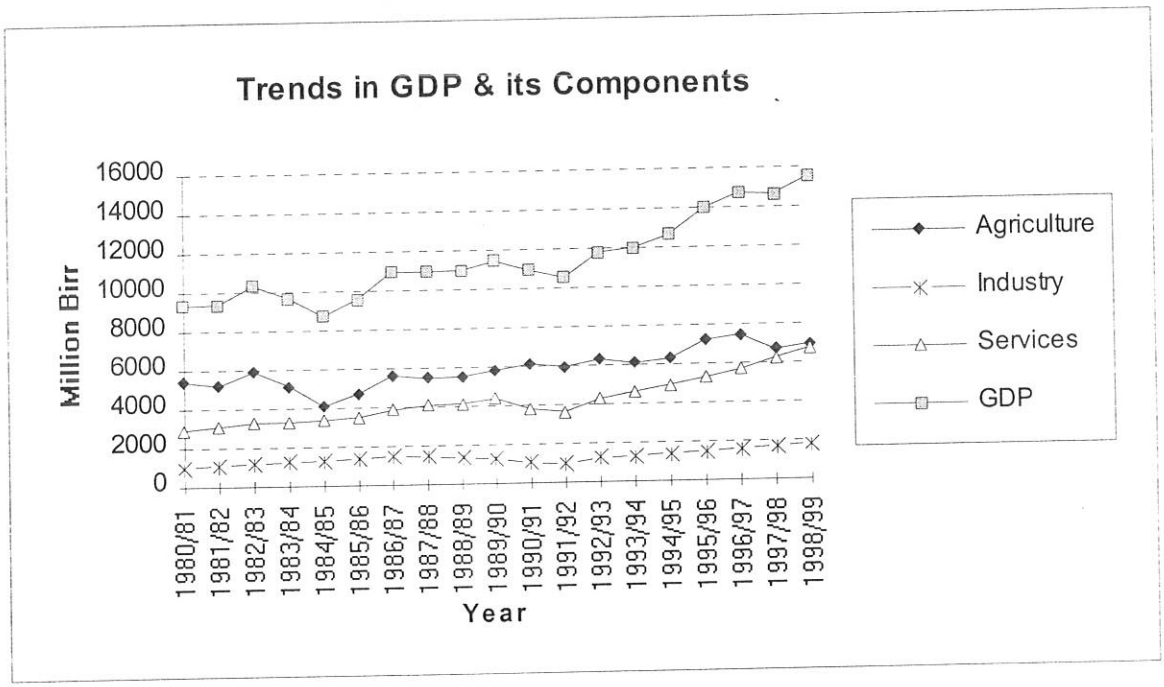
Sector/Year	1980/81-1990/91	1991/92-1998/99
Agriculture	52.5	50.0
Industry	12.2	10.8
Services	35.3	39.2

Source: Own calculation from MEDaC data, 1998

As depicted in Table 1.2, agriculture was the predominant sector, which contributed 52.5% of GDP in 1980/81-1990/91, and this share declined slightly to 50.0% in 1991/92-1998/99. In both regimes, agriculture maintains its leading position in terms of its contribution to the national GDP. This confirms that agriculture has been and is the dominant sector in the Ethiopian economy. The share of the Industrial sector in the total GDP was 12.2% for the

period 1980/81 - 1990/91, compared with 10.8% in 1991/92 - 1998/99, showed a slight decline in its share implying the relatively slower pace in the growth rate of the sector. It is to be recalled that this sector grew downward by 7.1% during 1991/92, where industrial activities were operating below capacity and constrained by several factors. On the other hand, the share of the Service sector in GDP increased from 35.3% in 1980/81-1990/91 to 39.2% in 1991/92-1998/99 implying superior performance as compared to the other two sectors.

Figure 1.1:



As indicated in the above graph, the pattern of total GDP at constant factor cost follows that of agriculture. It is clear that fluctuations in the agricultural sector is directly reflected in the total GDP of the country since it is a leading sector. The share of service sector in the total

GDP shows an increasing trend especially in the 1990s.

Table 1.3: Demand side indicators of macroeconomic variables (as % of GDP)

Indicators/Year	1980/81-1990/91	1991/92-1998/99
Aggregate Consumption	92.8	93.9
Public consumption	16.8	12.2
Private consumption	76.0	81.7
Gross Capital Formation (GCF)	14.2	16.2
Gross Domestic saving (GDS)	7.2	6.1

Source: Computed from MEDaC data of national accounts, 1998

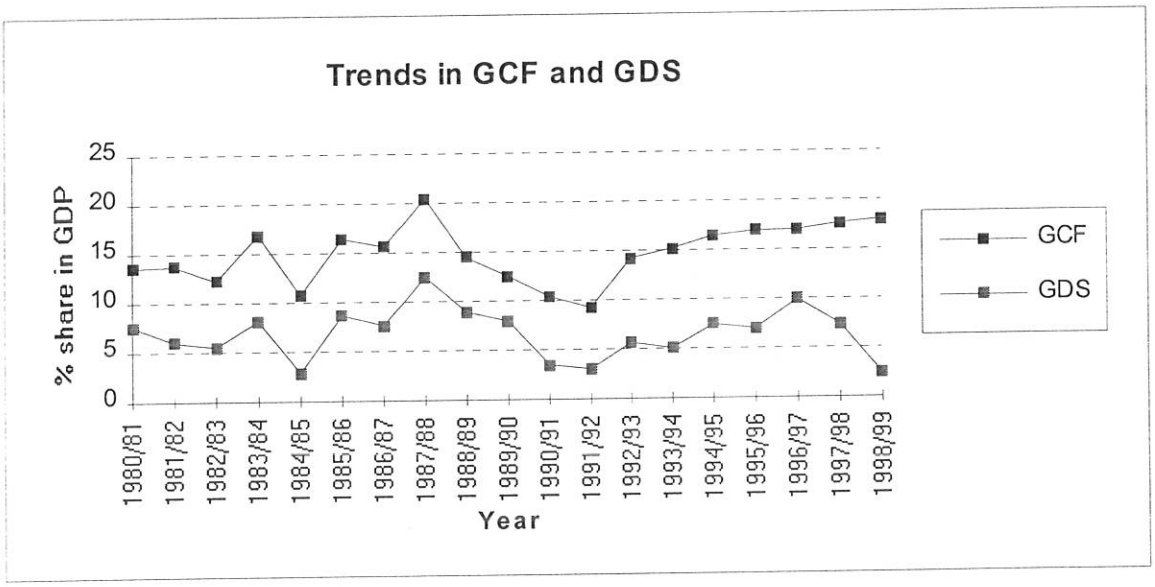
Table 1.3 summarizes other important macroeconomic variables which show the economic situation of the period considered. Gross Capital formation as a share of GDP increased from 14.2% in 1980/81 - 1990/91 to 16.2% in 1991/92 - 1998/99. The higher share in the 1990s might be due to the creation of an enabling environment, especially for the development of the private sector and hence the mobilization of the available resources.

The size and level of investment has a direct repercussion on consumption and saving. The proportion of public and private consumption expenditure together in GDP rose by a small amount from 92.8% in 1980/81 - 1990/91 to 93.9% during 1991/92 - 1998/99. Of this, private consumption expenditure as percentage of GDP accounts for about 76% and 81.9% in 1980/81 - 1990/91 and 1991/92 - 1998/99, respectively. Public consumption expenditure, on the other hand, has declined from 16.8% in 1980/81 - 1990/91 to 12.2% in 1991/92 - 1998/99.

The ratio of domestic saving to GDP has decreased from 7.2% in 1980/81 - 1990/91 to 6.1%

in 1991/92 - 1998/99. The following graph depicts the trends of gross domestic savings and gross capital formation as a proportion of GDP.

Figure 1. 2:



Both GDS and GCF fluctuated like a saw tooth in the 1980s. Reading the figure shows that GDS and GCF had been at there lowest in 1984/85 because of the severe drought and famine. After 1987/88, where both reached their peak, GDS and GCF had declined progressively and reached their minimum point in 1991/92 because of the intensive internal war that reached its climax. While GCF has been almost steadily increasing after 1991/92, that of GDS has started declining right from 1995/96 on wards. GDS has again attained it lowest level in 1998/99 as that of 1984/85 because of severs drought that affected the peasant sector. This shows that GDS has remained low and incapable of financing domestic investment.

1.4.2.1 Agriculture

It is clear from the above discussion that the agricultural sector is the leading economic activity and is the basis for the national economy. Thus, the predominantly subsistence and agrarian character of the Ethiopian economy has not shown any structural change for the last two decades. A look at sectoral components of major sectors of the economy provides how each activity has been performed during the period under review.

Table 1.4 below shows the structure of subsistence agriculture (agriculture proper), which consists chiefly of crops & Livestock and Hunting, has been the major component of the overall agricultural GDP for the period under consideration. Strictly speaking, about 86.5% of the total agricultural GDP was generated by subsistence agriculture in 1980/81-1990/91, compared with 87.4% in 1991/92-1996/97[2], showing a marginal increase. However, the share of Forestry in the total agricultural value added declined slightly from 13.4% in 1980/81-1990/91 to 12.5% in 1991/92-1996/97; and that of Fishing has remained at 0.1% in both periods.

Table 1.4: Structure of Agricultural GDP (in % per annum)

Activity/Year	1980/81-1990/91	1991/92-1996/97
Agriculture(proper)	86.5	87.4
Forestry	13.4	12.5
Fishing	0.1	0.1

Source: Own calculation from MEDaC data, 1998

[2] Agricultural GDP breakdown is not available since 1997/98.

Of the components of agriculture, the crop sub-sector accounts for a significant proportion of the value added of the same. A look at the post reform periods confirms this fact.

Table 1.5: Indicators of agricultural performance (annual growth rates in %)

Sub-sector\Year	1992/93-1996/97
Private crop sub-sector	6.
State-Farm crop sub-sector	-0.2
Total crop sub-sector	6.1
Livestock & Hunting	1.8
Forestry	1.7
Fishing	4.5
Agriculture & Allied activities	4.6

Source: MEDaC, Survey of the Ethiopian economy, 1999

Table 1.5 above reads that the crop sub-sector registered on the average an annual growth rate of 6.1% during the indicated period. This growth rate was due to the higher growth rate of private crop sub-sector of about 6.4%. That of the state-Farm crop sub-sector showed a negative growth rate of about -0.2%. The overall agricultural value added grew on the average by 4.6% during the post reform periods. Given the population growth rate of about 2.9% per annum, per capita agricultural value added has been increasing by about 1.7% during the period considered.

The available documents show that about 97% of the total crop output is produced by the peasant sector (MEDaC, 1999). Some of the Crops produced by both the peasant and state farms include cereals, pulses, and oilseeds, which are of staple food crops. Of these, cereals

constitute a larger proportion of the gross value of agricultural production.

Table 1.6: Production of major crops[3] (as % of major crops)

Crop type\Year	Average share (1980/81-1990/91)	Average share (1991/92-1998/99)
Cereals	87.5	88.4
Teff	17.8	18.3
Barely	15.6	11.4
Wheat	11.4	12.8
Maize	23.3	27.5
Others	19.4	18.4
Pulses	10.6	9.5
Oilseeds	1.9	2.1

Source: Own calculation based on data from MEDaC, 1999

Table 1.6 shows that cereals have been and are being the dominant element of major crops followed by pulses. A look at the same table reveals that cereals comprise about 87.5% of the major crops in the period 1980/81-1990/91 and this share has increased to 88.4% during the period 1991/92-1998/99. Of the components of cereals, maize constitutes the largest share accounting about 23.3% and 27.5% of major crops in 1980/81-1990/91 and 1991/92-1998/99, respectively. This is followed by teff, which accounts for about 17.8% and 18.3% in 1980/81-1990/91 and 1991/92-1998/99, respectively. Similarly, the share of oilseeds in major crops has increased marginally from 1.9% in 1980/81-1990/91 to 2.1% in 1991/92-1998/99. However, the share of pulses in the production of major crops has declined slightly from 10.6% in 1980/81-1990/91 to 9.5% in 1991/92-1998/99.

[3]Major crops include both peasant farm and State farm production.

1.4.2.2 The Industrial Sector

As it is pointed out earlier, the contribution of the Industrial sector in total GDP has been very small in magnitude. The Industrial sector has been the source of dynamism and acts as a pacesetter of the development process in many countries. However, this has not been the case in Ethiopia. This is because the technological base of this sector is weak, fragile, and dependent on the imported raw materials and spare parts. Table 1.7 indicates the core elements of the industrial sector. The most dynamic part of this sector has been the manufacturing activity and it is considered to be an "engine of economic growth". Large and medium scale manufacturing industries have stagnated in the past two decades. Table 1.7 reveals that their share in the total industrial GDP remain at 39.0% in both regimes, namely in 1980/81-1990/91 and 1991/92-1998/99. The share of Small Scale and Handicrafts in the total industrial GDP, on the other hand, have increased from 17.7% in 1980/81-1990/91 to 18.5% in 1991/92-1998/99. And others, that is, mining and quarrying, construction, water, electricity together contribute about 43.2% and 42.4% during the period 1980/81-1990/91 and 1991/92-1998/99, respectively.

Table 1.7: Industrial GDP by Sub-Sector (as % of industrial GDP)

Activity/Year	1980/81-1990/91	1991/92-1998/99
Large and Medium Scale Manufacturing	39.1	39.1
Small Scale Industry and Handicrafts	17.7	18.5
others	43.2	42.4

Source: Own calculation based on data from MEDaC, 1998

It is possible to disaggregate the industrial sub-sectors in order to examine the contribution of each the total industrial value added. Table 1.8 indicates the breakdown and the share of food, beverages, textiles, non-metals, metals, and other industry in the gross value added of the industrial sector.

Table 1.8: Contributions of industrial activities to gross value added of manufacturing and electricity, 1995/96

Industry type	% Share in industrial value added at fc.	Import intensity[4]
Food	21.7	0.13
Beverages	12.5	0.42
Textiles	18.4	0.39
Non-metals	10.9	0.70
Metals	9.6	0.90
Other industry	26.9	0.51

Source: Own calculation from CSA data, 1997

Of the list of industrial activities, food, textiles, and beverages account for a significant proportion of the total value added manufacturing and electricity industries. Of course, other industry takes the largest share, which accounts for about 26.9% of the gross value added of manufacturing and electricity industries. Food, beverages, and textiles account for about 21.7%, 12.5%, and 18.4% of the gross value added of manufacturing and electricity industries, respectively.

[4] Import intensity refers to only for Large and medium scale manufacturing sub-sector.

The available documents show that large and medium scale manufacturing industries depend heavily on imported raw materials, which account about 60% in the first half of the 1980s. A study by the Ministry of Economic Development and Cooperation shows that import intensity has increased from 0.33 in 1991/92 to 0.44 in 1996/97 representing average annual growth rate of about 6% (MEDaC, 1999). This clearly shows weak integration with other sectors of the domestic economy. As indicated in the above table, metals show a high import dependency, followed by non-metals and other industry. Food, beverages, and textiles show less dependence on imported raw materials. Specifically, food processing and textiles show import dependency less than 40% and they have relatively strong relationship with other sectors of the national economy.

1.4.2.3 Service sector

From economic theory we know that the service sector grow upward with economic development. As indicated above, the average share of this sector in the aggregate GDP has increased from 35.3% in 1980/81-1990/91 to 39.2% in 1992/92-1998/99. Of this, distributive services account for about 14.5% and 13.8% in 1980/81-1990/91 and 1992/92-1998/99, respectively. Other services constitute on the average 20.7% and 25.4% during the two periods according to their order. This sharp increase after 1991 might be due to policy measures undertaken in line with this sector. Within the service sector, National Bank of Ethiopia, which is responsible for the coordination of overall financial activities, accounts for about 2.4% of total service value added, while other financial activities and other services

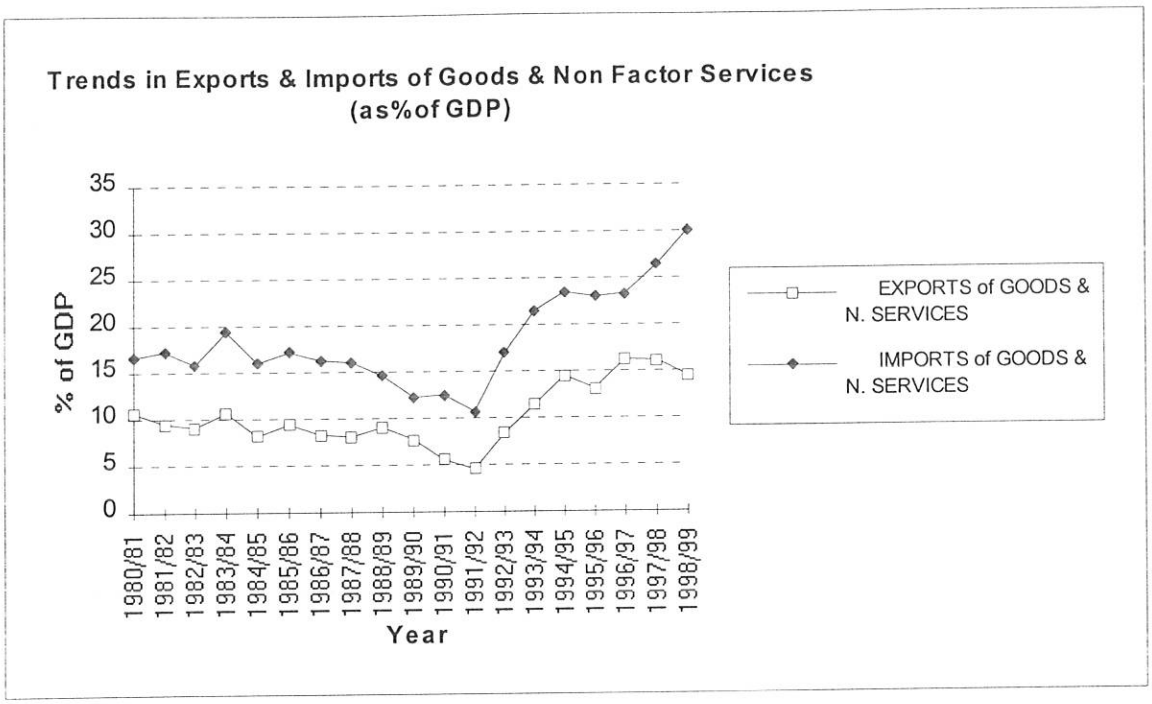
account for 18.3% and 79.3% of the same, respectively. Other services contribute the largest share for the overall service GDP.

1.4.2.4 The External Sector

The foreign trade map of Ethiopia depicts the usual developing country feature, exports consist of primary commodities and imports are largely manufactures and fuel. A brief account of the performance of the external trade pattern is shown as follows.

The figure below shows the trends of exports and imports of goods and non-factor services for the two different economic regimes. As the graph shows, the ratio of exports of goods and non-factor services to GDP at current market price had been both fluctuating and progressively declining in the 1980s. The disappointing performance of this export sector was due to a variety of reasons. The most important factors were the over valued exchange rate, high implicit and explicit export tax, the use of subsidies, rationing of foreign exchange, monopoly of the export trade by the sate and more importantly the relatively unfavorable prices received for the export of primary commodities. This sector starts increasing in the in the post reform periods of the 1990s. A healthy performance of exports in the period 1991/92-1998/99 was because of a package of policy measures as devaluation, tariff reform, market liberalization and elimination of some of export taxes taken by the government.

Figure 1.3:



What is more interesting is that imports have been over and above exports during the period under consideration implying a deficit in the current account or a widening in the resource gap. Although imports as a percentage of GDP had been greater than that of exports, it showed a downward trend in the 1980s. This downward trend might be because of the restrictive economic policy especially in the foreign trade. But this trend has reversed and imports have been increasing significantly relative to exports in the 1990s despite major policy reforms. The available documents reveal that imports of capital goods, fuel, and semi-finished goods have been and are being the dominant import items in the country in the 1980s as well as in the 1990s.

The following table shows the structure of major export items.

Table 1.9:Structure of Exports (as % of total exports)

Activity/Year	1980/81-1990/91	1991/92-1996/97
Coffee	62.4	66.7
Skins and Hides	13.3	11.8
Chat	2.7	6.6
Pulses & Oilseeds	4.5	6.1

Source: National Bank of Ethiopia (NBE), Quarterly Bulletin, Vol. 14, No. 1, 1998/99

The composition of exports revealed that coffee has been the major export item for a long period of time. It is the largest contributor of foreign exchange earning for the country. There have been ample evidence that coffee contributed about 55-65% of visible exports in the beginning of 1960s (MEDaC, 1999). As can be seen from Table 1.9 above, the dominance of coffee in the export sector has also been maintained in the 1980s and 1990s. It accounted, on average, for 62.4% of the total exports in 1980/81-1990/91, compared with 66.7% in 1991/92-1997/98. The other export item next to coffee has been Hides and Skins which accounted for 13.3% in 1980/81-1990/91 and 11.8% 1991/92-1997/98 of the total exports.

Though coffee dominated the total export items in the 1980s, it declined by 6.5% and 4.1% per annum in value and volume terms, respectively, in 1980/81-1990/91 as indicated in Table 1.10 below.

Table 1.10: Growth Rates of Export items

Item\ Year	1980/81-1990/91		1991/92-1997/98		1992/93-1997/98	
	Value	Volume	Value	Volume	Value	Volume
Coffee	-6.5	-4.1	60.6	24.5	40.0	12.2
Others	-2.4	-3.7	49.6	8.5	36.5	2.1

Source: Computed from NBE data Quarterly Bulletin vol. 14, no. 1, and 1998/99

Similarly, other export items (such as pulses and Oilseeds, Chat, Hides and Skins) taken together grew downward by about 3.7% & 2.4% per annum in volume and value terms, respectively, during 1980/81-1990/91. However, this trend has reversed in the 1990s as can be seen in the growth rates. After the introduction of the reform programs, coffee has registered an average an annual growth rate of 24.5% and 60.6% in volume and value terms, respectively, in 1991/92-1997/98. Taking the period 1992/93-1997/98, it grew, on average, by 12.2% and 40.0% in volume and value terms, respectively. Note that instability of the economy and introduction of substantial economic reform programs characterizes the periods 1991/92 and 1992/93, respectively. Other export items also show a positive growth rate. They registered an average annual growth rate of 8.5% and 49.6% in volume and value terms, respectively, during the period 1991/92-1997/98.

The improvement of major export items in the 1990s could be ascribed to both good weather condition and policy reforms undertaken within the context of Structural Adjustment Program, such as devaluation and liberalization of the market. These measures induced the supply of coffee by discouraging illegal trade and encouraging legal trade in the short run. It is clear from the above discussion that the commodity mix of the export sector has not shown any structural change for the last two decades or so.

Based on the above macroeconomic indicators, one can say that the performance of the Ethiopian economy has been disappointing in the past three decades or so. The formulation of development policies and subsequent design of strategies have traditionally been based on

key macro variables, such as GDP, inflation, and the like. However, such aggregates conceal changes that might have occurred in different sectors since different sectors do respond differently to any policy package. In order to capture the degree of intersectoral relationships and income distribution, the need for economy wide framework is vital. The premise is that it is difficult to design policies and strategies without having a coherent and consistent information system (Alarcon, 1999). Thus, a well-informed policy-making calls for such type of complete database so that development into the forefront can be done via well-articulated strategies, the inclusion of distributional variables during the process of policy formulation with other variables etc. This, therefore, underscore the need for social accounting matrix (SAM) which incorporates the distributional aspect of the economic system. Such a general equilibrium data framework is used for the construction of various types of policy models right from fixed-coefficient models to a more complex computable general equilibrium models. Thus, our intention is towards the former end.

CHAPTER TWO

II. Survey of Literature

In this section an attempt to review both theoretical as well as empirical literatures will be made. The first subsection discusses the theoretical literature and then empirical literature will be followed in the second subsection.

2.1 Theoretical Literature

2.1.1 The National Income Accounting Framework

Although the concept social accounting was coined by J. Hicks in 1942, the origins of it could be traced back to the late 17th century (Stone, 1977). The emergence of nation-state in Europe created the need for a purely descriptive and quantitative presentation of facts relevant for public or government policy. In this regard, G. King estimated the national income of England in 1688. In his account, he distinguished 25 socioeconomic groups, segregating savers from dissavers. According to Stone as quoted in Abrar et al. (1998: 6) the objective of constructing this national income was to evaluate the contribution of various classes of the society to the national wealth. It was half a century later that pierre De Boisguillebert and Marshall estimated the national income of France with the objective of evaluating the then tax system of the country. Following this, Francois Quesnay published his

prominent work, Tableau Economique, in 1758.

The introduction of Tableau Economique by Francois Quesnay further developed the earlier established social accounts. Tableau Economique give a clear picture of the interdependencies that exist in any economic system. Though estimates of individual items of national income and expenditures have shown improvements towards the late 19th century, their treatment in the accounting framework was delayed until the 1930s. To mention some Ludwig in Palestina, Edward Van Cleeff in the Netherlands and Morris Copland in the United States developed systems of national book-keeping (Vandemoortele, 1987).

The database for macroeconomic policy formulation and planning are deep-rooted in national income aggregates which have been compiled in accordance with the guidelines of United Nations System of National Accounts (UNSNA)[5]. Based on the SNA recommendations, the national accounts attempt to provide an estimate of the output of all the economic units operating in an economy. Conventionally, there are three approaches of compiling the national income aggregates of a country (Arkadie et. al., 1969). These are the production or value-added, the income, and the expenditure approaches. These methods are equivalent, each being a different way of looking at the same total. In other words, total valued added is equal to aggregate expenditure and total income that is, gross domestic product = total expenditure=total income. This equality will provide a check on each other, that is, to

[5] For details of the evolution of SNA, see R. Stone (1977), UNSO (1968).

maintain consistency.

The purpose of compiling national income accounts, among other things, is to assess the behavior of macroeconomic aggregates. In other words, the behavior of national income accounts has been increasingly used as a measure of economic performance. These aggregates have become the basis for measuring levels of welfare in a country. Although national accounts are still the most important part of policy instruments in many countries, they suffer a lot of shortcomings. One of the problems of using aggregate figures is that they mask a diversity of changes that occur in an economy. Hence, such aggregates are found to be inappropriate for detailed analysis of policies. For instance, in the compiled national accounts, we find that all households are aggregated into a single account and this leaves no room for issues of income distribution. Thus, neither national income aggregates nor the conventional input-output accounts provide detailed information about the link between institutions, factors of production and production activities. Such interactions are missing in the national accounts. The appropriate tool for capturing the interrelationship between economic units is social accounting matrix.

Giving due emphasis on the socioeconomic dimensions of growth, data needs for development planning are indispensable. It is partly to satisfy this immense data appetite that the use of Social Accounting Matrix (SAM) has now become popular. Although SAMs came into being in the 1960s, their actual application was delayed until in the 1970s (Vandemoortele, 1987). Their implementation was started in 1952 when the ILO mission went to Colombia, Iran and Sri Lanka led by Seers. It is known that Seers, Thorbecke, and

Pyatt are the actual founding fathers of the SAM (ibid.: 5).

The construction and use of SAMs were closely associated with the growing dissatisfaction with the results of growth policies in developing countries. The disappointing outcome of such policies particularly with respect to their distributional impact, shifted the attention to questions concerning the processes and mechanisms by which the production of goods and services, income generation and income distribution relate to each other (Alarcon et al., 1991). Since these issues have direct policy implications, examining them on empirical basis is essential for policy advice. The appropriate tool for such types of analysis is SAMs because they combine successfully indicators of growth, income distribution and poverty into a single consistent accounting framework (ibid.: 3).

The degree to which SAMs can be used for the formulation of development policy depends crucially on the system of classification of accounts adopted and available information. In general, SAMs can be constructed for the purpose of analyzing the situation of an economy at a point in time. The second use of SAMs is for policy formulation. Since SAM is only an accounting framework, it does not describe the underlying technical and behavioral relationships between cells. Generally, SAMs can be used for the construction of two types of macro models, namely fixed-coefficient and computable general equilibrium (CGE) models, which are used for policy formulation. More specifically, the purpose of constructing multisectoral macro models, such as fixed coefficient and CGE models include, among others, to analyze long-term growth, assess the impact of exogenous variables on endogenous variables, choice of development strategy, income distribution, investment allocation, trade

policy, tax policy, and the like (Robinson, 1989). The formulation of SAM-based macro models is influenced significantly by the underlying assumptions. In order to provide background information to the modeling exercise carried in this study, the theoretical specification of SAM-based macro models will be discussed in subsection 2.1.2 below.

2.1.2 Theoretical Specifications of SAM-Based Macroeconomic Models

In this subsection, an attempt will be made to show the specifications of multisectoral SAM-based macro models and how different assumptions affect the formulation of these models.

2.1.2.1 Fixed-Coefficient Models

Before going directly to the theoretical specifications of SAM-based macro models, it is important to briefly examine how input-output tables and the resulting I-O models can be extended to incorporate institutional accounts.

In the literature of multisectoral economic data, input-output (I-O) tables provide pertinent information on inter-industry transactions and they have been the basis for constructing multisectoral I-O models. The essence of these models is that they capture the interrelationships of the production structure emanating from the flow of intermediate goods. In other words, these models are used for investigating the impact of a change in the final demand of a given sector on other sectors of the economy. The original innovator of I-O

models for such kind of purpose is W. Leontief (Sadoulet & Javry, 1995). The main uses of I-O model include, among others, forecasting sectoral production or supply to meet sectoral demands, forecasting primary inputs, identifies key sectors with maximum linkages and the like. The basic assumption of the I-O models is that sectoral production is completely demand- driven. The implication of this is that there is unutilized capacity and underemployment of resources in the economy. In terms of the theoretical approach, I-O models follow the Keynesian formulation whereby output is being driven by demand. However, if the assumption of structural rigidity is introduced in some sectors, then the resulting I-O model is supply constraint, which follows the structuralist formulation. It is important to note that the magnitude of input-output multipliers under the two assumptions are different implying that difference in assumptions influences model specification.

Although the input-output accounting framework can be used for analyzing a number of policy issues, it lacks an important part of development policy, that is, the distribution of income among economic units. That is, it does not show factoral income distribution and hence it misses the important relationship between production activities, factors of production, and institutions. If institutional accounts, that is, income and expenditure of households, firms, government and other socioeconomic units are included in the input-output table, then the complete circular flow income an be obtained. This extended input-output data framework is termed as the social accounting matrix (SAM). Because SAM contains both social as well as economic information, it provides a conceptual basis to assess growth and distributional issues in a single analytical framework (Chowdhury & Kirkpatrick,

1994: 58). The beauty of SAM is that it brings the different economic actors together whose behavior is to be modeled in a consistent framework.

The social accounting matrix is more than a general equilibrium data framework. It is the basis for the formulation of different macro models, such as fixed-coefficient models, CGE models and the like which are used for economic policy analysis and policy simulation exercises.

If a linear function is assumed between cell entries, which directly reflect their functional relationships, then the SAM can be considered as a fixed-coefficient model. These models are based on a SAM and assume linear behavioral and technical relationships. Conceiving the SAM as the simplest linear model requires certain variables to be set exogenously, which makes the outcome of the system entirely depend on the choice of the value of those exogenous variables. The distinction between endogenous and exogenous accounts corresponds to that of endogenous and exogenous variables. According to Kouwenaar (1991: 228)," those accounts for which expenditure (in the column) depends on the revenues (in the row) of the same accounts are endogenous. Taking fixed proportions between cells and column totals, the endogenous variables (the column totals of the endogenous accounts) can be solved as linear functions of the exogenous variables (column totals of the exogenous accounts)".

Moreover, in the literature of fixed-coefficient modeling, the criteria for classifying accounts

as endogenous versus exogenous include the following. First, those accounts, which can be used as policy instruments, such as the government accounts, are usually treated as exogenous. Second, those accounts, which do not exert effects on other accounts, should be made exogenous (e.g. combined capital account in the short-run). Third, those accounts, which are beyond the control of the domestic economy, should be made exogenous (e.g. the rest of the economy). The exogeneity of the external environment is strictly valid if the domestic country is small in relation to the external environment (Alarcon, 1999).

Linear models with accounting multipliers (the inverse of fixed proportions between cells and column sums) and fixed- price models can be considered as simple cases of a general equilibrium model. As indicated above, the essence of linear fixed-coefficient models are to capture linkages in a general framework that allows the computation of both direct and indirect effects of any exogenous or policy-induced shock.

In this case the whole arrangement of accounts can be thought of as a partitioned matrix as follows.

	Endogenous Accounts (n)	**Sum of Exogenous Accounts (1)**	**Total**
Endogenous Accounts (n)	AX	F	X
Exogenous Accounts (m)	BX		L
Total	X'		

Source: Sadoulet and Javry,1995

where

$X(x_1, x_2,...)$ =denotes the vector of gross income or expenditure of the endogenous accounts,

F, L = the vector sum of expenditures and the column vector of the income of exogenous accounts, respectively,

A =the square matrix of size n×n of the endogenous accounts coefficients, and

B =the rectangular matrix of size m×n of the coefficients with rows as exogenous accounts and columns as endogenous accounts.

According to Pyatt and Round (1979), the income levels of endogenous accounts is given by $x=(I-A)^{-1}$ F and the matrix of multipliers denoted by M is given by $M=(I-A)^{-1}$. This means that the income levels of endogenous accounts are determined as functions of the exogenous demand on other accounts. Similar to I-O models, fixed-coefficient models are demand determined and hence the underlying structure is Keynesian. These models assume idle capacity in the economy and fixed prices and which implies that any increase in demand can be met by higher output, that is, there is no supply constraint in the economy in the short-run. But fixed-coefficient models can also be formulated by introducing the assumption of supply constraint. In this case, the size of SAM multipliers will be different from the SAM multipliers without supply constraint. This is obvious since different assumptions lead to a different model specification.

According to Pyatt and Round (1989), the aggregate multiplier matrix, $M=(I-A)^{-1}$, can be

decomposed into transfer multiplier matrix (M_1), open-loop multiplier matrix (M_2), and closed-loop multiplier matrix (M_3). Pursuant to this formulation, the total multiplier matrix, M, can be expressed as the product of the three multiplier matrices, that is, $M= M_3 M_2 M_1$. The transfer multiplier matrix captures the effects of transfers within the economy, such as transfers between institutions, transfers between activities, which is commonly known as input-output module. This sub-matrix is also known as "own direct effects". The open-loop multiplier matrix captures the interactions that take place among endogenous accounts and it is also known as cross-effects. It measures the impact of an exogenous injection into one account on other accounts but without returning to its point of origin. Finally, the closed-loop multiplier matrix measures higher order effects of an exogenous injection into an account on that account itself after having completed its tour in the economy before bringing second round effects. This sub-matrix is also known as own indirect or circular multiplier effects since it captures the full circular effect of the an exogenous injection into an account after completing its tour in the economy.

As proposed by Stone (1985), the total multiplier effects can also be expressed in terms of additive components as: M= I+T+O+C, where I, T, O, and C refer to initial injection, net transfer effects, open-loop effects, and closed-loop effects, respectively. It has been shown that the additive and multiplicative components can be related as $M= I+T+O+C= M_3 M_2 M_1$. In this case, (M1-I), (M2-I) M1, and (M3-I) M2 M1 give net transfer effect, open-loop effect, and closed-loop effect, respectively.

Apart from aggregate multiplier matrix, there is also leakage multiplier matrix. This multiplier matrix shows leakage, such as savings, taxes, and the likes are affected by exogenous injections into endogenous accounts. This multiplier matrix can measure any changes that take place in exogenous accounts as a result of injections into endogenous accounts.

The limitations of fixed-coefficient models emanate from their restrictive assumptions, such as constant prices, linearity, fixed-coefficients and the like. Moreover, fixed-coefficient models don not take the role of time into consideration, that is, they are static. Apart from these drawbacks, fixed-coefficient models are powerful in examining the interactions of the various sectors of the economy as well as policy-induced shocks.

The shortcomings of fixed-coefficient models can be improved by constructing computable general equilibrium (CGE) models. The basic theoretical underpinning of CGE models is the neoclassical general equilibrium theory in which markets are self-regulating and adjust themselves to equilibrium. A CGE model, which is an economy-wide framework, depicts the interactions of various economic units or actors across markets. First, it works by specifying the different economic agents, such as households, companies, government and the like. Second, the motivation and behavior of agents such as profit maximization for firms, utility maximization for households and reducing market distortions in the case of government have to be clearly specified. Third, the institutional structure comprising the nature of market interactions as competitive or otherwise in the case of product and factor markets and the

corresponding power structure determining prices and the activity level in each market. Finally, the equilibrium values of all endogenous variables have to be solved. In general, working with CGE models calls for a full-fledged specification of both demand and supply aspects of all the relevant markets (Robinson, 1989). Since CGE models integrate the behavior of economic agents by imposing constraints on the functions of the economy, such as markets clear either via prices or quantity. In such models, demand and supply determine prices and quantities in the system. This implies that in CGE modeling, a complete and consistent data set (SAM) is required where the parameter values of most parameters can be obtained. This enables the model to exactly reproduce the constructed data set as a base solution to the model. In these models, equilibrium is maintained either via relative prices due to neoclassical assumption, or quantity adjustment as in the case of structuralist formulation. In these specifications too, the type of model to be formulated crucially depends on the underlying assumptions.

So far the theoretical basis of SAM-based macroeconomic models and their specifications have been outlined. In the following subsection, an attempt will be made to present empirical literature.

2.2 Empirical Literature

2.2.1 General

In this section, a review of compiled SAMs for different countries and their cross-country differences will be made since they are the basis for constructing SAM-based fixed coefficient models.

A large number of SAMs have been compiled for both developed and developing countries. Since the construction and use of SAM is country specific, the modular composition of it is flexible, allowing any disaggregation. For instance, a number of SAMs do not include separate commodity accounts while others do not include accounts for factors of production. Only a few SAMs have detailed capital accounts (Heemst, 1991:9).

To mention some country case studies, the 1976 SAM for Kenya has seven accounts which did not contain commodity accounts (Heemst, 1991). The 1989 SAM for Sudan has six accounts including commodity accounts (Mahran, 1997). Similarly, the 1975 SAM for Greece and the 1980 SAM for Ecuador each has only five accounts (Skoutzos, 1990; Sadoulet and Janvry, 1995). To see inter-country differences in the classification of each account, the following table depicts clearly the degree of disaggregation of major accounts.

Table 2.1: Categorization of different country SAMs

Country	Year of reference	Factors of Production	Institutions	Production activities	Commodities	Total
Iran	1970	-	4	12	-	16
Malaysia	1970	13	11	30	59	113
Sri Lanka	1970	57	23	48	-	128
Swaziland	1971/72	9	10	26	44	89
Philippines	1972	3	5	12	-	20
Botswana	1974/75	8	13	15	-	36
Ecuador	1975	13	16	48	45	122
Egypt	1976	-	9	26	-	35
Kenya	1976	7	14	26	-	37
Fiji	1977	8	51	38	54	
Indonesia	1980	23	12	22	44	101
Pakistan	1983/84	2	9	21	14	46
Morocco	1980	5	10	11	-	26
Madagascar	1984	-	10	15	12	37
Ethiopia	1987	4	6	25	26	61

Source: Alarcon et al., 1991, Sahn,E. (1996), MOPED (1994).

Table 2.1 depicts that institution and production activities have been distinguished in all sample SAMs though there are variations in the degree of detail. Institutional disaggregation, for example, ranks from 4 groups in the case of Iran to 51 as in the case of Fiji. Similarly, the classification of production activities ranges from 11 in the case of Morocco, 12 in the case of Egypt and Iran, to 48 in the case of Sri Lanka and Ecuador. By the same analogy, the production factors account also shows differences in the degree of disaggregation varying from two to fifty-seven.

Seven of the above listed SAMs do not contain separate accounts dealing with commodities. This might be explained by lack of data on the supply of commodities from the production activities and imports on the other hand, and on the use of commodities by institutional sectors on the other. The reason for incorporating factor accounts in the SAM is to show

clearly how the value added generated in various activities is distributed over the factors of production and subsequently how factorial incomes are distributed over institutions.

With regard to the criteria for disaggregating the sub-category, such as labor, occupation and skill, and location are the most frequently used criteria. The occupation and skill related disaggregation are initiated by the consideration that the various kinds of activities as well as the level of technologies applied in each, require different types of labor. Moreover, different households provide different kinds of labor. As such, this kind of information on the link between income generating groups, production activities and income distributed over households via different types of labor is essential to analyze this interrelationship. With regard to location-based disaggregation, Heemst (1991:21) points out that "... does justice the spatial dimensions of economic activities and policies, among other things, it facilitates the analysis of the impact of economic activities in, or policies geared towards one location (e.g. rural ones) on the factor incomes in another location (e.g. urban ones)."

As far as the classification of institutions is concerned, three types of institutions can be identified that operate in any economy, namely, households, enterprises and government. In most SAMs, households constitute the largest of all. Households can be further disaggregated according to urban-rural location. The rationale for a locational dimension is to reflect a fundamental dichotomy, which is closely related to the concept of duality. In effect policies normally have a locational element affecting different locations differently. The other criterion is economic disaggregation, i.e. it captures the dissimilarities between households,

among other things, with respect to the ownership of factors determining earning capacity, such as capital, land, and different types of labor, explaining in turn the income differentials between households.

The disaggregating of enterprises or firms is based on the public-private criterion and the central versus local criterion is used for categorizing government (Alarcon et al., 1991).

So far we have seen the degree of disaggregation of accounts in a SAM for different countries. There are significant variations in the classification as well as disaggregation of accounts of the sample SAMs. This variation mainly emanates from differences in objective and availability of information.

Therefore, the most important lessons to be drawn from these SAMs are the following. First, the construction of SAM is flexible allowing for any disaggregation of sectors. Hence flexibility is one of the beauty of SAM, dictated by the concrete realities of a country and the problem at hand. Second, the size of any SAM crucially depends, among other things, on the purpose and more importantly on the availability of data.

2.2.2 Fixed-Coefficient Models

As indicated in section 2.1.2.3, social accounting matrix (SAM) is the basis for the formulation of macro models, such as fixed-coefficient models and CGE which are used for economic policy analysis, and policy simulation exercises. Accordingly, SAM-based fixed

coefficient models have been developed for a number of countries.

SAM-based fixed coefficient models have been applied to different countries to analyze different policy measures and/or exogenous shocks. Since the purpose of this study is to develop linear SAM multiplier models, the empirical survey will be limited only to these types of models.

Pyatt and Round (1972) built a SAM multiplier model for Iran to evaluate the situations that prevailed the plan period covering 1972-1977. The accounts of production activities which are broken down into 12 sectors and institutions which again are divided into three types of households, namely rural, urban poor, and urban rich. The remaining accounts, that is, government, capital, and the rest of the world accounts are exogenous. The simultaneous determination of sectoral output vector and household income groups vector is the special feature of this model. The interesting part of this model is that there is no account for factors of production and that value added is directly paid to households rather than paid via production factors.

Thorbeck-Sengupta (1972) built a model for Colombia, which is based on an implicit SAM to analyze the effects of technological-induced agriculture change on employment and income distribution. The SAM, in which the model is based, consists of 12 production activities, two factors of production, namely labor and non-labor, 14 households, government, capital, and the rest of the world accounts. This model has two parts. First, a

quantitative description of both the macroeconomic and sectoral structure of the Colombian economy during the period 1950 to 1967 was made. This part has two steps. Building a macroeconomic model of Colombia covering the period 1950 -1967 consisted the first step. After having constructed the model, the paths of endogenous variables, such as gross domestic product, total consumption, investment, and imports can be determined as functions of exogenous variables, such as exports, changes in terms of trade, and public expenditures. In the second step, generation of input-output and employment information has been made which is used to derive sectoral income distribution. In the second part, projections of both macroeconomic as well as sectoral variables to 1980 have been made. In this part, the sectoral gross output and value added vectors have been projected to the 1980s. The determination of personal income distribution and not explicitly based on the SAM are the special features of this model.

Skourtzos (1990) constructed a fixed coefficient model for Greece to establish a quantitative relationship between production activities which are disaggregated into 35 activities, production factors which consist of 5 types of labor and 3 categories of capital, and 7 types of institutions, namely incorporated companies, urban households, semi-urban households, rural households, government, and the rest of the world. There is also a separate combined capital account in the model. This model treats the government, capital, and the foreign sector accounts as exogenous and the remaining accounts are endogenous. This model, by partitioning the 1975 SAM of Greece into endogenous and exogenous, measures the effects of the latter on the former by multiplier decomposition analysis. In the SAM, in which the

model is based, the industrial sector has been highly disaggregated while the agricultural sector has been treated as a single sector. The service sector has been fairly disaggregated. Despite this, the model is important in spelling out issues of growth, employment, income distribution, and the like.

Keuning and Thorbecke (1992) built a fixed coefficient model for Indonesia with the objective of evaluating the impact of structural adjustment policies on employment, poverty, and rural development based on the 1980 SAM. This SAM has been partitioned into 70 endogenous and 5 exogenous accounts yielding the total of 75 accounts. The endogenous accounts identified in the SAM include factors of production which consist of 16 labor types and 7 categories of capital, institutions which comprise 8 socioeconomic households and companies, government expenditures which include 4 programs of current expenditures (expenditures on education and health, other wages and salaries, other goods and services, and household transfers) and 9 investment programs (covering agriculture, industry, mining, energy, transport and tourism, education, health, housing and water works, general services, and other activities, production activities-cum-commodities which are disaggregated into 24 categories including 4 public works, namely agriculture, transportation, utilities and communication, and other activities, and indirect taxes. The exogenous accounts are subsidies, private capital, total government current expenditures, total government capital expenditures, and the rest of the world.

The impact of the exogenous shocks gets transmitted through the interdependent SAM

system and their total, direct, and indirect effects on the endogenous accounts has been estimated through the multiplier process. This model is very interesting in evaluating the effects of government budget reduction on the socioeconomic household classes in particular and on the economy at large.

Dorosh and Haggblade (1993) built a semi-input output model, which is a type of SAM-based fixed coefficient model, to compare the growth generating power of alternative agricultural development strategies in Madagascar. The special feature of this model is that it uses the semi-input output (SIO) rather than the usual input output module. The SAM, in which this model is based, includes 12 commodity accounts, 15 activities, 6 household groups, one non-government institutions, government, capital, and the rest of the world accounts. Moreover, the model distinguishes commodities as tradable, non-tradable, elastic supply, and fixed supply. In this regard, it is assumed that most internationally traded goods denoted by Z_1, such as coffee, and given their world prices, their supply is fixed and the assumption of elastic supply is employed for the non-traded goods designated as Z_2 . In other words, supply responses in non-traded goods is assumed to be perfectly elastic. In these sectors, an increase in demand leads to higher income. This is indeed a different approach utilizing the semi-input-output table built in the social accounting matrix. By doing so, the fixed coefficient model is used to assess the impact of different policies on the economy.

Kone and Thorbecke (1996) have used fixed-coefficient model to analyze the direct and indirect effects of structural reforms and macroeconomic policies on growth and poverty in

Zaire. In this study, they derive two types of multipliers for the Zairian economy. First, under the assumption of idle capacity in the economy, they compute the unconstraint multiplier matrix, that is, any exogenous increase in demand is met by output expansion. Second, under the assumption of supply constraint in the economy, they derive the constraint multiplier matrix, that is, exogenous demand increase is limited by supply. Based on the policy simulation exercises, they found that there is a strong linkage between economic growth and poverty alleviation.

Pradhan and Sahoo (1996) constructed SAM-multipliers for India. This SAM contains 10 activities, two production factors, one urban and six rural groups. The household sector has been disaggregated based on the occupation criterion. Both the SAM multiplier and its direct, indirect, cross effects have been computed for the Indian economy. The interesting feature of this model is that the magnitudes of direct and the total input-output multipliers coincide.

Hassan and Fareed (1994) built a fixed coefficient model for Sudan to analyze the effects of structural adjustment policies on growth and income distribution. The SAM multipliers indicate that modern irrigated agriculture, large capital-intensive and highly import-dependent industries have the weakest linkages in the economy and the smallest impact on household income. However, traditional agriculture including livestock and forestry have, according to this study, the strongest linkages and have the largest impact on household income.

In recent years, the application of SAM at the regional level, hence they are called regional SAMs[6], has become the most powerful tools in analyzing economic linkages of a particular district or village (Sadoulet & Javnry, 1995). Village or district levels SAMs are powerful tools to investigate the size and magnitude of resource flows and to evaluate different government policy and/ or exogenous shocks in a particular village.

Lewis and Thorbecke (1992) constructed a fixed coefficient model for a small Keynian village called Kurtus based on the regional social accounting matrix (RSAM). The objective of the study is to explore the impact of production activities on regional value added and employment, examine the effects of sectoral production on the size of household income and expenditure, and to identify the relative strength of production and consumption linkages in stimulating aggregate income. The regional SAM consists of 4 factors of production, 5 household classes, companies and government have one account each, 3 capital accounts, 3 accounts for rest of the world, and 12 activities. It has been assumed that the government, capital, and the rest of the world accounts are exogenous whereas the rest are endogenous accounts. The accounts for the rest of the world capture any transactions that take place outside the Kutus region. The study is interesting in analyzing different policy issues under the assumptions of both idle capacity in the economy and supply constraint in some sectors, such as traditional agriculture.

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[6] Discussion of regional applications of SAMs can be found in part I chapter 4 of Pyatt and Round 1985).

Adelman et al (1987) built a SAM multiplier model based on a village SAM with the objective of analyzing the economic structure of a migrant-sending rural economy in Central Mexico. The village matrix multiplier and its decompositions have been derived and utilized in policy experiments on the production, value added, income, and investment flows of the village in question. The results reveal the central role of both internal and international migration in the village economy and the importance of targeting anti-poverty policies toward the ladles.

The common concern in all these models is to make output and income distribution endogenous within a multisectoral framework. In doing so, the availability of up to date SAM is important for the construction of internally consistent and interdependent models so as to evaluate different policy measures in an economy. The advantage of the model based on the general data framework is that the SAM data system provides the base-year information and permitted the calibration of all linear coefficients appearing in the model. Due to this advantage, it is important from the beginning to build a model explicitly on the underlying SAM. These are the lessons to be drawn from the above empirical surveys.

2.2.3 A cursory review of macroeconomic models in Ethiopia

Most of the macroeconomic models, few in number, developed for Ethiopia are not based on consistent data set. Investigating the modeling situation of Ethiopia shows that some attempts have been made to construct macroeconomic models based on time series data (Asmerom et.

al., 1985; Berhanu, 1994; Lemma, 1993; MOPED, 1995; MEDaC, 1996). The main focus of these models is on key macroeconomic variables and intersectoral interactions as well as issues of income distributions are left untouched. These macro variables hide important changes that take place in the economy, that is, they do not show the macro-micro effects of policy measures and/ or exogenous shocks.

The most interesting SAM-multiplier model applied to the three Ethiopian villages is that of Taye (1991). He constructed social accounting matrices for the three villages separately to analyze the impact of government policies on the cooperative transaction flows. The finding in these villages shows that the then government policies, following the 1975 land reform, had a negative impact on the economic activities of the sampled villages. According to this study, the then marketing strategy acted as a means of affecting these villages negatively in favor of short-term urban interests. The SAMs of the three villages do not contain factors of production and the distinction between the rest of Ethiopia and the rest of the world are absent. Moreover, the author failed to decompose the village accounting multiplier into separate effects, that is, transfer, open loop, and closed-loop effects. Apart from these setbacks, such type of fixed-coefficient model is the only type of its kind in Ethiopia to date. The present study is different from the previous one in terms of sectoral disaggregation and its coverage. Hence, this study encompasses the previous village level study and it can light on the structure of the economy at large.

The other SAM-based macroeconomic model is that of computable general equilibrium

(CGE) model constructed for the Grain Marketing Policy modeling to analyze issues of food security including grain pricing, storage, famine early warning and identification of food aid requirements in the country. This model was developed by the then ONNCP (now renamed as MEDaC) experts in collaboration with the Food Studies Group of the University of Oxford (MOPED, 1994). This is a general equilibrium model, which emphasize the operation of the markets for the main cereal commodities. In this model, the agricultural sector particularly the crop subsector has been fairly disaggregated while the rest of the economy was treated as a single sector. Moreover, no attempt was made to distinguish commodities between traded and non-traded. Despite this, it is a good starting point for developing a full-fledged CGE model with its consistent database.

The most recent CGE model is that of a one country with two sectors and three commodities usually known as a "1-2-3 model" developed by World Bank (1998) to assess economy-wide effects of policy reforms, particularly fiscal sustainability of government expenditures and the growth of same over the medium-term with respect to anticipated resources in the country. One of the limitations of this model is that it is highly aggregative and does not show detailed structure of the economy.

Having reviewed both theoretical and empirical literature of SAM-based macroeconomic models, specifically fixed-coefficient models, an attempt will be made to present, based on the above literature survey, the method of analysis of this study. This is the subject which is treated in the following chapter.

CHAPTER THREE

III. METHOD OF ANALYSIS

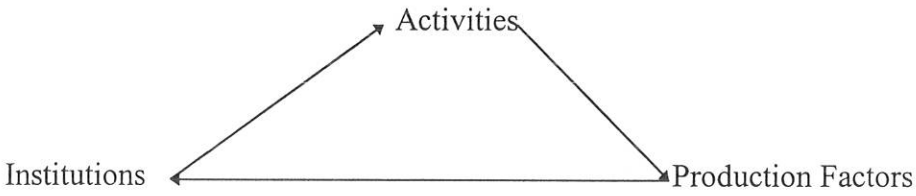
In chapter one, the stylized facts of the Ethiopian economy have been outlined. As indicated, the predominantly agrarian character of the Ethiopian economy has not shown any significant structural change in the past two decades or so. In this chapter, an attempt will be made to capture the interaction of the various sectors in a consistent accounting framework called the social accounting matrix (SAM). The resulting SAM will be used to construct a fixed coefficient model to measure the effects of macroeconomic policies and/or exogenous shocks.

3.1 CHARACTERIZATION OF THE THEORETICAL SAM

To begin with, social accounting matrix is a data system that is consistent and complete on transactions among sectors and institutions. It is consistent because for every receipt there is a corresponding outlay and complete since both the receiver and the sender of each and every transaction is clearly identified (Sadoulet & Javry, 1995). Hence, SAM is a socioeconomic information system, which describes all transactions that occur in an economy at a point in time. As summarized in Vandemoortele (1987) SAM consists of three words. The word social refers to different socioeconomic groups and treated separately in the database. The word accounting means that all transactions are expressed in monetary values and accounts.

Finally, matrix refers to these socioeconomic groups and the monetary values of transactions that are represented and arranged in rows and columns. The rows of the SAM record incomings while the columns of the same record the outgoings or expenditures. Hence, the intersection of the rows and columns has a dual meaning, that is, receipts for one account and expenditure for another. It is an accounting necessity that receipts and expenditures must balance and this ensures the consistency of the system.

SAM depicts the interconnections that exist among production activities, production factors, and institutions. Such interrelationships can be presented diagrammatically as follows.



The arrow shows the direction of influence. As indicated in the diagram, production activities require factors of production, such as labor, capital, and land in order to produce goods and services. Production factors obtain income from the service they rendered and the income so obtained is channeled to institutions according to their factor endowments. Institutions allocate their income to final consumption of goods and services, transfers, and savings. Production activities by selling their outputs to other sectors (intermediate consumption), institutions, or export to the external sector obtain income. On the other hand, these sectors pay for the factors of production for their factor services and circular flow is closed.

The suggested theoretical SAM consists of the following blocks. These are: (1) Inter-activity demand (2) Consumption demand by institutions (3) Gross capital formation (4) Exports of goods (5) GDP at factor cost (6) Factor income received from the rest of the world (7) Indirect taxes (8) GNP at factor cost (9) Income taxes & institutional transfers (10) Current non-factor transfers from the rest of the world (11) External account balance (12) Imports of goods from the rest of the world (13) Factor payments made to the rest of the world (14) Current non-factor payments to the rest of the world.

In terms of the matrix format, such interconnections can be presented as follows.

Table : 3.1 The basic schematic structure of SAM

	Factors of production 1	Institutions 2	Production activities 3	Capital account 4	Rest of the world 5	Total 7
Factors of production (1)			Value-added payment to factors (1,3)			Total factor income
Institutions (2)	Distribution of factor income (2,1)	Subsidies, taxes &Inter-institutional income transfers (2,2)	Indirect taxes, Export and import taxes (2,3)		Income transfers (2,5)	Gross National Disposable income
Production activities (3)		Consumption demand (3, 2)	Inter-activity demand (3,3)	Gross capital formation (3,4)	Exports (3,5)	Gross output
Capital account (4)		Savings by institutions (4,2)			Balance of payments deficit/ surplus (4,5)	Aggregate savings
Rest of the world (5)		Transfer income (5,2)	Imports (5,3)			Total foreign exchange outflow
Total (7)	Total factor outlay	Total current expenditure & savings	Gross demand	Gross investment	Total foreign exchange inflow	

Table 3.1 consists of five different accounts. Following the usual convention, the row and column record the receipts and expenditures, respectively. The description of each account with respect to the circular flow of income is as follows.

3.1.1 THE ACCOUNT OF FACTORS OF PRODUCTION

The first row and first column of the SAM represent this account. The row of this account depicts factor income that is paid by production activities. The total of this row shows aggregate factor income received or earned. The column of this account, on the other hand, shows how incomes obtained from activities and the rest of the world are distributed to institutions. The column total shows the total factor payments in the economy.

3.1.2 INSTITUTIONS' ACCOUNT

The second row and second column of the SAM represent the account of institutions. The receipts of this account include factor income (2,1), subsidies, inter-institutional transfers, and income taxes (2,2), indirect taxes on goods and services, export and import duties paid by the production activities to the government (2,3), and transfer income received from the rest of the world (2,5). The row total gives total income of institutions. The way institutions spend their receipts can be read in the column of the same account. The outlays of this account include subsidies to production activities made by the government, transfer payments made other accounts (2,2), final consumption expenditure on domestic goods as well as on

imported goods and services (3,2), income taxes (2,2), and transfer payments made to the rest of the world (5,2). The remaining income is saved (4,2). The column total yields the aggregate expenditure and savings of institutions.

3.1.3 THE PRODUCTION ACTIVITIES ACCOUNT

The third row and third column of the SAM denote the account of production activities. The row of this account shows the income received from the sale of output to other sectors, that is, input-output module (3,3), sales of consumption goods to institutions (3, 2), sale for investment goods to the capital account (3,4), and exports to the external sector (3,5). The row total gives the gross output in the economy. Along the column, we find the cost structure of this account. These costs include payment for the purchase of intermediate inputs, indirect taxes on goods and services to the government, payment for factors of production, and costs for imported consumer goods. The total of the column gives the total supply in the economy.

3.1.4 THE CAPITAL ACCOUNT

This account records savings by different institutions including rest of the world and investment expenditures by various sectors. The fifth row and fifth column of the SAM represent this account. The sources of income include savings by various institutions (4,2) and foreign savings (4,5) while the outlays of this account are payment for both domestically and imported investment goods (3,4). The expenditure of this account means that the

different institutions pay for their demand for investment goods from their savings in the capital account. Instead of making this payment directly, the capital account pays on their behalf. The row and column totals yield gross national saving supply and aggregate investment in the economy, respectively.

3.1.5 THE REST OF THE WORLD ACCOUNT

The sixth row and sixth column of the SAM represents the rest of the world account. The receipts of this account include factor income received from abroad, income from exports of goods and services, and transfer income received from institutions. The row total shows the total foreign exchange outflow. The expenditure of this account include payment for the exports of goods and services (5,3), transfer payment to institutions (5,2), payment for factors (5,1), and the rest is saved (5,4). The column sum shows the total foreign exchange inflow in the economy.

Having described the modular composition of the basic schematic structure of SAM, it is important to briefly describe the 1987 SAM and how it can be adapted to our purpose.

3.2 AN OVERVIEW OF THE 1987 SAM

The 1987 SAM has been prepared for the computable general equilibrium modeling exercise for grain marketing policy design. It is the outcome of a group of Ethiopian experts and Food

Studies Group of the University of Oxford. The size of this SAM is a 61 by 61 matrix and contains 25 production activities, 26 commodities, 4 factors of production, namely labor, capital, Peasant farmland, and State farmland, and 6 institutions, namely rural households, urban households, government, stocks, tax, and the rest of the world. The value of land has been calculated as the rental price of land.

In the SAM, the three cereals, namely teff, wheat, and maize constitute about 13.2% of total GDP and the remaining agricultural activities named as "other agriculture" comprise about 25% of total GDP. The other activities, namely industry and services constitute about 41.5% of the national GDP and trading activities account for 20.3% of the same.

It has been shown in this SAM that about 53%, 5.7%, and 23% of the gross value outputs of Peasant farm teff, wheat, and maize accrue to Peasant farmland, capital, and labor, respectively. Similarly, about 16%, 32%, and 9% of the gross value output of State farm wheat accrue to state farmland, capital, and labor, respectively. With regard to state farm maize, the SAM shows that 28%, 13%, and 23% of the gross value of maize accrue to state farmland, capital, and labor, respectively.

The income generation module shows that 43%, 10.3%, and 38% of the total rural households income constitute the return to Peasant farmland, capital, and labor respectively. A small magnitude (about 0.05%) of the entire rural household income has come from transfers from the government. Urban households derive about 1.4%, 31.5%, and 44% of

their total income from State farmland, capital, and labor according to their order. They also receive transfers from government and rest of the world, which constitute about 6% and 7% of the total urban households income, respectively. In both household types, transfers between rural and urban households have been excluded. This is not a realistic assumption since there are at least urban to rural transfers.

Government income includes both direct and indirect tax revenues and transfers. Reading the SAM shows that 52.4% and 10.7% of the total government income comprise tax and transfers from the rest of the world according to their order.

In this SAM, although the cereal sub-sector of the agricultural activities is fairly disaggregated, the nonagricultural sectors of the economy are crudely treated as a single sector. This implies that the industrial and service sectors should be disaggregated so as to capture the stylized features of the Ethiopian economy.

For the present purpose, the 1987 SAM will be used with some modifications and re-arrangements. One of the arrangements is to treat the commodity account within the activities account. In doing so, the following procedures have been employed. First, with regard to activities, rows and columns are to be aggregated. Second, intersecting sub-matrix, with the exception of the input-output module, has to be set equal to zero in order to eliminate transfers within the consolidated account. Third, the agricultural sector is further disaggregated to include export items explicitly (Coffee and other agricultural exports).

Fourth, the industrial sector has been broken down into six sub-sectors depending on their contribution to gross value of industrial out put. Fifth, the service sector has also been divided into three sub-sectors. Sixth, the accounts of production factors have been collapsed into two categories, labor and capital. Seventh, the classification of households is maintained. Eighth, the stocks account has been replaced by the capital account. Ninth, the tax account has been merged with the government account and hence no separate taxes account. The design of the current social accounting matrix includes the following categories.

I. Production activities
1. Teff
2. Wheat
3. Maize
4. Coffee
5. Other agricultural exports
6. Other agriculture
7. Food
8. Beverages
9. Textiles
10. Non-metals
11. Metals
12. Other industry
13. National Bank
14. Other financial services
15. Other services

II. Factors of Production
16. Labor
17. Capital

III. Institutions
18. Rural households
19. Urban households
20. Government

21. Capital account
22. Rest of the world

3.3 THE CURRENT SOCIAL ACCOUNTING MATRIX

So far an attempt has been made to outline the basic schematic structure of social accounting matrix and highlight the main features of the 1987 SAM. As indicated above, social accounting matrix is the matrix presentation of economic activities, agents, and the like in an economy at a point in time. This typical feature can be depicted in the Ethiopian SAM as follows. Note also that the empirical SAM is arranged in essentially the same way as the schematic structure set out earlier. The current SAM is essentially the updated version of the

1987 SAM. However, the present SAM is highly based on the current available data sets. The disaggregation of sectors is limited by the availability of detailed information at sectoral level. The main data sources include: National Income Account Statistics, Household Income, Consumption, and Expenditure Survey (1995/96), Industrial Establishment Surveys (1997), Welfare Monitoring Surveys (1999), Government Revenue and Expenditure Accounts (1995/96), Distributive Services Surveys, Survey of the Ethiopian economy (1999), and other relevant data sources.

Whenever there is shortage of information, some cells are filled from the earlier SAM. This can be done on the basis of the proportionality assumption, which states that the input into each sector is a linear function of the level of its output. In other words, the amount of each input demanded by any sector varies in direct proportion to that sector's total output. The basic assumptions employed in updating the 1987 SAM include the following:

Information on households can be obtained from the 1995/96 Household Income, Consumption, and Expenditure Survey. This survey contains detailed information about income and/ or receipts, consumption and non-consumption expenditures on different items, and savings for both rural as well as urban households.

It is assumed that all rural households remittance payments are to urban households only. Similarly, all urban households remittance payments are to rural households and abroad only.

Unrequited current transfers from the rest of the world have been assumed to accrue entirely to urban households and government. Such type of transfers to rural households has been assumed to be negligible. Moreover, it is assumed that urban households and government can make transfers to the rest of the world.

With regard to the factors of production, two main categories have been identified, namely labor and capital. The contribution of each to the industrial production is available in survey data. The difficult part is to estimate the contribution of these factors in the value of agricultural production. According to the ONNCP study (cited in MEDaC, 1998) on labor days per hectare and the contribution of non-labor inputs for different crops, the return to labor has been estimated to be about 60% of the gross value of agricultural production. After having accounted for cost of intermediate inputs, the return to capital has been estimated as residual. Further, it is assumed that all agricultural income accrues to rural households only and all industrial and service income accrue to urban households only.

In order to calculate the amount of traditional seeds used by each activity especially in the agricultural sector, we resort to the application rate in each activity. The application rate shows the quantity of each seed required per hectare. This is consistent with the national account method. For the three cereal components, for example, the application rate for teff, wheat, and maize are 27.5, 143.8, and 28.8 kg per hectare, respectively, for the year 1995/96. This means that the quantity of teff, wheat, and maize used as seed is 27.5, 143.8, and 28.8 kg per hectare, respectively. With regard to improved seeds, data have been available by crop type.

In terms of chemical fertilizer usage, studies have been conducted to estimate the amount of fertilizer consumption by each crop. According to the Agricultural Input Enterprise study (cited in MEDaC, 1999), of the total fertilizer consumed in the country, 40% is used by teff, 50% by wheat, maize, & sorghum, and 10% by coffee, cotton, tobacco.

Gross capital formation for the industrial sector is available in the manufacturing surveys. For the agricultural sectors, fixed capital formation for the three cereal sub-sectors can be found as a proportion of the 1987 coefficients to the total agricultural capital formation. This is so since data on capital formation by sub-sector is not available.

3.3.1 THE CHOICE OF 1995/96 AS THE BASE YEAR

The relative availability of data and the concentration of major survey data basically dictate the choice of 1995/96 as the base year. Traditionally, the base year has been chosen on the basis of stable inflation rate, normal GDP growth rate, and the like. In other words, the base year has to be free from war, drought, economic boom, and the like (Central Statistical Authority, 2000). This is the usual justification for the choice of a base year. In fact, the 1995/96 was the year of high agricultural production and consequently higher GDP growth rate as compared to other years. However, this year is not characterized by extreme economic boom and also it was free from any exogenous shocks, such as war and drought. It is believed that the availability of basic statistical information and purpose of the study should influence the choice of a base year. Moreover, this year has been chosen as the base

year for the country.

3.3.2 INTERPRETATION OF A DISAGGREGATED SAM

The SAM indicated in Table 3.2 represents a disaggregated version of the schematic SAM outlined earlier. It comprises fifteen accounts for activities, two accounts for factors of production, three accounts for institutions, a combined capital account, a tax account, and one account for the rest of the world. This SAM captures the structure of the Ethiopian economy in the reference year. Based on SAM, a review of intersectoral relation, income distribution and consumption pattern, saving-investment relation, and the role of the external sector will be presented.

TABLE 3.2: SOCIAL ACCOUNTING MATRIX FOR ETHIOPIA, 1995/96 (MILLION BIRR)														
		1	2	3	4	5	6	7	8	9	10	11	12	13
Labor	1	0.000	0.000	0.000	0.000	2,012.470	976.710	1,433.940	1,272.260	3,419.920	10,183.030	222.330	171.930	245.520
Capital	2	0.000	0.000	0.000	0.000	1,191.420	385.270	818.970	796.530	2,047.230	4,534.280	265.655	300.550	269.745
Rural HHs	3	19,298.330	9,773.700	0.000	327.240	0.000	0.000	0.000	0.000	0.000	0.000	2.610	0.150	0.610
Urban HHs	4	5,520.700	10,058.094	834.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.390	0.140	0.560
Teff	5	0.000	0.000	2,130.870	1,023.840	91.500	0.000	0.000	0.000	0.000	0.000	4.200	0.000	0.000
Wheat	6	0.000	0.000	546.890	425.470	0.000	205.100	0.000	0.000	0.000	0.000	271.700	0.000	0.000
Maize	7	0.000	0.000	1,194.680	748.030	0.000	0.000	46.700	0.000	0.000	0.000	0.300	0.000	0.000
Coffee	8	0.000	0.000	208.150	152.060	0.000	0.000	0.000	0.840	0.000	0.000	1.500	0.000	0.000
Other agric. exports	9	0.000	0.000	2,793.710	2,656.060	0.000	0.000	0.000	0.000	229.490	0.000	239.130	0.000	0.000
Other agric.	10	0.000	0.000	10,399.690	2,369.010	0.000	0.000	0.000	0.000	0.000	1,968.974	80.030	0.000	124.250
Food processing	11	0.000	0.000	608.060	100.790	0.000	0.000	0.000	0.000	0.000	4.912	137.540	297.040	0.000
Beverages	12	0.000	0.000	1,625.320	530.280	0.000	0.000	0.000	0.000	0.000	0.000	0.000	124.710	0.000
Textiles	13	0.000	0.000	820.440	95.930	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	717.250
Non-Metals	14	0.000	0.000	52.660	20.750	0.000	0.000	0.000	0.000	0.000	1.392	0.000	0.000	0.000
Metals	15	0.000	0.000	1,496.510	1,054.320	0.000	0.000	0.000	0.000	0.000	1.310	0.000	0.000	0.000
Other Industry	16	0.000	0.000	145.230	53.570	4.390	0.620	1.990	0.420	0.730	9.415	34.000	24.250	1.110
National Bank	17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other fin. services	18	0.000	0.000	102.180	114.520	1.440	0.770	1.050	0.860	2.490	12.117	15.970	13.350	16.720
Other services	19	0.000	0.000	4,981.030	5,123.620	0.000	0.000	0.000	0.000	0.000		58.910	69.600	69.630
Government	20	0.000	0.000	309.400	1,444.400	0.000	0.000	0.000	94.400	25.100	0.000	173.280	355.160	203.030
Capital Account	21	0.000	0.000	1,479.900	2,354.470	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rest of the World	22	0.000	0.000	0.000	7.560	52.897	59.383	87.249	49.527	1,000.000	256.284	292.231	1,288.485	328.798
Unidentified items	23	0.000	0.000	(37.040)	(55.400)	(2.130)	0.000	0.000	(85.320)	(15.060)	(0.000)	38.954	(0.014)	0.000
Total		24,819.030	19,831.794	29,692.480	18,546.520	3,351.987	1,627.853	2,389.899	2,129.516	6,709.900	16,971.714	1,840.729	2,645.351	1,977.223

		14	15	16	17	18	19	20	21	22	23	Total
Labor	1	14.700	153.690	165.910	48.040	1,184.830	3,313.750	0.000	0.000	0.000	(0.000)	24,819.030
Capital	2	31.120	109.989	92.314	282.810	1,294.661	7,411.250	0.000	0.000	0.000	0.000	19,831.794
Rural HHs	3	1.070	5.670	5.210	0.000	0.000	0.000	242.540	0.000	0.000	35.350	29,692.480
Urban HHs	4	0.980	5.200	4.780	0.000	0.000	0.000	222.560	0.000	1,974.830	(78.510)	18,546.524
Teff	5	0.000	0.000	0.000	0.000	0.000	0.000	123.540	45.210	0.000	(67.173)	3,351.987
Wheat	6	0.000	0.000	0.000	0.000	0.000	0.000	203.220	20.090	0.000	(44.617)	1,627.853
Maize	7	0.000	0.000	0.000	0.000	0.000	0.000	468.520	26.790	0.000	(95.121)	2,389.899
Coffee	8	0.000	0.000	0.000	0.000	0.000	0.000	41.620	1.200	1,724.000	0.146	2,129.516
Other agric. exports	9	0.000	0.000	0.000	0.000	0.000	0.000	29.740	408.190	315.300	38.280	6,709.900
Other agric.	10	0.000	0.000	234.392	0.000	0.000	0.000	722.030	1,173.050	0.000	(99.712)	16,971.714
Food processing	11	0.000	0.000	460.307	0.000	0.000	76.955	47.190	148.200	12.200	(52.464)	1,851.730
Beverages	12	0.000	0.000	8.193	0.000	0.000	44.818	0.000	296.400	0.000	15.631	2,645.351
Textiles	13	0.000	0.000	51.947	0.160	0.000	73.554	0.000	185.250	3.120	29.572	1,977.223
Non-Metals	14	0.000	0.000	37.743	0.000	0.000	36.382	0.000	197.600	0.000	(35.504)	311.023
Metals	15	0.000	0.000	8.128	0.000	0.000	103.925	0.000	160.550	0.000	79.746	2,904.488
Other Industry	16	44.030	128.130	4,052.562	0.790	10.120	1,236.550	2,026.140	1,858.900	453.180	(7.902)	10,078.225
National Bank	17	0.000	0.000	0.000	0.000	0.000	41.338	297.700	0.000	0.000	(0.372)	338.665
Other fin. services	18	2.790	8.630	1,583.009	0.322	0.000	702.611	0.000	52.970	0.000	(85.808)	2,545.991
Other services	19	40.810	44.200	134.769	6.670	53.140	116.658	958.980	4,601.700	2,347.380	(12.872)	18,594.226
Government	20	33.860	983.810	900.560	0.005	3.240	200.625	0.000	0.000	2,721.540	6.320	7,454.730
Capital Account	21	0.000	0.000	0.000	0.000	0.000	0.000	1,603.300	0.000	3,690.990	47.440	9,176.100
Rest of the World	22	141.660	1,465.169	2,338.425	0.000	0.000	5,326.496	541.840	0.000	0.000	0.006	13,236.010
Unidentified items	23	0.003	0.000	(0.024)	(0.132)	0.000	(90.685)	(27.000)	0.000	(6.530)	0.000	
Total		311.023	2,904.488	10,078.225	338.665	2,545.991	18,594.226	7,454.730	9,176.100	13,236.010	(327.568)	

3.3.2.1 INTERSECTORAL RELATION

Beginning with the production activities, the row and column totals of these sectors shows the contribution of each sector to the gross output of the economy. For this purpose, Table 3.2 will be in service. In terms of sectoral contribution, the six agricultural subsectors together constitute 44.6% of the gross output, while the six manufacturing subsectors and the three services subsectors contribute 26.5% and 28.9% of the gross output, respectively.

Within the agricultural subsectors, the major crop items teff, wheat, and maize account for 10.1%, 4.9%, and 7.2% of the gross value of agricultural output. This can be clearly seen by looking at Table 3. 2. About 2.7%, 0.13%, and 0.04% of the gross value of teff is used for seed, purchase of industrial inputs such as chemicals, pesticides, and payment for other financial services such as credit. The relationship between teff and the external world is through import of chemical fertilizer, which constitutes about 1.6% of the gross value of agricultural output. The major agricultural export item, coffee, accounts for 6.6% of the gross value of agricultural output. Of the total output of coffee, 0.04% is used as seed, 0.02% used for the payment of other industrial inputs, 0.044% is used for payment of other financial services, 4.4% is paid as taxes, and 2.3% is used for payment for imported intermediate inputs. Generally, the agricultural subsectors show a dependency on imports below 15%. Other accounts of the agricultural subsectors can be interpreted in a similar way.

With regard to the industrial subsectors, we find that food, beverages, textiles, and metals

constitute 9.0%, 13.4%, 10.0%, and 15.0% of the gross value industrial output, respectively. Moreover, the above subsectors, according their order, show 16.3%, 48.7%, 16.6%, and 50.5% dependency on foreign sources. It is also revealing to find that food processing depends on wheat (15.2%), other agricultural exports (13.3%), and other services (3.2%). Beverages depend on food processing (11.2%) and other services (2.6%). Textiles depend on local sources as an intermediate input, constituting other agriculture (6.3%) and other services (3.5%).

It is clear from the table that metals pay the highest indirect taxes (33.8%), followed by beverages (13.4%). Note also that indirect taxes are leakages from the production activities.

3.3.2.2 DISTRIBUTION OF INCOME AND OUTLAY

Following is an attempt to examine the major sources of institutional incomes. In the case of labor, the income takes the form of wages and salaries and benefits, while operating surplus in the case of capital. It is assumed that all agricultural income accrues to rural households, while industrial and service income accrues to urban households. It is clear that the sources of rural households income mainly come from wages from agricultural labor and operating surplus from agricultural capital, which is estimated as residual. Of the total rural household income, the highest is derived from labor (77.8%), followed by agricultural capital in the form of operating surplus (22.2%). Transfers from urban households (1.7%) and government (3.4%) augment this income. Note that of the total government transfers to rural households,

about 174.5 million Birr represents fertilizer subsidy in the reference year. The income of urban households consists chiefly of capital (50.7%) and labor (49.3%). As in the case of rural households, transfers from rural households (2.8%), from government (3.1%), and international transfers in the form of current transfers (14.9%) also supplement this income. Government income takes the form of both direct and indirect taxes, current transfers both factor and non-factor income (20.6%). Direct and indirect taxes constitute 24.4% and 41.4% of the total government income, respectively.

A look at the composition of consumption expenditure shows that rural households spend a higher proportion of their income on food (59.04%), while urban households spend 39.4% of their income on the same. This is not inconsistent with the results of the study conducted by the Welfare Monitoring Unit of MEDaC (1999). This study revealed that people in rural areas spend a larger share of their income on food than what people spend in urban areas. In this case, Engel's law seems to hold which states that the share of total consumption spent on food is greater for poor people than the relatively non-poor.

The saving behavior of the three institutions can be analyzed by looking at the intersection of the combined capital account and the accounts of the corresponding institutions. Note that savings of each institution are estimated as residual. The average propensities to save for the three institutions for the year 1995/96 are 0.049, 0.12 and 0.21 for the rural households, urban households and government, respectively. The rural households are the least savers as they lead their life on subsistence agriculture.

Looking at the direct taxes burden between types of households reveals that rural households pay 17.6% of the total direct taxes while urban households pay 82.4% of the same. This indicates that urban households bear the burden of direct taxes. The proportion of direct taxes in the total income indicates 1.04% and 7.8% for rural and urban households, respectively.

3.3.2.3 SAVING- INVESTMENT RELATION

The combined capital account shows receipts in rows and expenditure in column. The expenditure on this account reveals investment and change in stocks, which amounts to Birr 9,176.1 million in the reference year. This capital expenditure can be financed by households and government savings which together constitute Birr 5,437.67 million and capital inflows from the rest of the world which amounts Birr 3,738.43 million including omissions and errors of Birr 47.44 million. This indicates the *ex post* identity between gross saving and aggregate investment in the economy. However, we can not tell anything how their own savings or capital transfers finance capital expenditures of individual sectors. This calls for a separate capital account for each institution.

3.3.2.4 THE ROLE OF THE EXTERNAL SECTOR

The structure of the external trade can be visualized by looking at exports and imports of goods and services. Imports of industrial goods account for 46% of the total imports

followed by imports of services, 42.1%. On the other hand, exports of goods are dominated by coffee, which constitute 68.7% of all exported goods and 35.5% of all exported goods and services. The exports of services account for 48.3% of all goods and services exported. Clearly, total import bill is greater than export revenue implying a balance of payment deficit. The sources of foreign exchange earnings are exports of goods and services, Birr 4,855.1 million, factor income and current non-factor income (private transfers) received from rest of the world, Birr 2,228.63 million, and official transfers from the rest of the world, Birr 2,467.74 million, and the balance Birr 3690.99 million indicating external account deficit.

The uses of foreign exchange shows that 95.8% of the total foreign exchange is used for payment of imports of goods and services while 4% represent factor and official payments and 0.2% private transfers abroad (by urban households).

3.4 MODEL STRUCTURE OF SAM

In order to use SAM for analytical framework, it is necessary to partition the SAM into endogenous and exogenous accounts. This will enable us to identify the impact of a change in the latter on the former. The basic assumptions of the linear equilibrium model include constant relative prices, average and marginal propensities are equal and they are linear and fixed, expenditure and income elasticities are equal to unity for the accounting model. Furthermore, this model assumes that the economy is typified by under capacity utilization of resources.

Endogenous accounts consist of production factors, institutions (households) and production activities for they form part of stated objectives. In other words, the objective(s) of any economic policy is to bring growth, alleviate poverty, and the like. Hence, it is necessary to endogenize households, factors of production, and production activities so as to see how they respond to policy measures. On the other hand, exogenous accounts include government, combined capital account, and the rest of the world. Government is viewed as an interventionist institution which formulates policies and uses instruments, such as taxes, subsidies, and the like to achieve its objectives. Capital account is also assumed to be exogenous because it does not have effects over other accounts in the short-run. This model assumes that there is under capacity utilization of resources in the Ethiopian economy implying any increase in exogenous demand is met by output increase. Due to the existence of idle capacity in the economy, in the short-term, no additional investment is required to bring output-income increase in the economy resulting from an exogenous demand increase. Finally, the rest of the world account is set exogenous since Ethiopia is considered to be a small open economy and hence its macroeconomic policies can not influence world aggregates. In other words, Ethiopia is small enough to influence world aggregates. It takes, for instance, export price of coffee as given.

The separation of SAM into endogenous and exogenous accounts is presented in a schematic form as follows.

Table 3.3: Partitioning of SAM

Payments \ Receipts	Endogenous Accounts			Exogenous Accounts		
	Production Factors 1	Institutions 2	Activities 3	Government 4	Capital Acc 5.	ROW 6
Production Factors Institutions Activities	Endogenous Transactions			Injections		
Government Capital Account Rest of the World	Leakages			Exogenous Transactions		

Source: Vandemoortele, 1987

As depicted in the above table, the intersection of the third row and the second column represents the transaction matrix of the endogenous accounts. The intersection of the third row and third column represents the matrix of an injection, a transaction from exogenous accounts into endogenous accounts and may take the form of current transfers from the government or from abroad to households. By the same analogy, government final consumption, gross fixed capital formation and exports also represent injections for they rise the demand for the output of production activities.

The intersection of the fourth row and second column of the same table shows the matrix of leakages, transactions from endogenous accounts into exogenous accounts and can take the form of taxes, international transfers, savings and imports. Finally, the fourth row and third column shows the transaction matrix of exogenous accounts.

Thus by partitioning the SAM, the effects of changes in the exogenous accounts on the endogenous accounts of the economy can be captured. Multiplier analysis corresponding to

the SAM-based linear fixed coefficient model can do this.

Following Pyatt and Round (1979) formulation and denoting Y as the column vector whose elements are the row sums of the endogenous accounts (y_1, y_2, y_3), we have

$$Y = T + X \qquad (1)$$

where

T refers to the matrix of transactions between endogenous accounts and

X refers to the matrix of injections into endogenous accounts. Here an injection is a transaction from exogenous accounts into endogenous accounts and can take the form of current transfers from the government or from the rest of the world to households.

Further, defining the matrix of average endogenous transaction propensities as A_n , then we have

$$A_n = T/Y \Leftrightarrow T = A_n Y \qquad (2)$$

Alternatively, equation (2) can be expressed as

$$n = \begin{bmatrix} 0 & 0 & T_{13}y_3^{-1} \\ T_{21}y_1^{-1} & T_{22}y_2^{1} & 0 \\ 0 & T_{32}y_2^{1} & T_{33}y_3^{-1} \end{bmatrix} = \begin{bmatrix} 0 & 0 & A_{13} \\ A_{21} & A_{22} & 0 \\ 0 & A_{32} & A_{33} \end{bmatrix} \qquad (3)$$

The subscripts 1,2, and 3 refer respectively to factors of production, endogenous institutions and production activities. As indicated in equation (3), the matrix of average endogenous transaction propensities An is composed of five sub matrices:

(a) payment matrix of factors of production by production activities A_{13}

(b) transaction matrix of factor incomes into institutional incomes A21

(c) transaction matrix between endogenous institutions A22

(d) consumption matrix A32, and

(e) industrial transaction matrix A33

From equation (1) and (2) we get

$$Y = A_n Y + X \qquad (4)$$

Equation (4) shows that total endogenous income is the sum of the value of endogenous transactions and the value of exogenous injections.

Rearranging Equation (4) yields

$$Y = (I - A_n)^{-1} X \qquad (5)$$

Letting $M = (I - A_n)^{-1}$, we have

$$Y = MX \qquad (6)$$

Matrix M has been termed as the accounting multiplier matrix since it explains the endogenous variables such as factors of production, production activities and endogenous

institutions in terms of the exogenous variables as government, capital account and rest of the world. The basic departure of equation (6) from the conventional input-output model is that the former concerns with the simultaneous determination of the levels of output, incomes of the factors of production and household consumption. By contrast, the input-output model concerns with the determination of output levels only.

The multiplier matrix shows how a change in any element of the exogenous accounts will affect the endogenous accounts. In other words, it measures the aggregate effect of injections into the economy on the interwoven parts of the endogenous system such as structure of output, factor demand, income distribution and consumption patterns. Technically, the matrix M, according to Pyatt and Round (1979), can be expressed as a product of three multiplier sub matrices as follows:

$$M = M_3 M_2 M_1 \tag{7}$$

Hence, equation (6) can alternatively be expressed as

$$Y = M_3 M_2 M_1 X \tag{8}$$

The first multiplier matrix M_1 captures transfer effects, that is, it measures the effects of transfer within endogenous accounts of the economy. Formally, this matrix is given by:

$$M_1 = \begin{bmatrix} I & 0 & 0 \\ 0 & (I - A_{22})^{-1} & 0 \\ 0 & 0 & (I - A_{33})^{-1} \end{bmatrix} \tag{9}$$

Such multipliers show how an injection into a specific set of endogenous accounts will affect

this same set of accounts due to the interrelationships that exist between the endogenous variables that make up this set of accounts. To clarify this point, an exogenous change in a production activity, for example, will cause a chain of transfer between all other production activities.

The second multiplier M_2 measures the cross-effects or the " open-loop" effects and shows the interactions among and between the sets of endogenous accounts. Formally, this sub matrix is given by:

$$M_2 = \begin{bmatrix} I & A & A_{13} \\ (I - A_{22})^{-1} A_{21} & I & B \\ C & (I - A_{33})^{-1} A_{32} & I \end{bmatrix} \qquad (10)$$

where $A = A_{13}(I-A33)^{-1}A_{32}$, $B = (I-A_{22})^{-1}A_{21}A_{13}$ and

$C = (I-A_{33})^{-1}A_{32}(I-A_{22})^{-1}A_{21}$

This sub matrix measures the influence of an injection into one part of the system upon other parts of the system. As it is vividly indicated in equation (3), there is no direct relationship between, for instance, production activities and the incomes of institutions. A unit increase in the demand of production activities will increase factorial incomes by A_{13}. If, on the other hand, the expenditure of production factors increase by a unit, then institutional incomes will increase by A_{21}. The total interaction within the institutional accounts due to the rise in the

institutional incomes by $A_{21}$are $(I-A_{22})^{-1}A_{21}$. As a result, the aggregate increase in institutional incomes because of a unit increase in the exogenous demand for production activities will be $(I-A_{22})^{-1}A_{21}\ A_{13}$. This multiplier is termed as the "open-loop" multiplier in the literature.

Third sub matrix denoted by M_3 measures the full circular effect of an injection into the economy, traveling through the economic system back to its initial point. Mathematically, this sub matrix is given by:

$$M_3 = \begin{bmatrix} D & 0 & 0 \\ 0 & E & 0 \\ 0 & 0 & F \end{bmatrix} \qquad (11)$$

where $D = \{I-A_{13}(I-A_{33})^{-1}A_{32}(I-A_{22})^{-1}A_{21}(I-A_{22})^{-1}A_{21}\}^{-1}$,

$E = \{I - (I-A_{22})^{-1}A_{21}(I-A_{33})^{-1}A_{32}\}^{-1}$ and

$F = \{I - (I-A_{33})^{-1}A_{32}(I-A_{22})^{-1}A_{21}(I-A_{22})^{-1}A_{21}A_{13}\}^{-1}$

This multiplier matrix captures "closed-loop" effects, for example, from production activities to factors of production, to institutions and back to production activities in the form of consumption demand and son on.

Note that both M_1 and M_3 are block diagonal matrices and hence they only reflect direct and feedback effects or own-effects.

According to Stone (1985), the aggregate multiplier matrix, M, can be expressed in terms of additive components as follows.

$$M = I + (M_1 - I) + (M_2 - I) M_1 + (M_3 - I) M_2 M_1 = I + T + O + C \quad (12)$$

Where I= identity multiplier matrix showing the effect of an injection into an account.

T= (M_1-I) refers to the net transfer multiplier measuring the net intra-group or direct effect or within account effects where the initial injection take place.

O= $(M_2-I)\ M_1$ refers to open-loop multiplier measures the net extra-group or net cross-effect arising from the initial injection when it has finished traveling outside the original account. In other words, it shows additional effects coming from M_2.

C= $(M_3-I)\ M_2M_1$ refers to closed –loop multiplier measuring the net contribution of circular effects or net inter-group effects.

Now turning to the leakages, suppose that the average propensities to leake, A_l, from the endogenous accounts into the exogenous ones is given by

$$A_l = Y/L \qquad \Leftrightarrow L = A_l Y \quad (13)$$

where L refers to the matrix of leakages and Y is as defined above.

From equation (12), the description of the average propensities to leak can be expressed as

$$A_l = \begin{bmatrix} 0 & A_{42} & 0 \\ 0 & A_{52} & A_{53} \\ 0 & A_{62} & 0 \end{bmatrix} \quad (14)$$

The subscripts 4, 5, and 6 refer respectively to government, capital account and rest of the

world.

Upon substituting equation (5), the value of Y (i.e., $(I-A_n)^{-1}X$), into equation (12), we have

$$L = A_1MX \qquad (15)$$

Letting $M_1=A_1M$. Then equation (14) becomes

$$L= M_1X \qquad (16)$$

Hence, M_1 is termed as the matrix of leakage multipliers in the literature and reflects how the leakages are affected by the injection of the exogenous accounts into the endogenous accounts.

After having depicted the socioeconomic profile of Ethiopia in the form of SAM, the above method will be used to explore the main characteristics of the Ethiopian economy.

CHAPTER FOUR

IV. EMPIRICAL RESULTS

In the previous chapter, attempts have been made to highlight the basic structure of the Ethiopian economy using social accounting matrix for the year 1995/96. It was also shown how SAM could be transformed into a model. In this chapter, the accounting multipliers in the context of the Ethiopian economy are presented.

4.1 THE IMPACT OF AN EXOGENOUS INJECTION INTO HOUSEHOLDS

In this subsection, an attempt is made to present the effects of an exogenous injection into the incomes of households, both rural and urban households, on production activities, factors of production, and households themselves. Table 4.1 below depicts such effects.

Table 4.1: Effects of exogenous injection into the incomes of households

Destination of injections	Result of a 1 million Birr injection into: Origin of injections — Rural HHs	Urban HHs
Teff	0.242	0.191
Wheat	0.094	0.082
Maize	0.143	0.123
Coffee	0.026	0.023
Food processing	0.094	0.063
Beverages	0.178	0.126
Textiles	0.125	0.075
Non-Metals	0.008	0.006
Metals	0.185	0.165
Labor	1.42	1.098
Capital	0.978	0.814
Rural HHs	2.600	1.285
Urban HHs	0.884	1.694

Source: Extracted from the aggregate multiplier matrix

An exogenous increase in the incomes of households has an effect on the three endogenous accounts including the households themselves. It is clear from Table 4.1 that a 1 million Birr injection into the rural households increases the demand for the products of teff, metals, beverages, maize, and textiles by 0.242, 0.184, 0.178, 0.143 and 0.125 million Birr, respectivelyWith regard to the factors of production, the same injection into rural households increases the demand for labor and capital, after successive interactions among endogenous accounts, by 1.42 and 0.978 million Birr, respectively. The incomes of labor have increased by more than the initial injection. Finally, the same magnitude of exogenous injection into the rural households increase the incomes of the same by 2.60 million and that of urban households by 0.884 million Birr. It is important to note that rural household incomes increase significantly by more than double the initial injection. This is due to the fact that the initial injection first increases the demand for outputs of production activities thereby necessitating the employment of additional factors of production, which in turn increases incomes of production factors. This higher factor income would be distributed between rural and urban households. Due to increased income, households demand for goods and services increases and production activities hire more factors of production and the effect continues. As we shall see latter, rural households have the largest total backward linkages, the column sum 9.458, as compared to urban households, 7.779.

The same quantum injection, on the other hand, into the urban households brings a 0.191, 0.165, 0.126, 0.122, 0.116, and 0.075, million Birr increase in the demand for the products of teff, metals, beverages, maize, and textiles, respectively. In both rural and urban areas, the

largest impact is felt in the demand for teff followed by metals and beverages. This implies that exists huge demand for these products that has far-reaching implication for choice of development strategy. An injection of the same magnitude increases labor income by 1.098 million Birr and capital income by 0.815 million Birr. An exogenous increase in the urban households income increases the income of these households by 1.694 million Birr and due to the trickledown effect rural income increases by 1.285 million Birr. In this case, the incomes of both households have increased by more than the initial injection as opposed to the case of rural households where the exogenous injection increased only the income of the same by more than the initial injection.

4.2 EFFECTS OF AN EXOGENOUS INJECTION INTO PRODUCTION ACTIVITIES

In this subsection, the impacts of an exogenous injection into the production activities on themselves, factors of production and on household incomes will be presented. The multipliers for factors of production show the amount by which incomes of production factors would increase for a million Birr increase in the demand for goods and services. Similarly, the household income multipliers indicate the amount by which household incomes would increase for a million Birr increase in the demand for the products of production activities. If there is an exogenous injection into each of the production activities, each sector increases or stimulates activities of other sectors of the economy. For instance, if one million Birr is injected into teff, then it results in an increment of 0.25 million Birr on

itself, 0.083 million Birr on food processing, 0.158 million Birr on beverages, 0.075 million Birr on textiles, and 0.176 million Birr on metals. These exogenous changes in sectoral demand increase the production of the whole economy by 4.32 million Birr. If, instead, the same amount is injected into coffee, it brings about an increment of 0.024 million Birr on itself, 0.082 million Birr on food processing, 0.156 million on beverages, 0.106 million on textiles, and 0.174 million Birr on metals. In the aggregate, this injection increases the entire production by 4.25 million Birr. If the same amount is injected into the industrial subsectors, such as food processing, it results in an increment of 0.149 million Birr on teff, 0.241 million Birr on wheat, 0.137 million Birr on itself, and 0.505 million Birr on other services. This injection would bring an increase in the whole production of 3.727 million Birr.

It is interesting to note that the accounting multipliers for production activities show that relatively large figures have been observed in the activities, such as teff, wheat, maize, food processing, and textiles. This indicates that any exogenous increase in the demand for the outputs of activities mainly affects production of necessity items. A similar result has been obtained for Sir Lanka, Zaire, and Greece. For more details see the aggregate multiplier matrix.

Table 4.2 below shows the effects of exogenous changes in the demand for products of goods and services on factors of production. These multipliers give the increase in the incomes of production factors for a one million Birr increase in the sectoral demand. It was found that all agricultural and industrial activities, with no exception, have a significant impact on the

incomes of both factors of production. Among the industrial subsectors, food and textiles have greater effect on labor than capital.

Table 4.2: Impact on factor employment of exogenous change in demand

	Teff	wheat	Maize	Coffee	Food processing	Beverages	Textiles	Non-metals	Metals
Labor	1.909	1.951	1.875	1.872	1.245	0.498	1.004	0.506	0.231
Capital	1.274	1.160	1.239	1.272	0.905	0.436	0.786	0.471	0.17

Source: Extracted from the aggregate multiplier matrix

Among all activities, agriculture is the most important stimulant in generating factor income as compared to industrial subsectors.

It is also important to assess the impact of exogenous changes in sectoral demand on the level of the incomes of households. Table 4.3 provides the multiplier effects of such changes.

Table 4.3: Household income multipliers for production activities

	Teff	wheat	Maize	Coffee	Food processing	Beverages	Textiles	Non-metals	Metals
Rural HHs	2.132	2.108	2.089	2.103	1. 394	0.609	1.180	0.635	0.268
Urban HHs	1.131	1.082	1.105	1.121	0.758	0.349	0.656	0.372	0.147

Source: Extracted from the aggregate multiplier matrix

Of all the activities, teff generates the largest increase for rural household income, followed by wheat and coffee. Of the industrial activities, food processing and textiles generate

relatively high income for rural households. For urban households, the largest increase in income is generated from teff, followed by coffee and maize. Exogenous demand changes in teff would bring an increment of total household income by 3.26 million Birr, which is shared between rural and urban households in the proportion of 65.3% and 34.7%, respectively. It is important to clarify at this stage that how demand shock in teff brings a rise in household income. The transmission mechanism is through cross effects and circular multiplier effects, that is, through indirect effects. First, a positive demand shock in teff leads to higher factor employment which tends to increase factor income. This higher income is then reflected in the rise of household incomes and this additional income increases their consumption of both agricultural and industrial goods and services which induces activities to produce more by paying higher income for production factors and this increases household income further and the effect continues. There is also transfer effects between households. For instance, if there is an increase in the income of rural households, the income of urban households will increase because of transfer from the former to the latter. It is clear that rural households benefit more from the exogenous demand changes in teff than their urban counterparts. If there is an exogenous increases in demand for coffee, incomes of rural and urban households increase by 2.103 and 1.121 million Birr, respectively, while total household income increases by 3.22 million Birr where rural households take 65.2% and urban households claim 34.8% of the total. This shows that rural households are still the main beneficiaries of the injection similar to teff.

If the injection is in one of the industrial subsectors, such as food, then rural and urban

households income experience an increment of 1.394 and 0.758 million Birr in their respective incomes. This injection would bring an increase in the total household incomes by 2.152 million Birr.

4.3 EFFECTS OF AN EXOGENOUS INJECTION INTO PRODUCTION FACTORS

In this section, an attempt is made to present the impacts of an exogenous injection into the production factors on factors themselves, on household incomes, and on activities.

Table 4.4: Effects of an exogenous injection into factors of production

Destination of injections	Result of a 1 million Birr injection into Origin of injections	
	Labor	Capital
Teff	0.231	0.216
Wheat	0.091	0.088
Maize	0.139	0.133
Coffee	0.025	0.024
Food processing	0.087	0.078
Beverages	0.166	0.152
Textiles	0.114	0.10
Non-Metals	0.007	0.007
Metals	0.181	0.175
Labor	2.346	1.255
Capital	0.942	1.894
Rural HHs	2.307	1.933
Urban HHs	1.064	1.295

Source: Extracted from the aggregate multiplier matrix

As indicated in Table 4.4, of the production activities, teff has increased by 0.231 and 0.216 million Birr due to a one million Birr injection in to labor and capital incomes, respectively. In fact all activities have increased by less than the initial injection from an exogenous increase in labor income.

A one million Birr injection in labor brings a 1.346 million Birr additional income on itself and 0.942 million Birr increment in the capital income. Thus, labor is most affected by the exogenous increase in the income of it.

It is clear from the basic structure of SAM that incomes earned by factors of production are distributed to households according their factor endowments. Because of this relationship, any exogenous change in the incomes of production factors affects the incomes of households. Rural and urban households income increase by 2.307 and 1.064 million Birr, respectively, due to a one million Birr injection in the incomes of labor. On the other hand, when the same amount of injection is made to capital, rural and urban households income increase by 1.933 and 1.295 million Birr, respectively. In either case, rural households benefit more from the exogenous increase in the incomes of production factors.

4.4 ANALYSIS OF LINKAGES

It is known that the various sectors of the economy are interdependent as users of inputs from other sectors and as suppliers of inputs to other sectors. According to Herischman's

terminology, the former is termed as backward linkage and the latter is called forward linkage (Sadoulet and Javry, 1995). Backward linkage measures the proportion of an activity's output that represent purchases from other activities, while forward linkage measures the proportion of an activity's output that is used as inputs by other sectors. Before the 1970s, linkages had been measured based on input-output matrix. Linkages based on only inter-activity flows have been the main reason for ignoring agriculture while giving due emphasis to industrialization. Since peasant agriculture, the dominant activity in most developing economies, is the producer of primary commodities, it has weak backward linkages. And since it is the producer of final commodities, it has low forward linkages. However, the inclusion of income and final consumption linkages into input-output matrix brought the key role of agriculture in development from the 1970s ownwards (ibid.: 273). In developing economies like Ethiopia, the largest segment of the population is dependent on agriculture. As such, agriculture is considered to be the main source of household incomes and expenditures. Expenditures of agricultural households can induce industrialization under the force of effective demand. Thus, when we consider the linkage effects brought by agricultural incomes, then agriculture will be as strong as industrial sector and induces a relatively more equitable distribution of growth (ibid., :291).

Accordingly, the *i*th column sum of the aggregate multiplier matrix gives the total input requirement from all sectors and this is the economy-wide backward linkage of this sector. The *i*th row sum of the aggregate multiplier matrix indicates the total forward linkage of the *i*th sector. These linkage types can be used for assessing the degree of interdependence of a

given sector. Looking at the aggregate multiplier matrix, teff has got the highest backward linkage (10.764), followed by wheat (10.671). Food processing and textiles have also strong backward linkages indicating their high dependence on domestic sources and less dependence on imported materials. Surprisingly, backward linkages with the magnitude of less than 5 occur in beverage (4.148), non-metals (4.471), and metals (2.352). This is clearly a sign of their high import dependence. As indicated earlier, non-metals and metals have high import-intensity with magnitudes of 0.70 and 0.90, respectively. These subsectors have weak integration with the rest of the domestic economy.

With regard to forward linkages, it can be gleaned from the same table that teff has got the highest forward linkage (4.305) followed by metals (3.620), beverages (3.382), and textiles (3.157). Among the industrial subsectors, metals have got the highest forward linkages followed by beverages.

Relating these linkages for individual sectors to the overall linkage effect, the sectoral degree of interdependence can be examined. Taking the column elements of the aggregate multiplier matrix, a sector's backward linkage can be expressed as:

Backward Linkage = $n\Sigma i\ rij / \Sigma i\Sigma j\ rij$

where n= number of sectors

rij= elements of the aggregate multiplier matrix

Forward linkage = $n\Sigma j\ rij / \Sigma i\Sigma j\ rij$

According to this method, a sector has high forward or backward linkage when it has a linkage greater than unity. As indicated in the table, all agricultural subsectors have backward linkages higher than unity implying that they have greater integration with the rest of the economy. Surprisingly, all industrial subsectors have backward linkages below unity showing their high import dependence. With regard to forward linkages, all agricultural and industrial activities have forward linkages less than unity indicating weak integration with the rest of the economy.

The total linkage, which is the composite of the multipliers of different accounts, is useful in assessing the aggregate effect expected at the national level. The individual effects can be calculated and they are called partial forward or backward linkages. Looking at the accounts of production activities, wheat has the largest partial backward linkage (4.364) followed by teff (4.319). Among the industrial subsectors, food processing has the largest partial backward linkage (3.727) followed by textile (3.610). Between households, rural households have the largest partial backward linkage effects of (3.483). And also between factors of production, labor has higher partial backward linkage (3.286) as compared to capital.

It is also important to consider the degree of per account partial forward linkages. In this respect, the partial forward linkages of factors of production are 45.152 while that of households and production activities are 48.363 and 67.626, respectively. The production activities have the largest partial forward linkages, followed by households. The sum of these linkages gives us the economy-wide linkage.

4.5 DECOMPOSITION OF THE AGGREGATE MULTIPLIER MATRIX

The total multiplier can be decomposed into transfer multiplier matrix ($M_{1)}$, open loop multiplier matrix ($M_{2)}$, and closed loop multiplier matrix ($M_{3)}$, that is, $M= M_3 M_2M_1$. This can also be expressed in additive form as M= I+T+O+C, that is, the aggregate multiplier is the sum of initial injection, transfer effect, open-loop effects, and closed-loop effects.

4.5.1 TRANSFER MULTIPLIER MATRIX (M1)

This submatrix captures the effects of an account on itself via direct transfers within a module and it is also known as own direct effects. The first block diagonal of this submatrix is an identity because there are no transfers between factors of production. The second block diagonal captures the multiplier effect resulting from direct transfers between households. Finally, the third block diagonal measures the multiplier effects of inter-industry transfers, which is usually known as the Leontief inverse. The result of this submatrix, which indicates selected rows and columns, is given in Table 4.5.

TABLE 4.5: TRANSFER MULTIPLIER MATRIX - M1=INV(I-A0)

		1	2	3	4	5	6	7	8	9	10	11	12	13
Labor	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Capital	2	0	1	0	0	0	0	0	0	0	0	0	0	0
Rural HHs	3	0	0	1.000496	0.017653	0	0	0	0	0	0	0	0	0
Urban HHs	4	0	0	0.028129	1.000496	0	0	0	0	0	0	0	0	0
Teff	5	0	0	0	0	1.028064	8.59E-08	1.67E-07	3.91E-08	0.00254	0.000302	1.64E-06	3.09E-05	9.01E-06
Wheat	6	0	0	0	0	1.9E-05	1.144163	1.2E-05	2.82E-06	0.182868	0.021735	0.000118	0.002226	0.000648
Maize	7	0	0	0	0	1.87E-08	6.09E-09	1.01993	2.77E-09	0.00018	2.14E-05	1.16E-07	2.19E-06	6.38E-07
Coffee	8	0	0	0	0	9.17E-08	2.99E-08	5.79E-08	1.000395	0.000883	0.000105	5.71E-07	1.07E-05	3.13E-06
Food processing	9	0	0	0	0	0.000113	3.66E-05	7.11E-05	1.67E-05	1.082813	0.128696	0.0007	0.013183	0.003839
Beverages	10	0	0	0	0	2.07E-06	6.94E-07	1.32E-06	3.24E-07	0.000123	1.049578	0.000149	0.000563	0.000107
Textiles	11	0	0	0	0	1.87E-05	6.13E-06	1.18E-05	2.81E-06	0.000528	0.000395	1.569672	0.002901	0.000719
Non-Metals	12	0	0	0	0	8.61E-06	2.82E-06	5.44E-06	1.29E-06	0.000216	0.000154	0.000149	1.001217	0.000318
Metals	13	0	0	0	0	2.13E-06	7.4E-07	1.37E-06	3.55E-07	0.000235	0.000202	0.000329	0.000972	1.000156
sum		1	1	1.028625	1.018149	1.031432	1.145659	1.02223	1.001239	1.560887	1.293342	1.764069	1.475296	1.117014

Source: Own computation

The transfer multiplier effects between households are small. The table indicates that a one million Birr transfer to the rural households increases the income of the same by 0.001 million Birr, while the income of urban households increases by 0.028 million Birr. If the same amount of money is transferred to urban households, the income of same increases by a small amount (0.001 million Birr) and rural households income increase by 0.0177 million Birr. Looking at the total transfer effect, one can observe that rural households have greater transfer effect than urban households.

A look at inter-activity transfers, the third block diagonal, and shows that textile depicts the largest degree of interdependence with the entire economy, followed by food processing. By the classical Leontief inverse, the industrial subsectors have strong integration with the rest of the economy. This is so since this inverse takes into account only the input-output module and does not consider the feedbacks coming from income and consumption linkages. When evaluating the agricultural sectors based on this inverse, their linkages are very small implying weak integration with the rest of the economy. This is not surprising since the agricultural sector is the producer of primary commodities and the main supplier of final commodities and hence has low linkages with the entire economy.

4.5.2 THE OPEN-LOOP MULTIPLIER MATRIX (M2)

This submatrix shows how an external income injection brings a change in endogenous demand, which transmits throughout the system without returning to its original injection. This submatrix is also known as cross-effects or extra group effects. In Table 4.6 below, selected rows and columns of this submatrix are presented.

TABLE 4.6: OPEN-LOOP MULTIPLIER MATRIX -M2=(I+A*+A*2)

		1	2	3	4	5	6	7	8	9	10	11	12	13
Labor	1	1	0	0.437673	0.315711	0.600381	0.599999	0.6	0.597441	0.120784	0.064993	0.124174	0.047263	0.052915
Capital	2	0	1	0.286028	0.263855	0.355437	0.236674	0.34268	0.374043	0.144321	0.113614	0.136426	0.100057	0.037869
Rural HHs	3	0.781874	0.502028	1	0	0.647862	0.587941	0.641159	0.654903	0.168332	0.107912	0.165892	0.090683	0.062368
Urban HHs	4	0.24442	0.521285	0	1	0.332029	0.270026	0.325286	0.341009	0.106093	0.075166	0.10176	0.066959	0.03452
Teff	5	0.071623	0.066677	0.073853	0.056784	1	0	0	0	0	0	0	0	0
Wheat	6	0.027625	0.028101	0.02644	0.028444	0	1	0	0	0	0	0	0	0
Maize	7	0.042145	0.042049	0.041042	0.041139	0	0	1	0	0	0	0	0	0
Coffee	8	0.007511	0.007815	0.007039	0.008213	0	0	0	1	0	0	0	0	0
Food processing	9	0.028024	0.022731	0.031778	0.013002	0	0	0	0	0	0	0	0	0
Beverages	10	0.052802	0.045109	0.057919	0.030756	0	0	0	0	0	0	0	0	0
Textiles	11	0.037466	0.027776	0.044726	0.010209	0	0	0	0	0	0	0	0	0
Non-Metals	12	0.002231	0.002103	0.002278	0.001841	0	0	0	0	0	0	0	0	0
Metals	13	0.054508	0.056301	0.051437	0.058468	0	0	0	0	0	0	0	0	0

Source: Own computation

Looking at the intersection of accounts of production factors and household accounts can see the effects of a change in incomes of factors of production on the allocation of incomes over households. It is vividly shown that rural households stand to benefit more from an increase in labor income than their urban counterparts. On the other hand, urban households gain slightly higher from the rise in capital income than rural households.

The intersection of household accounts and production activities shows the impacts of a change in the incomes of the former on the structure of the latter. It is clear that rural households spend a larger proportion of their additional income on the products of teff, followed by beverages and metals. On the other hand, urban households spend a significant amount of their additional income on the products of metals, followed by teff.

The effects of a change in the structure of activities on the incomes of production factors can be examined by looking at the intersection of the two accounts. It is to be noted that the incomes of labor are highly influenced by increased production of agricultural activities. In other words, increased agricultural production significantly affects labor income. For more details see the table.

4.5.3 CLOSED-LOOP MULTIPLIER EFFECTS (M3)

This submatrx measures the effects of an exogenous injection into an endogenous account on itself after a series of interactions in the system. It captures cross effects together. It is also termed as circular or inter-group effects or own-indirect effects. In Table 4.7 below, selected rows and columns are presented.

TABLE 4.7: CLOSED-LOOP MULTIPLIER MATRIX -M3= Inv(I-A*3)

		1	2	3	4	5	6	7	8	9	10	11	12	13
Labor	1	2.344137	1.253161	0	0	0	0	0	0	0	0	0	0	0
Capital	2	0.939562	1.893371	0	0	0	0	0	0	0	0	0	0	0
Rural HHs	3	0	0	2.560751	1.23689	0	0	0	0	0	0	0	0	0
Urban HHs	4	0	0	0.835046	1.676757	0	0	0	0	0	0	0	0	0
Teff	5	0	0	0	0	1.215186	0.189446	0.212343	0.218527	0.059019	0.039524	0.058095	0.032508	0.020379
Wheat	6	0	0	0	0	0.085947	1.075482	0.084792	0.087313	0.023686	0.015903	0.023301	0.013096	0.008149
Maize	7	0	0	0	0	0.130104	0.114323	1.128362	0.132161	0.035817	0.024035	0.03524	0.019787	0.012333
Coffee	8	0	0	0	0	0.023584	0.020699	0.023265	1.023961	0.006507	0.004372	0.006401	0.003601	0.002237
Food processing	9	0	0	0	0	0.080044	0.070728	0.079013	0.081242	1.021794	0.014538	0.021472	0.011935	0.007566
Beverages	10	0	0	0	0	0.153635	0.13557	0.151638	0.155967	0.041945	1.028021	0.041312	0.02302	0.014532
Textiles	11	0	0	0	0	0.103777	0.091912	0.102464	0.105294	0.028126	0.018713	1.027726	0.015344	0.009798
Non-Metals	12	0	0	0	0	0.006736	0.005928	0.006647	0.006841	0.001849	0.001239	0.00182	1.001019	0.000638
Metals	13	0	0	0	0	0.17064	0.149799	0.16834	0.173363	0.047065	0.031614	0.046297	0.02604	1.016184

Source: Own computations

The indirect impacts of a change in an account can be observed by looking at the intersection of that account with itself. In this way, the factor accounts revealed that the own-indirect effects of labor are substantial. With regard to the redistribution of income over households, it appears that the indirect effects of the rural households are not only significantly large but also by far greater than urban indirect effects. Hence, rural households benefit more from the own- indirect effects. Finally, the third block diagonal depicts the indirect effects of activities on themselves. The indirect effects of teff, metals, and beverages are found to be substantial as compared to other sectors.

4.6 LEAKAGE MULTIPLIER MATRIX

In this subsection, leakage effects into the exogenous accounts, namely government, consolidated capital account, and the rest of the world caused by exogenous changes in the endogenous accounts will be presented. Table 4.8 shows leakage multipliers.

Table 4.8: LEAKAGE MULTIPLIER MATRIX - EXOGENOUS

	1	2	3	4	5	6	7	8	9	10	11	12	13
Government	0.233	0.240	0.227	0.253	0.232	0.225	0.227	0.273	0.260	0.225	0.294	0.208	0.376
Capital Account	0.250	0.261	0.242	0.279	0.250	0.242	0.244	0.247	0.166	0.075	0.142	0.079	0.032
Rest of the World	0.527	0.509	0.541	0.479	0.529	0.542	0.538	0.529	0.558	0.701	0.569	0.716	0.593
Unidentified items	-0.010	-0.010	-0.009	-0.011	-0.010	-0.009	-0.009	-0.050	0.016	0.000	-0.006	-0.003	-0.001

Source: Extracted from the aggregated multiplier matrix

From the table it is clear, for example, that a one million Birr exogenous injection into the incomes of urban households leak out to the government in the form of taxes by 0.253 million Birr, to the combined capital account in the form of savings by 0.279 million Birr, and to the foreign sector in the form of imports by 0.48 million Birr.

4.7 POLICY SIMULATION ANALYSIS

The aggregate multiplier matrix can be used for assessing some policy experiments through scenario analysis. The method employed here is akin to that used by Keuning and Thorbecke (1992). This method is formally expressed as:

$MXi = Yi$

where M is the aggregate multiplier matrix, Yi is a 19 by 3 of endogenous incomes generated by a set of exogenous injections, Xi, such as government, capital account, and rest of the world represented by a 19 by 3 matrix. Yi gives the endogenous incomes for each endogenous account generated directly or indirectly by the three exogenous injections. The resulting total endogenous incomes can be obtained by summing along the rows of each endogenous account. It is assumed in the subsequent simulation exercises that the expenditure shares within each defined account remain constant, the average and marginal propensities are equal, idle capacity in the economy, and prices remain fixed over the time horizon of the model.

The first simulation exercises revolve around issues of poverty in Ethiopia. According to poverty studies in the country, the size and magnitude of poverty differ in rural and urban areas of Ethiopia (MEDaC, 1999). Pursuant to this study, the poverty gap, which measures the size of households expenditure that fall below the poverty line, is 13% for rural and 10% for urban population. The implication is that rural people are 13% short of fulfilling the minimum expenditure requirement while urban people are 10% of short in fulfilling the

minimum requirement. These show that poverty in rural areas is more widespread than that of urban areas.

According to Table 3.2, the total incomes of rural and urban households are 29,692.48 and 18,546.52 million Birr, respectively. Moreover, it is estimated that rural and urban populations are 47.0 and 7.6 million, respectively, in 1995/96. In other words, rural population represents 85.6% of the total population while urban population accounts for 14.4%. The per capita income of rural households (total rural income divided by total rural population) is calculated to be 658.37 Birr while that of urban households is 2440.33 Birr. Based on the average per capita incomes, rural households are worse off and go in line with the size of the poverty gap. Therefore, in order to fill the poverty gap and thus eliminate poverty, rural and urban households require additional income of 3860.02 and 1854.65 million Birr, respectively.

By using the aggregate multipliers of households below, one can evaluate the impact of injecting additional income into the system and identify accounts to be injected so as to bring the expected results. This additional income can take the form of government transfers to the respective households.

Table 4.9: Accounting Multipliers of households

Type of Households	Rural Households	Urban Households
Rural Households	2.60	1.285
Urban Households	0.884	1.694

Source: Extracted from the aggregate multiplier matrix

The above household multipliers are used in order to identify the effects of variable injection into an account. In other words, these multipliers are used to examine how much additional injections are required and through which account(s) would it be more feasible to reduce rural and urban poverty gap simultaneously.

If the injection is targeted on rural incomes, the magnitude of injection required is 1484.624 million Birr. On the other hand, if the target is on urban incomes, the level of injection required is 1094.84 million Birr. The results of the simulation exercises are presented in Table 4.10.

Table 4.10: Effects of additional injection into households

	Simulation 1	Simulation 2
	1484.624	**1094.84**
	Rural HHs	Urban HHs
Rural HHs	3860.02	1406.87
Urban HHs	1313.89	1854.65

Source: Model Simulations

Table 4.10 reveals that injecting 1484.624 million Birr into the rural households bridges the rural poverty gap. However, the urban households receive 1313.89 million Birr representing about 70.8% of the required income and do not bridge the urban poverty gap. If, instead, the injection were to the urban households, rural and urban households would get additional income of 1406.87 and 1854.65 million Birr, respectively. In this case, the level of injection closes the urban poverty gap but reduce the rural households poverty gap by mere 36.5%.

Although both scenarios reduce the poverty gap of households, the size of injection and the type of account(s) to be injected do matter. The results of both scenarios do not bring the expected results simultaneously. As indicated, the first simulation closes rural poverty gap and reduce significantly, 70.8%, the urban poverty gap. Only 29.2% of the urban households poverty gap remains unfilled. On the other hand, the second simulation would eliminate the urban poverty gap but it leaves the large proportion of rural poverty gap. Hence, of the opted simulations, preference is placed on the first simulation for it better narrows the poverty gap.

The second policy experiment shows the impact of complete fertilizer subsidy elimination on the performance of the economy, particularly on rural households and agricultural activities. As indicated in the reference period, subsidy on fertilizer amounts to174.5 million Birr and this have been completely removed by the end of 1995/96. This removal of subsidy reduces the income of rural households by the same magnitude. In this experiment, two cases have been considered about the 174.5 million Birr. The first simulation considers the government retains it within its account and this augments government revenue. The second simulation considers alternative use of the fund, that is, spending it in high priority sectors, such as health, education or infrastructure, which are included in other services. In all these simulations, it is assumed that all other exogenous variables remain at their 1995/96 level. Table 4.11 below shows the results of the first case.

Table 4.11: Effect of fertilizer subsidy elimination

	Simulation 3: 100% Subsidy Elimination	
	change(value)	% change
Labor	-247.478	-0.99862
Capital	-170.631	-0.86154
Rural HHs	-453.745	-1.53113
Urban HHs	-154.344	-0.83388
Teff	-42.2758	-1.26363
Wheat	-16.4665	-1.01317
Maize	-24.9723	-1.04662
Coffee	-4.46181	-0.20959
Other agric. exports	-69.3629	-1.03551
Other agric.	-205.053	-1.21026
Food	-16.4617	-0.91903
Beverages	-31.0272	-1.1749
Textiles	-21.8703	-1.10778
Non-Metals	-1.31798	-0.42403
Metals	-32.3634	-1.11624
Other Industry	-22.2609	-0.22096
National Bank	-0.27314	-0.08066
Other fin. services	-11.4608	-0.45049
Other services	-122.862	-0.66149

Source: Model simulation

Since fertilizer is a major input for the agricultural activities, the price of it determines its use in agriculture. The cost of fertilizer subsidy removal is highly reflected in the deterioration of the income of rural households. Moreover, agricultural activities and some industrial activities, such as food, beverages, and textiles have been significantly affected negatively by the removal of fertilizer subsidy. Such policy measures bring a decline in household income and sectoral output. The elimination of fertilizer subsidy has a harsher consequence on agricultural activities, particularly on teff, followed by wheat and maize. This is so since teff accounts for a larger proportion (about 40%) of the total fertilizer consumed in the country. Further more, private saving has declined by 1.103% but there is improvement in government

revenues as a result of the said policy measure. Under the second case, both sectoral output and household income have decreased. Further more, private saving and government revenues have also declined by 0.335% and 0.170%, respectively. In both cases, loss of output due to removal of fertilizer subsidy is greater than the cost of subsidy and hence it has negative repercussions on the entire economy.

The forth and fifth simulations show the potential impacts of different public investment programmes on the structure of the economy. As indicated in the Public Investment Programme (PIP), 64.15 and 569.825 million Birr are allocated to investments in the industrial and agricultural sectors respectively for the Ethiopian fiscal year 1993 (EFDRE, 1999). The purpose of such investments is to improve the productivity and production of the said sectors. The intended magnitude of investment in agriculture is, as stipulated in the PIP, greater than that of industrial sectors. This shows the strong emphasis given to the dominant sector, agriculture. However, 72.4% of the proposed total capital expenditure in agriculture is financed by external source while all industrial investments are going to be financed by the central government. This investment programmes are undertaken only by the central government and regional investment programmes are excluded from the PIP. Thus, the simulation results show the impact of central government investment activities on the economy as a whole. The likely effect of investment in different sectors can be examined by assuming that such investments are allocated to each sector proportional to its original investment and all other exogenous variables remain at their 1995/96 level. The result of this experiment is given in Table 4.12.

Table 4.12: Effects of sectoral investment programmes

	Simulation 4:Agricultural investment		Simulation 5: Industrial Investment	
	change (value)	% change	change(value)	% change
Labor	1112.114	4.487609	82.27682	0.332004
Capital	703.7532	3.553346	63.79381	0.322104
Rural HHs	1222.837	4.126383	96.35639	0.325148
Urban HHs	638.6792	3.450607	53.36487	0.288316
Teff	142.4089	4.256614	10.17843	0.304234
Wheat	59.46286	3.658692	6.366786	0.391742
Maize	85.76156	3.594384	6.152307	0.257852
Coffee	14.26667	0.670174	1.127616	0.05297
Other agric. exports	364.9092	5.447704	19.63816	0.293177
Other agric.	1039.288	6.134037	51.7302	0.30532
Food	52.54501	2.933493	16.93627	0.945521
Beverages	90.53746	3.428345	14.36853	0.544087
Textiles	62.33477	3.157386	13.12136	0.664624
Non-Metals	4.289884	1.380172	5.334937	1.716394
Metals	100.3469	3.461039	11.83738	0.40828
Other Industry	146.2352	1.451518	154.0792	1.529377
National Bank	0.87913	0.259622	0.080097	0.023654
Other fin. services	48.86321	1.920647	26.69619	1.049337
Other services	395.4425	2.129059	36.02839	0.193977

Source: Model simulation

Sectoral investment programmes in agriculture have more effect in household income and output than the corresponding investment in industrial sectors although the size of investment in the latter is small. Investment in agriculture particularly increases the incomes of rural households as compared to their urban counterparts. In either case, investment in both sectors improves the incomes of households and stimulates output despite their differential impact on the economy.

The sixth simulation exercise considers the likely impact of an export expansion strategy on

the economy at large. It is indicated in the Second EPRDF Five-Year Programme for Development, Peace, and Democracy that export expansion is highly emphasized so as to boost the foreign exchange capacity of the country (EPRDF, 2000). Within this strategy, the second simulation experiment specifically considers the probable effects of a 10% increase in the exports of coffee and industrial goods on the household income and other sectors of the economy and assuming all other exogenous variables remain at their 1995/96 level. The results of this experiment are shown in Table 4.13.

Table 4.13: Effects of increase in the exports of coffee and industrial goods

	Simulation 6: 10% increase in coffee exports		Simulation 7: 10% increase in the exports of total industrial goods	
	change	% change	change	% change
Labor	322.976	1.30327	35.9788	0.14518
Capital	219.398	1.10777	27.6132	0.13942
Rural HHs	362.67	1.22381	41.9935	0.1417
Urban HHs	193.311	1.0444	23.1883	0.12528
Teff	37.7622	1.12871	4.43048	0.13243
Wheat	15.1558	0.93252	2.66365	0.16389
Maize	22.8374	0.95715	2.67832	0.11225
Coffee	176.609	8.29616	0.49034	0.02303
Other agric. exports	65.9386	0.98439	8.46134	0.12632
Other agric.	174.179	1.02803	22.6307	0.13357
Food	14.0719	0.78561	6.75057	0.37687
Beverages	26.9508	1.02054	3.21433	0.12172
Textiles	18.1952	0.92162	3.23115	0.16366
Non-Metals	1.18243	0.38042	0.42726	0.13746
Metals	29.9572	1.03325	3.58605	0.12369
Other Industry	20.813	0.20659	78.7253	0.78142
National Bank	0.26215	0.07742	0.03426	0.01012
Other fin. services	10.9352	0.42982	13.3776	0.52583
Other services	117.918	0.63487	15.4106	0.08297

Source: Model simulation

As indicated in the table above, an increase in coffee exports, the dominant agricultural

export item, leads to a rise in household income and stimulates other activities. Of all the activities, the rise in coffee exports has significantly influenced teff, other agriculture, beverages, and metals. If the policy objective is to increase the export of total industrial goods, the magnitude of this impact on the economy is different as compared to coffee exports. This increase is assumed to have come from industrial export items proportional to their original exports.

Although the same increase in manufactured export items stimulate household incomes and other activities, the effect is less than that of coffee. This is not suprising that coffee accounts for a larger proportion of export items in the economy and a 10% increase in the same is indeed large in absolute terms. The size of coffee exports significantly influence the foreign exchange earning capacity of the country, which in turn is dependent on nature (rain) and world market conditions for coffee. This implies that if there were a decline in our coffee exports in the world market, say because of lower world demand for it, the domestic economy would be adversely affected. The shocks (either bad weather conditions or lower world price for coffee) coming from coffee exports are greater than any other export items. Hence, to minimize this risk, diversifying export items is critical.

4.8 CONCLUSIONS AND POLICY IMPLICATIONS

In this study an attempt has been made to provide empirical evidence regarding the magnitude of economic linkages in Ethiopia. The analysis has been based on the Social Accounting Matrix (SAM) -based multiplier. The advantage of this method is that it captures both the direct and indirect effects of any exogenous changes. Based on the SAM-multiplier analysis, the following are the main conclusions and policy implications.

First, regarding the effects of exogenous changes in the incomes of households, the main features can be presented as follows. It is found that an exogenous increase in the incomes of rural households would generate significant demand for teff, followed by metals, beverages, maize, and textiles. Similarly, an exogenous increase in the incomes of urban households would generate relatively more demand for the products of teff, followed by metals, beverages, maize, and textiles. However, stimulating incomes of urban households do not exert substantial influence on production activities. Relatively speaking, stimulating the incomes of rural households better generates demand for goods and services.

The effects of exogenous increases in the incomes of rural households would significantly increase, by more than 100% of the original increase, the incomes of the same but has less impact on the incomes of urban households. An exogenous increase in the incomes of urban households, on the other hand, significantly increases the incomes of both rural and urban households though it increases the incomes of the latter by less than the initial exogenous increase. This indicates that whichever household gets the initial injection, the incomes of

both households tend to increase. However, if the issue of income inequality is taken into account, then stimulating incomes of urban households is preferable since it increases both households income with little difference.

Second, concerning the effects of exogenous changes for the demand for activities, it was found that the classical Leontief inverse grossly underestimates the overall interdependence of the domestic economy. According to this inverse, industrial sector in general and textile, food processing, and beverages in particular have strong integration with the rest of the economy. However, a different picture would be emerged if the overall interdependence of the economy, which is the result of both direct as well as indirect or induced effects, were taken into account. Based on these criteria, the agricultural sector in general and teff, wheat, and coffee in particular has strong integration with the entire economy. An exogenous increase in the demand for activities has a significant impact on the demand for both factors of production. More specifically, an exogenous increase in the demand for products of agricultural activities has a larger effect on the demand for both labor and capital. Within the industrial subsectors, only food and textiles have strong impact on labor from an exogenous increase in the demand for the products of these activities. This implies that labor absorption in these two sectors is much sensitive to product demand changes. In agriculture subsectors, employment of factors of production is also influenced by changes in product demand. As a result of this, any exogenous increase in the product demand would bring additional income for both types of households. However, rural households benefit more than urban households do from an exogenous increase in the products of agricultural activities. Moreover, an exogenous change in the demand for food and textiles would also have a significant effect on

the incomes of the rural households. This implies that policies directed towards the expansion of the rural sector and on selected manufacturing activities (food processing and textiles) would generate substantial income for the rural society as well as the urban households alike.

Third, with regard to poverty gap simulation exercises, it was found that if the policy objective is to eliminate rural and urban poverty simultaneously, injecting additional income to the rural society is preferred. This would close rural poverty gap and reduce urban poverty gap by more than 70%. If the target were on urban households, rural poverty would reduce by mere a 36% while closing urban poverty completely. The implication of this finding is that due emphasis must be given to the majority of the rural population if the objective of eliminating rural and urban poverty is to be achieved simultaneously.

Fourth, complete subsidy elimination on fertilizer brings a decline in sectoral output and household income. Such removal negatively affects agricultural activities, the incomes of households, private savings and government revenues. In other words, other things being equal, private savings and government revenues consequently the domestic saving of the country would have been higher than that they would be without removal of such subsidy. Of the industrial subsectors, food processing, beverages, and textiles have been affected adversely because of their interconnections with the agricultural sector. If the policy objective is to raise agricultural production, the effects of lifting fertilizer subsidy should be carefully considered before implementation. This is so since loss of total sectoral output is

greater than the cost of fertilizer subsidy. Had it not been removed, agricultural output would have been much higher, assuming other things remain constant. One of the objectives of Agricultural Development-led- Industrialization strategy is to increase the productivity and production of the agricultural sector, particularly the peasant sector and thereby to alleviate rural poverty. On the other hand, because of budgetary constraints or otherwise, the government has lifted subsidy on fertilizer which immediately has a negative effect on peasant agriculture. Hence, there exists a trade-off between increased agricultural production and removal of fertilizer subsidy. This in turn aggravates rural poverty, which feeds itself into other areas. Thus, in order to attain the stated objectives, decision- makers shall re-consider this potential conflict.

Fifth, the analysis also showed that public investment programme in agriculture and industry has significant effect on household incomes and output growth. Specifically, investment in agriculture appeared to increase both household incomes and sectoral outputs. Rural households enjoyed a marginal increase over urban households from additional investment in agriculture. Although investment in the industrial sectors stimulate household incomes and sectoral output, such increments are low as compared to the effect coming from agricultural investments.

Finally, policy experiments with respect to export promotion showed that the effect of increasing agricultural exports particularly coffee is indeed substantial as compared to exports of industrial goods in terms of stimulating household income and sectoral output.

The implication of this simulation exercise is that since coffee production and its export demand are determined by weather condition and world market conditions, any exogenous fall in coffee output as well as world demand for coffee exports has a harsher consequence on the domestic economy than other export items. Hence, there is a need for export diversification so as to mitigate windfall shortages in foreign exchange earnings.

By and large, the performance of Ethiopian economy has been influenced by the dominant sector, agriculture, which is the main source of rural household income and savings. However, this sector is significantly vulnerable to the size and magnitude of rainfall, the twin disaster, unfavorable policy-induced shocks, and other negative external factors. These factors reinforcing each other so that they have mitigated the growth of this sector in particular and the national economy in general. Moreover, the structure of the industrial sector has remained weak and import-intensive let alone cushioning the level of economic activity. And the domestic market base for industrial goods is small. This is partly attributed to the fact that a significant proportion of the population is residing in rural areas whose income is dependent on rain-fed agriculture[7]. This indicates that in the agrarian economy like ours, the realization of long-term economic development rests on the transformation of the agricultural sector. According to Myrdal as quoted in Todaro (1997) " it is in the agricultural sector that the battle for long-term economic development will be won or lost". In other words, to avert massive starvation, improve the living standards of the rural people, and bring economic growth, the production and productivity of the Ethiopian agricultural sector should

[7] An estimated 10.6 million people are vulnerable to food shortage in 2000.

be speed up. This is indeed a very difficult task given the existing farming system, erratic rainfall, rapid population growth, land holding size, input utilization, and the like. Hence, much more needs to be done to transform this sector and thereby to sustain growth.

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ANNEX

ANNEX 1: AVERAGE PROPENSITIES -ENDOGENOUS

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Labor	1	0.000	0.000	0.000	0.000	0.600	0.600	0.600	0.597	0.510	0.600	0.121	0.065	0.124	0.047	0.053	0.016	0.142	0.465	0.178
Capital	2	0.000	0.000	0.000	0.000	0.355	0.237	0.343	0.374	0.305	0.267	0.144	0.114	0.136	0.100	0.038	0.009	0.835	0.509	0.399
Rural HHs	3	0.778	0.493	0.000	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.003	0.002	0.001	0.000	0.000	0.000
Urban HHs	4	0.222	0.507	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.003	0.002	0.000	0.000	0.000	0.000
Teff	5	0.000	0.000	0.072	0.055	0.027	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	6	0.000	0.000	0.018	0.023	0.000	0.126	0.000	0.000	0.000	0.000	0.148	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maize	7	0.000	0.000	0.040	0.040	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coffee	8	0.000	0.000	0.007	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other agric. export	9	0.000	0.000	0.094	0.143	0.000	0.000	0.000	0.000	0.034	0.000	0.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other agric.	10	0.000	0.000	0.350	0.128	0.000	0.000	0.000	0.000	0.000	0.116	0.043	0.000	0.063	0.000	0.000	0.023	0.000	0.000	0.000
Food processing	11	0.000	0.000	0.020	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.112	0.000	0.000	0.000	0.046	0.000	0.000	0.004
Beverages	12	0.000	0.000	0.055	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.000	0.000	0.000	0.001	0.000	0.000	0.002
Textiles	13	0.000	0.000	0.028	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.363	0.000	0.000	0.005	0.000	0.000	0.004
Non-Metals	14	0.000	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.002
Metals	15	0.000	0.000	0.050	0.057	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.006
Other Industry	16	0.000	0.000	0.005	0.003	0.001	0.000	0.001	0.000	0.000	0.001	0.018	0.009	0.001	0.142	0.044	0.402	0.002	0.004	0.067
National Bank	17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Other fin. services	18	0.000	0.000	0.003	0.006	0.000	0.000	0.000	0.000	0.000	0.001	0.009	0.005	0.008	0.009	0.003	0.157	0.001	0.000	0.038
Other services	19	0.000	0.000	0.168	0.276	0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.026	0.035	0.131	0.015	0.013	0.020	0.021	0.006

ANNEX 2: AVERAGE PROPENSITIES - EXOGENOUS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Government	0.000	0.000	0.010	0.078	0.000	0.000	0.000	0.044	0.004	0.000	0.094	0.134	0.103	0.109	0.339	0.089	0.000	0.001	0.011
Capital Account	0.000	0.000	0.050	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rest of the world	0.000	0.000	0.000	0.000	0.016	0.036	0.037	0.023	0.149	0.015	0.159	0.487	0.166	0.455	0.504	0.232	0.000	0.000	0.286
Unidentified items	0.000	0.000	-0.001	-0.003	-0.001	0.000	0.000	-0.040	-0.002	0.000	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.005

ANNEX 3: AGGREGATE MULTIPLIER MATRIX-INV(I-An)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	TOTALBWLK
Labor	1	2.346	1.255	1.417	1.097	1.908	1.951	1.875	1.872	1.635	1.974	1.214	0.498	1.004	0.506	0.231	0.753	1.405	1.755	1.057	25.751
Capital	2	0.941	1.894	0.977	0.814	1.274	1.160	1.239	1.272	1.095	1.213	0.882	0.436	0.786	0.470	0.170	0.579	1.739	1.425	1.035	19.401
Rural HHs	3	2.307	1.933	2.599	1.285	2.132	2.108	2.089	2.103	1.829	2.153	1.394	0.609	1.180	0.635	0.268	0.881	1.972	2.088	1.346	30.910
Urban HHs	4	1.064	1.295	0.884	1.694	1.131	1.082	1.105	1.121	0.971	1.115	0.758	0.349	0.656	0.372	0.147	0.487	1.250	1.172	0.798	17.453
Teff	5	0.231	0.216	0.242	0.191	1.250	0.217	0.217	0.219	0.190	0.222	0.149	0.065	0.124	0.068	0.028	0.093	0.217	0.221	0.145	4.305
Wheat	6	0.091	0.088	0.094	0.082	0.089	1.231	0.087	0.087	0.076	0.089	0.241	0.048	0.050	0.030	0.012	0.051	0.088	0.089	0.060	2.682
Maize	7	0.138	0.133	0.143	0.122	0.134	0.131	1.151	0.132	0.115	0.134	0.089	0.039	0.075	0.041	0.017	0.056	0.132	0.134	0.088	3.007
Coffee	8	0.025	0.024	0.026	0.023	0.024	0.024	0.024	1.024	0.021	0.024	0.017	0.007	0.014	0.008	0.003	0.010	0.024	0.024	0.016	1.362
Other agric. expor	9	0.394	0.391	0.397	0.385	0.387	0.377	0.378	0.382	1.367	0.386	0.401	0.132	0.219	0.122	0.050	0.174	0.388	0.388	0.258	6.975
Other agric.	10	1.083	0.967	1.174	0.765	1.023	1.006	1.002	1.010	0.878	2.160	0.726	0.303	0.683	0.318	0.132	0.475	0.977	1.012	0.662	16.355
Food processing	11	0.087	0.078	0.094	0.063	0.083	0.081	0.081	0.081	0.071	0.083	1.137	0.153	0.047	0.038	0.014	0.118	0.079	0.082	0.064	2.534
Beverages	12	0.166	0.152	0.178	0.126	0.158	0.155	0.155	0.156	0.136	0.159	0.104	1.096	0.089	0.049	0.020	0.067	0.153	0.157	0.105	3.382
Textiles	13	0.114	0.100	0.125	0.075	0.107	0.105	0.105	0.106	0.092	0.108	0.071	0.031	1.629	0.035	0.014	0.058	0.102	0.106	0.076	3.157
Non-Metals	14	0.007	0.007	0.008	0.006	0.007	0.007	0.007	0.007	0.006	0.007	0.005	0.002	0.004	1.003	0.001	0.009	0.007	0.007	0.007	1.114
Metals	15	0.181	0.175	0.185	0.165	0.176	0.172	0.172	0.174	0.151	0.176	0.116	0.052	0.099	0.055	1.023	0.075	0.175	0.176	0.122	3.620
Other Industry	16	0.125	0.122	0.127	0.116	0.124	0.120	0.121	0.121	0.105	0.123	0.118	0.060	0.077	0.291	0.091	1.733	0.127	0.131	0.195	4.026
National Bank	17	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.000	0.001	1.002	0.002	0.003	1.026
Other fin. services	18	0.065	0.064	0.066	0.063	0.064	0.063	0.063	0.063	0.055	0.065	0.059	0.030	0.053	0.074	0.024	0.293	0.067	1.066	0.099	2.395
Other services	19	0.703	0.703	0.704	0.702	0.692	0.674	0.677	0.684	0.594	0.691	0.493	0.237	0.447	0.353	0.105	0.324	0.717	0.717	1.471	11.687
Total FWLK		**10.071**	**9.597**	**9.441**	**7.776**	**10.764**	**10.665**	**10.547**	**10.616**	**9.387**	**10.883**	**7.974**	**4.148**	**7.236**	**4.471**	**2.351**	**6.237**	**10.620**	**10.750**	**7.606**	**161.141**
Partial FWLK-FP		3.286	3.149	2.393	1.911	3.182	3.111	3.114	3.144	2.730	3.186	2.096	0.934	1.790	0.976	0.401	1.332	3.144	3.180	2.092	45.152
Partial FWLK-HHs		3.371	3.227	3.483	2.978	3.263	3.190	3.193	3.224	2.800	3.268	2.152	0.958	1.836	1.008	0.415	1.368	3.223	3.260	2.145	48.363
Partial FWLK-PA		3.414	3.221	3.564	2.886	4.319	4.364	4.239	4.248	3.856	4.429	3.727	2.256	3.610	2.487	1.535	3.538	4.254	4.311	3.369	67.626

ANNEX 4: TRANSFER MULTIPLIER MATRIX (M1)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Labor	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural HHs	3	0	0	1.0005	0.0177	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urban HHs	4	0	0	0.0281	1.0005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Teff	5	0	0	0	0	1.028064	8.59E-08	1.67E-07	3.91E-08	2.25E-08	9.59E-07	0.00254	0.000302	1.64E-06	3.09E-05	9.01E-06	0.000196	9.42E-07	1.29E-06	2.46E-05
Wheat	6	0	0	0	0	1.9E-05	1.144163	1.2E-05	2.82E-06	1.62E-06	6.9E-05	0.182868	0.021735	0.000118	0.002226	0.000648	0.014082	6.78E-05	9.29E-05	0.001769
Maize	7	0	0	0	0	1.87E-08	6.09E-09	1.01993	2.77E-09	1.6E-09	6.8E-08	0.00018	2.14E-05	1.16E-07	2.19E-06	6.38E-07	1.39E-05	6.68E-08	9.14E-08	1.74E-06
Coffee	8	0	0	0	0	9.17E-08	2.99E-08	5.79E-08	1.000395	7.83E-09	3.33E-07	0.000883	0.000105	5.71E-07	1.07E-05	3.13E-06	6.8E-05	3.27E-07	4.48E-07	8.54E-06
Other agric. expo	9	0	0	0	0	1.51E-05	4.93E-06	9.56E-06	2.24E-06	1.035414	5.5E-05	0.14565	0.017311	9.41E-05	0.001773	0.000516	0.011216	5.4E-05	7.4E-05	0.001409
Other agric.	10	0	0	0	0	6.66E-05	2.17E-05	4.2E-05	9.85E-06	5.67E-06	1.131291	0.054289	0.006985	0.11183	0.007516	0.002239	0.049341	0.000248	0.00028	0.004029
Food processing	11	0	0	0	0	0.000113	3.66E-05	7.11E-05	1.67E-05	9.6E-06	0.000409	1.082813	0.128696	0.0007	0.013183	0.003839	0.083381	0.000402	0.00055	0.010474
Beverages	12	0	0	0	0	2.07E-06	6.94E-07	1.32E-06	3.24E-07	1.94E-07	1.1E-06	0.000123	1.049578	0.000149	0.000563	0.000107	0.001517	5.59E-05	6.14E-05	0.002653
Textiles	13	0	0	0	0	1.87E-05	6.13E-06	1.18E-05	2.81E-06	1.63E-06	9.34E-06	0.000528	0.000395	1.569672	0.002901	0.000719	0.013807	0.000916	0.000205	0.007195
Non-Metals	14	0	0	0	0	8.61E-06	2.82E-06	5.44E-06	1.29E-06	7.46E-07	9.7E-05	0.000216	0.000154	0.000149	1.001217	0.000318	0.006367	6.23E-05	7.55E-05	0.002404
Metals	15	0	0	0	0	2.13E-06	7.4E-07	1.37E-06	3.55E-07	2.22E-07	8.86E-05	0.000235	0.000202	0.000329	0.000972	1.000156	0.001541	0.000117	0.000126	0.005738
Other Industry	16	0	0	0	0	0.002269	0.000738	0.001433	0.000336	0.000193	0.001106	0.037816	0.023839	0.008017	0.253195	0.075973	1.682207	0.006184	0.009068	0.114108
National Bank	17	0	0	0	0	1.18E-07	5.68E-08	8.21E-08	3.32E-08	2.62E-08	1.41E-07	7.96E-05	7.23E-05	0.000125	0.000305	3.75E-05	7.18E-05	1.000045	4.72E-05	0.002246
Other fin. service	18	0	0	0	0	0.000801	0.000659	0.000675	0.000457	0.000415	0.000989	0.016875	0.011414	0.016743	0.054092	0.015587	0.266405	0.002691	1.002234	0.056303
Other services	19	0	0	0	0	5.29E-05	2.56E-05	3.69E-05	1.49E-05	1.18E-05	6.33E-05	0.035792	0.032533	0.05614	0.137308	0.016861	0.032313	0.020017	0.021212	1.010144
sum		1	1	1.0286	1.0181	1.031432	1.145659	1.02223	1.001239	1.036054	1.134179	1.560887	1.293342	1.764069	1.475296	1.117014	2.162524	1.030859	1.034028	1.218506

ANNEX 5: OPEN-LOOP MULTIPLIER MATRIX (M2)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Labor	1	1.000	0.000	0.438	0.316	0.600	0.600	0.600	0.597	0.510	0.600	0.121	0.065	0.124	0.047	0.053	0.016	0.142	0.465	0.178
Capital	2	0.000	1.000	0.286	0.264	0.355	0.237	0.343	0.374	0.305	0.267	0.144	0.114	0.136	0.100	0.038	0.009	0.835	0.509	0.399
Rural HHs	3	0.782	0.502	1.000	0.000	0.648	0.588	0.641	0.655	0.552	0.603	0.168	0.108	0.166	0.091	0.062	0.018	0.530	0.619	0.339
Urban HHs	4	0.244	0.521	0.000	1.000	0.332	0.270	0.325	0.341	0.284	0.286	0.106	0.075	0.102	0.067	0.035	0.009	0.470	0.379	0.251
Teff	5	0.072	0.067	0.074	0.057	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wheat	6	0.028	0.028	0.026	0.028	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maize	7	0.042	0.042	0.041	0.041	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coffee	8	0.008	0.008	0.007	0.008	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other agric. export	9	0.116	0.129	0.102	0.150	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other agric.	10	0.350	0.278	0.402	0.147	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Food processing	11	0.028	0.023	0.032	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Beverages	12	0.053	0.045	0.058	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Textiles	13	0.037	0.028	0.045	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-Metals	14	0.002	0.002	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Metals	15	0.055	0.056	0.051	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other Industry	16	0.037	0.039	0.035	0.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
National Bank	17	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Other fin. services	18	0.019	0.021	0.017	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
Other services	19	0.206	0.235	0.175	0.282	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000

ANNEX 6: CLOSED-LOOP MULTIPLIER MATRIX(M3)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Labor	1	2.344	1.253	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Capital	2	0.940	1.893	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rural HHs	3	0.000	0.000	2.561	1.237	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Urban HHs	4	0.000	0.000	0.835	1.677	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Teff	5	0.000	0.000	0.000	0.000	1.215	0.189	0.212	0.219	0.183	0.196	0.059	0.040	0.058	0.033	0.020	0.006	0.213	0.217	0.127
Wheat	6	0.000	0.000	0.000	0.000	0.086	1.075	0.085	0.087	0.073	0.078	0.024	0.016	0.023	0.013	0.008	0.002	0.086	0.087	0.051
Maize	7	0.000	0.000	0.000	0.000	0.130	0.114	1.128	0.132	0.111	0.118	0.036	0.024	0.035	0.020	0.012	0.003	0.130	0.132	0.077
Coffee	8	0.000	0.000	0.000	0.000	0.024	0.021	0.023	1.024	0.020	0.021	0.007	0.004	0.006	0.004	0.002	0.001	0.024	0.024	0.014
Other agric. exports	9	0.000	0.000	0.000	0.000	0.375	0.329	0.370	0.381	1.320	0.341	0.104	0.070	0.102	0.058	0.036	0.010	0.382	0.382	0.226
Other agric.	10	0.000	0.000	0.000	0.000	0.993	0.878	0.980	1.008	0.846	1.907	0.270	0.180	0.266	0.148	0.094	0.027	0.960	0.995	0.578
Food processing	11	0.000	0.000	0.000	0.000	0.080	0.071	0.079	0.081	0.068	0.073	1.022	0.015	0.021	0.012	0.008	0.002	0.078	0.080	0.047
Beverages	12	0.000	0.000	0.000	0.000	0.154	0.136	0.152	0.156	0.131	0.140	0.042	1.028	0.041	0.023	0.015	0.004	0.150	0.154	0.090
Textiles	13	0.000	0.000	0.000	0.000	0.104	0.092	0.102	0.105	0.088	0.095	0.028	0.019	1.028	0.015	0.010	0.003	0.099	0.104	0.060
Non-Metals	14	0.000	0.000	0.000	0.000	0.007	0.006	0.007	0.007	0.006	0.006	0.002	0.001	0.002	1.001	0.001	0.000	0.007	0.007	0.004
Metals	15	0.000	0.000	0.000	0.000	0.171	0.150	0.168	0.173	0.145	0.155	0.047	0.032	0.046	0.026	1.016	0.005	0.172	0.173	0.102
Other Industry	16	0.000	0.000	0.000	0.000	0.118	0.104	0.117	0.120	0.101	0.107	0.033	0.022	0.032	0.018	0.011	1.003	0.119	0.120	0.071
National Bank	17	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	1.002	0.002	0.001
Other fin. services	18	0.000	0.000	0.000	0.000	0.062	0.054	0.061	0.063	0.053	0.056	0.017	0.012	0.017	0.009	0.006	0.002	0.063	1.063	0.037
Other services	19	0.000	0.000	0.000	0.000	0.671	0.588	0.662	0.682	0.572	0.609	0.186	0.125	0.183	0.103	0.064	0.018	0.686	0.684	1.405

ANNEX 7: LEAKAGE MULTIPLIER MATRIX - EXOGENOUS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Government	0.233	0.240	0.227	0.253	0.232	0.225	0.227	0.273	0.203	0.231	0.260	0.225	0.294	0.208	0.376	0.260	0.238	0.236	0.181
Capital Account	0.250	0.261	0.242	0.279	0.250	0.242	0.244	0.247	0.214	0.249	0.166	0.075	0.142	0.079	0.032	0.106	0.257	0.253	0.168
Rest of the World	0.527	0.509	0.541	0.479	0.529	0.542	0.538	0.529	0.594	0.530	0.558	0.701	0.569	0.716	0.593	0.637	0.515	0.521	0.662
Unidentified items	-0.010	-0.010	-0.009	-0.011	-0.010	-0.009	-0.009	-0.050	-0.011	-0.010	0.016	0.000	-0.006	-0.003	-0.001	-0.003	-0.010	-0.010	-0.011

DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented in any other university. All sources of references used for this thesis have been dully acknowledged.

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