

**INDIRA GANDHI NATIONAL OPEN UNIVERSITY  
SCHOOL OF SOCIAL SCIENCES  
DISCIPLINE OF ECONOMICS**

**THE CONTRIBUTION OF AGRICULTURE TO  
ECONOMY WIDE GROWTH & POVERTY  
REDUCTION IN ETHIOPIA: A SAM BASED  
MULTIPLIER ANALYSIS**

BY

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May, 2012

ADDIS ABABA, ETHIOPIA

Programme Code:

MEC

Course Code:

MECP-001

Enrolment No:

089131013

Study Centre Code: 8105

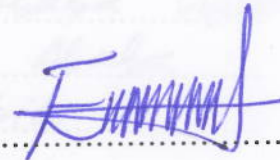
Regional Centre.....

## TOPIC OF THE PROJECT WORK

THE CONTRIBUTION OF AGRICULTURE TO  
ECONOMY WIDE GROWTH & POVERTY REDUCTION  
IN ETHIOPIA: A SAM BASED MULTIPLIER ANALYSIS.

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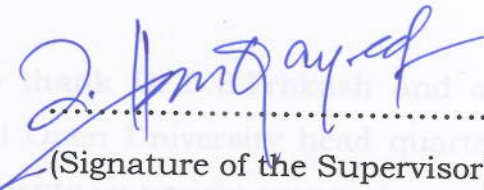
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## CERTIFICATE

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## Acknowledgement

The successful completion of this Master's Project paper was made possible through the invaluable contribution of a number of people.

First and foremost, I would like to express my sincere gratitude to my advisor, Dr.Syed Hasan Qayed for his guidance, encouragement and insightful comment. He is also accessible and willing to help. As a result, this research work runs smoothly.

Besides my advisor, I would like to thank Dr.B.S.Prakash and other colleague's at Indira Gandhi National Open University head quarter in New Delhi for providing valuable comments on project proposal.

My sincere thanks also go to my friend Engidaw Tegegne who offered me advice and suggestions whenever I needed.

My appreciation extends to my friend Tsegaye Mebratu who strongly recommended me to join the famous Indira Gandhi National Open University.

Above all, I thank god for giving me strength to complete this research project.

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## List of Acronyms

ADLI	Agricultural Development Led Industrialization
CGE	Computable General Equilibrium
CSA	Central Statistical Agency
EDRI	Ethiopian Development Research Institute
EMM	Economy wide Multi-Market Model
EPRDF	Ethiopian People Revolutionary Democratic Front
GDP	Gross Domestic Product
IFPRI	International Food Policy Research Institute
ISIC	International Standard for Industrial Classification
MINVERSE	Matrix Inverse
MMULT	Matrix multiplication
MoFED	Ministry of Finance & Economic Development
NBE	National Bank of Ethiopia
PADETES	Participatory, Demonstration and Training Extension System
SAM	Social Accounting Matrix
SNA	System of National Accounts

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## **Abstract**

Agricultural Development Led Industrialization (ADLI) is the main strategy of Ethiopian Government towards achieving accelerated growth and poverty reduction. This study examines the role of agriculture in the overall economic growth, demand creation and poverty reduction using a 2005/06 Ethiopian Social Accounting Matrix (SAM). A SAM based Multiplier Analysis technique is used in deriving sectoral multipliers.

The main findings of this analysis reveal that exogenous injection such as increase in government spending, increase in export demand and increase in transfer from the Rest of the world will produce greater demand, overall economic growth and poverty reduction when the injection is taken place on agriculture.

# CHAPTER ONE

## INTRODUCTION

### 1.1. Background and Justification of Study

The ultimate goal of Economic policy is to bring economic development, reduction of poverty and inequality in a society. Empirical evidence suggests that economic growth is the most effective means to increase the welfare of the poor and alleviate poverty (Sadoulet, 2000; Adams, 2004). In addition to this, Fields (1989) suggested that, a decline in poverty is not possible without economic growth. However, the decline in poverty does not necessarily imply equal distribution of income. According to Simon Kuznet, The relationship between economic growth and income inequality is an inverted **U** shape. i.e. economic growth increase income inequality in the early stage and decrease in the later stage.

In the context of developing countries, agricultural growth is believed to be the key driver of economic development and structural transformation. Mellor and Dorosh (2009) argued that, “A high rate of Agricultural growth has a far reaching positive implications for the economic development of low-income countries in terms of increasing employment and accelerating poverty reduction through its linkages with other sectors”. Chenery and Syrquin (1975) also argued that, structural transformation transfers capital and labor from agriculture to fuel growth in industry and service sector in developing countries. On the other hand, Johnston and Mellor, 1961; Hirschman, (1975) argued that agriculture has weaker production linkages with the rest of the economy, hence, has fewer stimuli effect to the overall growth.

Similar to developing countries, Agriculture is a dominant sector in Ethiopian economy in-terms of its contribution to Gross Domestic

Product (GDP), Export earning and employment generation. According to the Ministry of Finance and Economic Development (MoFED) National Accounts Statistics of Ethiopia, January 2010 report, starting from 2005/06, the Ethiopian economy is growing on an average of 10.9% annually. During this period, agricultural, industry and service sectors grow at an average of 8%, 10% and 14.6% respectively. In 2005/06, the share of agriculture to the overall Gross Domestic Product (GDP) was 47% that of the industry and service was 13% and 40% respectively. In the year 2009/10, the share agriculture to the GDP drop by 11.9% from 47% to 41%, and the share of industry also drop from 13.4% to 13%. However, the share of service sector increase by 16.1% from 40.4% to 46.9%. In addition to the contribution to the overall Gross Domestic Product (GDP), agriculture is the main sources of export earning. According to the 2008 National Bank of Ethiopia (NBE) report, Agriculture account 82% of export earning. Furthermore, 85% of rural population's livelihood is directly or indirectly linked with agriculture. It also serves as source raw material for cottage, small & large scale industries.

Based on the above theoretical justification and the structure of the economy, In 1994, Ethiopia has formally adopted Agricultural Development Led Industrialization (ADLI) as its main development strategy of reducing poverty. The objective of ADLI is to strengthen the linkages between agriculture and industry by increasing the productivity of small farmers, expanding large scale private commercial farms, and by integrating the output of agriculture with the input of industry. It is believed that, the growth in agriculture will induce overall economic growth, and structural transformation by stimulating demand and supply. In this research paper, the researcher used a Social Accounting Matrix (SAM) as a tool to study sectoral linkages.

A Social Accounting Matrix (SAM) is a square matrix that represents all the transactions that are taking place in an economy during a period of one year. It is a comprehensive framework that shows the interaction of the three basic forms of economic activity, namely; production, consumption and accumulation plus the transaction of the domestic economy with the rest of the world. In SAM receipts are recorded in rows and expenditures are recorded in the column. The corresponding row and column total of the matrix must be equal to each other; it is a framework that is widely used for the analysis of sectoral linkage and income distribution in the country. Therefore, the purpose of this research paper is to empirically investigate whether the Agricultural Development Led Industrial (ADLI) policy is reducing poverty through investigating the sectoral linkages between agriculture, industry and service and to study the effect of exogenous shocks such as increase in government spending, investment & export on overall demand, GDP growth and poverty reduction based on the 2005/06 Ethiopian SAM constructed by the Ethiopian Development Research Institute (EDRI).

## 1.2. Statement of the Problem

As explained above, The Ethiopian government has adopted the Agricultural Development Led Industrialization strategy in 1994 to promote growth and reduce poverty. The strategy has the objective of increasing agricultural production and productivity for export as well as domestic consumption. Since the adoption of the strategy, public spending on agriculture and various rural infrastructures has increased tremendously. However, the welfare impact of this strategy has not been assessed through SAM based multiplied analysis model which shows the interaction of all sectors of the economy.

On March (2007), International Food Policy Research Institute (IFPRI) has studied the Agricultural growth linkages in Ethiopia using Semi-Input-Output model and Economy wide Multi-Market Model (EMM) by

classifying the economy into agriculture and non-agriculture. However, the link between agriculture, industry and service has not been dealt.

Now a day, questions are rising on the welfare impact of ADLI and the link between agriculture, industry and service. This research paper has attempted to investigate the income generating capacity of the Agriculture to the households and answered the impact of exogenous injection such as increase in government spending, investment and Remittance from the Rest of the World on the overall demand of economic growth and poverty reduction based on the 2005/06 Ethiopian SAM constructed by Ethiopian Development Research Institute (EDRI).

### 1.3. Objectives of the Study

The general objective of the study is to empirically investigate the welfare impact of the Agricultural Development Led Industrialization (ADLI) through investigating sectoral linkages.

The specific objectives of the study are as follows:

- To identify the impact of exogenous injection such as increase in government spending, increase in investment & increase in export demand on the output of agriculture, industry & service.
- To identify a sector which creates greater demand and growth?

## 1.4. Research Questions

Based on the objective of the study, the following research questions have been tested.

- I. Which sector of the economy creates greater demand?
- II. Which sector of the economy play a significant role in the overall economic growth?
- III. Which sector of the economy plays a significant role in poverty reduction?

## 1.5. Scope of the Study

This study has covered all economic activities that are covered in National Accounts Sources and Methods of Ethiopia, (MoFED), May 2005. Industries are classified based on International Standard for Industrial Classification (ISIC rev 3.1) and the 1993 Systems of National Accounts (SNA) is applied. Accordingly, agriculture includes: crop production, animal farming, forestry production & fishing. Industry includes: Manufacturing, construction, Electricity and water production & Mining and Quarrying production. Service includes: Banking and Insurance, Trade, Hotels and Restaurant, Transport and communications, Health, Education, Real Estate and Renting activity & Domestic and other service activities in Ethiopia in the year 2005/06.

## 1.6. Limitation of the Study

The SAM based multiplier analysis model has two limitations. First, it assumes that there is excess capacity in all sectors and unemployed (Underemployed) factors of production. Second, prices are fixed; there is no allowance for substitution effects at any stage.

## 1.7. Significance of the Study

SAM based multiplier analysis has significant contribution for Macroeconomic policy making and decision taking. This research has examined the welfare impact of Agricultural Development Led Industrialization (ADLI) and the sectoral interdependence between agriculture, industry and service. Hence, it will help policy makers to understand the impact of ADLI on demand, growth and household income. In addition, it will help policy makers to prepare appropriate sectoral policy for industry and service. The research finding will also help to bring new ideas which will require further studies.

## 1.8. Organization of the Study

The research paper is organized into six chapters. The first chapter introduces, background, Statement of the problem, Objective of the research paper, research questions, Scope and limitation of study, and significance of the study. The second chapter describes Ethiopia's geographical location, the structure of the economy & economic policies. The third chapter explains the Structure of the 2005/06 Ethiopian Social Accounting Matrix (SAM) and the various literatures on SAM based multiplier analysis and sectoral linkages. The fourth chapter presents the research methodology, data source, data collection and analysis. The fifth chapter presents the empirical results of the research. The sixth chapter provides the conclusion and policy recommendations.

## 1.9. Test Procedure

The multiplier results computed from the 2005/06 SAM is compared to different sectors. A sector which has a larger multiplier in terms of demand, GDP growth rate & household income is more important in creating demand, growth & poverty reduction.

## CHAPTER TWO

# REVIEW OF DEVELOPMENT POLICIES & STRATEGIES IN ETHIOPIA

### 2.1. Description of Ethiopia

The Federal Democratic Republic of Ethiopia is located in the eastern part of Africa neighboring Sudan in the west, Kenya in the south, Somalia in the east and Djibouti and Eritrea in the Northeast and North respectively. It is divided into nine regional states and two administrative councils. The total area of the country is 1,133,380 sq km. According to the Central Statistical Agency 2007 population and housing census estimate, the total population of the country is 74, 777,981. 84 percent of the population lives in rural area and 16 percent live in urban areas. Addis Ababa is the capital city of the federal government and the seat of African union. The country is composed of 80 ethnic groups the largest include Oromo, Amhara, Somali, Sidama, Tigray & Gurage .Agriculture is the main economic activity and livelihood of the of the rural population. Coffee and hides and skins are the main export commodities .The religious composition among other includes, Orthodox Christians, Muslim, Protestant and catholic. The climatic variation varies from tropical zone with an average temperature 27°C to subtropical zone 22°C and temperate zone 16°C. *Birr* is the name of the National currency. According to March 31, 2012 exchange rate, 1US dollar is equivalent to 17.39 Birr.



## 2.2. Economic Policies & Strategies

In Ethiopia, Development policies started in the mid fifties. The first five year development plan covered the period 1957-1961. Subsequently, two other five year development plans, i.e. second five year development plans covering the period 1963-1967 and third five year development plan covering the period 1968-1973, were formulated and successfully implemented before 1974 revolution.

Based on political systems, development policies and strategies are grouped into three. The Imperial regime includes the period before 1974; the Military regime which ruled the country from 1974 to 1991 and the Ethiopian People Revolutionary Democratic Front (EPRDF) which is currently in power by overthrowing the military regime in 1991.

### 2.2.1. Development Policies before 1974

In Ethiopian history, the period before 1974 is known as the Imperial period, during this period, three consecutive development plans have been successfully executed. The introduction of these plans helps in the promotion of commercial farming and domestic manufacturing activities. It has given an impetus to the establishment of foreign direct investment through investment incentives, which invited foreign capital into the country. During this period, modern institutions were organized to undertake the development of social and physical infrastructures such as the construction of roads and highways, telecommunications, hydroelectric power and water supply projects with the help of expatriates' technical assistance. Financial institutions like the National and Commercial Banks, Development and Investment Banks, and saving and Mortgage Banks were established.

Agriculture was the dominant sector of the economy in terms of contribution to Gross Domestic Product (GDP), Employment and export. It is dominated by small scale farmers who have been adopting low inputs, low outputs, rain-fed mixed farming with backward traditional technologies. Small scale peasant farmers account for 95% of the total area under crops. The government tries to re-invigorate small holders production by means of package programmes which includes the introduction of new technology to increase productivity and market for products. In addition to this, the government promoted a policy towards the transformation of subsistence agriculture to commercial farms by providing investment incentives.

During this period, Import substitution industrial strategy was adopted and domestic industries were protected through high rate of customs duties. This strategy was introduced with the view to utilize the country's idle natural resources as well as to create employment opportunities.

In general, the imperial government followed a market oriented economic system that had created a conducive environment for the development of private sectors.

### 2.2.2. Development Policies 1974 to 1991

After the coming to power of the military regime in 1974, the command economic system was adopted in line with a socialist principle. The government followed public led development strategy and to that effect, large and medium scale industries, private banks and insurance, rural and urban lands, trading houses and supermarkets and other similar institutions were nationalized.

The Ministry of Industry was given the responsibility to supervise both public and private industries. Private sector participation in production, distribution and marketing of goods and services was discouraged. There were entry barriers through capital ceiling, discriminatory mechanism in foreign exchange allocation, and domestic input acquisitions. Private sector was restricted to small-scale, handicrafts and cottage industries. Price control on goods and quota systems were imposed in delivery and receipt of goods and services.

### 2.2.3. Development Policies after 1991

After the downfall of the military regime in 1991, the Transitional Government of Ethiopia led by the Ethiopian People Democratic Revolutionary Front (EPRDF) launched a new economic policy in 1991 based on the free market economic principles. One of the pillars of the new economic policy was creating an enabling environment for private sector development. Some of the reforms undertaken by EPRDF are:-

- Introduction of a free market economic system in the place of command and centrally planned management;
- New investment code enacted to encourage both local and foreign investment;
- Privatization of public enterprises as alternative way for the involvement of private investors ;
- Allowing free entry for the private sector in Banking, Insurance, export and import trade;
- Dismantling corporations and providing management autonomy for public enterprises;
- Enacting a new Labour code that gives more power to employer to hire and fire workers;
- Improving the financial environment in terms of expanding and diversifying the services in line with the growing needs of the private sector;

- Establishing national and regional investment offices so as to promote private investments;
- Undertaking fiscal policy reforms such as the removal of subsidies to public enterprises and adjustment of tax structures;
- Undertaking monetary policy reforms like allowing market forces to influence the determination of interest rate in a way to allocate investment resources to productive areas and also encourage saving ;
- Deregulating price and removing controls in the distribution of goods and services;
- Devaluating domestic currency and introducing auction system in foreign currency acquisition;
- Devolution of powers to regions.

#### 2.2.4 Agricultural Development Led Industrialization (ADLI)

Ethiopia has formally adopted Agricultural Development Led Industrialization (ADLI) as a development strategy in 1994, with the aim of investing in agricultural productivity in order to stimulate farm output and income. The objective of the strategy is to strengthen the interdependence between agriculture and industry by increasing the productivity of peasant farmers, expanding large scale private commercial farms, and reconstructing the manufacturing sector in such a way that it can make use of the country's natural and human resources. It has been justified by the fact that agriculture is the largest sector in terms of output, employment & export. According to the strategy, growth in agriculture is supposed to induce overall economic growth by stimulating both demand and supply. On the demand side, expansion in agricultural activities is supposed to increase demand for industrial products (e.g. agricultural inputs and consumer goods) manufactured by domestic firms. On the supply side, the sector provides

food (thereby reduce or eliminate the need to import grains and other food products), raw material for manufacturing, and export products. It enhances the productivity of agricultural sector by.

1. Improving agricultural practices through increased use of fertilizers and improved seeds as well as through training ;
2. Developing agricultural infrastructure through small scale irrigation, improved rural banking;
3. Promoting large scale (private as well as state owned) commercial farming.

ADLI is designed to make agriculture to be the engine of growth through the domestic and international trade, this has to be achieved by increasing the proportion of marketable output and correspondingly decreasing the ratio of production for own consumption. To facilitate the commercialization of agriculture, the government has implemented an extension program known as the Participatory, Demonstration, and Training Extension System (PADETES) with the objective of to helping small farmers to increase their productivity by providing credit for inputs as well as by demonstrating and disseminating information on major crops. Cooperative facilitates input and output marketing and promotes the provision of rural finance.

## CHAPTER THREE

### LITERATURE REVIEW

#### 3.1. Overview of Ethiopian 2005/06 SAM

The 2005/06 Micro SAM contains 99 activity accounts, 21 industrial and 12 service activities. 91 commodities are broadly divided into marketed and own-consumed commodities. The agricultural sector produces 25 marketed and 20 own-consumed commodities. The industry sector produces 30 marketed commodities and the service sector produces 14 marketed and 2 own-consumed commodities.

Factor income flows are recorded in 25 factor accounts. There are 14 household accounts, distinguishing rural & urban households by income class. The micro SAM shows detailed representation of the tax system, which separately identifies eight indirect commodity tax categories and nine types of direct taxes. The SAM also composed accounts for marketing margins –which records the sum of trade & transport margins, the government, changes in stock of finished and semi-finished goods, saving-investment flows, and transaction between the Ethiopian economy and the rest of the world. The fully disaggregated SAM is a square matrix with 255 rows and columns.

#### 3.2. Review of SAM based Multiplier Analysis

Azharia A. Elbushra, Ibrahim El-Dukheri, Ali A.Salih has conducted a SAM based multiplier analysis to examine the effect of income injection in the total outputs of the different production activities and household

income on Sudan economy using the 2000 SAM. The model results reveal that the injection of income (one billion Sudanese Dinar) in any account benefits the account it self more, with service sector recording the highest response, followed by agriculture and industry. It also shows that the injection in agriculture sector yields the highest multiplier effects in GDP and household income. The result revealed that households are better off if the injection takes place in Agriculture sector. It also indicated that agriculture is playing a leading role in poverty alleviation.

Husain M.Jami has conducted a SAM-based multiplier model to track the growth-poverty & inequality in Bangladesh. The study has identified that, the rural households experience higher percentage increase in their incomes when the GDP growth emanates out of the stimuli in agriculture and food processing sector. In contrast, the urban household groups experience a higher percentage increase in the incomes if the GDP growth is led by the service sectors. A 1% GDP growth in cereals crops would lead to 1.086% increase in income of the rural landless farmers and 0.753% increase in the income of urban high education households. A 1% GDP growth attributable to the exogenous injections in the “other service” sector would increase the income of landless farmer group by 0.816% while the same amount of increase would result 1.204% income increase of the urban high education group. On the other hand, 1 unit increase in the exogenous demand of cereal crops increase landless household’s income by 0.2354 units. The result also shows that rural high skilled non-agricultural households accrue greater benefit from the stimuli generated in the service sector (health, other service, education etc). The agricultural sectors, on the other hand, are found to be least income generating for the urban households.

Xinshen Diao, Belay Fekadu & Bingxin Yu has conducted Agricultural Growth linkages in Ethiopia based on 2001/02 SAM. They concluded that the growth in agriculture produces a stronger linkage than growth

in non-agriculture. The potential benefits of stimulating growth in agricultural production are substantial. In their analysis, a 1 birr increase in maize output under traditional agricultural production will generate 1.97 birr increase rise in total GDP. Similar changes in GDP are observed for 2.18 birr for teff, 3.45 birr of coffee, 1.4 birr for textile, and 1.16 birr for other manufactured products. A 1 birr increase in the textile and other manufacturing output can generate 0.12 birr and 0.05 birr direct increase in GDP. The SAM based analysis also shown a 1 birr increase in maize output under traditional agricultural production will generate 1.32 birr rise in total household income; while an equivalent change in traditional teff and coffee production will increase total household income by 1.48 birr and 1.88 birr respectively. Growth in the manufacturing has much lower positive impact on household incomes. In the distribution of income across households, expansion of maize and teff production with traditional technology naturally benefits farm households most. A substantial proportion of coffee is exported, due to that, very high transport and trade margins are associated with crop. As a consequence, a relatively small fraction of income gained from growth in coffee production accrues to farm households. Most of this income goes to wage earners and entrepreneurs.

Steven A. Block has conducted a four sector simulation model in Ethiopia and found that the growth multipliers are 1.54 for agriculture, 1.8 for service & 1.34 for modern industry and 1.22 for traditional industry. The simulation result further indicate that a \$1 service sector income shock generates \$ 0.8 in indirect benefits, a \$ agricultural income shock generate \$ 0.54 in indirect gains.

The simulation result shows \$1 increase in modern industrial income generates an additional \$0.08 of income (23% of the indirect impact) for its own work force, which comprises 2% of the labor force. It will generate \$0.043 income to be shared among the 86% of the labor force employed



in agriculture. Similarly, \$1 shock to traditional industry generate \$ 0.04 income ( 3% of the total benefit ) for the 86% labor force in agriculture & 89% of the total benefit to traditional industry.

The result also shown that, a 1dollar shock to service sector income generates \$ 0.42 for the agriculture sector and \$ 1.04 ( 58% of the total benefit ) for the 12% of the labor force in service.

## CHAPTER FOUR

### SAM BASED MULTIPLIER ANALYSIS

#### 4.1. The Basic Structure of SAM

The circular flow of income is the way of depicting all the transactions that are taking place in the economy in a specified period of time. It captures all transfers and transactions between sectors and institutions. Production activities purchases land, Labor & capital inputs from the factor markets, and intermediate inputs from commodity markets, and use these to produce goods and services. These are supplemented by imports (M) and then sold through commodity markets to households (C), the government (G), Investment (I) and export (E). In the circular flow diagram, one institution expenditure becomes another institution income. A Social Accounting Matrix (SAM) represents all these transactions in a matrix format. It is a square matrix in which each row and column represents total income and expenditure respectively. In line with the accounting principle, the account in row must be equal to the account in column.

The SAM distinguishes between “Activities” and “Commodities”. Activities are entities that produce goods and services, and commodities are those goods and services that are produced by activities. Activities produce goods and services by combining factors of production with intermediate inputs. The payment of factors such as wages, rents, profit is known as value added. Commodities are either supplied domestically or imported. Final demand for commodities consists of household consumption, government consumption, gross capital formation or investment and export. We can describe all transactions that are taking place in the economy in the Social Accounting Matrix (SAM) format as follows.

**Table 4.1: The Basic Structure of a SAM**  
Expenditure Columns

	<b>Activities C1</b>	<b>Commodities C2</b>	<b>Factors C3</b>	<b>Households C4</b>	<b>Government C5</b>	<b>Savings &amp; Investment C6</b>	<b>Rest of the World C7</b>	<b>Total</b>
Activities R1		Domestic Supply						Activity Income
Commodities R2	Intermediate Demand			Consumption Spending(C)	Recurrent Spending (G)	Investment Demand(I)	Export Earning (E)	Total Demand
Factors R3	Value- added							Total Factor Income
Households R4			Factor Payments to Households		Social transfers		Foreign remittances	Total Household Income
Government R5		Sales taxes & Import tariff		Direct taxes			Foreign Grants & Loans	Government Income
Savings & Investment R6				Private Saving	Fiscal Surplus		Current account balance	Total Savings
Rest of the World R7		Import payments (M)						Foreign Exchange Outflow
<b>Total</b>	<b>Gross Output</b>	<b>Total Supply</b>	<b>Total Factor Spending</b>	<b>Total Household Spending</b>	<b>Government Expenditure</b>	<b>Total Investment Spending</b>	<b>Foreign Exchange Inflow</b>	

**Table 4.2: SAM entries expressed as symbols**

	Activities		Commodities		Factors	Households	Exogenous Demand	Total
	A1	A2	C1	C2	F	H	E	
A1			x <sub>1</sub>					X <sub>1</sub>
A2				x <sub>2</sub>				X <sub>2</sub>
C1	Z <sub>11</sub>	Z <sub>12</sub>				C <sub>1</sub>	E <sub>1</sub>	Z <sub>1</sub>
C2	Z <sub>21</sub>	Z <sub>22</sub>				C <sub>2</sub>	E <sub>2</sub>	Z <sub>2</sub>
F	V <sub>1</sub>	V <sub>2</sub>						V
H					V <sub>1</sub> + V <sub>2</sub>			Y
E			L <sub>1</sub>	L <sub>2</sub>		S		E
Total	X <sub>1</sub>	X <sub>2</sub>	Z <sub>1</sub>	Z <sub>2</sub>	V	Y	E	

Where X is gross output of each activities (i.e. X<sub>1</sub> and X<sub>2</sub>)  
 Z is the total demand for each commodity (i.e. Z<sub>1</sub> & Z<sub>2</sub>)  
 V is the total factor income (equal to household income)  
 Y is the household income (equal to factor income)  
 E is exogenous component of demand (government, investment and exports)

**Table 4.3:** M-Matrix

Dividing each column by its column total to derive the coefficient matrix called “ M-Matrix”

	Activities		Commodities		Factors	Households	Exogenous Demand	Total
	A1	A2	C1	C2	F	H	E	
A1			$b_1 = \frac{X_1}{Z_1}$					X <sub>1</sub>
A2				$b_2 = \frac{X_2}{Z_2}$				X <sub>2</sub>
C1	$a_{11} = \frac{z_{11}}{X_1}$	$a_{12} = \frac{z_{12}}{X_2}$				$c_1 = \frac{C_1}{Y}$	E <sub>1</sub>	Z <sub>1</sub>
C2	$a_{21} = \frac{z_{21}}{X_1}$	$a_{22} = \frac{z_{22}}{X_2}$				$c_2 = \frac{C_2}{Y}$	E <sub>2</sub>	Z <sub>2</sub>
F	$v_1 = \frac{V_1}{X_1}$	$v_2 = \frac{V_2}{X_2}$						V
H					<b>1</b>			Y
E			$l_1 = \frac{L_1}{Z_1}$	$l_2 = \frac{L_2}{Z_2}$				E
Total	1	1	1	1	1	1	E	

Where  $\mathbf{a}_{ij}$  is technical coefficients (i.e. input or intermediate share in  
 $\mathbf{b}_{ij}$  is the share of domestic output in total demand  
 $\mathbf{v}_{ij}$  is the share of value added or factor income in gross output  
 $\mathbf{l}_{ij}$  is the value of total demand from imports or commodity taxes  
 $\mathbf{c}_{ij}$  is household consumption expenditure shares  
 $\mathbf{s}$  is the household saving rate ( i.e. saving as a share of total household income)

## 4.2 SAM based Multiplier Model

Using the symbols in the table, we can derive a SAM based multiplier model as follows: total demand  $Z$  in each sector is the sum of intermediate input demand, household consumption demand, and other exogenous sources of demand  $E$ , such as public consumption and investment.

$$\begin{aligned} Z_1 &= a_{11}X_1 + a_{12}X_2 + c_1Y + E_1 \\ Z_2 &= a_{21}X_1 + a_{22}X_2 + c_2Y + E_2 \dots\dots\dots (1) \end{aligned}$$

From the SAM we know that gross output  $X$  is only part of total demand  $Z$ ,

$$\begin{aligned} X_1 &= b_1Z_1 \\ X_2 &= b_2Z_2 \dots\dots\dots (2) \end{aligned}$$

The total household income depends on the share factor's earning in each sector as follows.

$$\begin{aligned} Y &= v_1X_1 + v_2X_2 \dots\dots\dots (3) \\ Y &= v_1b_1z_1 + v_2b_2z_2 \dots\dots\dots (4) \end{aligned}$$

Replacing  $X$  &  $Y$  and combining (2) & (4) with (1) we get the following.

$$\begin{aligned} Z_1 &= a_{11}b_1z_1 + a_{12}b_2z_2 + c_1(v_1b_1z_1 + v_2b_2z_2) + E_1 \\ Z_2 &= a_{21}b_1z_1 + a_{22}b_2z_2 + c_2(v_1b_1z_1 + v_2b_2z_2) + E_2 \dots\dots\dots (5) \end{aligned}$$

Moving all terms, except for exogenous demand E, onto the left hand side, we get

$$\begin{aligned} Z_1 - a_{11}b_1z_1 - c_1v_1b_1z_1 - a_{12}b_2z_2 - c_1v_1b_2z_2 &= E_1 \\ -a_{21}b_1Z_1 - c_2v_1b_1z_1 + Z_2 - a_{22}b_2Z_2 - c_2v_2b_2z_2 &= E_2 \dots\dots\dots(6) \end{aligned}$$

Finally, grouping Z terms together

$$\begin{aligned} (1 - a_{11}b_1 - c_1v_1b_1)Z_1 + (-a_{12}b_2 - c_1v_2b_2)Z_2 &= E_1 \\ (-a_{21}b_1 - c_2v_1b_1)Z_1 + (1 - a_{22}b_2 - c_2v_2b_2)Z_2 &= E_2 \dots\dots\dots(7) \end{aligned}$$

We can use matrix algebra to convert equation 7 into matrix format.

$$\begin{bmatrix} 1 - a_{11}b_1 - c_1v_1b_1 & -a_{12}b_2 - c_1v_2b_2 \\ -a_{21}b_1 - c_2v_1b_1 & 1 - a_{22}b_2 - c_2v_2b_2 \end{bmatrix} \begin{bmatrix} Z_1 \\ Z_2 \end{bmatrix} = \begin{bmatrix} E_1 \\ E_2 \end{bmatrix} \dots\dots\dots(8)$$

This is the identity matrix (I) minus the coefficient matrix (M)

$$\begin{bmatrix} 1 - a_{11}b_1 - c_1v_1b_1 & -a_{12}b_2 - c_1v_2b_2 \\ -a_{21}b_1 - c_2v_1b_1 & 1 - a_{22}b_2 - c_2v_2b_2 \end{bmatrix} = I - M \dots\dots\dots(9)$$

If we rename the other two vectors Z and E we can express equation (8) as equation (10)

$$(I - M)Z = E \dots\dots\dots(10)$$

By rearranging the terms, we arrive at the multiplier formula

$$Z = (I - M)^{-1} E \dots\dots\dots(11)$$

Equation (11) is known as **open Leontief Model** it tells us when exogenous demand (E) such as government spending, Investment & export increases, the final increase into the total demand equal to Z. Matrix Z is known as multiplier matrix or SAM based multiplier model. It helps to calculate the size of multiplier across the different sectors and

households. This multiplier indicates the relative income generating capacity of different sectors to the household, and also indicates the sectoral interdependence between agriculture, industry and service.

### 4.3. Data Source

The data which are used in this research paper are collected from the secondary sources; The 2005/06 Social Accounting Matrix (SAM) of Ethiopia which is constructed by Ethiopian Development Research Institute (EDRI) is the main source for the analysis. The Micro SAM is a 255 X 255 square matrix. The Macro SAM which is derived from Micro summarizes the diversity of production activity by different sectors & institutions of the economy and their interdependence. In addition to this, The Ministry of Finance and Economic Development (MoFED) 2010 National Accounts Statistics of Ethiopia, The various publications by the Central Statistical Agency (CSA), including the 2004 welfare monitoring survey, the 2003/04 Household Income Consumption and Expenditure survey, the 2005/06 annual agricultural sample survey, the 2005/06 large and medium scale manufacturing industries survey, the 2003 distributive and service trade survey are used. Other sources of information include SAM based research papers, journals and reports from the government and private websites.

### 4.4. Method of Data Analysis

The collected data are analyzed using MINVERSE and MMULT function the in excel, MINVERSE inverts matrix and MMULT multiply two matrix. The matrix  $(I - M)^{-1}$  in the equation 11 above is called the SAM multiplier matrix (Pyatt and Round, 1979; Thorbecke and Jung, 1996) and individual sectoral multiplier is given by  $M = m_{ij}$ . Where,  $ij$  are the rows and column of the matrix. This multiplier matrix has been termed as the



accounting multiplier matrix since it is computed from the average expenditure propensities of the endogenous variables. It gives insight into the anatomy of the structure of an economy in terms of inter-sectoral linkages, transfer effects, cross effects between different parts of the economy. The diagonal multiplier measures the direct impact of an exogenous expenditure on the particular sector, the off-diagonal multipliers measures the indirect impact of exogenous injections on the other sectors.

## CHAPTER FIVE

### ANALYSIS AND RESULTS

#### 5.1. Conceptual Framework of SAM based Multiplier Analysis

In order to better evaluate the role of Economic growth in poverty reduction strategies, it is better to analysis the links among income distribution by factor shares, personal income distribution and alternative policies. A better understanding of the relationships between sectors, income distributions in different household groups and alternative policies requires building a system in which the information on production, intermediate and final demand and income distribution between different groups are linked together. To this end, the impact of sector output on poverty alleviation can be direct through the increase in incomes accruing to the poor households who contributed through their labor or land to the sector's growth output. Another part of poverty alleviation comes though the interdependence of economic activities (Thorbecke, Jung, 1996,p.280)

A SAM multiplier analysis has been used to examine the consequences of real shocks in the economy. The model assumes the existence of excess capacity and unemployed or underemployed labor resources. It can be used to estimate the effects of exogenous changes and injections, such as increase in the demand for given production activity, government expenditures, investment or export. As long as excess capacity of labor prevails, any exogenous changes in demand can be satisfied though the corresponding increases in output without having any effect on prices. Thus, for any given injection in the exogenous variables, the influence is transmitted though the interdependence of SAM system. The total direct and indirect effects of the injection on the endogenous accounts, i.e. the

total output of the different production activities and the income of the various factors and socioeconomic groups are estimated through the multiplier process (Thorbecke, 2000, p.17). A main outcome of SAM-based multiplier analysis is to examine the effects of real shocks on the economy on the distribution of income across different group of households. Another important feature of SAM based multiplier analysis is that it leads to understanding the nature of the linkage in an economy and the effect of exogenous shock on distribution and poverty reduction (Round, 2003,p.271)

Table 5.1. Exogenous and endogenous accounts in a Simplified SAM

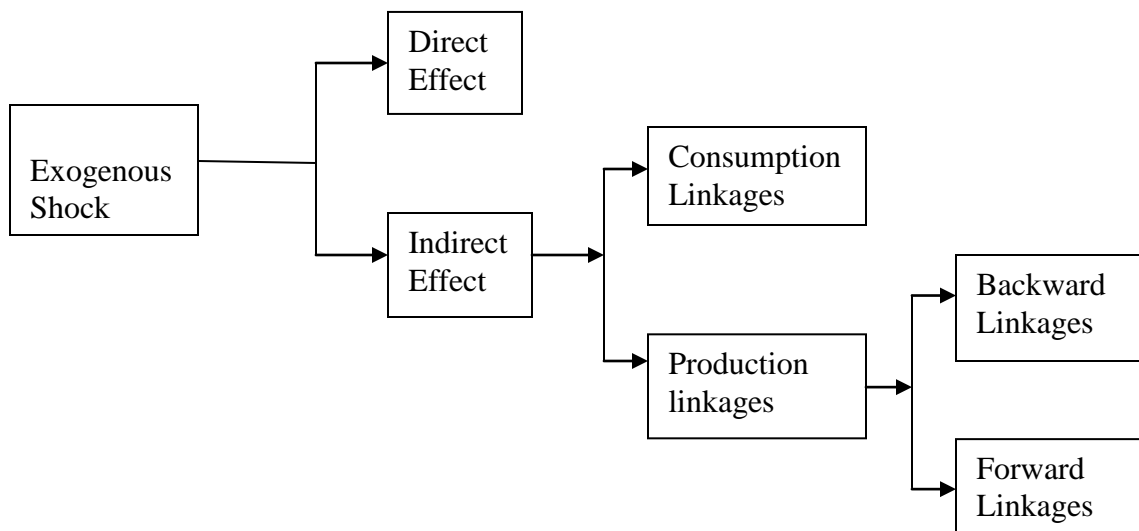
	Endogenous Accounts				Exogenous Accounts	Total
	Activities	Commodities	Factors	Household		
Activities		Domestic output				
Commodities	Input coefficient			Household spending		
Factors	Factor Shares					
Household			Factor Payments			
Exogenous Accounts						
Total						

Source: Breisinger et al, 2009

The SAM multiplier is focusing on determining the total effect that arises from an exogenous shock (increase in government spending, increase in export demand, or increase in investment demand). The total effect (multiplier effect) of these shocks is composed of direct and indirect effects. Direct effects are those pertaining to the sectors that are directly affected by the shocks. For example, an exogenous increase in demand for Ethiopian agricultural export has a direct impact on agricultural sector. However, it may also have indirect effect steaming from agricultural linkages to other sectors and parts of the economy. These indirect linkages can, in turn, be separated into production and consumption linkages. Production linkages are determined by sectors

production technologies, they are differentiated into Backward and Forward linkages. Backward production linkages are the demand for additional inputs used by the producer to supply additional goods and services. For example, when agricultural production expands, it demands intermediate goods like fertilizers, machinery, and transport services. This demand then stimulates production in other sectors to supply these intermediate goods. Forward production linkages account for the increased supply of input to upstream industries. For example, when agricultural production expands, it can supply more goods for food processing sectors, which stimulates manufacturing production (Breisinger et al, 2009)

Figure 5.1: Direct and Indirect linkages



SAM multipliers measure the value of all production and consumption linkage effects. It captures direct and indirect effects in the first and all subsequent rounds of the circular income flow. Multipliers translate initial changes in exogenous demand into total production and income changes of endogenous accounts. From the above diagram, three types of multiplier can be distinguished. First, an **Output Multiplier** combines all direct and indirect (consumption and production) effects across

multiple rounds and reports the final increase in gross output of all production activities. Second, a ***GDP Multiplier*** measures the total change value added or factor income caused by direct and indirect effects. Finally, the ***Income Multiplier*** measures the total changes in household income.

A SAM based modeling requires that accounts to be separated into endogenous and exogenous. The need for this distinction arises from the fact that there must be an array into the system i.e. some variables must be multiplied exogenously via injections in order to evaluate the effects (Alarcon, 2000). Therefore, in developing a simple model, the first step is to decide which accounts should be exogenous and which are to be endogenous. In this study, government spending, investment and export are considered as exogenous. This is because government spending is essentially determined by policy, the external sector is outside domestic control, and investment is exogenous because it is determined by the investment policy of the government. Thus, the endogenous accounts are activities, commodities, factors of production and households.

## 5.2. Model Results and Discussion

The impact of any given injection into the exogenous accounts of the SAM is transmitted through interdependent SAM system among the endogenous accounts. The interwoven nature of the system implies that incomes of factors, households and production sectors are all derived from exogenous injections into the economy via a multiplier process. The interpretation of the values in the multiplier is straightforward. When read column wise, the values show the increase of income in each of the four endogenous elements due to one unit of external injection into the column element via the exogenous accounts. Thus it shows the increase in gross outputs of sectors, commodity expenditure, income of factors of production and income of the household on all the items respectively.

Table 5.2: Multiplier effects of Exogenous shock on Endogenous Accounts

		Commodities			
		Agriculture	Industry	Service	Household
Activities	Agriculture	1.79	0.32	0.69	0.98
	Industry	0.21	0.38	0.19	0.20
	Service	0.80	0.24	1.78	0.91
Commodities	Agriculture	2.05	0.37	0.79	1.13
	Industry	0.86	1.58	0.79	0.82
	Service	0.89	0.27	1.99	1.02
Factors	Labor	1.34	0.28	0.72	0.81
	Capital	0.78	0.24	0.96	0.65
Household		2.03	0.49	1.57	2.38
Government		0.24	0.22	0.25	0.23
Capital		0.24	0.06	0.18	0.28
ROW		0.52	0.72	0.58	0.49

Source: Multiplier model results

### 5.2.1. The Impact of Exogenous Injection on Demand

Table 5.2. Indicates that the multiplier value of exogenous shocks on endogenous accounts on output, commodities, factors & households. The result shows a 1 billion birr injection into the agricultural sector will generate an extra 2.05 billion birr demand for agricultural commodities and 0.86 & 0.89 billion birr additional demand for industrial and service commodities respectively. This injection will increase the gross output of agriculture industry and service by 1.79, 0.21 & 0.80 billion birr

respectively. It indicates that agricultural sector shows the greatest response when the injection takes place on the sector itself. If a similar 1 billion birr injection is taking place on the industrial sector, it will generate a 1.58 billion birr additional demand for industrial commodities and 0.37 and 0.27 billion birr for agriculture and service commodities respectively. It will increase the gross output of agriculture, industry and service by 0.32, 0.38 & 0.24 respectively. The multiplier table also indicates that if an equivalent amount of injection is taken place on the service sector, it will create 1.99 billion birr additional demand for service sector output and a similar amount of 0.79 billion birr for agriculture and industrial commodities. This also increases the gross output agriculture, industry and service by 0.69, 0.19 & 1.78 respectively.

Similarly, when the injection are inserted via the household accounts (e.g. increase remittance from abroad, increase government transfers & increase corporate transfers), it will create an additional 1.13 billion birr demand for agricultural commodities and 0.82 & 1.02 billion birr for industrial and service commodities. This injection also increase the output of agriculture by 0.98 billion birr and that of industry and service by 0.2 & 0.91 billion birr respectively.

In all the above exogenous injections, the model result showed that the sector will give greater respond both in terms of output and demand when the injection is taking place on the sector itself. However, the agricultural sector will create the highest demand as compared to industry and service. This is largely due to its heavy linkage with those sectors.

In Ethiopia, Large and Medium, Small Scale and Cottage manufacturing industries uses agricultural products as main sources of raw materials. Among others, the food & beverage, wearing apparel, leather and leather

products of these manufacturing industries are heavily dependent on agricultural inputs. The Large and Medium scale manufacturing industries which represent 66.4 percent of total manufacturing output is the main user of agricultural inputs.

Table 5.3: Component of Large and Medium Scale Manufacturing in 2005/06

Type of Industry	'000 Birr	
	Actual Production	Percentage
Food and Beverage	5,230,700	36.61
Tobacco	330,426	2.31
Textile	883,515	6.18
Wearing Apparel	75,459	0.53
Leather and Leather Products	931,152	6.52
Wood	70,604	0.49
Paper and Printing	766,739	5.37
Chemical	903,242	6.32
Rubber and Plastics	896,862	6.28
Non-Metallic Products	1,629,974	11.41
Iron and Steel	1,345,970	9.42
Metallic Products	471,363	3.30
Machinery and Equipment	135,740	0.95
Motor Vehicles	343,551	2.40
Furniture	271,914	1.90
Total	14,287,211	100

Source: 2005/06 Large and Medium Scale Manufacturing Industries Survey by CSA

As we can see from table 5.3 and 5.4, the Food and Beverage, Textile, Wearing Apparel, Leather and Leather products together they accounts 49.84 percent of the actual value of production. The Food and Beverage which represent 36.6 percent of the production use 79.4 percent raw material from locally produced crop and livestock products. The manufacture of Sugar and Malt liquor which contribute 28.1 and 21.1



percent of food production uses sugar cane and Barley as their main inputs.

Table 5.4: Cost of Raw Materials Consumed by Large & Medium Scale manufacturing Industries in 2005/06

'000 Birr

Type of Industry	Cost of Raw Materials Consumed			Percentage of Local	Percentage of Import
	Local	Import	Total		
Food and Beverage	1,665,028	432,556	2,097,584	79.4	20.6
Tobacco	12,220	57,084	69,304	17.6	82.4
Textile	315,479	218,356	533,835	59.1	40.9
Wearing Apparel	23,549	10,665	34,214	68.8	31.2
Leather and Leather Products	499,484	132,419	631,903	79.0	21.0
Wood	11,248	9,032	20,280	55.5	44.5
Paper and Printing	81,911	305,396	387,307	21.1	78.9
Chemical	96,599	474,152	570,752	16.9	83.1
Rubber and Plastics	36,342	405,383	441,725	8.2	91.8
Non-Metallic Products	265,795	27,811	293,605	90.5	9.5
Iron and Steel	335,716	688,063	1,023,778	32.8	67.2
Metallic Products	22,070	275,997	298,066	7.4	92.6
Machinery and Equipment	336	103,655	103,992	0.3	99.7
Motor Vehicles	14,727	261,242	275,969	5.3	94.7
Furniture	73,016	68,670	141,686	51.5	48.5
Total	3,453,520	3,470,481	6,924,000	49.9	50.1

Source: 2005/06 Large and Medium Scale Manufacturing Industries Survey by CSA

The Leather and Leather product manufacturing industry which accounts for 6.52 percent of the manufacturing output use 79 percent raw material from locally produced livestock hides and skins. Textile which shares 6.18 percent of Large and Medium Scale Manufacturing also use 59.1 percent of locally produced cotton.

The Small Scale Manufacturing industries which use small power driven machine and employee less than 10 person represents 11.2 percent of the manufacturing output has greater dependency on the agricultural product. As we can see from table 5.5 that, grain mill which contributes 80 percent output uses crop products such as Teff, Maize and Wheat as its inputs.

Table 5.5: Value Added of Small Scale Manufacturing industries in 2005/06

Type of Industry	Value Added	' 000 Birr
		Percentage
Grain Mill	497,494	80.3
Food (except Grain Mill)	29,795	4.8
Textile	1,265	0.2
Wearing Apparel	10,495	1.7
Leather & Footwear	165	0.0
Wood	2,583	0.4
Paper	1,310	0.2
Publishing & printing	7,406	1.2
Chemicals	314	0.1
Other Non-Metallic	4,623	0.7
Fabricated Metals	38,697	6.2
Machinery and Equipment	572	0.1
Motor Vehicles	146	0.0
Furniture and NEC	24,476	4.0
Total	619,341	100

Source: MoFED, National Accounts Estimates of Ethiopia 2010

The cottage industry did not use power driven machine; it is usually done at home. It is the second largest industry which accounts for 22.4 percent of the manufacturing output. Its output is heavily dependent on agricultural products. Table 5.6 shows that Food and Beverage, Tobacco, Textile, Wearing Apparel, Leather & Footwear and wood together

accounts 84.3 percent of output uses agricultural product as its primary input.

Table 5.6: Value Added by Cottage Industries in 2005/06

“ 000 Birr

Type of Industry	Value Added	Percentage
Food and Beverage	535,933	43.3
Tobacco	1,193	0.1
Textiles	416,897	33.7
Wearing Apparel	37,333	3.0
Leather and Footwear	19,847	1.6
Wood	32,264	2.6
Printing & Rep. of Rec. Media	1,787	0.1
Chemicals	2,727	0.2
Other Non-Metal	62,697	5.1
Fabricated Metal Products	34,950	2.8
Furniture & NEC	91,713	7.4
Total	1,237,341	100

Sources: MoFED, National Accounts Estimates of Ethiopia 2010

In addition to this, forestry products such as wood and bamboo are being intensively used in construction and in the production of furniture and household equipments.

Table 5.7: Goods and Service consumed by service sector

Sectors	Goods & Service for Intermediate Uses			
	Agriculture	Industry	Service	Total
Hotels & Restaurant	23	62.2	14.8	100
Construction Service	6.8	77.7	15.4	100
Public Administration and Defense	0.9	35.4	63.8	100
Education	0.5	96.8	2.7	100

Source: Computed from 2005/06 SAM

The agriculture sector has also a strong linkage with service sector. Table 5.7 shows that 23 percent Hotel and Restaurants intermediate use is derived from agricultural products. These includes: Cereal products such as teff, chick peas, haricot beans, lentils, vegetables products such as tomato, potato, cabbage, lettuce, red-peppers, fruits such as orange , papaya & mango, stimulant crops like coffee & tea spices and milk & egg products are the main outputs of agriculture which are directly consumed by hotels and restaurants.

To conclude, all multiplier model results, Large and Medium Scale Manufacturing Survey and National Accounts Estimates have shown that Agriculture is a sector which create greatest demand in Ethiopian economy, this addresses the first research question which says “Which sector of the economy create greater demand ?”

### 5.2.2. The Impact of Exogenous Injection on Growth

Table 5.8 shows the multiplier model results of gross output, Net output or GDP, Household income and consumption. A 1 billion birr injection into the agriculture sector will increase the gross output of the overall economy by 2.79 billion birr while similar injection into the industry and service will increase the overall economy by 0.94 and 2.66 billion birr respectively. The result shows that agriculture is the main output driver of Ethiopian Economy. This is due to its strongest linkage with the output of industries and services. As we have explained earlier, Agriculture sector is heavily linked with the output of Large and Medium, Small scale, cottage manufacturing industries and service sectors. All these industries are using agricultural products as their main inputs. Small scale and cottage industries especially in rural areas are directly using the output of crop, livestock and forestry.

Table 5.8: Impact of Total Multiplier on Gross Output, GDP, Household Income and Consumption

Multiplier	Commodities			Household
	Agriculture	Industry	Service	
Output	2.79	0.94	2.66	2.09
GDP	2.12	0.52	1.68	1.46
Household Income	2.03	0.49	1.57	2.38
Consumption	3.80	2.21	3.57	2.97

Source: Multiplier Model Results

Another sector which is heavily linked with the agricultural production is domestic trade. It represents 12.5 percent of GDP. Most of trading activities both in rural and urban areas are related to agricultural commodities.

Table 5.9: Trade Margin Share

	Billion Birr	
	Trade Margin	
Agriculture	7.21	31.2
Industry	15.87	68.8
Total	23.08	100

Source: Computed from 2005/06 SAM

Table 5.9: Shows that 31.2 percent of the total trade margin generated through trading activities is derived from agricultural outputs. Cereals, pulses, oilseeds, vegetables, coffee, root crops & spices are some the major products of agriculture which passes to the trading channel. Therefore, the increase in agricultural production has significant impact on the output of domestic trade. Agricultural production also affects the

output of transport; freight transport is a sector responsible in the distribution of agricultural products into different corner of the country. The increase in agricultural production will increase the freight transport and vice versa.

As we can see from multiplier table 5.8, the injection of 1 billion birr into different sector of the economy has different multiplier impact on Gross Domestic Product (GDP). Agriculture being the dominant sector of the economy has the largest multiplier impact on GDP as compared to industry and service. The injection of 1 billion birr into agricultural sector will increase the GDP by 2.12 billion birr. Next to agriculture, the service sector is the second largest GDP multiplier. A 1 billion birr injection into the service sector will increase the GDP by 1.68 billion birr. If the same amount of injection is taken place into the industry sector, it will increase the GDP by 0.52 billion birr. Table 5.2 also shows that 63% of the increase in GDP or 1.34 billion birr is attributed to the increase in factor income of labor. While 37 % of increase or 0.78 billion birr is attributed to the increase in factor income of capital. Whereas in service sector, the largest increment of GDP is attributed to factor income of capital. A1 billion birr injection into this sector will create a 57 % or 0.96 billion birr increase in GDP which is attributed to the increase in factor income of capital while 43% of increment in GDP goes to factor income of labor. If similar injection is taking place in the industrial sector, it will contribute to the increase in factor income of labor and capital by 54% and 46 % respectively. From the above discussion, we can conclude that, the growth in agriculture accelerate overall economic growth mainly by contributing to factor income of labor instead of capital, this is due to Ethiopian agriculture involves much of labor intensive activities than capital. As the sector employed the largest labor force in the rural population, any injection into the sector will have a direct impact on the majority of the rural population. It is also explained earlier that,

agriculture is heavily linked with both industry and service by providing inputs and outputs. This strong linkage makes the sector to play a dominant role in the overall GDP growth the economy. This answers the second research question which says “Which sector of the economy play a significant role in the overall economic growth?”

### 5.2.3. The Impact of Exogenous Injection on Poverty Reduction

The Household income multiplier shows the total effect on household income of a unit income increase in a given account. The multipliers value shows increase in income of the households due to a unit increase in the corresponding exogenous intervention. The exogenous intervention could be direct government transfers, corporate transfers or remittances from the rest of the world to household. Table 5.2 shows the income multipliers of different sectors, the multiplier value of 2.38 billion birr indicates that household benefit most when injection is taken place in the form of direct government transfers or remittances this is because; household uses all additional income to purchase final consumption goods from another household. However, most of the studies in developing countries indicate that factor income is the main sources of income as remittances or transfer from government is very negligible.

Table 5.10: Sources of Household Income

	Factors		Government Transfers	Transfer from ROW	Total
	Labor	Capital			
Household	60.29	55.47	1.54	15.8	133.1
Percentage	45.30	41.68	1.16	11.87	100.0

Source: Computed from 2005/06 SAM

Table 5:10 shows that household derive 86.97 percent of their income from factor income. 45.3 percent of it is derived from factor income of labor and 41.68 percent is from factor income of capital. Transfer from the Rest of the World accounts 11.87 percent. Only 1.16 percent of household income is derived from government transfer.

Table 5.2 also indicates that, A 1 billion birr injection into the agricultural sector will increase the total household income by 2.03 billion birr. While an equivalent amount of injection on industry will increase the household income by 0.49 billion birr. If the same amount of injection is taken place in the service sector it will increase the income of household by 1.57 billion birr. The result shows that agriculture is the largest income multiplier of household as compared to industry and service. This is because consumption linkages originating from injection into the agriculture have second and third round linkages effects. The increase in income of agricultural dependent households will increase the demand for non-agricultural goods and services in rural areas due to a higher propensity to consume locally made goods and services.

Table 5.11: Uses of Household Income

	Commodities			Billion Birr		
	Agriculture	Industry	Service	Direct tax	Saving	Total
Household	53.73	19.74	41.37	2.73	15.53	133.1
Percentage	40.37	14.83	31.08	2.05	11.67	100

Source: Computed from 2005/06 SAM

Table 5:11 shows that household uses 86.28 percent of their income in the purchase of goods and services. The major share 40.37 percent of household income is spent on consumption of agricultural products. The



service sector stands next with 31.08 percent. The rest 14.83 percent is spent in the consumption of industrial goods. The household also save 11.67 percent of their income. 2.05 percent of household income also goes to government in the form of direct tax.

(Mellor and Lele 1971) has shown that consumption linkages emanating from farm factor income can induce sizable second rounds of rural growth via increased consumer demand for non- agricultural goods and services as well as perishables. This indicates that in countries like Ethiopia, with the farm household forming the bulk of the poorest population, the role that agricultural income played is immense in improving household income, growth and poverty reduction. Policies and strategies focusing on agricultural growth by improving farmer's production will bring broader-based economic growth and sustainable poverty reduction. To summarize, all sectors generate growth linkages, but growth in agricultural sector gives stronger linkages than growth in industry and services. This is because the initial additional income increment of farm household from factor income will have a greater second and third round linkage effects. Therefore, the potential benefit of stimulating growth in agricultural production is substantial in poverty reduction. This answers the third research question which says "Which sector of the economy plays a significant role in poverty reduction?"

## CHAPTER SIX

### 6.1 CONCLUSIONS AND POLICY RECOMMENDATIONS

The Ethiopian government has adopted Agricultural Development Led Industrialization strategy in 1994 to promote growth and reduce poverty. The strategy has the objective of increasing agricultural production and productivity for export as well as domestic consumption. Since the adoption of the strategy, public spending on agriculture and various rural infrastructures has increased tremendously. However, the welfare impact of this strategy has not been assessed. The best way to analyze this is a SAM based multiplier analysis model which shows the interaction of the different sector of the economy such as agriculture, industry and service. This research paper entitled “The contribution of Agriculture to Economy wide growth and poverty reduction in Ethiopia: A SAM based multiplier Analysis” has the objective of investigating sectoral linkages and the welfare impact of Agricultural Development Led Industrialization (ADLI).

To achieve these objectives, three research questions were identified and empirically investigated. These are:-

- I. Which sector of the economy creates greater demand?
- II. Which sector of the economy play a significant role in the overall economic growth?
- III. Which sector of the economy plays a significant role in poverty reduction?

The 2005/06 Macro SAM which was constructed by Ethiopian Development Research Institute (EDRI) has been used as the main

source of data. The SAM contains eight major categories namely; Activities, commodities, margins, factors, households, government, investment and Rest of the World. To analysis sectoral linkages, the variables are classified into two endogenous and exogenous. The endogenous includes activities, commodities, margins, factors and households. The exogenous variables are those determined by policies of government and Rest of the World. In this study, government spending, investment and export are classified as exogenous; because government spending is determined by fiscal policy, the external sector is outside domestic control, and investment is determined by the investment policy of the government. Multipliers for the different endogenous variables were derived from Macro SAM using MINVERSE and MMULT matrix algebra function in excel.

The multiplier model result has shown that a 1 billion birr exogenous injection into the agricultural sector will generate 2.05 billion birr demand for agricultural commodities and 0.86 & 0.89 billion birr additional demand for industry and service commodities respectively. This shows that the overall demand of agricultural commodities will double when the injection is taken place in agriculture. This is mainly because of the sector strongest linkages with industry and service. Large and Medium scale manufacturing, small scale and cottage industries use agricultural products as their main inputs. Agriculture has also strong linkage with service mainly because of primary products of agriculture are used by Hotels and Restaurants. The model result also showed that, the sector plays a leading role to the overall GDP growth by contributing more to the factor income labor than capital. A 1 billion birr injection into agriculture will increase the overall GDP by more than double i.e. the overall GDP increase by 2.12 billion birr as compared to 0.52 & 1.68 billion birr on industry and service respectively. It is also observed from the model result that agriculture will increase the total household income

more than industry and service. A 1 billion birr injection into the agriculture sector will increase household income by 2.03 billion birr as compared to 0.49 and 1.57 billion birr increase for similar injection on industry and service respectively. Any additional income generated from farm household will increase the demand for non-agricultural goods and services in rural areas due to a higher propensity to consume locally made goods and service and will have a greater second and third round ripple effects. This makes agriculture a key driving force toward poverty reduction strategies.

In conclusion, Ethiopia is a developing country in which majority of the population living in rural areas under poverty. Any policy related to the expansion of agricultural production and productivity will benefit the majority of the rural population and create greater demand to the overall economy. The greater demand will lead to greater supply of other sectors such as industry and service which leads to growth and poverty reduction. Therefore, the Agricultural Development Led Industrialization (ADLI) strategy will reduce poverty significantly if it is properly programmed and implemented.

The finding of this study has the following policy recommendations.

- The study has shown that agriculture has a strong linkage with industry, to achieve sustainable growth and poverty reduction; both agriculture and industry have to grow side by side. Therefore, appropriate industrial policies which complement ADLI have to be implemented.
- Urban development and inter regional linkages plays a greater role in increasing the demand for agricultural goods. This increase has a greater ripple effect in poverty reduction. Therefore, policies related to urbanization have to be implemented.

- Instead of developing heavy dependency on imported raw materials, manufacturing industries should be encouraged to use more domestically produced agricultural products as their main inputs. This will create more demand and growth to the overall economy. Therefore, policies which encourage the use of domestic agricultural products have to be in place.

Finally, since the model is based on a number of assumptions such as fixed prices, excess capacity in all sectors and unemployed (Underemployed) factors of production. It has its own limitations. Therefore, cautions need to be made in interpreting the model results. To address some of these and get further analytical insights, a computable general equilibrium (CGE) has to be constructed.

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Table A2: SAM Multipliers

		Activities			Commodities			Margin	Factors		Household	Government	Capital	ROW
		Agri	Ind	Ser	Agri	Ind	Ser		Lab	Cap				
Activities	Agri	1.96	0.66	0.77	1.79	0.32	0.69	0.78	0.98	0.87	0.98	0.00	0.00	0.00
	Ind	0.20	1.30	0.22	0.21	0.38	0.19	0.33	0.20	0.18	0.20	0.00	0.00	0.00
	Ser	0.87	0.63	1.99	0.80	0.24	1.78	0.41	0.91	0.81	0.91	0.00	0.00	0.00
Commodities	Agri	1.10	0.75	0.89	2.05	0.37	0.79	0.89	1.13	1.00	1.13	0.00	0.00	0.00
	Ind	0.83	1.21	0.88	0.86	1.58	0.79	1.35	0.82	0.73	0.82	0.00	0.00	0.00
	Ser	0.97	0.70	1.11	0.89	0.27	1.99	0.46	1.02	0.90	1.02	0.00	0.00	0.00
Margin		0.28	0.32	0.27	0.38	0.36	0.24	1.37	0.28	0.25	0.28	0.00	0.00	0.00
Factors	Lab	1.47	0.63	0.81	1.34	0.28	0.72	0.61	1.81	0.72	0.81	0.00	0.00	0.00
	Cap	0.85	0.62	1.08	0.78	0.24	0.96	0.41	0.65	1.57	0.65	0.00	0.00	0.00
Household		2.22	1.18	1.76	2.03	0.49	1.57	0.97	2.38	2.11	2.38	0.00	0.00	0.00
Government		0.25	0.24	0.27	0.24	0.22	0.25	0.23	0.23	0.32	0.23	1.00	0.00	0.00
Capital		0.26	0.14	0.21	0.24	0.06	0.18	0.11	0.28	0.25	0.28	0.00	1.00	0.00
ROW		0.49	0.62	0.52	0.52	0.72	0.56	0.66	0.49	0.44	0.49	0.00	0.00	1.00

Source: Authors Computation

Agri=Agriculture  
Ind =Industry  
Ser = Service  
Lab = Labor  
Cap = Capital  
ROW=Rest of the World

Table A3: GDP by Economic Activity at Current Prices (000' Birr)

	1996	1997	1998	1999	2000	2001	2002
Industry/Year	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Agriculture, Hunting and Forestry	34,951,194	45,709,931	58,369,113	75,802,169	117,003,960	160,491,143	165,489,007
Crop	19,732,776	27,296,975	35,402,548	48,364,287	80,013,059	111,737,367	109,122,005
Animal Farming and Hunting	10,710,495	13,485,245	17,484,021	20,834,045	27,663,734	37,383,517	44,022,773
Forestry	4,507,922	4,927,711	5,482,545	6,603,837	9,327,166	11,370,259	12,344,229
Fishing	37,244	49,843	62,065	72,844	104,354	136,176	178,836
Mining and Quarrying	472,837	559,778	676,017	635,612	920,902	1,269,813	2,475,073
Manufacturing	4,215,671	4,682,879	5,533,464	7,136,040	9,251,396	11,813,224	14,467,218
Large and Medium Scale Manufacturing	2,838,629	3,024,605	3,676,781	4,923,455	6,471,124	7,777,741	9,785,414
Small Scale and Cottage Industries	1,377,042	1,658,274	1,856,683	2,212,585	2,780,272	4,035,483	4,681,805
Electricity and Water	1,812,317	1,951,586	2,316,027	3,135,501	3,480,996	3,716,971	4,457,244
Construction	4,626,752	5,510,819	6,921,071	9,268,810	12,000,273	16,073,853	15,882,454
Whole Sale and Retail Trade	9,635,285	11,638,598	15,354,844	21,139,856	30,497,383	46,474,247	51,880,783
Hotels and Restaurants	1,790,250	2,102,051	2,821,683	4,334,097	6,440,625	10,154,509	14,550,779
Transport and Communications	5,011,770	6,823,589	6,863,056	7,927,587	9,344,675	12,766,307	15,966,605
Financial Intermediation	1,336,644	1,633,014	2,208,373	2,668,799	3,632,208	5,770,753	6,744,667
Real Estate, Renting and Business Activities	6,754,311	7,486,146	9,119,465	13,380,850	19,986,149	24,297,045	36,202,533
Public Administration and Defense	4,098,847	4,686,859	5,446,614	6,342,591	8,370,387	10,320,218	11,577,246
Education	2,580,437	2,986,734	3,793,051	4,830,781	6,193,100	7,389,912	8,840,946
Health and Social Work	761,316	931,168	1,069,964	1,303,992	1,732,699	2,084,785	2,421,955
Other Community , Social & Personal Services	1,466,681	1,693,037	2,074,588	2,652,723	3,709,591	5,352,037	5,930,509
Private Households with Employed Persons	227,811	242,527	320,724	370,947	506,429	674,143	728,989
Total	79,779,366	98,688,560	122,950,117	161,003,200	233,175,128	318,785,137	357,794,846
Less : FISIM	594,415	682,806	1,006,665	1,200,059	1,657,451	2,544,247	2,842,569
Gross Value Added at Current Basic Prices	79,184,951	98,005,755	121,943,453	159,803,141	231,517,677	316,240,890	354,952,277
Taxes on Products	7,476,000	8,467,000	9,698,000	12,186,000	16,785,000	19,139,000	28,412,000
GDP at Current Market Prices	86,660,951	106,472,755	131,641,453	171,989,141	248,302,677	335,379,890	383,364,277

Source: MoFED National Accounts Estimates

Table A4: The Structure of Ethiopian 2005/06 SAM

<b>(A) Activity Accounts</b>	
<b>Code</b>	<b>Description AGRICULTURE</b>
atef	Growing of Teff
Abar	Growing of Barley
awhea	Growing of Wheat
amaiz	Growing of Maize
asorg	Growing of Sorghum
Apul	Growing of Pulses
avegfr	Growing of Vegetables and Fruits nec
Aoils	Growing of Oil seeds
acash	Growing of Cash crops nec: Sugar cane and beet, tea, chat,etc
aenset	Growing of Enset
acrop	Growing of crops nec
acoff	Growing of Coffee
alivst	Livestock farming, dairy farming, production of animal products
afisfor	Forestry and fishing
<b>Code</b>	<b>Description INDUSTRY</b>
amining	Mining and quarrying
aofood	Production, processing and preserving of meat and meat products
	Production and preserving of fish and fish products
	Processing and preserving of fruit and vegetables
	Manufacture of vegetables and animal oils and fats
	Manufacture of prepared animal feeds
	Manufacture of bakery products
	Manufacture of macaroni, noodles, couscous and similar farinaceous
	Manufacture of other food products n.e.c.
adairy	Manufacture of dairy products
agmill	Manufacture of grain mill products
agmillserv	Manufacture of grain mill services

Asug	Manufacture of sugar
	Manufacture of cocoa, chocolate and sugar confectionery
Abev	Distilling, rectifying and blending of spirits
	Manufacture of wines
	Manufacture of malt liquors and malt
	Manufacture of soft drinks; production of mineral waters
amtob	Manufacture of tobacco products
atext	Preparation and spinning of textile fibers; weaving of textiles
	Finishing of textiles
	Manufacture of made-up textile articles, except apparel
	Manufacture of carpets and rugs
	Manufacture of cordage, rope, twine and netting
	Manufacture of other textiles n.e.c.
	Manufacture of knitted and crocheted fabrics and articles
aapar	Manufacture of wearing apparel except fur apparel
aleath	Tanning and dressing of leather
	Manufacture of luggage handbags and the like, saddler and harness
	Manufacture of footwear
awood	Wood and wood products
apaperp	Manufacture of paper and paper products; publishing; printing
achem	Manufacture of chemicals, rubber and plastic products
aminprod	Manufacture of mineral products
abmetalp	Manufacture of basic iron and steel
	Manufacture of metal products
amach	Manufacture of ovens, furnaces and furnace burners
	Manufacture of machinery for food, beverage and tobacco processing
<b>Code</b>	<b>Description SERVICE</b>
aelecq	Manufacture of office, accounting and computing machinery
	Manufacture of accumulators, primary cells and primary batteries
Aveh	Manufacture of bodies (coachwork) for motor vehicles
	Manufacture of parts and accessories for motor vehicles and their engines
aomanu	Manufacture of furniture
	Manufacture of jewelry and related articles
aeselect	Electricity, gas, steam and hot-water supply

afwater	Activity of collecting(fetching) free water?(own consumption by HH)
awater	Collection purification and distribution of Water
acons	Construction
Atrad	Wholesale and retail trade; repair of Motor vehicles,
ahotel	Hotels and Restaurants
atrncom	Transport, Storage and communications
afserv	Financial intermediation
arest	Real Estate, Renting and Business Activities
apadmin	Public administration
aeduc	Education
aheal	Health and Social Work
aoserv	Business Activities
<b>(B) Commodity Accounts</b>	
<b>Code</b>	<b>Description Agriculture Marketed</b>
ctef	Teff
Cbar	Barley
cwhea	Wheat
cmaiz	Maize
Csorg	Sorghum
Cpul	Pulses
Cveg	Vegetables nec
Coils	Oil seeds
ccotts	Cotton Seed
ccane	Sugar cane sugar beet
cfruit	Fruit Crops
ctea	Tea
cchat	Chat
ccoff	Coffee
Censet	Enset
ccrop	Cereal grains and other crops nec
cfibre	Plant?based fibers
ccatt	Cattle
cpoul	Poultry; Other small livestock

cmilk	Raw milk
ccott	Raw cotton, Wool, silk?worm cocoons
caprod	Animal products nec
cfors	Forestry products
cflower	Flowers
cfish	Fish
<b>Code</b>	<b>Description Industry Marketed</b>
ccoal	Coal
cngas	Gas
cmin	Minerals nec
cmeat	Meat products
cvprod	Vegetable products; animal oils and fats
cdairy	Dairy products
csug	Sugar and sugar confectionary
cgmill	Grain mill products
cgmillserv	Grain mill services
cfood	Food products nec; animal feeds
cbev	Beverages
ctob	Tobacco Products
cmtea	Manufacturing of tea
cmtob	Manufacturing of tobacco
clcott	Lintel Cotton
ctext	Textiles
capar	Wearing apparel
cleath	Leather products
cwood	Wood products
cpaper	Paper products publishing
coilptrl	Petroleum coal products
cfert	Fertilizers
cchem	Chemicals, rubber and plastic products
cminprod	Mineral products nec
cmetal	Metals nec
cmprod	Metal products
cveh	Motor vehicles and parts; other transport equipment

celecq	Electronic equipment
cmach	Machinery and equipment nec
comanu	Manufactures nec
<b>Code</b>	<b>Description Service Marketed</b>
celect	Electricity
cwater	Water
ccons	Construction
ctrad	Trade and repair services
chotel	Hotels and restaurants
ctrans	Transport services
ccomm	Communication
cfserv	financial services
cbserv	Business services nec
cpadmin	Public administration and defense
ceduc	Education
cheal	Health
coserv	Recreation and other services
crest	Real estate and renting services
<b>Code</b>	<b>Own-Consumed Agricultural Commodities</b>
ctefo	Teff
cbaro	Barley
cwheao	Wheat
cmaizo	Maize
cpulo	Pulses
cvego	Vegetables nec
coilso	Oil seeds
ccaneo	Sugar cane sugar beet
cfruito	Fruit Crops
cchato	Chat
ccoffo	Coffee
ccropo	Cereal grains and other crops nec
cpoulo	Poultry; Other small livestock
cmilko	Raw milk

ccotto	Raw cotton, Wool, silk?worm cocoons
<b>Code</b>	<b>Own Consumed Processed Commodities</b>
caprodo	Animal products nec
cforso	Forestry products
cfisho	Fish
cmeato	Meat products
cdairyo	Dairy products
<b>Code</b>	<b>Own Consumed Service</b>
cfwatero	Water collection
cresto	Housing
<b>(C) Factor Accounts</b>	
<b>Code</b>	<b>Description</b>
flab0	Agricultural labor
flab1	Administrative workers
flab2	Professionals
flab3	Unskilled workers
flab4	Skilled workers
<b>(D) MARGINS</b>	
Total Margin	Transport and Trade Margin
<b>(E) Non-Household Institutions</b>	
<b>Code</b>	<b>Description</b>
Enterprises	Public Enterprises
Government	Government
Dstk	Stock Changes
S-I	Savings and Investm
RoW	Rest of the World
<b>(F) Household Accounts</b>	
<b>Code</b>	<b>Description</b>
HH-Rural_EZP	Poor rural households
HH-Rural_EZ1NP	Non-poor rural households
HH-SmallurbanP	Poor households in small urban settlements



HH-BigurbanP	Poor households in large urban settlements
HH-SmallurbanNP	Non-poor households in small urban settlements
HH-BigurbanNP	Non-poor households in large urban settlements
<b>(G) Tax Accounts</b>	
<b>Code</b>	<b>Description</b>
	Indirect Tax
LocEcsTx	Local Excise Tax
LocalVAT	Local Value Added Tax
ServTx	Service Tax
ImpDuty	Import Duty
ImpWTx	Import Withholding Tax
ImpEcsTx	Import Excise Tax
ImpVAT	Import Value Added Tax
Impsur	Import Surtax
	Direct Tax
HHIncTx	Personal Income Tax
AgIncTx	Agricultural Income Tax
ProfitTx	Profit Tax (Household and Cor
DivTx	Dividend Tax
RentIncTx	Rental Income Tax
IntIncTax	Interest Income Tax
CapGainTx	Capital Gains Tax
LandTx	Land Use Fee
OEntTx	Other Direct Enterprise taxes