FISCAL AGGREGATES, AID AND GROWTH IN ETHIOPIA: A VECTOR AUTOREGRESSIVE ANALYSIS

BY

MESFIN GULILAT TADESSE

A THESIS SUBMITTED TO
THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF SCIENCE IN
ECONOMICS (ECONOMIC POLICY ANALYSIS)

MARCH 2007
ADDIS ABABA

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

"Fiscal Aggregates, Aid and Growth in Ethiopia: A Vector Autoregressive Analysis."

By

Mesfin Gulilat Tadesse

Approved by the Board of Examiners:

Dr. Eyed Hasan Dayed	Eyed
Advisor	**Signature**
Teshome Mulat	
Examiner	**Signature**
Shail Singh	
Examiner	**Signature**

Acknowledgment

Praise God, the almighty for successful completion of my Master degree. My appreciation and gratitude goes to my advisor Dr. Syed Hasan for his invaluable and constructive suggestions. Words cannot express the gratitude I have to my family and friends without whose encouragement and support this undertaking would have been not possible.

I am grateful to all those who helped me through out the last two years. I am also thankful to all colleagues at Planning and Research Department of the Ministry of revenues. It is also my pleasure to thank the Ministry of Revenues for sponsoring my study.

Finally, I would like to express my special appreciation to the School of Graduates Studies of the Addis Ababa University for the financial support it provided me to complete my research work.

Table of Contents

List of Tables

Lists of Figures

List of Appendices

Acronyms

I(0)	Integrated of order zero (stationery series)
I(1)	Integrated of order one(non-stationary series)
2SLS	Two Stage Least Squares
3SLS	Three Stage Least Squares
ADF	Augmented Dickey-Fuller
ADI	African Development Indicator
AR	Autoregressive
DF	Dickey-Fuller
EEA	Ethiopian Economic Association
EEPRI	Ethiopian Economic Policy Research Institute
GDP	Gross Domestic Product
GDS	Gross Domestic Saving
GFCF	Gross Fixed Capital Formation
GNP	Gross National Product
HDI	Human Development Index
ICOR	Incremental Capital Output Ratio
LDC	Least Developed Country
MoFED	Ministry of Finance and Economic Development
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Square
PP	Phillips-Perron
PPP	Purchasing Power Parity
SSA	Sub-Saharan Africa
VAR	Vector Autoregressive
VECM	Vector Error Correction Model

Abstract

Like any other developing countries, aid can affect economic growth of Ethiopia, such as through its impact on government behavior, investment and saving. Government expenditure can also raise growth by increasing the general level of economic activity. As much of aid is given to the government, its effect on growth and poverty reduction is likely to be properly mediated by government fiscal policy that makes the analysis of fiscal impact of aid and its relationships with growth more interesting.

The main objective of this study is to examine the fiscal impact of aid and its relationships with growth in Ethiopia using annual time series data over the period 1960/61-2004/05. Multivariate cointegration and vector error correction model (VECM) are estimated to establish the short and long run relationship between foreign aid, fiscal aggregates and economic growth. The main findings show that foreign aid (both grant and loan) has significant positive impact on long-run growth of output and expenditure. Government expenditure is also found to have a positive long-run influence on growth, and there is no evidence that shows tax revenue retards growth in Ethiopia.

Although both grants and loans have positive long-run influence on growth, the policy implication is that foreign aid to Ethiopia could better if given in the form of grants and associated with fiscal discipline because foreign aid which comes in the form of loan may be transferred to debt burden problem as country's debt stock has accumulated to unsustainable level.

1. Introduction

1.1 Background

Today, for millions people of the developing countries and their government, the main aspiration is achieving sustainable economic development. Achieving economic development means getting food security, access to education, health care as well as self-respect. In other words, achievement of economic development means achieving a better life and improvement of the general well being of the society. This achievement cannot come simply by aspiration it requires designing good policies and taking practical action mainly in the area of saving, and investment. The saving requirement can be fulfilled either by domestic saving or foreign saving (foreign aid). Since most of the developing countries are neither in position to generate adequate resources from domestic saving nor able to borrow money from international capital markets at ongoing market interest rate.

Economic growth is central for all round development. Growth process in general is constrained process subject to resource scarcity; the case in developing countries is different. Developing countries face a wide range of constraints, which makes their case unique. These problems are structural by origins as they are derived from being exporters of primarily commodities, the production system being dominated by traditional practice, unskilled labor, low level of technology, etc. (Rodan, 1961).

Importance of capital accumulation in the growth process and hence social transformation was recognized long time ago (see Harrod, 1939, Domar, 1946, and Lewis, 1954). Owing to the structural constraints, developing countries failed to finance desired level of investment out of domestic resources (saving). Nurkse (1958) expressed the problem of capital formation in developing

countries from both demand and supply sides by saying 'a country is poor because it is poor'. Early development economics theory noticed that developing countries are trapped in vicious circle of poverty and hence their economies are stagnant. This condition made foreign capital (which is mainly foreign aid) an optimal means to break the circle and hence fasten the transformation process.

Early structural development models such as Harrod-Domar growth model, two-gap model of Chenery and Strout (1966) showed how foreign aid would enable developing countries to transform their economies. The two gap model which is considered as an extension of Harrod-Domar model has firmly established that foreign aid would assist developing countries by eliminating the two gaps (saving and foreign exchange gap) simultaneously. It solves the two gaps when aid is coming in the form of hard currencies which enables recipient countries to import more capital goods over and above what they would have done from their domestic resources only (Rodan, 1961, Chenery and Strout, 1966).

The success of the Marshall Plan of 1948-1952 which enabled the war devastated European countries' spurring their economy to get out of crisis was cited as an evidence to extend aid to other developing countries (OECD, 1985). Theoretical support for this view can be tracked back to Rostow (1963) who illustrated that developing countries in the first stage of development need foreign capital to kick-start their economies. In Rostow's growth stages theory, developing countries can then take-off to a stage of self-sustained growth. Since 1960s, aid becomes one feature for the relationship between developed and developing countries (McGillivray and Morrissey, (2001) and Franco-Rodriguez et al. (1998)).

The question to follow is the effectiveness of aid in bringing desired change. It is difficult to conclude, as empirical studies are not powerful as what theories

predict about importance of aid. The results from empirical studies are mixed some argued that aid has positive impact when used in good policy environment (see Burnside and Dollar (1997), Durbarry et al. (1998), Ali et al. (1998), Khan (1998), and Lancaster (1999), while others argued aid retards growth (see Griffin (1970), Weisskopf (1972), Dowling and Hiement (1983), Mosley et al. (1987), Dollar and Easterly (1999)). Moreover, some of these studies show that an increase in aid may lead to a decline in public saving through lowering tax revenue as the government reduces either in the level of taxation or their collection effort.

However, others such as Bulir and Hamann (2003) have also argued that short falls in aid may translate in to short falls in domestic revenue, although the magnitude of this effect appears to depend on the composition of aid (Gupta et al. (2003). Nevertheless, to the extent that foreign assistance may have adverse effects on incentives to raise taxes or control public expenditure, the issue of how to manage aid inflows to maximize efficiency becomes important.

Foreign economic assistance has played an important role in the economic development of Ethiopia since 1960s. The primarily objectives of donors in Ethiopia has been the promotion of economic growth through support of investment, reforms, poverty reductions and minimizing the vulnerability of the economy to adverse natural and terms of trade shocks. The effectiveness of foreign aid in Ethiopia depends not only on external factors, that is, on its availability in required volume, favorable financial terms and on external conditions but also in internal factors such as project implementation capacity and foreign aid absorptive capacity of the country as well as proper utilization of resources. In short, the issue of effectiveness of foreign aid on economic development is overarching in external and internal factors.

Aid can have impact on growth through direct financing of projects that enhance the well being of the poor. On the other hand aid also indirectly

benefits the poor through funding the government expenditure that is growth enhancing that requires the effectiveness of aid.

Since the success of economic development depends primarily on country's own efforts, Ethiopian policy makers must take measures that contribute to the efficient utilization of foreign resources and ultimately to reduce its dependency on foreign aid. These measures may include creating favorable policy environment to optimize domestic capital accumulation and resource mobilization, allocating obtained foreign resource and domestic revenue on public investment which have high economic returns, which foster economic growth.

Hence, taking the issues of effectiveness aid the paper will evaluate the contribution of aid in promoting overall growth. Since almost all aid passes through government structures, the study will take the case of fiscal impact of aid and its relation with growth taking Ethiopia as the case in the study.

1.2 Statement of the Problem

Developing countries are heavily dependent on external resource to expand the productive capacity of their economies. In response to the demand for transfer resources by developing countries, developed countries (donors) have provided financial support in the hope that aid would enable developing countries (recipient) to build up their productive capacity, and thereby in the long-run finance their investment and import requirement for self-sustaining economic growth through normal commercial channels. Aid, purportedly given to supplement the domestic saving, foreign exchange earning, and to fill fiscal gap of recipient countries to enable them achieve some higher rate of growth, can lead to perverse results. Because aid is given to governments, the effectiveness of aid will depend crucially on the fiscal response of government to aid.

Like any other low-income developing countries foreign aid has played important role in the economic development of Ethiopia in providing finance, sharing ideas, training opportunities and capacity building. Given the weak productive capacity and competitiveness of its economy, there has been no period where the country has mobilized adequate domestic resources required for its public investment. As is the case in most developing countries foreign aid in Ethiopia is source of finance as can be seen using aid dependency indicators such as aid to GDP ratio (22 %), aid to tax revenue ratio (121.2%) and expenditure ratio (60.4%) during the year 2004/05.

Ethiopia has received substantial amount of aid and still there is a need for more aid in order to mitigate the problem of poverty and to promote economic growth. Despite the massive inflows of aid, the growth performance of the economy over the last five decades was disappointing. Real GDP and Real GDP per capita on averages have grown only by 2.65 and 0.5 percent respectively over the period 1960/61-2004/05. Although it failed to translate into growth, the growing resources gap (gross domestic saving minus gross capital formation) indicates that foreign aid has enabled the country to finance, which is consistent with the prediction of 'optimist' model, higher level of investment. Given heavy dependency on aid and its continuity to rely on foreign aid perhaps for long time to come, make the analysis of impact of aid on government tax revenue, spending behavior and its relationships with economic growth more interesting.

In Ethiopia where per capita income is the lowest in the world (about 100 USD) as compared to other poor countries, if the fiscal impact of foreign aid is growth enhancing it requires detailed empirical analysis. Foreign aid inflows should not only focus on raising the available resource for public expenditure, but also focus on poverty reduction and thereby contributes for economic growth.

Therefore, Ethiopia still being poor and recipient of substantial amount of aid and what is more, there is still a need for more aid in the endeavor of fighting poverty and promoting growth further confirms the need to address aid effectiveness issues. Thus, the paper will address the issue of aid effectiveness with this respect, and as most aid passes through government the issue will be addressed taking into account this major transmission mechanism.

1.3 Objectives of the Study

The main objective of the study is to analyze the fiscal impact of foreign aid and its relationships with economic growth. Specifically the study has the following objectives.

- To identify the possible relationship of government spending and growth.
- To analyze the possible relationship of foreign aid (grant, loan) and growth.
- To identify whether tax revenue promotes or retards growth.
- To examine the impact of foreign aid (grant, loan) on government spending and tax revenue

1.4 Significance of the Study

The main economic rationale for giving aid seems to be the desire to help the recipient countries to attain some higher rates of growth and yet the empirical evidence on the effectiveness of aid in stimulating economic growth is mixed and the theoretical literature continues to be mired in controversy (McGillivray et al., 2005). In part, the controversies are rooted in the different ideological stances and methodological approaches taken by various researchers.

White (1992) identifies critics of aid from both the left and right hand side of the political spectrum. The perceptions that aid can promote sustainable economic growth predicted on aid supplementing domestic savings and foreign

earnings in a recipient country. Hence, aid is said to be effective in a recipient country if an increase in aid raises saving and export earning which enable recipient country increase investment and, in turn, economic growth. This line of enquiry of aid effectiveness is known as the two-gap approach pioneered by Chenery and Strout (1966). As outlined by White, one criticism of the two-gap model has been the subject of the saving debate in which the radical position has been that aid supplants domestic saving, to lessening the impact on growth. And one question to emerge from this analysis is how recipient governments respond to aid inflows.

Tsikata (1998) highlights the importance of an appropriate macroeconomic policy mix to address the problems of aid on competitiveness and a crowding out of private investment. Morrissey (2002) also suggests that the government policies can play an important role in enhancing aid effectiveness through seeking to improve the productivity of investment. Hence the degree to which aid can stimulate economic growth depends critically on the behavior of the recipient governments.

Ethiopia has received substantial amount of aid and still there is a need for more aid in order to make contribution for economic growth and to mitigate the problem of poverty. This makes the study on aid effectiveness more vital.
Some studies have been conducted with regard to aid in Ethiopia fore example by Jiffar (2002), Dawit and Yemisrach (2002), Wondwosson (2003), Abera (2004), Tefferi (2004) and Meheret (2005). To the best knowledge these researchers have not considered the effectiveness of aid through analyzing the fiscal impact of aid and its relationship with economic growth. This is one of the major questions on the role of foreign aid that needs answer in the formulation of economic policy and development strategy. The search for answer to the aid effectiveness issue through addressing the above objectives makes it possible to drive useful policy implications.

Therefore, the significance of the study is four folds. *First*, the results of the study could also help in formulating relevant policies for government expenditure, taxation and borrowing through better and more effective use of domestic and foreign resources. *Second*, the study may induce further research in this area especially on the aspect not captured by this study. *Third*, its major methodological contribution, which apply multivariate cointegration and vector error correction (VEC) modeling framework focusing on the fiscal impact of foreign aid and its relationships with economic growth. *Fourth*, it utilizes longer country specific econometric time series data (1960/61-2004/05) by developing countries standard, which is reasonably enough to conduct VAR analysis.

1.5 Organization of the paper

The paper organized in six sections. Following the introduction, Section two gives background information on the overall performances of the Ethiopian economy. The third section presents review of literature on aid effectiveness. In Section four, methodology and data source are discussed. Section five concentrated with estimation results and interpretations. Finally, concluding remarks and policy implications are presented in section six.

2. Macroeconomic Performance of the Ethiopian Economy

2.1. General Overview of the Economy

Ethiopia is a land locked country (since May 1991) in the horn of Africa with estimated population of 73 million of which more than 80 percent living in rural areas being employed in agricultural sector. Ethiopia's past history is characterized partly by socialism, protracted civil war, recurrent of drought and economic mismanagement.

It is one of the least developed and by far one of the poorest nations in the world. According to Human Development Report 2005, Ethiopia ranked 170 out of 177 countries with GDP per capita income USD 711 (in Purchasing Power Parity (PPP)). Per capita GDP 711(PPP USD) is far below the least developing countries (PPP USD 1328) and Sub-Saharan Africa (PPP USD 1856). This is also true when we compare with neighboring countries such as Kenya (PPP USD 1037), Uganda (PPP USD 1457) and Sudan (PPP USD 1910).

Real GDP and real per capita income growth frequently falls below zero level. In Ethiopia on average the annual growth rate of GDP had been 3.8 and real per capita 1.7 during the Imperial era (1960/61-1973/74). This declined during the Derg regime (1974/75-1990/91) in which the growth rate of GDP declined to 2.3 and per capital growth falls below zero level to 0.8 percent.

During the period 1991/92-2004/05 there seems an improvement in the overall performance with 4.5 percent of real GDP and 1.1 percent rates of per capita growth as compared to the Derg regime but more or less similar with that of Imperial regime. Even though there are different factors behind in the performance of the three regimes external aggression, protracted civil war, heavy drought, high population pressure and economic mismanagement are

the common phenomenon of the three regimes. The over all growth performance of real GDP and GDP per capita income during the last four and half decades was amounted to only 2.65 and 0.5 percent respectively while the population growth was about 2.8 percent annually.

Table 2.1 Average Growth Rate of GDP

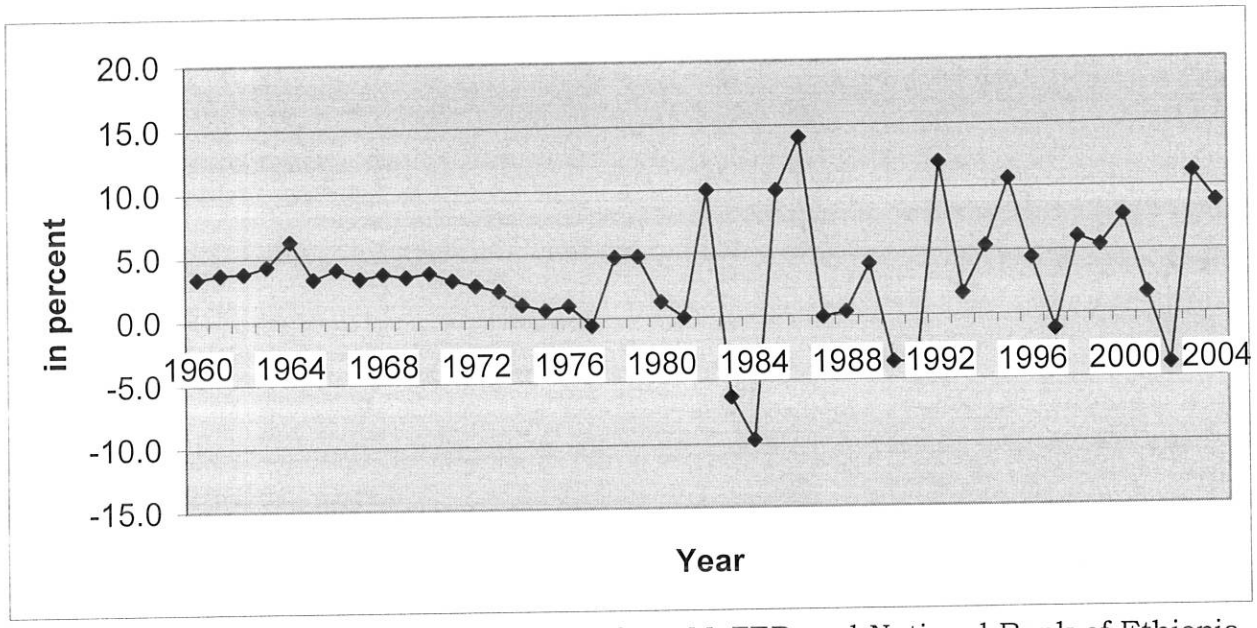
Period	Real GDP	Per capita GDP
1960/61-1973/74	3.8	1.7
1974/75-1990/91	2.3	-0.8
1991/92-2004/05	4.5	1.1
1960/61-2004/05	2.65	0.5

Source: Author's computation using data from MoFED and National Bank of Ethiopia (1960-2004

Currently more has to be done in order to grow in sustainable way and to take the impoverished out of the vicious circle of poverty. According to Ethiopian Economic Association (1999/2000) report, for Ethiopia to reach the level of per capita income achieved by the average Sub Saharan Africa annual per capita growth of 7 percent is required for about 23 years.

Fig.2.1 shows that the real per capita income growth rate in the country is highly volatile. Especially since the Derg regime the rates were fluctuating around zero mainly explained by bad weather condition (mainly due to shortage of rain fall), and war (both civil and external war). Especially bad weather conditions explain the ups and downs of real GDP and per capita income growth in Ethiopia, for instance during the year 1984/85, 1990/91, 1996/1997, 2002/03 the growth rate of per capita GDP was below zero level.

Fig 2.1 Trend in Real GDP Growth Rate



Source: Author's computation using data from MoFED and National Bank of Ethiopia (1960-2004).

2.1.1 Structure of the Economy (Real sector]

As the case of most developing countries agriculture remained to be the dominant sector of the Ethiopian economy contributing the highest share to total output or GDP. Notwithstanding the share is declining, the dominance of agriculture sector is still viable in the economy as it accounts about 45 percent of GDP and employs more than 80 percent of the population and contributes about 90 percent of country's export earning after four decades of ups and downs.

Agricultural growth performance was mainly explained by weather condition as both farming and livestock sub sectors remained to be nature dependent. Besides bad weather conditions, factors such as diminishing farm size, subsistence farming, soil degradation, tenure insecurity system, weak agricultural research base and extension system, lack of credit service, imperfect agricultural market and poor infrastructure have also been identified

as major bottlenecks for poor performance of the agricultural sector (Ethiopian Economic Association 1999/2000).

Agriculture being the dominant sector in the economy, the fluctuations in the overall growth is to a great extent attributable to its performance. Hence as can be seen from Fig 2.1 the performance of GDP closely follows the agricultural sector trend. In the major drought years of 1984/85, 1996/97, 2002/03 there has been a major drop in agricultural production and hence GDP. What is more important is its growth performance is slow as compared to other sectors. The huge drop (32.48 percent) in the share of agriculture output in the last four decades was counterbalanced by the 28.62 percent increase in service sector and 3.86 percent increase in industry sector.

Table 2.2 Contribution of Sectors to real GDP

Sector	Period					
	1960/61	1960/61-1973/74	1974/75-1990/91	1991/92-2004/05	1960/61-2004/05	2004/05
Agriculture	75.78	68.1	55.6	47.5	57.07	43.30
Industry	6.94	9.2	11.4	10.8	10.47	10.80
Disturb. Ser	8.46	11.6	14.3	14.6	13.5	15.50
Other Service	8.82	11.1	18.7	27.1	18.97	30.40
Total	100	100	100	100	100	100

Source: Author's computation using data from MoFED and National Bank of Ethiopia1 (1960-2004).

As shown in Table 2.2, the agricultural sector accounted for about 68%, 56%, 48%, and 57% of the real GDP during the periods 1960/61-1973/74, 1974/74-1990/91, 991/92-2004/05 and 1960/61-2004/05, respectively. The declining trend in the contribution of agricultural sector to the national output over the last forty-five years shows as if structural transformation has taken place in the national economy in general, and in the agricultural sector in particular.

Fundamentally, the growth of the Ethiopian economy depends on what happens to the agricultural sector, which has the largest share in every aspect of the national economy. The industrial sector accounted for 9.2, 11.4, 10.8, 10.5 percent, distributive service sector accounted for 11.6, 14.3,14.6, 13.5 percent while other service sector accounted for 11.1, 18.7, 27.1, 18.97 percent in the period 1960/61-1973/74, 1974/75-1990/91, 1991/92-2004/05 and 1960/61-2004/05.

What is more important is that, owing to high population growth rate (about 2.8 %) the growth rate of GDP has not been enough to improve the standard of living of the population. On the average the growth rate of per capita GDP was only 0.5 percent over the last four and half decades. Needless to say, this is too small a change for an economy that is at the subsistence level. It has to be also noted that due to the variability in the growth rate of GDP (agriculture dependent economy), the gains in good years tends to be lost in bad years. For instance the loss of per capita income in agriculture registered in 2002/03 was offset by the gains in 2003/04. Due to this effect on agricultural output, the net effect was an average reduction of 1.3 percent in agricultural per capita income during the last four and more decades.

In similar vein, the share of industrial sector stay close to 11 percent and its overall sectoral growth was between 5 and 7 percent of GDP since 1960s, due to the almost stagnant growth in industry and the high population pressure resulting the per capita income in non-agriculture sub sectors on average grew only by less than 1 percent over the last four and half decades.

During the whole sample period in general and the Derg regime in particular, the performance of the agricultural sector is not satisfactory. This is substantiated by the sectors less than a unit factor contribution for real GDP growth (see Table 2.3), whereas the rest non-agricultural sectors have been contributing more than a unit factor to the real economic growth throughout

the sample period. In the periods 1960/61-1973/74, 1974/75-1990/91, 1991/92-2004/05 and 1960/61-2004/05 growth in agriculture sector on average accounted for 36, 19, 18.5, and 29.2 percent of the GDP growth while industry contributed 16.4, 23, 13.4, and 13.7 percent, distributive service (trade, hotels & restaurant, transport & communication) contributed 23.2, 20, 20.6, and 18.5 percent, and the other services sector which includes services provided by both the public and the private sectors (banking & insurance, public administration & defense, education, health etc.) accounted for 24.4, 38, 47.5 and 38.6 percent per annum, respectively.

Table 2.3 Sectoral Contributions to Economic Growth

Periods	Items	Agriculture	Industry	Distr. service	Other service	Sum
1960/61-1973/74	Value	1.42	0.60	0.90	0.91	3.83
	%	36.0	16.4	23.20	24.4	100
1974/75-1990/91	Value	0.55	0.42	0.37	0.69	2.3
	%	19.0	23	20.0	38	100
1991/92-2004/05	Value	0.82	0.62	0.94	2.12	4.5
	%	18.5	13.4	20.6	47.5	100
1960/61-2004/05	Value	0.75	0.37	.49	0.99	2.65
	%	29.2	13.7	18.5	38.6	100

Source: Author's computation using data from MoFED and National Bank of Ethiopia (1960-2004).

2.1.2 External sector

The performances of external sector which measures the country's transaction with the rest of the world (export plus import to GDP ratio) is growing overtime as both export and import are growing. The export sector is structurally dominated by export of primarily commodities since more than 90 percent of export earning comes from the agricultural sector while the remaining obtained from export of gold and sugar.

Coffee alone accounted for about 41 percent of export in year 2004/05 due to the improvement in price of coffee in the international market and volume of coffee export which shows significant growth (50 percent) as compared with the previous year. The export of non-coffee item also increased during the year 2004/05 by almost 36 percent resulting in an over all growth in the value of export by 28 percent.

When we look at in terms of composition of export, the previous dominance of coffee seems to have changed in the last five years. For the first time in history, the share of coffee in total Ethiopian export falls below 50 percent in year 2000/01 and has not recovered since then. Given the effort that has being made to diversify exports, it is dubious that it will regain its dominant position that used to have for long periods of time. The new entrants and those that increased their share in the export market (animals and related products, flowers, oilseeds) are expected to end the dominance of coffee export by increasing their share in the export market provided that the internal and external environment is conducive for Ethiopian export. Heavy dependency on export of a single commodity coffee and being price taker in the international market makes the country most vulnerable to shocks in world coffee price. For instance in year 2002/03 following the decline in the international price for coffee, the shares of coffee has declined to 37.3 percent while the share of others (oilseeds, chat and sugar) together have grown to 34.2 percent.

The performance of the external sector also reveals country's dependence on foreign assistance. This is mainly due to the fact that the industrials sector remained at its infant stage that makes the country unable to meet the demand of necessary raw materials and capital goods that can be used as input within and outside of the sector and hence the demand was fulfilled from international market through import.

Regarding the composition of import, the major components have been items that are directly or indirectly related to production. For instance, during the period 2004/05 about 53 percent of the total import composed of capital goods, raw materials and semi finished goods. The other main component of imported goods is consumer goods that amounted to 27 percent during the year 2004/05.

The growth rate of import increased from 9 percent in 1960/61 to 33 percent of GDP in the year 2004/05 while the growth rate of export slightly declined from 7.46 to 7.3 percent GDP during the same period. The increased in demand for import with the limited export capability widened the trade deficit from around 1.5 percent of GDP in year 1960/61 to 25 percent of GDP in year 2004/05.

Table 2.4 Import- Export Gap and its Growth Rate

Items	Periods			
	1960/61-1973/74	1974/75-1990/91	1991/92-2004/05	1960/61-2004/05
Average Export (% GDP)	8.76	9.22	10.38	9.44
Average Import (% GDP)	10.56	15.4	22.48	16.09
Average Resource Gap	-1.8	-6.18	-12.1	-6.55
Growth rate of Export (% GDP)	4.25	-3.5	6.78	2.06
Growth rate of Import (% GDP	1.59	1.93	8.6	3.55

Source: Author's computation using data from National Bank of Ethiopia (1960-2004).

From Table 2.4, one can see that during Imperial era (1960/61-1973/74) on average export and import share as percentage of GDP were 8.76 and 10.56 respectively while the resource gap being -1.8. In the case of the Derg regime (1974/75-1990/91) the resource gap has been widened and reached -6.18, due to an increasing trend of import sector and decreasing trend of export sector. This could be due to the fixed exchange rate policy and restrictive foreign exchange licensing system for private use that thwarted the competitiveness of the export sector.

On the other hand since 1991 foreign sector has been liberalized and exchange rate devalued in order to encourage export and make competitive in the international market. This could be seen on average by increasing the growth rate of export as percentage of GDP to 6.78. But as the growth rate of import simultaneously also increased to 8.6, the resource gap on average has rather widened to -12.1.

2.1.3. Investment and saving

Macro economic theory reveals that economic growth is considerably affected by the rate of investment, which in turn highly influenced by rate of gross domestic saving. The difference between saving and investment is known as investment saving gap and shows the status of resource gap.

From the basic macroeconomic identity saving is equal to investment in closed economy whereas in an open economy investment is financed from both domestic and foreign saving (aid). During the last four and half decades only in the years 1972/73 and 1973/74 domestic saving was greater than investment rate in the Ethiopian economy while in all other years investment was much higher than saving rate implying that foreign saving (which comes mainly in the form of grant and loan) financed the gap.

On average the gross domestic saving as percentage of GDP is below actual investment, which is represented by gross fixed capital formation (GFCF) as percentage of GDP. The gross domestic saving to GDP ratio shows a continuous decline from 13.7 in 1960s to 5.5 during the year 2004/05 while the resource gap increase from –1.5 to almost -16 percent of GDP. Investment, which is financed from both domestic and foreign sources showed a slight increase from 15.2 percent of GDP in 1960 to 21 percent in year 2004 that shows 5.9 percentage point increase over the whole sample period (1960/61-2004/05).

Although the current investment record of 21 percent of GDP is comparable to low-income countries and Sub-Saharan Africa averages of 20 and 17 percent (World Bank, 2003). This record is low compared to the investment level desired to reduce poverty by half in year 2015, but it is high compared to domestically available resource for investment financing which is 5.5 percent of GDP.

The low saving ability and increased demand for investment has resulted in widening the resource gap, which is financed from foreign source. Since most developing countries especially those in Sub-Saharan Africa are less attractive to foreign private investment due to unstable political and economic environments, foreign capital comes mainly in the form of foreign aid, which is the main subject of this paper. Foreign aid, which comes in the form of loan, will be transferred to debt burden problem as the country's debt stock has accumulated to unsustainable level.

Table 2.5 Investments and Saving as Percentage of GDP

Items	Periods			
	1960/61-1973/74	1974/75-1990/91	1991/92-2004/05	1960/61-2004/05
Average fixed capital formation	15.82	13.27	14.74	14.52
Average gross domestic saving	14.15	7.09	3.89	8.29
Saving -Investment gap	-1.67	-6.18	-10.85	-6.23

Source: Author's computation using data from MoFED and National Bank of Ethiopia (1960-2004).

When we look at Table 2.5, one can easily see that the lowest gap has been registered in the Imperial regime (1960/61-1973/74), which is -1.67 percent of GDP. This is an era where the resource gap has shown a decreasing trend, this is happened due to decreasing investment growth rate rather than growth in saving rate. On the other hand during the Derg regime (1974/75-1990/91) on

average the fixed capital formation and the gross domestic saving as the percentage of GDP has been 13.27 and 7.09 percent respectively resulting in widening the resource gap to -6.18 percent of GDP. In this regime, despite the fact that the saving rate has shown an increasing trend it has not been able to close the resource gap requirement.

In the present government (1991/92-2004/05) the saving level registered, as the percentage of GDP has been low, 3.89 as compared to the investment level recorded 14.74 percentage of GDP resulting in resource gap -10.85 percent. Looking at the rate of growth of saving one can conclude that the saving showed decreasing trend, as the result of which the deficit gap is increasing at increasing rate.

In general the widening of the resource gap is an indication that the country is highly dependent on foreign finance in the form of grant and loan. This cautions policy maker besides encouraging saving to speed up investment, it is also important to be efficient in the management and proper utilization of the foreign assistance so as to grow out of being dependent on foreign aid and accumulated debt.

2.1.4. Public sector

The role of government in the development process has been more considered significantly after the Keynesian revolution. The government intervention is justified in the provision of public goods /services and public investment using taxes, subsidies and other instruments to correct market failure.

The prevailing situation of developing countries is characterized by underdevelopment in physical and social infrastructures, low levels of saving

and investment availability calls for the government to participate in the development process so as to break the vicious circle of poverty.

Likewise, as one of the developing countries, Ethiopia shares the aforementioned characteristics and the government has been involved at various levels in the economy. Especially after the 1974 revolution the Derg government has expanded the role of the government more beyond what is recommend by Keynesian theory. The government nationalizes private property and hence engaged in production and distribution of goods and services beyond providing basic infrastructure and social services.

On the other hand, the current government rationalization and liberalization the economy have reduced the role of government. Government gave more emphasis according to economic, social, and infrastructural sectors (roads, communication education, health, clean water, etc) priority, but in both regimes expenditure has not been solely covered from domestic sources.

In general, the Ethiopian governments' fiscal position has revealed a significant change over the last five decades. The government budget that was in surplus in the early 1960s now has sunk in to continuous and growing deficit. Although, both the revenue and expenditure were growing the widening of the budget deficit confirms that the rate at which expenditure has grown exceeded that of revenue.

With some ups and downs total government expenditure to GDP ratio that was 6.52 percent in 1960s now has grown to 25.5 percent of GDP in year 2004/05 while domestic revenue grew from 6.6 to 16 percent of GDP in the period under review. In similar vein, the tax revenue increased from 5.4 percent of GDP in 1960 to about 12.7 percent of GDP in 2004/05 of which the foreign trade tax contributes about 54.2 percent of the total tax revenue, which shows the foreign trade tax is still the main source of revenue in Ethiopia. The highest

growth rate in domestic expenditure as compare to revenue has resulted in widening the fiscal deficits (excluding grant) to about 9.5 in 2004/05 from fiscal surplus of 0.1 percent of GDP in 1960/61.

When we are looking at the composition of expenditure the share of recurrent expenditure declined from around 78 percent in 1960/61 to 53 percent, while that of capital expenditure grew from 22 in 196/61 to 47 percent in 2004/05. The rise in capital expenditure shows the switching of expenditure from which it is believed to be non- productive to the one that is more productive and assumed to have positive contribution to output growth than recurrent expenditure. Moreover, pro-poor spending increased from 37 percent in 2000/01 to 51 percent in the year 2004/05.

Table 2.6 Government Revenue and Expenditure (as percentage of GDP)

Items	Periods			
	1960/61-1973/74	1974/75-1990/91	1991/92-2004/05	1960/61-2004/05
Average total revenue	10.41	20	17.76	16.28
Average tax revenue	7.31	12.8	10.2	10.29
Total Expenditure	10.11	25.9	23.3	20.25
Recurrent expenditure	8.65	18.8	15.3	14.53
Share of Recur. Expend from total.)	75	70	65.4	70.13
Capital expenditure	1.46	7.1	8.0	5.72
Share of Cap. Expend. (From total.)	25	30	34.6	29.87
Deficit including grant	0.03	-5.9	-5.6	-3.97
Deficit exc. grant	-1.55	-8.3	-8.8	-6.38

Source: Author's computation using data from MOFED and National Bank of Ethiopia (1960-2004).

2.2. Significance of Foreign aid in the Ethiopia Economy

Foreign aid is defined as any official grant and concessional loan in currency or in kind that are broadly aimed at transferring resources from developed country to developing countries to assist economic transition (Rodan, 1961). Foreign aid has been transformed to developing countries in the form of project aid, commodity aid (including food aid), technical assistance and budget support. Foreign aid is needed to fill the resource gap i.e. be it the investment-saving gap, foreign exchange (export–import) gap and fiscal (expenditure-revenue) gap.

Ethiopia is one of the poorest countries that need external assistance to finance its development activities. According to Human Development Report 2005, Ethiopia ranked 170 out of 177 countries leaving only 7 Sub-Saharan African countries behind. Out of estimated 73 million-population (as July 2004), more than 44 percent live in absolute poverty. Fortunately, the flow of official development assistance (ODA) to Ethiopia is increasing; the ODA receipts which was about 1.5 percent of GDP in 1960 reached 22 percent of GDP in 2004. During the last forty-five years (1960-2004) the total ODA inflows amounted to about USD 25.2 billion of which around 75 percent was ODA grant (OECD online database (2005), World Bank (2005), Brehanu Abegaz (1999) and Assefa Abebe (2004)).

Like in any other low-income developing countries, ODA has played an important role in economic development of Ethiopia in providing finance, sharing ideas and capacity building. Given the weak productive capacity and competitiveness of its economy, it has been difficult for Ethiopia to mobilize adequate domestic resources necessary to finance its development activities. As the result, ODA has played a key role in economic development programs of successive Ethiopian governments. Behind the performance of Ethiopia

economy, foreign assistance has been an important factor in the endeavor of growth and poverty alleviation.

To explain the role of ODA in the Ethiopian economy let us mention a few example, one of the best hospital in Ethiopia, Dejazmach Balcha Hospital was built and supported by Russia, one of the best school in Ethiopia, Lyce Gebremariam School was built and still supported by France, Sweden establish one Food Processing Factory (Fafa), one special pediatrics clinic in the compound of Black Lion Hospital and more than 6500 elementary schools in different parts of Ethiopia, Alemaya Agricultural College, Chilalo Agricultural Development Unit(CADU) project, Gonder Health College, National Malaria Prevention agency, Ethiopian Civil Aviation and the Ethiopian Road Authority were mainly supported by the united State of America during the Imperial era . It is also possible to mention many more institutions that had been built and supported in Ethiopia with help of external assistance resources (Assefa Abebe, 2004).

During the socialist period also Ethiopia had been receiving development assistance from Eastern Block donors particularly from Soviet Union and East Germany as well as from Western bilateral and multilateral donors. Ethiopia received credits from the then Eastern Block that had been heavily directed to a small number of large-scale industrial projects such as Muger Cement Factory, the Nazareth Tractors Assembly Plant, and the Melkawakena Hydroelectric Power Project (Tadesse Getachew, 1994)

Similarly, during the post-Derg regime ODA played the prominent role in enabling more Ethiopian to get access to education, health and safe drinking water as well as in building, expanding and maintaining physical infrastructure. For instance during the period 1991-2000 more than 418 major completed and ongoing development project were funded by ODA in Ethiopia (MoFED, 2001a).

The heavily reliance of Ethiopia on foreign resource can also be confirmed by looking at the aid dependence indicators (ratio of foreign aid to GDP, total government expenditure, total government revenue, etc)

Table 2.7 Aid as percentage of GDP and other fiscal variables

Period	Net ODA/GDP (%)	ODA/Total Expenditure (%)	ODA/Tax revenue (%)	ODA/Domestic revenue (%)
1960	1.5	20.74	25	20.34
1970	3.3	22.36	35.48	29.78
1980	7.98	27.34	55.29	40.2
1990	12.84	52.67	120.42	84.05
2000	15.5	66.68	140.31	106.86
2004	21.5	60.4	121.23	96.14

Source: Author's Computation using data from OECD online database and MoFED (1960-2004)

Looking at the sectoral allocation of ODA of which its main objective is economic development and welfare includes the two most important social and economic sectors. Fore example, over the periods 1990 to 2004, 53 percent of total ODA inflows went to social sector while the economic sector took 47 percent. In terms of ODA types (ODA grant and ODA loan) again the lion share of ODA grant (59.41 percent) went to social sector while in turn the economic sector took the leading position in ODA loan (62.54 percent).

Agricultural and, transportation- communication sub- sectors accounted for the highest share (70 %) from economic sector of which agriculture (36%) and transportation- communication (34%), similarly health and education sub sectors took the highest share (51.1 %) from the social sector of which health (28.9%) and education (22.2%).

Table 2.8 Sectoral allocations of ODA by aid types

Years	Social sector		Economic sector	
	ODA/OA Grant	ODA/OA Loan	ODA/OA Grant	ODA/OA Loan
1990	75.3	44.8	24.6	55.2
1991	47	---	53	---
1992	72.3	---	27.7	---
1993	49.6	11.1	50.4	88.9
1994	48.2	0	51.7	100
1995	50.5	0	49.4	100
1996	62.4	73.1	37.5	26.9
1997	39.4	0	60.6	100
1998	32.9	38.5	67.1	61.5
1999	64.1	---	35.9	---
2000	57.4	97.9	42.6	2.1
2001	67.7	52.6	32.3	47.4
2002	65.1	35.7	34.9	64.3
2003	87.5	---	12.5	---
2004	68.2	41.64	31.8	58.36
Average	59.41	37.46	40.59	62.54

Source: Authors computation using data from OECD online database and National Bank of Ethiopia (1990-2004).

"---"Indicates data unavailability

3.Literature Review

3.1 Theoretical Literature

3.1.1 Theoretical Background for Aid

Foreign aid is defined as any official grant and concessional loan in currency or in kind that are broadly aimed at transferring resources from developed to less developed nations to speed up economic transition (Rodan, 1961). According to world bank (1998) and Todaro (1994) foreign aid is any inflow of capital to less developed countries that meet two criteria; (i) its objective should be non commercial from the point of view of donors, and (ii) it should be characterized by concessional terms, that is, the interest rate and repayment periods for borrowed capital should be softer than commercial terms.

From the donors' point of view, although the main objectives of aid is to stimulate economic growth and improve social welfare in developing countries other considerations such as strategic self interest, humanitarian issues may be included (Congressional Budget Office (1997), International Development Cooperation Agency of United States (1998)).

Foreign aid in the way defined above has formally started following the end of World War II when United States had allocated massive capital to help the war devastated Western Europe economies. The first largest and successful foreign aid in history is the one United States of America provided in 1948 to rehabilitate war-devastated economies of Western Europe under the Marshall Plan. The massive injection of foreign aid (USD 13.3 billion over four years) in to the West European economies indeed was a cure that enabled them to get back to self -sustained growth path.

The Marshall Plan in the late 1940s and early 1950s led many to believe that similar transfer to developing countries would permit their comparably spectacular transformation. The success of the Marshall Plan together with early positive development theories of 1950s and 1960s laid the foundation for arguments in favor of transferring capital to developing countries to promote economic growth and improvement of social welfare (International Development Cooperation Agency of United States, 1998).

Theoretically, the then prominent development models, that is, the Harrod-Domar (Harrod (1939), Domar (1946) and Todaro (1994)) and the two gap models (See Chenery and Strout, 1966) indicated that the major constraints developing countries face are low domestic saving (Saving Gap) and shortages of foreign exchange earning (foreign exchange gap). Hence the theories emphasized the capital constraint that developing countries experience. Nurkse (1958) expressed this by saying they are in "vicious circle of poverty"' (low level of productivity, low level of income and low level of saving), which implies that they could not invest at the rate sufficient to accelerate growth in per capita income (Nurkse, 1958). Nurkse demonstrated the problem by showing both the supply and demand side of capital accumulation. These are: -' from the supply side low real per capita income, low savings, and low investment potential and in the demand side' low per capita income, low efficient demand, small incentives for investment, low productivity'. Therefore, injection of foreign capital in the form of official development assistance was thought as a helpful means to supplement domestic saving and ease shortage of foreign exchange. It was assumed that aid would enhance investment by financing imported capital goods and hence output (see Rodan (1961), Chenery and Strout (1966)).

Following the practical success of Marshall Plan, developed nation have transferred huge resource to stimulate economic growth and social welfare. Over the period 1960 to 2004 more than 470 billion USD disbursed in the form of net official development assistance (ODA) from which Sub-Saharan Africa

took the lion share, (about 76 percent). Over specified period Ethiopia alone received about USD 25 billion (OECD, 2005). Regardless of this huge foreign resource inflow in general Africa's and in particular Ethiopia's growth performance is disappointing.

Even though the above argument seems convincing in the sense that developed nation have transferred huge resource to developing countries, the practical outcome is mixed due to many factors including getting donors attention, etc. According to the CBO (1997) report in 1940s war- torn European countries received much of the aid, in 1950s and 1960s Asian countries (South Korea, Taiwan and South Vietnam) got emphasis while in 1970s due to economical and political factors the emphasis shifted to the Middle East.

From this analysis it is easy to understand that foreign aid disbursement is not merely to support the economy of developing countries but also other considerations such as politics and strategic economic interest could be taken into account. Had foreign aid disbursement purely based on an economic consideration in the sense that aimed at helping the transformation of economies of developing countries it should have been Ethiopia the poorest nation, which is in need. Therefore, such an outcome can only been enlightened with political and economic strategic interest of donors in addition to utilization capacity record of previously donated resource.

Boone (1996) has argued that in the face of popular argument that aid is primarily motivated to assist the poor, recent studies come up with convincing evidence that aid is motivated by 'political, strategic and welfare interest of donors rather than pure considerations of the need of recipient countries.

As Boone (1996) argued 'USA aid inflows are motivated by military and strategic factors, for British and French aid goes to former colonies and countries with which they have long trade and investment relation, OPEC aid

goes to neighbors and in favor of member of Arab league'. In Ethiopian context for recent aid coming from Scandinavian and East Asian countries it can be said that it is mainly based on economic needs so as to enhance social and economic infrastructures. Hence, from my personal observation, I can say unlike USA and European Union the above motives mentioned by Boone (1996) for aid flows from Scandinavian and East Asian countries economic considerations is at the center of the recipients need.

Hence, this paper goes within general framework that aid is motivated to facilitate economic transformation in developing countries. This is not undermining other factors that donors take into account in providing aid otherwise it will be complex to consider growth impact of aid. The well-established development models (see Harrod-Domar model, two-gap model, three gap model, and Revised Minimum Standard Model of World Bank) all recognized foreign aid as an important source of finance in developing countries as it is motivated to help developing countries to achieve sustainable growth.

The early "optimist" development economics ('Stracturalist') models include the Lewis (1954) two sector model which predicted that development comes by transferring unlimited supply of labor from subsistence agricultural to modern industrial sector in urban areas. Lewis noted that by transferring labor from rural to urban sector at subsistence wage allows accumulation of capital and hence output growth in the industrial sector without affecting output in the agricultural sector (see Lewis 1954, Todaro 1994). The Harrod-Domar growth model (Todaro, 1994) and two-gap model (see Chenery and Strout, 1966) are also among the early 'optimist' development models, which argued about importance of resource accumulation for rapid and sustained growth of output and the positive role of aid in the process. Domar (1946) argued that investment 'not only generates income but also increase productive capacity'.

In early literature on aid and growth in less developed country, foreign aid was perceived only as an exogenous net incremental to the capital stock of the recipient country. It assumed by pro-aid development economists such as Rodan (1961) that each dollar of foreign resources in the form of aid would result in an increase of one dollar in total investment. In other words, aid was not treated as a component of national income adding to both consumption and investment. Hence, fungibility of aid resources was not allowed for, and aid for consumption purpose was skipped over in this type of macroeconomic impact analysis of aid (Hansen and Tarp, 2000b).

The theoretical groundwork underlying this empirical work is the Harrod-Domar growth model with the casual chain running from aid to saving to investment and thereby to growth. Papenek (1972) characterized the highly optimistic approach embedded in the Harrod-Domar theoretical growth model as curiously naïve. At the same time, he forcefully countered the argument that put forward in the late 1960s by Griffin (1970) and Griffin and Enos (1970). They held a skeptical view of aid and argued that "the association is loose, but the general tendency is that the greater the capital inflows from abroad the lower the rate of growth of the receiving countries" (Griffin and Enos (1970)). A number of interacting reasons were listed for why aid may retard development; particular attention was paid to the observation that aid leads to lower domestic savings.

In 1950s and 1960s the Harrod-Domar model was used as the basis for analyzing the impact of transferring capital to developing countries. In addition, as Easterly (1990) mentioned the Harrod-Domar model is still in use in many developing countries for 'Planning and to calculate the financing gap'.

The issues debated in the first generation of theoretical and empirical works continued in to 1990s. To understand this approach it is useful to layout the underlying framework. The core of Harrod-Domar model is the Leontief

production function and the assumption of excess supply of labor. No substitution among production inputs is possible, and output is linearly related to capital, i.e. the scarce factor of production. Capital accumulation is then the key to development. The only way in which savings, domestic and foreign including aid, can impact growth in this model is through the accumulation of physical capital, i.e. investment. Assuming the capital output ratio (v) is constant, and the growth rate in production, g_{yt}. The production function for developing countries can take the form:

$$Y(t) = Y(k(t)) \qquad [1]$$

Where Y(t) is production at time, t, and K(t) capital stock at time, t
By taking the derivatives of equation [1] with respect to time and dividing by output, Y, this gives growth rate of output (g_{yt}):

$$g_{yt} = \frac{\dot{Y}_t}{Y_t} = \nu \frac{\dot{k}_t}{Y_t} \qquad [2]$$

Where $g_{yt} or \frac{\dot{Y}_t}{Y_t}$ is output or GDP growth rate, Y_t- production in year t and $\dot{k}_t$ is Change in capital stock overtime, ν is incremental capital output ratio (ICOR), which is constant. Relating the changes in the capital stock to gross investment, I_t, and allowing for a constant depreciation rate of capital, δ, it follows that:

$$g_{Yt} = \nu \frac{I_t}{Y_t} - \delta = \nu i_t - \delta \qquad [3]$$

Where, I_t, is investment ratio and the rest as defined in equation [2]
The implication of this model is that capital accumulation is the key to prosperity in development. Given this relationship the second intellectual underpinning is that it is believed that there is the shortage of capital

explanation of under development. The underlying assumption is that capital market imperfection, making aid necessary to fulfill the requirement of capital. Hence the role of foreign aid has been justified with the belief that if investment was the bottleneck, the return on additional investment in developing countries would be higher than in developed countries which would increase growth. The role of aid hence comes to be regarded as transfer of resources (Krueger, 1986).

The Harrod-Domar model assumes only saving constraint. This was expanded in the sixties by influential Chenery and Strout (1966) two-gap model. In this model foreign exchange constraint is introduced as separate potential constraint on growth. Hence in the two-gap model, the role of aid has come to be relaxing the 'saving constraint' and foreign exchange constraint thus helping the growth rate of developing countries. Inflows of foreign capital fill both the saving and foreign exchange gap simultaneously, so ex- post of the two is necessarily equal. If the prospective of foreign exchange gap is larger of the two, actual saving is supposed to fall short of potential savings, and if the prospective saving is larger, actual imports will be greater than those needed for growth. Thus, the finance of foreign transfer will differ depending on which gap is binding (Hansen and Tarp, 2000b referring Chenery and Eckstein, 1970). Later Bacha (1990) has added the third gap, (fiscal gap) and he argued that the 'third gap' is important for adjustment in highly indebted developing countries.

The empirical works were done using the Harrod-Domar growth model with the causal chain running from aid to growth through saving and investment. By considering equation [3] and taking, I_t, literature formulate the relationship as follows. In closed economy investment ratio, i_t, can be replaced by the domestic saving ratio, s_t. However, in an open economy the relation between savings and investment is defined as:

$$I_t \equiv S_t + F_t = S_t + A_t + F_{ot} + F_{pt} \qquad [4]$$

Where F_t is the total inflow of resources, including, aid A_t as well as private and other foreign inflows, F_{pt} and F_{ot} respectively. Expressing domestic savings, S_t and foreign inflows as a ratio of Y_t, the following identity appears:

$$i_t \equiv s_t + a_t + f_{ot} + f_{pt} \qquad [5]$$

Assuming that $\frac{\partial f_{pt}}{\partial a_t} = \frac{\partial f_{ot}}{\partial a_t} = 0$, which implies aid has no impact on private and other foreign inflows. Therefore the marginal effect of aid on investment reduces to:

$$\frac{\partial i_t}{\partial a_t} = \frac{\partial s_t}{\partial a_t} + 1 \qquad [6]$$

From (6) it is clear that the impact of aid on domestic saving has implication for how the macroeconomic effectiveness of aid is assessed, as the aid-saving link, in turn, affects the investment ratio.

Based on the above equation Hansen and Tarp (2000b) categorized early works as the first generation studies (aid, saving and growth studies), which focuses on aid-saving link that in turn affects the investment ratio in order to look at the macroeconomic effectiveness of aid.

The macroeconomic impact of aid on saving is an indirect way of trying to come to grip with aid–growth relationship. In the second generation (aid, investment and growth studies) of empirical works, focus turned to estimate the link between aid and growth; some estimated the link via investment and some directly in reduced form equations. In so far as there is an underlying structural model, focus remains on capital accumulation and is consistent with the Harrod-Domar model or simple Solow neoclassical growth model (Hansen and Tarp, 2000b).

Hansen and Tarp (2000b) argued that over the past few years, anew, third generation of aid effectiveness studies (Aid, policy and growth Studies) has flourished, and compared to earlier works they break a novel ground in four areas. *First*, they work with panel data for a number of years and large number of countries. The data cover a large share of developing countries trade and other economic activities. *Second*, new growth theories have inspired the analysis in distinct ways, providing a different analytical basis compared to previous works. Measures of economic policies and institutional environment are included directly in reduced form of growth regression along side traditional macroeconomic variables. *Third*, endogeneity of aid and other variables are addressed explicitly in some studies. *Fourth*, the aid-growth relationship is explicitly seen as nonlinear, while some of the earlier analyses addressed some of these issues. Generally the third- generation studies represent a distinct step forward in empirical cross-country works.

More recently, the research on aid effectiveness includes the possibilities of the interaction between aid and policy index in the aid growth regression. The research pioneered by Burnside and Dollar (1997) focuses on the necessity of sound policy management as conducive to sustainable economic growth. They modified the neoclassical growth model to show how distortionary policy may affect economic growth in developing countries.

The publication of Assessing Aid Report (World Bank, 1998) provided anew stimulus to the discussion on the effectiveness of development aid. The report contains an extensive analysis of aid effectiveness and based on the innovative macro-econometrics research, since it is one of the first studies acknowledging that aid effectiveness may depend on specific circumstances in recipient countries. The Assessing Aid report states that aid does help to increase growth, but only in countries with sound economic management or 'good governance'. In the report this is generally translated into 'good' economic policies and building 'strong' institutions.

3.1.2 Fiscal response (Aid effectiveness)

Although empirical studies on aid-growth relation came up with mixed results, early development models supported the idea that foreign aid promotes growth in recipient countries by augmenting little domestic savings, easing foreign exchange shortage and filling the fiscal gap. Recent studies have shifted from the old aid- growth analysis to fiscal response analysis, which examines the impact of aid on government revenue and expenditures behavior and thereby on economic growth. However, regarding the fiscal response, there were no such well-developed theories, which predict the impact of foreign aid inflow on recipient government's revenue collection, expenditure and borrowing behavior. On the revenue side, aid may increase the government's tax collection efforts especially when the aid is tied with project and the government is required to mobilize domestic resource to cover part of the cost of the project. The domestic resources counter part of aid could mainly come through increased domestic taxation.

A number of fiscal response studies hypothesized that inflows of aid may also reduce the government's tax collection effort, especially weak governments with weak institutional set up may tend to reduce their tax collection efforts when they got some foreign resources especially grant (Griffin, 1970) because foreign resources are an additional resource for the government to finance its expenditures. In that case, foreign resources are driving domestic resource, which implies its outcome is to retard growth (Griffin, 1970, Weisskopf, 1972). As Rodan (1961) argued domestic efforts being the principal element in the transition, inflows of foreign resources creates a disincentive like reducing tax collection effort of the government it rather becomes adverse to growth. That is studies that found aid reduces domestic saving argue that aid retards growth (see Griffin, 1970, Weisskopf 1972). World Bank (1998) argued that when aid

reduces tax 'it encourages incompetence, corruption, misguided policies', which retards growth.

In another words, aid definitely increases government expenditure for the obvious reason that it increases the availability of resources that helps the government to finance its expenditures assuming that reduction in tax does not offset the inflow of aid. However, the type of expenditure, which increases following aid inflows, may differ from country to country. There is a hypothesis that governments in the recipient countries mostly use the resources to finance consumption like military expenditure, increasing salary of civil servant, etc. (Heller, 1975). Other may use it to finance developmental project like construction of irrigation schemes, dams etc (Gang and Khan, 1991). The growth effect of such uses of foreign resource is obviously different. The growth outcome of foreign resource depends on how it is used and its effect on government tax revenue. There remains a debate whether reduction in tax and increased consumption rather than investment has low growth payoff.

Most of the studies reviewed below hypothesized that the effects of different types of aid on fiscal aggregates differ across the government of the recipient country. According to the hypothesis grants may be directed to consumption while loans tend to be used in productive area of capital expenditure. The difference being the first one is not paid while the latter one is paid back implying the existence of incentive problem. These hypotheses are based on different assumptions about the behavior of the government in the recipient country. Hence, it will be an empirical issue to investigate which one of the above hypotheses is valid.

The earlier model in the fiscal response literature was the Heller (1975) model, which specified the recipient country policy makers utility function in linear-quadratic form written in deviation of actual from target values of the choice variables (government expenditure and revenue). The utility function is

maximized subject to financing constraints, which was disaggregated into two, where the accounting identity total receipts equal total expenditure holds. The loss function specified above exhibits diminishing marginal utility and it increases with expenditures and decrease with domestic resources. Although the government tries to minimize the deviations from the target values, it is symmetric (it assumes that the government attach equal weight to overshooting and undershooting of the choice variables).

The Heller (1975) theoretical model was criticized on different grounds. *First*, it fails to measure interdependency between policy variables and has problem in measurement of target variables (White, 1994). S*econd*, specification of the utility function, which assumed that policy makers attach equal weight for overshooting and undershooting from the target variables (symmetric) (Gang and Khan 1996) and the linear-quadratic loss function creates a problem in maximization (Mosely et al., 1987, Binh and McGillivray, 1993, White 1994, Alemayehu, 2002). T*hird,* specification of the budget constraint and assumptions of exogeneity of aid (Franco-Rodriguez et al., 1998) is generally inconsistent within its own framework and econometric problems (Alemayehu, 2002).

Mosely *et al.* (1987), Binh and McGillivray (1993), and White (1994) proposed the use of quadric utility function as the presence of the linear term makes optimization difficult when target values are achieved. Khan (1998), however, argued that quadratic specification of the loss function does not solve the problem. White (1994) further suggested the use of single equation constraint rather than disaggregating it into two as Heller, 1975 and Mosely et al., 1987. White argued that categorizing it into two over-restricts the government budgetary behavior and implies pre-determination of the allocation of resources.

However, after reviewing the literature on fiscal response McGillivray and Morrissey (2001) argued in favor of disaggregating budget constraint as the parameters of the budget constraint measure 'ex- post' fungibles. In addition to the minor modification mentioned above Mosely et al. (1987) extended the fiscal response analysis a step forward to investigate the total impact of foreign capital on output growth that goes through private and public investment. Hence, they specified private investment function in such a way that it captures the effect of aid that goes through change in price. They specified output as a function of public and private capital stock so that the indirect effect of aid, which goes through private and public investment, is captured.

In their first study Gang and Khan (1991) adopted the Heller's specification but in their latter study (Gang and Khan (1996)) they concluded that the earlier specification by Heller was unrealistic as it assumes that the government attaches equal weights to over and undershooting of the target variables. Hence, Gang and Khan (1996) proposed a 'quadratic-ratio loss function' rather than in deviation form (see Gang and Khan, 1996 and Khan, 1998).

Franco-Rodriguez et al. (1998) also modified the Heller specification by assuming that aid is an endogenous variable, which was treated as exogenous variable in the earlier studies (see Heller, 1975, Mosely et al., 1987, Khan and Hoshino, 1996). Contrary to the earlier studies Franco Rodriguez et al. (1998) has allowed domestic borrowing to finance consumption expenditure, which was earlier, restricted to financing investment. In the budget constraint, they used inequalities, which is lightly different from earlier studies.

Alemayehu (2002) developed an alternative fiscal response model based on stylized fact in developing countries. Alemayehu argued that the stylized facts in developing countries shows decisions in financing target expenditures move recursively from less costly to highly costly means. First, the policy makers sets target levels, then they move recursively from foreign financing, which is

assumed to be less costly to domestic financing (which is through raising domestic revenue) and finally to deficit financing (or cutting the expenditure items) which involves high cost (see Alemayehu, 2002). That means the objective of policymakers in developing countries is minimizing cost involved with alternative sources of financing expenditure targets. Strictly speaking however, the utility maximization specification used in the earlier fiscal response literature and the recursive nature model specified by Alemayehu (2002) where governments tries to minimize costs of financing through different means are compatible.

Alemayehu (2002) based on recursive decision-making framework in developing countries examined the revenue and government consumption effects of foreign capital inflows in Africa by independently estimating tax and government consumption function. In this work, Alemayehu tried to address some of the shortcoming of earlier works. One of the contributions is disaggregating the tax revenue into two direct and indirect taxes, which all the earlier works had lump them together. In addition, the two-tax revenue functions were specified in such a way that it captures not only the direct effects of foreign capital but also the indirect effects coming through changes in income. However, on the expenditure side his study was limited to the analysis of government consumption leaving aside government capital expenditures. Given the importance of government investment as the main channel through which foreign resources affect output growth. He has also addressed the econometrics problems of earlier studies like non-stationarity of the series by applying frontier econometric technique (Error Correction Model).

Gupta *et al.* (2003) has also followed non-optimization approach to investigate the revenue impact of foreign aid in 107 developing countries. They, however, used the first order derivative of the accounting identity with respect to aid inflows to derive the impact of aid on government revenue and expenditures.

Osei *et al.* (2003) argued that fiscal response model allows government to raise revenue and allocate to expenditure according to the target they set themselves. Aid is treated like other forms of revenue; the government has a target or expected value that is incorporated into fiscal planning or behavior. They argued that the most series problem in fiscal response model approach is that the theory is ad hoc and does not attempt to explain how the targets or parameters in the utility function and budget constraint are generated. Furthermore, fiscal response models are notoriously difficult to estimate and highly sensitive to quality of data so that studies frequently yield inconsistent estimates of parameters (see Franco-Rodriguez, 2000).

3.2. Review of Empirical Literature

3.2.1 Aid and Economic Growth

Early studies of aid effectiveness used the framework of the Harrod-Domar growth model, where investment is a key determinant of the steady state economic growth. However, given that developing countries could not generate this investment solely from their internal resources, the use of foreign capital was seen as the ultimate solution to overcome this shortage, in other words to fill the gap between required and actual investment. Further more, it was generally believed that aid could lead to one to one increment in investment and therefore economic growth. This desire to establish the link between aid and growth leads to numerous studies.

The empirical works on aid effectiveness study have been dominated by cross-country studies, and the selected studies on aid effectiveness indicate that the impact of aid on growth is mixed. Some studies find a statistical significant correlation between aid and growth and some don't. For example Papanek (1973) using data covering the 1955-1965 periods for sample of 34 least

developing countries obtained a significant positive impact of aid on growth. Gupta (1975) and Stoneman (1975) found a similar result for a wider sample of least developing countries and data. On the other hand, Griffin and Enos (1970) report a negative impact of aid on growth for a sample of 32 Latin American countries for the period 1957-64. Voivods (1973) using data covering the 1956-68 periods for 22 least developing countries and found negative impact of aid on growth, although the aid –growth coefficient is not significant.

Mosley (1980) used data covering the 1970-77 periods for 83 least developing countries and employs 3SLS techniques, and he found that the effect of aid on growth is not significant, except for 30 poorest countries where aid has significant positive effect on growth. In the follow-up study Mosley et al. (1987) introduces other explanatory variables into the regression equations (such as growth rate of export, growth rate of literacy and variables to cover other source of financial inflows) and applying both OLS and 3SLS technique to estimate the impact of aid on growth. Both methods not yield a statistical significant aid growth coefficient and they concluded that this result might relate to the issue of aid fungiblitiy issues and crowding out effect of investment in the public sector.

On the other hand, Dowling and Hiemenz (1983) examine the aid–growth nexus using data covering the 1968-79 periods for the 13 Asian countries, and control for a number of policies variables such as trade, finance and government intervention, and they obtained a positive and significant impact of aid on growth. Thus, it is not surprising that the ambiguity of the effectiveness of aid may partly arise from the OLS technique for estimating the aid–growth coefficients.

Given the lack of strong evidence to establish the nature of relationship between aid and economic growth, in the earlier study the focus shifted away from simple Harrod- Domar model towards more sophisticated model based on

the new growth theory, where economic policies and institutional development are important in determining growth performance.

One of the first studies of the new aid effectiveness with element of the new growth literature that attracted particular attention was a study by Boone (1994). Boone (1994) regressed growth on aid and other variables (population growth, terms of trade, index of debt distress, area dummies) for a sample of 98 developing countries in cross section analysis for the period 1970-90. His results show that the marginal propensity to consume from permanent transfer (aid) is one, implying that aid is totally consumed and therefore, aid has no effect on growth.

One criticism of Boone (1994) besides the cross section approach of his study the use of static model (Cass-Ramsey-Koopmans type model) which does not allow for dynamics for long period of time, and further more the model does not take into account the fiscal response channel (Mavrotas and Associates, 2000).

Another study built on the new growth theory is that of Mosley and Hudson (1995) who used an extended model to derive growth equation. Applying time series analysis to the sample of 19 developing countries over the period 1963-1990, they found that the overall impact of aid on growth was not significant. Further more, the reported R^2 is very low (less than 0.15) which suggests that the explanatory power of the variables in their model is very low.

On the other hand Durbary et al. (1998) assessing the impact of aid on growth, obtained result that strongly supports the view that foreign aid does have some positive impact on growth conditional on stable macroeconomic policy environment. They improved their model by examining the growth impact of aid within a model including both policy variables and all the major sources of investment finance that is foreign aid, private and other inflows and domestic savings.

Hadjimicheal *et al.* (1995) looked at the impact of macroeconomic policies, exogenous factors, and structural reforms on growth, savings and investment for a group of Sub-Saharan Africa countries over the period 1986-93. In their study they included intercept (time dummies), aid and policy variables were endogenized by incorporating a one year lag, aid squared term was introduced to address the issue of nonlinearity in the aid –growth relationship, and applied weighted least square method to account for country-wise hetroscedasticity. Their result shows that the aid coefficient is significantly positive while the aid-squared coefficient was negative which according to the authors suggests that " too much aid can hurt an economy, possibly because of the limited capacity of many Sub-Saharan African countries to absorb foreign resources" (Hadjimicheal et al., 1995). The authors also support the argument that stable macroeconomics environment and structural reforms have positively contributed to growth, savings, and investment.

Another well-published study is the work by Burnside and Dollar (1997) who examined aid effectiveness in interaction with growth oriented policies within framework laid by new growth theory, using Panel of 56 developing countries (40 low income and 16 middle income countries), 6 four year time periods from 1970-1973 to 1990-1993. In addition to aid, they included in their model policy interaction term to capture the impact of policy on effectiveness of aid. They used ordinary Least Square (OLS) and two stages least square (2SLS) estimation procedure to see the difference in considering aid as exogenous and endogenous. Their result showed that aid has a positive effect on growth in good policy environment in both OLS and 2SLS estimation. The results have further been explained through the analysis of aid impact on consumption in especially poor policies that there is a tendency to divert aid to government consumption spending rather than using it to finance growth promoting public investment. In the light of these findings Burnside and Dollar (1997) argue that aid should be allocated to countries with good policy environment (such as in

countries with low inflation, small budget deficit, openness to trade as well as good institution settings).

The Study by Burnside and Dollar (1997) has attracted particular attention not only among economist but also among policy makers and aid practitioners. For example these findings echoed in the report Assessing Aid (World Bank, 1998). The Assessing Aid report states that aid generally has a large effect in good-management environment, i.e. 1 percent of GDP in foreign assistance translates to sustained increase in growth of 0.5 percentage point of GDP. Some countries received only some amounts of aid and have grown at 2.2 percent per capita. The good management high aid group, however, grew faster 3.7 percent per capita etc; there is no such difference for countries with poor management. Those receiving small amount of aid have grown sluggishly (if at all), as those receiving large amounts of aid (World Bank, 1998). The Bank went further to claim that the effects of aid in good economic policy environment go beyond economic growth to reduce poverty by 1 percent, and to crowd in private investment by 1.9 percent for every 1 percent increase in aid.

The study by Burnside and Dollar (1997) and the resulting analysis by the Bank in Assessing Aid came under criticism on several grounds. Burnside and Dollar seem to suggest that the sufficient condition for aid to be "efficient " is to get internal policies right. However, besides good policies, other factor can also influence aid effectiveness; for example terms of trade, climatic shocks, recessions in the advanced economies etc., which are factors outside the control of the developing countries can influence effectiveness of aid. A country, which faced these factors, could perform badly in terms of the Burnside and Dollar criteria. Yet the authors do not sort out the effects of these factors.

Guillaumont and Chauvet (1999) stress that when external factors enter the picture (i) aid effectiveness does not significantly depend on the quality of policy, (ii) aid is more effective in more vulnerable countries, therefore, aid

should allocated to those countries. Further more they argue that if aid is allocated according to "revealed" policy, it is no because it is more effective when policy is good, but because it gives an incentive to improve policy (Guillaumont and Chauvet, 1999). Other critics on Burnside and Dollar study have pointed to the econometric and modeling issues, the use of cross sectional regression technique, which imply a policies and aid productivity across countries and time period do not vary.

The most telling criticism of Burnside and Dollar (1997) and consequently Assessing Aid came from Hansen and Tarp (2000, 2001) who stress that the Burnside-Dollar model is sensitive to choice of data, policy selectivity as well as model specification. The significance of the interaction term, which is crucial to their analysis, depends on five observations (Hansen and Tarp, 2000). Re-specifying the model and using the same sample as Burnside and Dollar (1997), Hansen and Tarp found that the policy interaction term becomes insignificant once outliers are included in the sample. The inclusion of the aid-squared term to capture possible polynomials effects in the aid-growth relationship seems to be more appropriate than aid-policy interaction terms (Hansen and Tarp, 2000). These findings also validated in Hansen and Tarp (2001) and concluded that aid and policy have independent positive effects on growth.

Within context of time series analysis, Lloyd et al. (2001) in a study of Ghana found that although good policy environment seems to enhance the growth prospect in the short-run but in the long-run there was no evidence that shows good policy was necessary for aid effectiveness. Easterly et al. (2003) using the same methodology of Burnside and Dollar (1997) but extending the data set to 1997 and adding additional countries found that foreign aid promote growth in good policy environment does not hold.

Le and Winter (2001) conducted a study in Vietnam with regard to aid allocation. Three types of aid has been identified as necessary for addressing poverty in developing countries i.e. aid promoting sustainable economic development, that directly targeted the poor and that provides transfers and safety net for immediate relief. Maximizing the benefit of aid in terms of poverty reduction requires determining an aid allocation that is balanced between these variables. The empirical result indicates through examining poverty within Vietnam that the optimality of aid allocation is in doubt. This has been due to disproportionate disbursement of aid across regions with regard to poverty incidence.

Collier and Dollar (2002) conducted a study on poverty efficient allocation of aid and compares it with actual aid allocation. They estimated the impact of aid on growth for large number of countries as a first towards estimating the impact of aid on poverty. Mapping aid on growth they estimated the equation where growth is a function of exogenous conditions, the level of policy, the level of net receipts of aid relative to GDP, the level of aid squared, and the interaction of policy and aid. Moreover, they have included a much broader range of policies for which comparable quantitative measures were lacking differing from Burnside and Dollar study. In their analysis it has been found that aid policy interaction term is significant. This implicates that donors can affect growth through the allocation of aid, and the analysis then suggests that the poverty efficient allocation of aid. The intuition of their approach is aid should be allocated to poor countries that have a good policy.

3.2.2 Fiscal Impact of Aid

The empirical literature on the effect of aid on growth has seen revival in recent years. A deficiency of the aid–growth literature is its failure to explicitly recognize that aid is given primarily to the government and hence any effect on

macroeconomic performance will be mediated through government behavior. Most of aid in developing countries is channeled through the government sector. Furthermore, foreign aid in most of these countries remain a major source of revenue given that the latter plays a key role in economic development process, studying the way the recipient government use these fund be an issue of paramount importance in the study of aid effectiveness. Hence, the broad fiscal response literature examines the impact of aid on government expenditure and tax revenue.

The first empirical findings regarding the impact of foreign aid on government behavior (fiscal aggregates) can be tracked back to Heller's (1975) work. Heller's study has considered the impact of different types of aid (grant and loan; bilateral and multilateral) on several categories of public expenditures (public expenditure for developmental purposes, civil consumption in the public sector, socio-economic consumption in the public sector), government revenue and domestic borrowing. Heller (1975) examined this using data from 11 African counties categorized as French and English speaking. He concluded that aid increased both government investment and consumption and reduces taxes and domestic borrowing. It increases total government expenditure because aid inflows increase availability of resource for the government to finance its expenditures.

By disaggregating aid into grant and loan, Heller (1975) found that grant has a stronger pro-consumption bias while concessional loan has strong pro-investment bias. Therefore, grant directly contributes to increased public consumption and indirectly to private consumption by reducing taxes. From the results Heller also concluded that there is structural difference between French speaking and English speaking countries, and he estimated the equations by pooling cross-section and times series data.

The two stage least square (2SLS) estimation results of Heller (1975) study showed that in both samples (French and English Speaking) government investment takes 63 to 76 percent of total loans in contrast to 41 to 53 percent of official grant, proving the argument that grants have pro-consumption bias while loans have pro-investment bias. "In the pooled sample no more than 9 percent of tax revenue is used to finance investment as contrasted to 22 percent for the Anglophone countries". Where, total grant is partially allocated to the consumption budget with the proportion of grant going to consumption expenditures being falling between 0.27 and 0.38. The total impact of grant was -0.19 and –0.18 respectively, suggesting that both grants and loans reduce tax by almost the same percentage (about 20 percent). For Anglophone countries the impact was around 30 percent. The result obtained by Heller (1975) that indicated grant to be more pro-consumption while loan to be more pro-investment bias strengthened the suspect that different types of aid have different macroeconomic effects.

Gang and Khan (1991) adopting the Heller (1975) model empirically examined the fiscal behavior of the Indian government to foreign capital inflows using time series data (1961-1984). To investigate the links between aid and development they proposed a two-step procedure. The first step concentrates on the fiscal response aspect of foreign aid while the second step deals with examining the impacts of public investment and consumption on developmental variables such as growth and income distribution. Although they employed the framework developed by Heller (1975), they have estimated using non-liner 3SLS estimation technique. Substantively, Gang and Khan (1991) results confirm Heller's initial findings on the tax side but contradict his and other earlier results on expenditure side. The parameters that show the proportion of tax revenues, grants and loans spent on recurrent expenditure are 1.08, -.79 and -0.03 respectively. The insignificancies of grants and loans parameters show that aid does not statistically affect government consumption but all tax revenues are used to finance consumption.

Gang and Khan (1991) findings asserted that aid (both grants and loans) are used to finance investment is different from the findings of Heller (1975) which reported that only 63 to 76 percent of total loans and 41to 53 percent of official grants goes to public investment. Contrary to the findings of Heller which reported that there is no statistically difference between the two sources of aid (bilateral and multilateral) they found that bilateral aid pulls resources out of government consumption while multilateral aid is used to finance both investment and consumption expenditure.

Khan and Hoshino (1992) also examined the fiscal response of recipient countries to foreign aid inflows by taking 5 countries from South and South-East Asia by adopting the Heller (1975) model and applying non-linear 3SLS estimation technique and they found that aid affects consumption investment and taxation similar to the findings of Heller.

Binh and McGillivray (1993) and White (1994) criticized the Gang and Khan (1991) conclusion that says aid in all goes to investment in India was misinterpretation of their own results. White criticized the way Gang and Khan generated the target values as the main source of the problem because they used the fitted values after regressing actual over some explanatory variables. For White, the way Gang and Khan generated the fitted values are not only inconsistent with budget constraint but also will not be meaningful when R^2 from the regression is near one or zero as generated values cannot be good proxy variables for target values, which policymakers set based on economic development objectives. This critic of White (1994) applies to all the studies followed similar approach.

McGillivray (1994) and White (1993) also tested the impact of aid on government revenue and expenditures by including feedback effects through higher income. Implicitly, White was assuming that aid enhances growth as expected by earlier developments theories, which negate the findings of Griffin

(1970) and Weisskopf (1972). White (1993) argued that even the study by Mosley et al. (1987) which considered the impact of aid on growth through changes in fiscal behavior of the recipient government and prices, did not explore the multiplier and dynamic aspects. Incorporating these effects, White (1993) showed the possibility that aid inflows increases taxes assuming that it crowds in private investment.

Otim (1996) in his study examined the fiscal behavior of three South Asian countries adapting the Heller (1975) model, and most of his findings confirms the results of Heller (1975), Khan and Hoshino (1992) that showed grants are pro-consumption while loans are pro-investment (as Otim found 65.6 percent of grants and 81.3 percent of loans finance investment expenditures). However, the findings show that inflow of aid increases recipient country's tax collection effort and in the presence of aid tax pulls resources out of consumption to support investment contrasts with Heller's findings.

Franco-Rodriguez et al. (1998) using Gang and Khan (1996) model examined the fiscal response behavior of Pakistan government using time series data of 1965-1998 by endogenisng aid, in which all earlier studies based on Heller (1975) model, assumed aid to be exogenous variable. Franco-Rodriguez et al. (1998) found that foreign aid induces government investment than consumption and reduction in tax effort is low. Further they argued that although aid commitment is exogenous to the recipient nations, once donors set the level aid disbursement, allocation among expenditure categories are determined by recipient and hence should be treated as endogenous variable. They found parameters estimate of the budget constraint, which shows the proportion of domestic revenue, aid and domestic borrowing to be 0.15, 0.49, and 0.46 respectively. This finding shows that domestic revenue is mainly used to finance consumption expenditure (85 percent) while foreign aid in Pakistan was evenly used to finance consumption and investment (50% each).

Similarly, Franco-Rodriguez et al. (2000) used the same theoretical framework to analyze the fiscal impact of aid for Costa-Rican government for the period 1971-1994. The finding of this study suggests that aid inflow has induced a positive effect on government revenues and expenditure while it has negative impact on public investment.

A study conducted by Kweka et al. (2000) showed that government consumption is more pro growth than public investment in Tanzania. Thus, the fact that the recipient governments use aid partly to finance consumption does not necessary implies wastage. Among the recurrent expenditure or consumption expenditures; expenditure on health, education, road maintenance, etc. are good things that improves the social welfare of the society and contributes positively to output growth although the effect is not immediate like as investment expenditure. Moreover, the World Bank report on Assessing Aid (1998) argued that considering expansion in public services in basic infrastructure like education, health services and clean water provision financed by foreign aid has not failed. Hence, the earlier conclusion that aid failed to promote growth was based on the assumption that government consumption is not as productive as investment.

Alemayehu (2002) used "an alternative approach" to analyze the fiscal response behavior of recipient countries in North Africa (NA), East and South Africa (ESA) and Western and Central Africa (WCA) by deviating from neoclassical optimization procedure. His findings showed that the effects of foreign capital on taxes and consumption expenditure differ across regions, nature of taxes and types of inflows. Although statistically insignificant, in all the regions of Africa, capital inflow has got a negative coefficient in direct tax equation showing that inflows tend to reduce direct taxes. Regarding the indirect taxes, also he found a negative coefficient for the foreign capital inflows, but it is statistically insignificant. As expected, foreign capital inflow is found to have positive impact on government consumption expenditure.

The study by Gupta et al. (2003) examined the revenue effect of foreign aid for 107 countries for the periods 1970-2000 by disaggregating total aid into grants and loans, came with similar results as that of Heller (1975), Khan and Hoshino (1992). They argued that concessional loans are generally associated with higher domestic revenue mobilization while grants have the opposite effect. Although Gupta et al. (2003) argued that the effect depends on the level of corruption in the country; they concluded that for sample countries used in this study as a whole, doubling grants from 0.4 percent of GDP to 0.8 percent of GDP could reduce revenue by 0.4 percentage points of GDP. This implies that grants have negative impact on tax revenue or collection effort for the sampled countries.

M'Amenja et al. (2005) applying multivariate cointegration framework for Kenya using 1964-2002 data found that government spending has positive impact on growth and tax revenue has no direct effect on growth, but it may have indirect effect through government spending, and also they found that the effect of aid depends whether one considers grant or loan. As the result, grant found to have positive impact on growth in the long run. However, loan appears to substitute for tax and finances fiscal deficits and therefore has negative impact in the long run. The positive influence of aid on the GDP growth rate seems to be derived from the incremental effect aid has on governmental consumption expenditure, which is a component of GDP.

In similar vein, Xayavong et al. (2006) examination apply VAR modeling framework for Ghana using 1965-2004 data in connection with short-run dynamics their result suggests that foreign aid boosts government expenditure and growth rate of the economy whilst it induces reductions in government investment expenditure and tax effort, displaces domestic borrowing and crowds out private investment. According to Xayavong et al. (2006) analysis the co-integrated VAR model suggests that there are two dimension of the long-run relationship: the one driven by the growth relation and the other by fiscal

relation. They found that in the growth relationships government consumption (made up of recurrent and developmental expenditures) and private investment increase the growth rate while government investment and taxation detract from growth. With respect to the fiscal relation, they found that the government investment consumption (capital and recurrent expenditures) worsen the budget deficit whilst taxation and foreign aid improve the fiscal position, as expected.

3.2.3 Ethiopian studies

Studies with regard to aid effectiveness have been conducted in Ethiopia recently given that the country is highly dependent on aid and the prevailing level of poverty and came up with different results which are summarized below.

Dawit and Yemisrach (2002) examined the interaction among foreign aid, external debt and economic growth applying Error Correction Method (ECM) and using time series data over the period 1970 to 1999. They specified three equations; Output equation, Investment and import equation. Their findings reveal that aid has a positive but insignificant effect on economic growth while investment has a positive significant impact. The relationship between foreign aid and import has also found to be positive and significant implying aid has been filling the foreign exchange gap. The implication of this is that foreign aid contributes to growth through facilitating greater investment and imports. Wondwossen (2003) has criticized this findings in his study on the relationship between aid, policy and economic growth by arguing that output specified as a function of saving, investment and other variables is likely to be biased, this mainly being due to problem of double counting since investment captures part of the growth impact of aid and put their result under question mark.

Wondwossen (2003) conducted study on the relationship between aid, policy and economic growth for the period 1962/63-2002/03 using Maximum Likelihood procedure. In his study investment and growth equations has been identified and residuals have been generated to avoid the problem of double counting. The study shows that foreign aid has significant positive contribution to investment whereas the effect of foreign aid on economic growth is found to be negative but insignificant. In another development aid interacted policy term, produced significantly positive result implying good policy environment increases the level of aid that can be positively expended (consumed).

Aberra (2004) also made a study on fiscal response to external finance recognizing the role of public sector on aid effectiveness and the paper examined the impact of aid hypothesizing that different types of aid (grant and loan) and aid from different sources (bilateral and multilateral) have different impact on government revenue collection and expenditure behavior. The study used two alternative approaches the neoclassical optimization based model of Heller (1975) and non-neoclassical approach model of Alemayehu (2002). The result from neoclassical approach shows that loans and grants from multilateral sources are pro-investment while loans and grants from bilateral sources are pro-consumption, and aid have no (zero) impact on domestic revenue. The result from non-neoclassical approaches reveals that aid positively affects government investment and has negative and almost no effect on government consumption. On the other hand, the analysis shows that aid has positive impact on direct tax collection while it does not have any effect on indirect tax collection.

Tefferi (2004) has studied the Dutch disease effect of aid and the links between aid and export performance using time series data over the period 1965/66-2001/02 applying Johansen Maximum Likelihood procedure. The result of the study shows that aid inflows lead to depreciation of real exchange rate rather

than appreciation and implicating the absence of Dutch disease effect and also aid inflows has been found to have positive effect on export performance.

Meheret (2005) conducted study on aid, pro-poor spending and welfare using data over the period 1965/66-2002/03 applying Johansen Maximum Likelihood procedure. The result of her study reveals that both domestic revenue and aid have significant positive effect on pro-poor expenditure. Per capita income has also a tendency to augment pro-poor expenditure presenting a possibility of growth being pro-poor, and the impact of aid on welfare confirms that aid improves welfare through funding pro-poor spending, however in short-run it is statistically insignificant due to the time lag implementation.

Based on the aforementioned recent studies in Ethiopian one can draw the conclusion that aid has positive impact on growth and on the other hand also one can draw the conclusion that aid is rather ineffective in Ethiopia unless good economic policies supported it, hence implying that the aid effectiveness issue in Ethiopia is also far from conclusive. Those studies that considered the public sector implicates the prevalence of aid fungibility and the fiscal response study point out that aid is pro-investment.

However to the knowledge of researches done, there has not been a study conducted with regard to fiscal impact of aid and its relationships with growth through the transmission mechanism of the public sector.

Hence, this paper tries to examine empirically the fiscal impact of aid and its relation with growth in Ethiopia by applying a vector autoregressive (VAR) and vector error -correction (VEC) modeling framework.

4. Econometric Methodology and Data

4.1 Methodology

In recent years, vector autoregressive (VAR) methods became the "tool of choice" in much of empirical macro-econometrics works. VAR is an econometric model used to capture the evolution and interdependency between multiple time series, generalizing univariate autoregressive (AR) models. All the variables in a VAR are treated symmetrically by including for each variable an equation explaining its evolution based on its own lags and the lags of all other variables in the models. The rationale behind the VAR models is "let the data speak for themselves" because unlike the regression models in which Y_t explained by k regressors $X_1, X_2, \ldots, X_k$, in VAR models Y_t may be explained by lagged values of Y itself and stochastic error terms. The VAR approach offer several advantage over single equation approach associative with Engle and Granger, such as the ability to deal with several endogenous variables and co-integrating vectors, the ability to test for weak exogeneity and parameter restrictions, and to handle both I(1) and I(0) variables in one system.

The principal differences of VAR modeling methodology from those in the structural approach are: - (1) There is no priori endogenous- exogenous division of variables i.e. all variables are endogenous. (2) No zero restriction is imposed, (3) There is no strict (and prior to modeling) economic theory within which the model is grounded. (4) Estimation is simple, that is, the usually OLS method can be applied to each equation separately. (5) The possibility of combining the long and short long-run information by exploiting the

cointegration property is the most important reason for VAR to receive attention from both economists and econometricians.

The VAR approach is data based and little economic theory is imposed directly (Sims, 1980). Although the structure is atheoretical, economic theory is often invoked to select the appropriate normalization and to interpret the results. The VAR approach assumes all variables in the system are potentially endogenous, so each variable is explained by its own lags and lagged values of the other variables. It also assumes that there is no a priori direction of causality among the variables; this is particularly useful for fiscal variables, which are often co-determined [Charemza and Deadman (1997), Blanchard and Perotti (1999)].

To conduct a test for co-integration in a multivariate framework using Johansen's (1988) maximum likelihood procedure, first the general VAR model of relationship between fiscal aggregates, aid and economic growth should have to be formulated and then tests for unit roots and determining the appropriate lag length of the endogenous variables will be undertaken consecutively. To apply the Johansen method of determining the number of co-integrating vectors, a general VAR(p) of the following form can be formulated.

$$X_t = \Phi_1 X_{t-1} + \Phi_2 X_{t-2} + \ldots + \Phi_p X_{t-p} + \Psi w_t + \varepsilon_t \qquad (7)$$

Where X_t is a (mx1) vector of endogenous fiscal and non-fiscal variables, w_t is a (q x 1) vector of deterministic variables and each Φ_i (I=1,---, p) and Ψ are (m x m) and (m x q) matrices of coefficients to be estimated using a (t= 1,..., T) sample of data. ε_t is a (mx1) vector of normally and independently distributed disturbances with zero mean and non-diagonal covariance matrix(vector of white noise disturbance terms). Providing the variable are (at most) integrated of order one (1) and co-integrated also has an equilibrium error correction representation that is observationally equivalent but which facilitates

estimation and hypothesis testing, as all terms are stationery. This reparameterization is given by:

$$\Delta X_t = \alpha\beta' X_{t-p} + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \Psi w_t + \varepsilon_t \qquad (8)$$

Attention focuses on the $(n \times r)$ co-integration vectors, β, that quantify the long-run relationship between the variables in the systems and the $(n \times r)$ matrix of equilibrium correction coefficients, α, elements which load deviation from this equilibrium $(\beta' X_{t-p})$ in to ΔX_t for correction. The Γ_i coefficients estimate the short-run effects of shocks on ΔX_t and thereby allow the short - and long- run responses to differ.

Usually co-integration analysis begins by ascertaining the time series properties of the data series. Models that assume a stationary process when none exists lead to erroneous or spurious statistical inferences (Granger and Newbold, 1974). Choosing an appropriate lag length is the next step in time series modeling. Once this is established, the estimation process passes through three distinct stages: -Determination of the number of co-integrating vectors(r) as proposed by Johansen and Juselius (1990), factorization of the impact matrix $\pi = \alpha\beta$э in order to estimate matrices α and β, and estimation and interpretation of the VAR model after co-integration is ascertained [Hamilton (1994), Johnston and DiNardo (1997)].

This paper tries to establish, through identifying restrictions, any structural economic relationship explained by the long-run model. Restrictions on the beta's (β) help to determine which variables are relevant in the co-integrating vector(s) while restrictions on alphas (α) help determine which variables are weakly exogenous to the system. In addition to knowing the significance of variables in the co-integrating space, restrictions on β also help in the identification and thus interpretation of the structural model. We use economic

theory to determine which restriction(s) to impose on each co-integrating vector [Hendry and Juselius (2001), Harris and Sollis (2003)].

The study also employs impulse response analysis, which attempts to trace out the time paths of various shocks in the variables contained in the VAR. To do this, the VAR is reformulated into a vector moving average as proposed by Sims (1980). Impulse response analysis describes the chain reaction or knock-on effects arising from one standard perturbation in one innovation in the system over time on all the variables in the system assuming no other shocks hit the system thereafter (Johnston and DiNardo, 1997). Strictly, it is a cumulative error (incorporating effects of other endogenous variables), so one cannot be certain that the variable being shocked is the source of the entire impulse response. Its shortcomings notwithstanding, impulse response analysis allows us to study the dynamic behavior of each variable in the system by determining whether or not an exogenous shock causes short-run or long-run changes in the variable of interest and also other variables in the VECM.

M'Amenja et al. (2005) argued that there has been some use of impulse response analysis to study fiscal behavior in recent years. Both orthogonalised and generalized impulse responses have been used for this purpose. The latter does not depend on the way in which variables are ordered in the system but the former does. For instance, Hjelm (2001) uses generalized impulse response analysis to study how US budget deficits react to shocks in taxes, government spending and output and found government spending shocks are permanent and tend to have negative impact on the budget deficit in the long-run. In the case of Germany, Hoppener (2001) uses impulse response to study the effects of fiscal response on output and finds a negative response of output to tax shocks and a positive response to government spending shocks. Blanchard and Perotti (1999) found similar results for the US.

Osei et al. (2003) adopted this approach to assess the fiscal impact of aid in Ghana, and M'Amenja et al. (2005) also apply the method for Kenya to examine

fiscal impacts of aid and its relation with growth and found a positive relationship between government expenditure and economic growth, grant and economic growth. It would be interesting to conduct similar test for Ethiopia and examine the dynamic interactions among our variables of interest.

According to Granger's representation theorem, if there is co-integration there must exist Granger causality in at least one direction and therefore one can reformulate the VAR into a VECM in which error correction terms are included. Existence of cointegration allows for the analysis of short-run dynamic model that identifies adjustment to the long-run equilibrium relationship through the Error Correction Model (ECM) representation.

A vector error correction model is a restricted VAR designed for use with non-stationary series that are cointegrated. The VECM has cointegration relation built into the specification so that it restricts the long-run behavior of the endogenous variable to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegrating term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The ECM has several advantages:

First, it incorporates both short and long-run effects, that is, the long-run equilibrium incorporated into the model. *Second*, all terms in ECM model are stationary so standard regression techniques with their associated statistical inferences are valid given the existence of cointegration. *Third*, the multicollinerity effects which typically strongly present in time series data is significantly reduced in the error- correction form, as differences are much more orthogonal than the levels of the variables. *Fourth*, all information about long-run effects are summarized in the level matrix,π which can therefore be given special attention when solving the problem of cointegration. *Fifth*, the interpretation of the estimates is much more intuitive, as the coefficients can

be naturally classified into short and long run effects. *Sixth,* the ECM is bound to cointegrate in that if the series are cointegrated then there must exists an ECM; and conversely an ECM generates cointegrated series (Engle and Granger, 1987).

Using the five variables of our interest, i.e. real per capita output (YR), total government spending (GE), total tax revenue (TR) and foreign aid (Grants aid (GA), Loan aid (LA)), and following Johansen and Juselius (1990) approach it is possible to formulate the VECM and obtain the following system of equations.

$$\Delta LYR_t = \sum_{k=1}^{r} \lambda_k v_{k,t-1} + \sum_{s=1}^{p} \alpha_{1,s} \Delta LYR_{t-s} + \sum_{s=1}^{p} \alpha_{2,s} \Delta LGE_{t-s} + \sum_{s=1}^{p} \alpha_{3,s} \Delta LTR_{t-s} + \sum_{s=1}^{p} \alpha_{4,s} \Delta LLA_{t-s} + \sum_{s=1}^{p} \alpha_{5,s} \Delta LGA_{t-s} + \varepsilon_{1,t}$$

$$\Delta LGE_t = \sum_{k=1}^{r} \lambda_k v_{k,t-1} + \sum_{s=1}^{p} \beta_{1,s} \Delta LYR_{t-s} + \sum_{s=1}^{p} \beta_{2,s} \Delta LGE_{t-s} + \sum_{s=1}^{p} \beta_{3,s} \Delta LTR_{t-s} + \sum_{s=1}^{p} \beta_{4,s} \Delta LLA_{t-s} + \sum_{s=1}^{p} \beta_{5,s} \Delta LGA_{t-s} + \varepsilon_{2,t}$$

$$\Delta LTR_t = \sum_{k=1}^{r} \lambda_k v_{k,t-1} + \sum_{s=1}^{p} \delta_{1,s} \Delta LYR_{t-s} + \sum_{s=1}^{p} \delta_{2,s} \Delta LGE_{t-s} + \sum_{s=1}^{p} \delta_{3,s} \Delta LTR_{t-s} + \sum_{s=1}^{p} \delta_{4,s} \Delta LLA_{t-s} + \sum_{s=1}^{p} \delta_{5,s} \Delta LGA_{t-s} + \varepsilon_{3,t}$$

$$\Delta LLA_t = \sum_{k=1}^{r} \lambda_k v_{k,t-1} + \sum_{s=1}^{p} \varphi_{1,s} \Delta LYR_{t-s} + \sum_{s=1}^{p} \varphi_{2,s} \Delta LGE_{t-s} + \sum_{s=1}^{p} \varphi_{3,s} \Delta LTR_{t-s} + \sum_{s=1}^{p} \varphi_{4,S} \Delta LLA_{t-s} + \sum_{s=1}^{p} \varphi_{5,s} \Delta LGA_{t-s} + \varepsilon_{4,t}$$

$$\Delta LGA_t = \sum_{k=1}^{r} \lambda_k v_{k,t-1} + \sum_{s=1}^{p} \theta_{1,s} \Delta LYR_{t-s} + \sum_{s=1}^{p} \theta_{2,s} \Delta LGE_{t-s} + \sum_{s=1}^{p} \theta_{3,s} \Delta LTR_{t-s} + \sum_{s=1}^{p} \theta_{4,s} \Delta LLA_{t-s} + \sum_{s=1}^{p} \theta_{5,s} \Delta LGA_{t-s} + \varepsilon_{5,t}$$

(9)

Where $v_{k,t-1}$ represents residuals from the co-integrating equations and λ_k are the adjustment coefficients while r and p are respective optimal lag lengths, and ε_{it} are errors assumed to be white noise.

4.2 Data and Variables

Data used in this study has been obtained from Ministry of Finance and Economic Development (MOFED), National Bank of Ethiopia (NBE), World Bank, International Financial Statistics of IMF, Ethiopian Economic Association (EEA), Multilateral and Bilateral Aid organization publications. The five variables used in the model are in logs so that their first difference represent growth rate, the variables are real income (YR), total government

expenditure (GE), total tax revenue (TR), and foreign aid (Grants aid (GA), Loan aid (LA)). Foreign aid is total net disbursement of official assistance (ODA) to Ethiopia, government expenditure includes consumption and capital expenditure (net of debt redemption), while total tax revenue includes direct and indirect tax revenue (excluding non-tax revenues). Thus, the variables include are real output, total spending, tax revenue disaggregated aid but omit deficits not to estimate an identity. Annual data is used over the period 1960 to 2004 all the variables are measured in Ethiopian Birr. The analysis of this paper rests on testing the impact of aid on growth through government fiscal behavior.

5. Empirical Results and Interpretations

5.1 Unit Root Test

Handling time series economic data particularly in regression analysis these days is becoming almost mandatory to test for stationary. A time series (stochastic process) is stationary if its mean, variance and auto covariance are independent of time (Harris, 1995). If the variables entering the regression are not stationary (unit root), then the results obtained using ordinary least squares (OLS) techniques would be spurious in the sense that variables would seem to have causation just because they merely have common trends overtime rather than true causation (see Gujarati, 1995 and Harris, 1995). Therefore, no inference can be made since the standard statistical tests like the F-distribution and t-distribution are invalid.

Since most economic time series variables are not stationary, thus the first step is to test whether the variables are stationary (that is to test for unit root). We should find the variables are non- stationary but become stationary often after differencing such a variable is said to have difference stationary processs (DSP). However, some variables may trend upward but along deterministic line such variables are categorized in trend stationary process (TSP), which requires detrending. Most economic variables are, however, in the category of difference stationary.

As precursor to empirical analysis the order of integration of the individual series is evaluated using standard Augmented Ducky Fuller (ADF) and Phillips Perron (PP) tests. The first step towards estimating time series is checking for stationarity. Accordingly, the test has been done using ADF and PP unit root

test, and the tests reveals that the variables are integrated of order one I(1), which implies that the variables become stationary after being differenced once.

Table 5.1 ADF Unit Root Test

Variables		With drift Lag		With drift and trend Lag	
		1	2	1	2
LYR_t		0.2073	0.4142	-2.001	-0.9855
LGE_t		-1.099	-0.8266	-3.015	-2.655
LTR_t		-0.1404	-0.249	-2.562	-2.888
LLA_t		-1.011	-0.696	-3.349	-2.262
LGA_t		0-.7432	-0.1983	-3.026	-2.289
Critical Value	5%	-2.932	-2.932	-3.516	-3.516
	1%	-3.589	-3.589	-4.184	-4.19
$DLYR_t$		-7.368**	-3.655**	-7.313**	-3.657*
$DLGE_t$		-5.032**	-4.035**	-5.010**	-4.035**
$DLTR_t$		-4.392**	-4.495**	-4.334**	-4.485**
$DLLA_t$		-7.252**	-4.416**	-7.174**	-4.358**
$DLGA_t$		-6.317**	-3.954*	-6.247**	-3.908*
Critical Value	5%	-2.932	-2.932	-3.519	-3.519
	1%	-3.593	-3.593	-4.19	-4.19

**, * Represents significance at 5% and 1% level, respectively

The Augmented Dickey Fuller –ADF (Table 5.1) and Phillips Perron –PP (Table 5.2) tests indicate that all variables entering the co-integration analysis are found to be non- stationary I(1) series with no significant drift and trend, and all the variables become stationary after being differenced once (see Table 5.1 & 5.2).

The choice of appropriate lag length is an important aspect in time series co-integration analysis. The lag length should be long enough to yield white noise residuals and short enough to preserve degrees of freedom. In this study first a model with 4 lags is estimated and then sequentially reduced them by

examining the significance of different lags using the joint F-test statistic, and in each round the highest insignificant lag was dropped until a significant lag was reached. In this study, significance occurred at lag length of two. This also confirmed by standard model selection criteria (AIC, SBC and HQC) and adoption of a general -to -specific modeling approach points to VAR of order two, which is congruent with the data (see Appendix 1).

Table 5.2 PP Unit Root Test

Variables		With drift Lag		With drift and trend Lag	
		1	2	1	2
LYR_t		0.175	0.387	-2.059	-1.776
LGE_t		-0.924	-0.944	-2.758	-2.748
LTR_t		-0.183	-0.180	-2.654	-2.732
LLA_t		-1.274	-1.268	-3.694	-3.598
LGA_t		-0.523	-0.402	-3.424	-3.406
Critical Value	5%	-2.947	-2.947	-3.524	-3.524
	1%	-3.621	-3.621	-4.205	-4.205
$DLYR_t$		-6.442**	-6.522**	-6.407**	-6.491**
$DLGE_t$		-6.595**	-6.600**	-6.611**	-6.619**
$DLTR_t$		-6.847**	-6.847**	-6.769**	-6.769**
$DLLA_t$		-7.662**	-8.016**	-7.930**	-7.930**
$DLGA_t$		-8.594**	-8.838**	-8.483**	-8.716**
Critical Value	5%	-2.950	-2.950	-3.528	-3.528
	1%	-3.628	-3.628	-4.214	-4.214

**, * Represents significance at 5% and 1% level, respectively

5.2 Cointegration Analysis (Identification of long-run model)

Given the variables are I(1), the estimation procedure follows conducting the co-integration test using Johansen maximum likelihood methodology to determine the long-run relationship. The Johansen's reduced rank procedure

enables us to establish the number of unique co-integration vectors spanning the co-integration space. We must therefore impose appropriate restriction and normalizations on βs to be able to unearth and interpret the underlying economic or structural model (Johansen (1995), Hendry and Juselius (2001)).

Given the forgoing discussion the empirical model estimated is restricted VAR (2) with two-cointegration relationship driven by the growth and fiscal response path. A model is estimated in which grants and loans were entered separately; co-integration test was then conducted using Johansen's trace and max. test statistics. From theory, and following our previous discussion two long-run relationships is expected that describe the output and fiscal relationship respectively. Besides economic theory, interpreting the test supported the possibility of two co-integrating relationships and also using other criteria such as plots of possible co-integrating vectors and the number of significant columns of the estimated adjustment coefficients of the estimated model (Hendry and Juselius, 2001).

There are three alternatives regarding the rank (r) of a matrix: - *First,* when r=n, that is, if there is full rank (when n is the number of variables entering in the co- integration space) then every variable is stationary I(0), and estimation in the level form would be recommended. *Second, when* r=0, then there is no co-integration, that is there is no long-run relationship among the variables involved and estimation by first difference of VAR is appropriate. The *third and interesting* case, when 0<r<n, it is possible to represent as $\alpha\beta'$ that is $(n\times r)$ vector of long-run parameters β and $(n\times r)$ α matrix which represents speed of adjustments to disequilibrium. Hence, $\alpha\beta' X_{t-p}$ of equation (8) represents up to n-1 linear combinations (co-integrating vectors) that ensures the convergence of X_t to their long-run steady state path (Harris, 1995 and Johansen, 1995).

Once the model assumes the last alternative (0<r<n), the first task is to determine the number of co-integrating vectors and gets estimate of Γ and π.

Table 5.3 Tests for Cointegration Relation

H_0: Rank = r	Eigenvalue	-Tlog(1-/mu)	Using T-nm	λ_{max} (95%)	-T\∑log (.)	Using T-nm	λ_{trace} (95%)
$r = 0$	0.687244	51.14**	39.57**	33.5	121**	93.47**	68.5
$r \leq 1$	0.618406	42.39**	32.76**	27.1	69.82**	53.95**	47.2
$r \leq 2$	0.260491	13.28	10.26	21.0	27.43	21.2	29.7
$r \leq 3$	0.212246	10.5	8.111	14.1	14.15	10.94	15.4
$r \leq 4$	0.079763	3.657	2.826	3.8	3.657	2.826	3.8

```
Vector portmanteau 5 lags= 86.696
Vector AR 1-2 F (50, 85) = 1.0663 [0.3912]
Vector normality Chi^2(10)= 1.3 [0.567891]
Vector Xi^2   F (300, 7) = 0.050351 [1.0000]
```

As shown in Table 5.3 both λ_{max} and the λ_{trace} statistics support the existence of two co-integration vectors. The result reveals that there is a possibility of at least two co-integrating vectors by both co-integration statistics, which supports the theoretical discussion of two co-integration relations.

After determining the cointegration relation, the diagnostics tests, especially tests for autocorrelation and normality must be conducted before proceeding to Johansen cointegration test that reveals adequacy of the model. Accordingly, the diagnostic test shows that the vector normality test does not reject the null of normality of residuals and similarly the vector autocorrelation test does not reject the null of no autocorrelation both at 5% and 1% level of significance, which signifies the adequacy of the model.

The test suggests the possibility of more than one cointegrating vectors, as in principal one has a simultaneous equation system with one relationship between the fiscal variables, and then a relationship between fiscal variables

and growth. As M'Amenja (2005) demonstrates in his study for Kenya, not all variables impact on growth that suggests not all fiscal variables cointegrated with growth (i.e. zero restriction holds for some variables).

The cointegration test confirms that there are two cointegrating vectors, so the next step will be determining the variables to be normalized and those on which restrictions are imposed. Although in general taxes are believed to distort incentives (return on factor income) and thus discourage investment and growth, Milesi–Ferretti and Roubini (1995) have argued that in a situation where government is free to borrow and lend, taxes may have zero long-run effect on growth. In such a situation, the government effect on long- run growth will be through expenditure, and taxes have no or marginal effect.

Thus, for the growth relation (in the first co-integrating vector) the normalization is on output and zero restriction is placed on tax revenue, and for the fiscal relation represented by second co-integrating vector, the study may exclude output as our interest is to investigate the relationship between aid, taxes and expenditure and hence in this case normalization will be on loan and restriction is placed on output.

Therefore, the first co-integrating vector reflecting growth relation was normalized on LYR (Per capita growth) and had zero restriction placed on LTR (Tax revenue), while the second cointegrating vector reflecting aid-fiscal aggregates relationship was normalized on LLA (Loan Aid) and had zero restriction placed on LYR (output).

Table 5.4 Results of Cointegration Tests

	Long-run parameter		Error correcting term	
Variable	β_1	β_2	$ECT1_{t-1}$	$ECT2_{t-1}$
LYR_t	1.0000	0.0000	**-0.2762**	-0.01450
LLA_t	-0.4238	1.0000	-0.6488	**-0.6527**
LGE_t	-0.6872	-0.5449	-0.1156	-0.10003

LTR_t	0.0000	0.4423	0.4471	0.0472
LGA_t	-0.2841	0.2164	0.5614	-0.2581

In the Table 5.4 $ECT1_{t-1}$ and $ECT2_{t-1}$ correspond with vector1 and vector2 respectively, and the bolded coefficients represent the error correcting terms for the respective vectors. Test result reveals that both vectors are error correcting (both have negative and significant error correcting terms), confirming that they are co-integrating vectors. As Juselius (2002) argued normalization and imposition of restriction must be done in a way that makes both economic and statistical sense. When over-identifying restrictions were imposed and tested, results either failed to make economic sense or statistically rejected by the likelihood ratio test. This study therefore adopted the just identified model for further analysis. This can be also confirmed by variable exclusion or parameter significant test (see Appendix 5.1& 5.2)

The exclusion test reveals that all variables included in the output and fiscal relationships are significant at 1% and 5% significance level. This is consistent with and supports the result obtained when significance test of the variables are conducted using the t-test. Therefore the two equations with long-run coefficients are given as follows:

$$LYR_t = 0.6872\,LGE_t + 0.4238\,LLA_t + 0.2841\,LGA_t \qquad (10)$$

(5. 83) (2.88) (2.94)

$$LLA_t = 0.5449\,LGE_t - 0.4423\,LTR_t - 0.2164\,LGA_t \qquad (11)$$

(3.19) (-2.13) (-2.77)

According to the output relationship (10) expenditure, grant and aid loan entered in the output equation show strong positive relationship signifying that all the variables entered into the output equation have significant and positive relationship with growth of real output. The result shows that the inflow of foreign aid (grant and loan) has strong positive relation and significant impact

in the growth of income in Ethiopia in the long run through increasing government expenditure (pro-growth expenditure). Similarly, government expenditure has consistent result, which has positive sign implying that it contributes to growth in the long run, though the expenditure is not disaggregated into capital and recurrent expenditure (even if the later has greater share). It also worth noting that the tests justify excluding tax from the long-run output model, implying that tax revenue has no negative impact on per capita income.

The fiscal relation represented by equation (11) supports the assumption that foreign loan has positive effect on government expenditure while it has negative effect on tax revenue. The negative relationship of foreign loan and tax revenue implies that government seeks foreign loan to finance increasing fiscal deficits when it is unable to cover its expenditures from domestic sources. In another development grant has positive relationship with expenditure and negative relationship with tax revenue that asserts increase in inflows of foreign grant reduce distortionary tax in Ethiopia. With respect to fiscal relation the long-run parameters suggest that increase in government expenditure worsen the budget deficits whilst foreign aid and taxation improve the budgetary condition.

In general the analysis shows that a positive relationship between foreign aid and government expenditure and a negative one between tax revenue and foreign aid. This supports the findings of M'Amenja et al. (2005) who found a significant positive relationship between government spending and foreign aid but a negative one between tax revenue and foreign aid for Kenya using the data for the periods 1964-2002, and Remmer (2004) who found a positive relationship between aid and government spending, and a negative relationship between government revenue and aid using a sample of 120 low and medium income countries for the period 1970-1999.

Foreign aid appears to be beneficial as both grant and loan have positive effect on output, which may have an implication that foreign aid directed to finance development expenditure that is growth enhancing. Grants and loans may expected to have different effect on fiscal behavior of the government since grant has no implication in terms of future repayment even as one expect the government would be willing to accept any grant offered and adjust the budget accordingly, whereas governments be less willing to accept all loans offered (until they know the money is needed) because it has future obligation of repayment of the principal and interest that may lead the country into heavy debt burden.

As it has been illustrated above, the role of foreign aid in filling the fiscal gap is very large indeed. Furthermore, it is beyond doubt that foreign aid will continue to play a key role in helping close the fiscal gap for some time to come. Increasing the level of tax revenue takes a long time and needs to be carefully balanced with the objectives of encouraging economic growth.

5.3 Impulse Response Analysis of the Long-run Model

The coefficients of the VAR models only reveal the direct, ceteris paribus effects. They do not take into account of the fact that lagged explanatory variables in each equation are inter-linked and therefore do not reflect the full impact of one variable on the other. For this reason, the analysis relies on a great deal on impulse response function to estimate the total short-run and long run impacts of an increase in one or more variables. Impulse response functions represent the time profile of the effect of a shock to one variable on the contemporaneous and future values of all endogenous variables. They capture both the direct and indirect or feedback effects caused by endogenity over time.

Orthogonalised impulse response functions could be used to examine a pure shock to one variable. These impulses, however, depend on which variables are allowed to affect each other contemporaneously, and in which order. This is not a straightforward decision, as contemporaneous causality cannot be tested and the results can unfortunately vary considerably depending on the assumptions. Generalized impulse response functions, on the other hand, do not require assumptions to be made about contemporaneous causality, and as mentioned above they are invariant to the order in which variables are included in the model. The generalized impulse response function takes full account of historical pattern of correlation of shocks (Pesaran and Shin, 1998) and another advantage of generalized impulse response function is that it handles a system of endogenous variables whereby they have contemporaneous effect on each other (Hjelm, 2001)

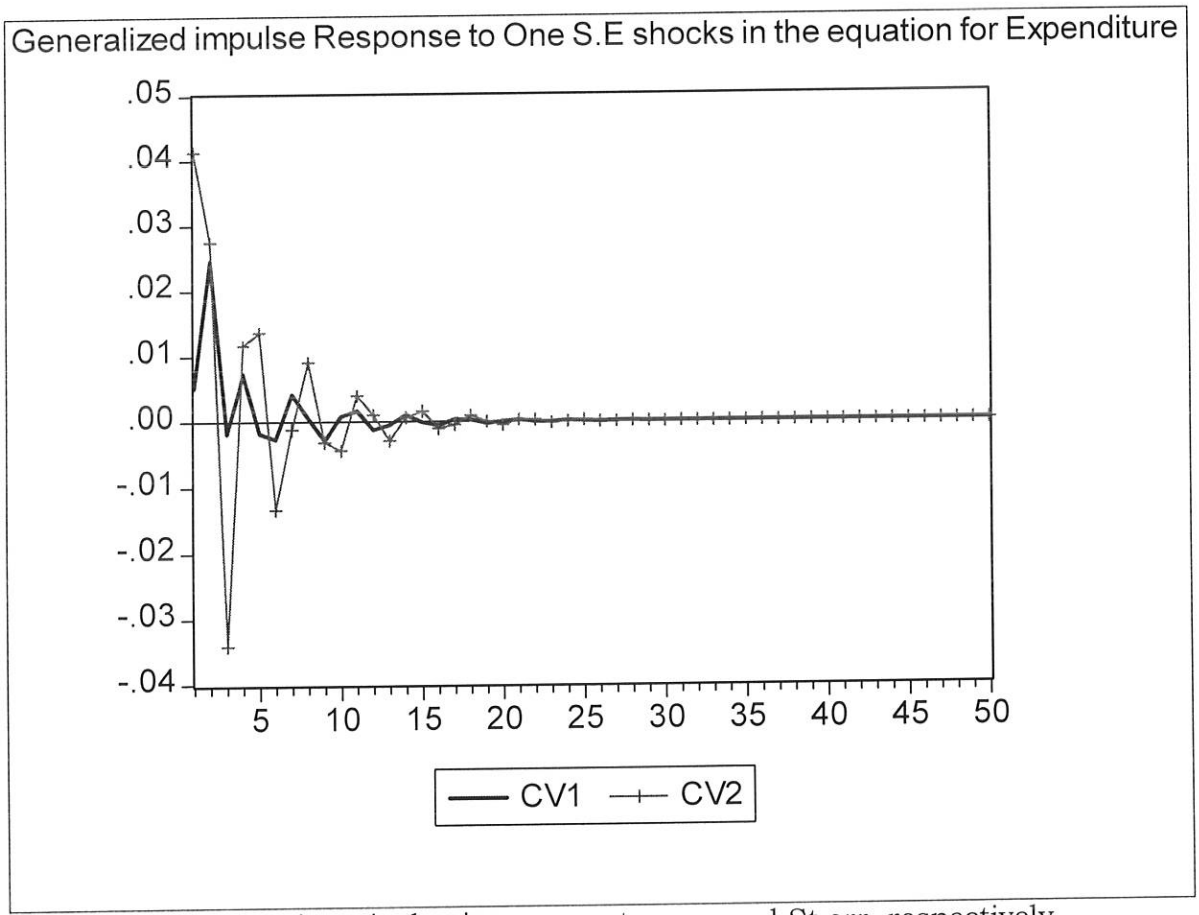
Due to difficulties associated with ordering, the decision was made to estimate generalized impulse response functions. However, if we are willing to accept that one of the variables included in the VAR models is the only one variable that has contemporaneous effect on all other variables included in the model, but it is not affected contemporaneously, then the orthogonalized and generalized impulse response functions will coincide.

To measure the effect of one standard error shock to the K^{th} equations at time (t) on expected values of x at time $(t+1)$, this study employs the generalized impulse response functions of Pesaran and Shin (1998) owing to the fact that, unlike the orthogonalzed impulse response functions it is unique, i.e. invariant to the ordering of the variables in the VAR.

The estimation of impulse response function requires the infinite moving averages representation of equation (7). In general impulse response analysis estimates the net effect of the direct and indirect effects of a shock, not only in the long run but also all periods following the shock. The main interest of the

analysis here is to determine how the economy reacts to various shocks in the variables. For example, due to the change in government in last decade in Ethiopia donors have vowed unprecedented amount of financial resources for various development activities in the economy. Therefore, it is interesting to investigate how such a huge injection of foreign aid might impact on long-run economic growth of the country. Following the above discussion, the paper analyses the effect of shocks on the cointegrating vectors and then turns to shocks related to specific variables.

Fig 5.1 Equation Specific Shocks (Expenditure) On Cointegrating Vectors

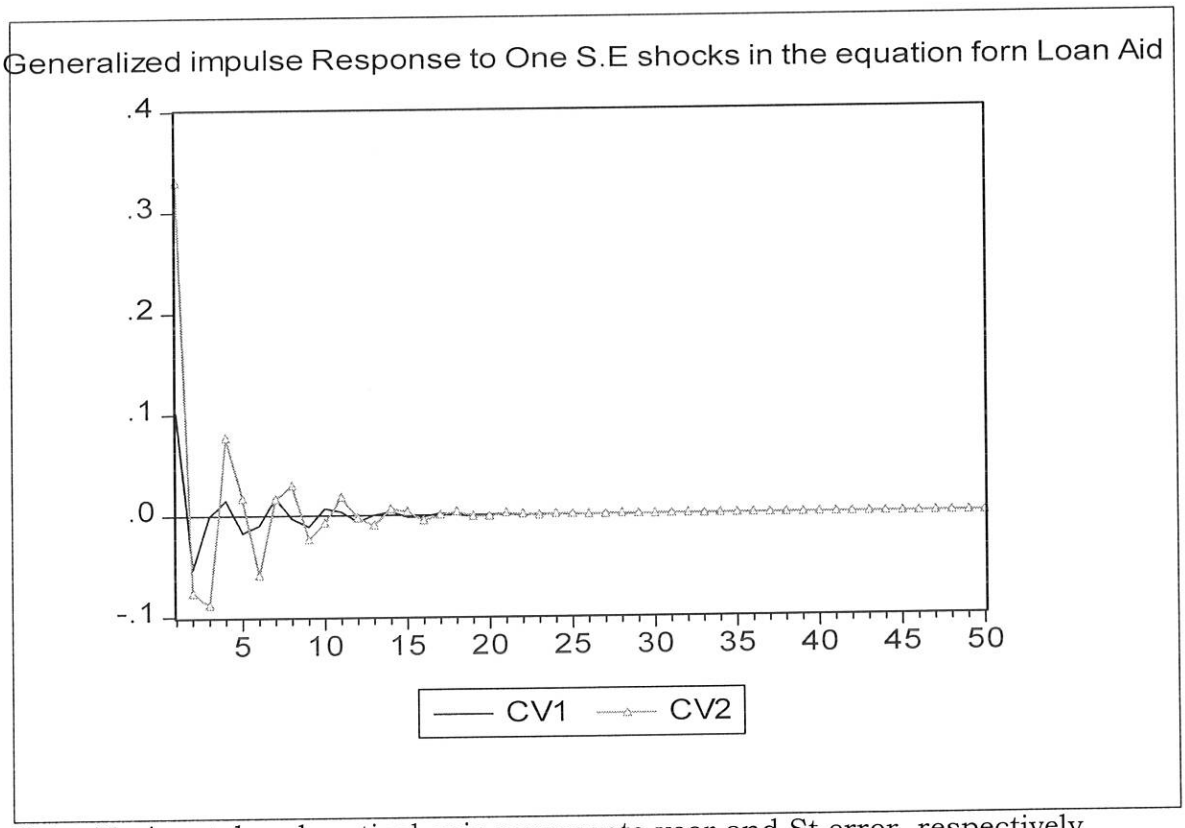


Note: Horizontal and vertical axis represents year and St.err, respectively.

Fig 5.1 shows the nature of responses of the two cointegrating vectors to shock in the equation for the government expenditure, that is, when the shocks emanates from the expenditure the two vectors takes less than 15 years to

revert to their long-run equilibrium. We note that expenditure has almost positive impact on output until it levels off after 12 years. Although both vectors start above their long-run equilibrium on impact, their response to expenditure shock is positive but dies out within 12 years for the output vector and about 15 years for the fiscal vector.

Fig 5.2 Equation specific shocks (Aid loan) on cointegrating vectors



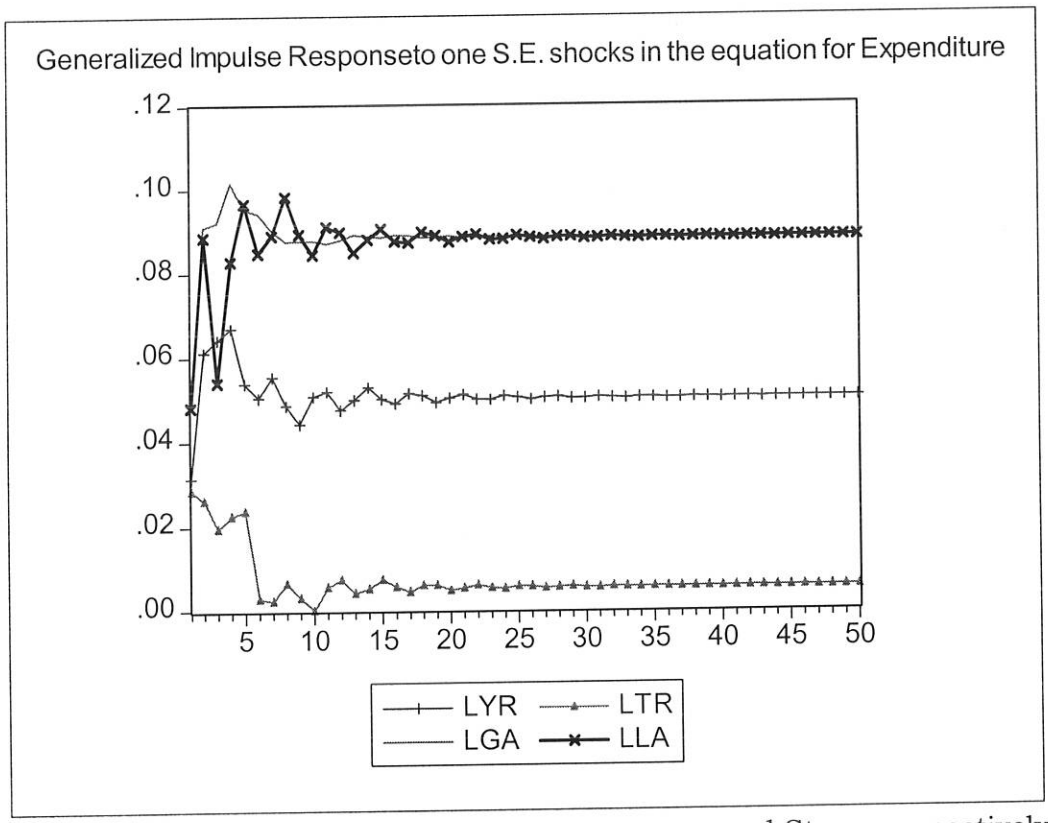
Note: Horizontal and vertical axis represents year and St.error, respectively.

In similar vein, if there is one standard error shock in loan, the effect on output vector dies out within 12 years, while the effect on the fiscal vector dissipates after 15 years. During the first, year the shock on aid loan has a positive impact on output and fiscal vectors. As can bee seen in Fig 5.2 a shock on loan has a higher impact on fiscal vector so it takes a little bit longer to get back to equilibrium than output vector.

In general, from the above discussion of impulse response analysis of the cointegrating vectors to specific variable shocks, one can easily learn that the cointegrating vectors time path converges to the long-run equilibrium in space of at most 15 years. These findings suggest that the estimated model is stable, which confirms the earlier diagnostic tests.

In the above two generalized impulse response analysis, the study tries to discuss effects of variable or equation specific shocks on cointegrating vectors, now the analysis turns to the effects of a shock in an equation on selected variables.

Fig 5.3 Effects of Expenditure shock on other variables



Note: Horizontal and vertical axis represents year and St.err, respectively.

Plots of generalized impulse responses for one standard error shock in expenditure is quite volatile in the early periods following the shock, and the impact of the shock on selected variables is positive in both the short and long-

run. According to the estimates, the shock persists over relatively longer period of time stabilizing after about 10 years.

The major effect of a shock to expenditure is on foreign aid (both loan and grant), which rises considerably and remains at higher equilibrium level there after. This illustrates the underlying relationship whereby aid is required to meet expenditure shock. The pattern of the effect is strong which indicates that a shock in expenditure results in an increase in foreign aid (both grant and loan) and output growth while the effect is very little on tax revenue, which hovers around zero.

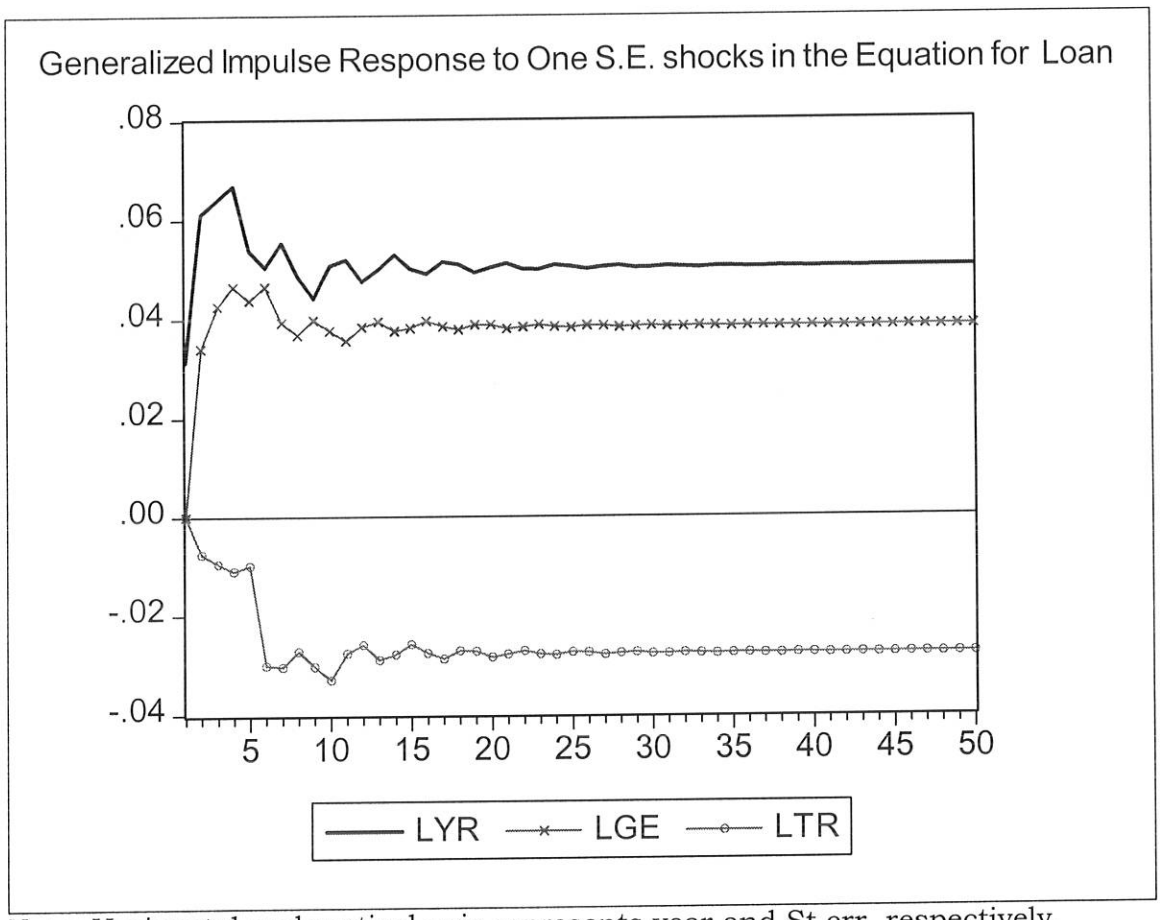
The above analysis shows that a shock in the expenditure equation generates explosive responses on it and on aid variable while it has very little effect on tax revenue. This implies that if one interested to take the difference between government expenditure and tax revenue response as representing budget deficits, subsequently an expenditure shock creates persistent deficits both in short and long-run. This highlights the fact that considering Ethiopia's narrow tax base along with weak tax administration and tax collection effort, tax revenue can not act in response sufficiently to match an expenditure shock as the result the government obliged to turn its face to external borrowing to finance its fiscal deficits.

In another development the major effect of shock to loan appears to have a permanent positive effect on expenditure and output while it has negative effect on tax revenue. According to the estimates the effect of the shock on output persists over relatively longer period of time, stabilizing about 15 years above its long-run equilibrium (Fig 5.4). The shock also has positive impact on expenditure, but negative impact on tax revenue.

Assuming the shock to the economy are mainly caused by disturbance in foreign loan, then our result suggest that an expected increase in foreign loan results in an increase in expenditure and remains positive through out the simulation periods. On the other hand, the immediate impact of a shock in foreign loan to tax revenue is negative and remains negative through out the

simulation period, but with some volatility within the first 12 years before stabilizing thereafter.

Fig 5.4 Effect of Shocks in Aid Loan on Selected Variables



Note: Horizontal and vertical axis represents year and St.err, respectively.

With reference to Fig 5.4, it can be seen that the impact of loan is consistent with the cointegration analysis result that shows foreign loan reduce distortionary tax, and the shock has positive impact on government spending and real output, which signifies the prominent role played by foreign loan in increasing public sector development expenditure and thereby promotes growth process.

Similarly, the effect of a shock in grant equation has higher positive impact on output, expenditure and tax revenue. The response of tax revenue to a shock in

grant is higher than that of expenditure implying that it generates budget surplus (see Appendix 6.1 & 6.2).

5.4 Vector Error Correction Model (VECM)

Having obtained the long-run cointegration relationships using Johansen approach, then it is possible to reformulate the long-run model and estimate the VECM with the error correction terms explicitly included. The error correcting terms $ECT1_{t-1}$ and $ECT2_{t-1}$ from the two-cointegration relations are included to capture the speed of adjustment to disturbance in the long-run equilibrium in the output and fiscal vectors. The negative sign of the coefficients of the error correcting terms accord with priori expectations and indicate the model is dynamically stable. Their relative magnitudes, however, suggest that an imbalance in the long-run growth relationship (-0.2762) is corrected much faster than the fiscal relationship (-0.6527).

The presence of cointegration relationship in the long-run model indicates that all terms in VECM are stationary and therefore conventional t-statistics can be used to evaluate the model. The vector error correction models (VECM) are presented in Table 5.5, and the diagnostics tests don't reveal any serious modeling deficiencies.

An examination of the coefficients of the lagged differences in case of growth of income relationship, changes in expenditure, loan and grant from the previous period significantly and positively impact on the growth rate of income in current period or in short-run, this result is consistent with the long-run analysis as shown in the previous discussion. The error correction term from output relationship posses the appropriate sign and is also significant.

The analysis of the short-run dynamics (equation) for government expenditure shows only growth of income and tax revenue appears to be significant and positively affect expenditure in short-run. In short-run, increase in tax revenue allows increased spending, which is consistent with our interpretation of the long-run model, it is when tax revenue is insufficient to fund expenditure, foreign aid is required to close the gap. In the case of tax revenue equation income, government expenditure, tax revenue and grant as expected, have positive associations with growth of current tax revenue, but only income and expenditure have significant impact on the growth of tax revenue.

With references to equation for loan, the result reveals that past income, government expenditure and tax revenue have significant impact on growth of loan in short-run. The positive association between income and loan can be interpreted to mean that in short-run; growth allows taking a new loan to strengthen growth, which is consistent with the long-run result. Similarly, the positive relationship of tax revenue with growth of loan shows that the ability of loan servicing in current period will be stronger if there was a rise in tax revenue in previous period. The error correction term for fiscal relationship possesses the right sign and is significant, signifying cointegration and also justifies the choice of loan for normalization.

An examination of the error correction model for grant equation shows that in short-run lagged income, expenditure, tax revenue and loan have significant impact. Income, expenditure and tax revenue have significant positive impact on growth of grant while lagged loan has negative impact. The positive relationship of income and government expenditure with growth of current grant implies that donors increase their grant aid along with increase in growth enhancing expenditure to reinforce growth. Similarly, lagged tax revenue has significant positive correlation with growth of current grant, which suggests that in the short-run grant associated with increase in tax revenue. Since grant do not require any future repayment and therefore should serve as non

distortionary way of financing expenditure and thus resulting in a positive relationship with output.

Table 5.5 Vector Error Correction Model

Regressor	Dependent Variable				
	DLYR	DLLA	DLTR	DLGE	DLGA
$DLYR_{t-1}$	-0.01481 (-1.04)	0.3651 (2.66)**	0.3396 (4.56)**	0.2351 (2.32) **	0.1221 (2.25)**
$DLGE_{t-1}$	0.2892 (3.10)**	0.1756 (1.95)*	0.1979 (2.92)**	0.6949 (1.32)	0.2324 (6.53)**
$DLTR_{t-1}$	0.3840 (1.53)	0.5402 (2.23)**	0.2088 (1.59)	0.5475 (2. 81)**	0.1809 (2.06)**
$DLLA_{t-1}$	0.6948 (2.49)**	0.4340 (1.61)	-0.0120 (-0.08)	0.5219 (0.35)	-0.3498 (-3.28)**
$DLGA_{t-1}$	1.6485 (5.31)**	0.3122 (1.04)	0.0608 (0.38)	0.0400 (0.52)	-0.1538 (-1.3)
$ECT1_{t-1-}$	-0.2762 (-3.44)**	-0.6488 (-1.19)-)	-0.4471 (-1.06)	-0.1156 (-0.52	0.5614 (1.21)
$ECT2_{t-1}$	-0.01450 (-0.61)	-0.6527 (-4.02)**	0.0472 (0.63)	-0.1003 (-1.51)	-0.2581 (-1.37)
C	0.03412 (2.7)**	-0.0014 (-0.02)	0.0562 (1.42)	0.0696 (1.98)**	-0.0152 (-0.15)

t- Statistics are in brackets.

Multivariate Diagnostics

Vector Portmanteau (5): 99.9094
Vector AR 1-2 test: F (50,108)= 1.1246 [0.3026]
Vector Normality test: Chi^2(10)= 9.420 [0.5131]
Vector hetero test: F (150,118)= 0.96161 [0.5916]
Vector hetero-X test: F (300,67)= 0.79576 [0.8966]

The diagnostics test does not reveal any model misspecification problems

6. Conclusions and Policy Implications

6.1 Conclusions

The main objective of this thesis has been to examine the fiscal impact of foreign aid its relationships with economic growth in Ethiopia. Both descriptive statistics and formal estimation procedures using multivariate cointegrated framework techniques are employed on data covering the period from 1960/61 to 2004/05. The main conclusions and policy implications could be summarized as follows.

The estimation result reveals that government expenditure appears to have significant beneficial impact on the rate of economic growth in Ethiopia. Tax revenue appears not to have significant direct influence on rate of economic growth in the long run, but may have indirect effect on growth through government expenditure. The analysis also shows that foreign aid has significant positive relationship with government expenditure and a negative one with tax revenue. Furthermore, with respect to the fiscal relationship the analysis shows that government expenditure worsen the budget deficits whilst foreign aid and taxation improve the fiscal position as expected.

Increase in external finance leads to higher government expenditure and also has significant positive long-term effect on economic growth. The analysis of the role of aid in the budgetary process leads to the conclusion that the fall in fiscal deficits as a result of increase in aid can have a stabilizing effect on the economy. Thus, the positive influence of foreign aid (both grant and loan) on the growth of real output seems to be derived from the incremental effect it has on governmental expenditure (as expenditure is a component of GDP).

In another development, the impulse response analysis of the long-run relationships when the shock emanates from expenditure and loan equations show that the two vectors took about 15 years to revert to their long-run equilibrium. Similarly, the impulse response analysis of government expenditure shock on selected variables reveals that the major effect is on foreign aid (grant and aid), which rises considerably and remains at higher level, there after indicating the underlying relationship whereby aid is required to meet expenditure shock. The analysis also indicates that major effect of shock on aid loan appears to have permanent positive effect on output and expenditure while it has negative effect on tax revenue.

In connection with the analysis of the short-run dynamics (error correction model), the study discovers that changes in expenditure and foreign aid from the previous period positively and significantly impact on the growth rate of income in current period. In short-run, increase in tax revenue allows increased spending, which is consistent with our interpretation of the long-run model, it is when tax revenue is insufficient to fund expenditure, foreign aid is required to close the gap.

Regarding the loan equation, the positive association of loan and tax revenue in short-run shows that the ability of loan servicing in current period will be stronger when there was a rise in tax revenue in the previous period, which differs from the long-run relationship. In the case of tax equation income and expenditure have positive correlation and significant impact on growth of tax revenue, as expected since the growth of economy and expenditure leads to rise in economic activities which in turn lead to rise in taxable income. When we look at the equation for grant, income and expenditure have positive association with growth of current grant that indicates donors increase their grant aid with increase in growth enhancing expenditure along with increase in growth rate of income.

6.2 Policy Implications

The study has presented empirical evidences on the fiscal impact of foreign aid in disaggregated form and its relationships with growth. These empirical findings highlight useful policy and theoretical implications for development.

First, one of the immediate implications of the analysis is that foreign aid has a positive impact on government expenditure and output growth. This suggests that increase in inflow of foreign aid is critical in rising government expenditure and fostering economic growth. Even though both grant and loan have positive impact on economic growth, loan bears future interest and principal repayments and furthermore, loan used as borrowing instrument to substitute for tax effort. This may undermine the effectiveness of aid in the long run in promoting growth since foreign aid which comes in the form of loan will be transferred to debt burden problem as country's debt stock has accumulated to unsustainable level. Therefore, aid to Ethiopia could be better and more effective if given in the form of grant and associated with fiscal discipline

Second, the empirical analysis did not come up with evidence that shows distortions associated with domestic tax revenue has retarded growth, as tax revenue did not appear to affect economic growth. Hence, for the government to meet its expenditure requirement from domestic sources a lot of efforts must be done to widen the narrow tax base along with modernizing the tax system and building up the capacity of the tax administrations. Modernization and capacity building will enable the tax administrations to assess and collect revenue (from taxable income) generated in the economy and to take enforcement action against tax evasion and fraud.

Third, the role of foreign aid in filling the fiscal gap is very large indeed in Ethiopia. Further more, it is beyond doubt that foreign aid will continue to play a key role in helping close the fiscal gap for some time to come. Increasing the level of tax revenue takes a long time and needs to be carefully balanced with

the objectives of encouraging economic growth through increasing government revenues and improving government expenditure management. Therefore, if Ethiopia to be less dependent on foreign aid, at least in the long-run, policy reforms should focus on increasing both public and private domestic savings and improving the quality and variety of exports in order to make them competitive in the international market.

Fourth, noting that the measure used in the analysis did not distinguish between capital and recurrent expenditures, the evidence suggests that government spending in its totality contributed to growth of per capita income in Ethiopia. This implies that it cannot be thought that this is an effect of government investment only, as recurrent spending such as on wages and social sectors can also contribute to growth of income as suggested by Kweka and Morrissey (2000) in their study for Tanzania. Therefore, the policy recommendation is that there is a need to re-examine the composition of government expenditure with a view to assess the contribution of its components to efficiency and re-directing expenditure to growth promoting activities.

Fifth, the main contribution of this study lies in the application of multivariate modeling framework to analyze the potential effect of foreign aid on fiscal aggregates and thereby on economic growth. Although the model is capable in explaining how aid inflows may influence economic performances in Ethiopia, the model developed in this study is in the aggregated form. So it would be more interesting if the impact of aid on economic growth can be disaggregated in at least three major sectors, that is, the agricultural, industrial, and the service sectors. By doing this, the channels through which aid may affect economic growth could be better highlighted.

References

Aberra Senbetta (2004), 'Fiscal Response to External Finance: An Empirical Evaluation Using Alternative Approach', M.Sc Thesis, Addis Ababa University.

Agnor, R. and Montiel, P. (1996), Development Macroeconomics, Princeton University Press.

Alemayehu Geda (2002), Finance and Trade in Africa, Macroeconomic Response in the World Economic Context: London, Palgrave-Macmillan.

Assefa Abebe (2004),' The Role of ODA in Economic Development: The Case of South Korea and Ethiopia', A Paper Presented at the Second International Conference on the Ethiopian Economy, June 2004, Addis Ababa.

Bacha, L.E. (1990), 'A Three- Gap Model of Foreign Transfers and the GDP Growth Rate in Developing Countries', Journal of Development Economics, 32: 279-296.

Barro, R.J (1990), 'Government Spending in a Simple Model of Endogenous Growth': Journal of political economy, 98(2): 103-25.

Berhanu Abegaz (1999), 'Aid and Reform in Ethiopia', Down Loaded from World Bank Website www.Worldbank.org/research/aid/Africa/ethiopia2.pdf, on May 20, 2006

Bigsten, A. (1998), 'Can Aid Generate In Africa?', Working Papers in Economics No.3 , Department of Economics , Gothenburg University .

Binh, T. and M. McGillivray (1993), 'Foreign Aid, Taxes and Public Investment: A Comment', Journal of Developmental Economics, 41: 173-176.

Boone, P. (1994),' The Impact of Foreign Aid on Savings and Growth', London School of Economics.

Burnside, C. and Dollar, D. (1997), 'Aid, policies and growth', The World Bank Policy Research Working Paper No. 1777, Washington D.C.

Bulir, A. and Hamann, J. (2003), 'Aid Volatility: An Empirical Assessment', IMF Staffs Paper, 50(1): 64-89.

Charemaz, W.C and Deadman, D.F. (1997), New Directions In Econometrics Practice: General to Specific Modeling, Contegration and Vector Autoregressive, 2nd edition, Edward Elgar Publishining Ltd., Cheltenham, UK.

Chenery, H. and Strout, A.M. (1966), 'Foreign Assistance and Economic Development', American Economic Review, 56(4): 679-733.

Collier, P and Dollar, D. (2002), 'Aid Allocation and Poverty Reduction', European Economic Review, Vol. 46.

Congressional Budget Office (CBO)(1997), 'The Role of Aid in Development', www.cbo.gov/showdoc.cfm, Accessed on March 2006.

Dawit and Yemisrach (2003), 'The Impact of Foreign Aid on Economic Growth in Ethiopia', Edited by Gebrehiwot Ageba, Jemal Mohammed and Solomon Tesfaye, Proceedings of the 11th Annual Conference on the Ethiopian Economy Nov., 2001, Nazareth.

Dickey, D.A and Fuller, W.A (1981), 'Likelihood Ratio Statistics for Autoregressive Time Series With Unit Root', Econometric a, 49:1057-1072.

Dollar, D. and Easterly, W. (1999), 'The Search for the Key: Aid, Investment, and Policies in Africa', Journal of African Economies, 8(4): 546-577.

Domar, E. (1946) 'Capital Expansion, Rate of Growth and Employment', Econometrica 4(2): 137-147.

Doorik, J. and Hendry, D.F. (2001), Modeling Dynamic System Using PCGive, Timberlake Consultants, London

Dowling, J.M. and Hiemenz, U. (1983), 'Aid, Savings and Growth in the Asian Regions', the Developing Economies, 21(1): 1-13

Durbarry, R.N., Gemmell and Greenaway, D. (1998), 'New Evidence on the Impact of Foreign Aid on Economic Growth', CREDIT Research Paper No.98/8, University of Nottingham.

Ethiopian Economic Association (1999/200), 'Annual Report on the Ethiopia economy', Vol.1, Edited by Befkadu Degefe and Brehanu Nega.

Franco-Rodriguez, S., McGillivray, M. and Morrissey, O. (1998) , 'Aid and the Public Sector in Pakistan: Evidence with Endogenous Aid', World Development, 26:1241-1250.

Gang, I.N. and Khan, H.A. (1991), 'Foreign Aid, Taxes and Public Investment', Journal of Development Economics, 24:355-369.

Gang, I.N. and Khan, H.A. (1996), 'Foreign Aid and Fiscal Behavior in a Bounded Rationality Model: Different Policy Regimes', Empirical economics Downloaded from Website (www.netec.ac.uk) on May 22, 2006.

Granger, C.W.J and Newbold, P. (1994), 'Spurious Regression in Econometrics', Journal of Econometrics, 2:111-120.

Griffin, K..(1970), 'Foreign Capital, Domestic Saving and Economic Development', Oxford Bulletin of Economics and Statistics, 32:99-112.

Griffin, K. and Enos, J. (1970), 'Foreign Assistance, Objectives and Consequences', Economic Development and Cultural Change, Vol. 18.

Gujarati, D.N (1998), Basic Econometrics, Third Edition, New York, McGraw-Hill.

Gupta, S., Clements, B. and Pivovardky, A. (2003,) 'Foreign Aid Revenue response: Does the Composition of Aid Matter?', IMF Working Paper No. 03/176, Washington D.C.

Hamilton, J.D. (1994), Time Series Analysis, Princeton University Press.

Hansen, H. and Tarp, F. (2000), 'Aid Effectiveness Disputed', Journal of International Development, 12(3).

Hansen, H. and Tarp, F. (2001), 'Aid and Growth Regression', Journal of Development Economics, 64.

Harris, R. (1995), Using Cointegration Analysis in Economic Modeling, Prentice Hall, Essex, England.

Harris, R and Sollis, R. (2003), 'Applied Time Series Modeling and Forecasting', West Sussex, John Wiley and Sons Ltd., England.

Harrod, R. (1939), 'An Essay in Dynamic Theory', Economic Journal, 49(139): 14-33

Heller, P.S. (1975), 'A model of Public Fiscal Behavior in Developing Countries: Aid, Investment and Taxation', American Economic Review, 65(3): 429-445.

Hendry, D.F. and Juselius, K. (2001),' Explaining co- integration Analysis': Part II, The Energy Journal, 2(1): 75-120.

Hoppener, Florien (2001), 'A VAR Analysis of the Effects of Fiscal Policy in Germany', Institute for International Economics, University of Bonn.

Jiffar Tarekegn (2002), 'The Impact of Foreign Aid on Public Spending: The Ethiopian Case', M.Sc Thesis, Addis Ababa University.

Johansen, S. (1988), 'Statistical Analysis of Cointegrating Vectors', Journal of Economics Dynamics and Control, 12:231-254.

Johansen, S. and Juselius, K. (1990), 'Maximum Likelihood Estimation and Inference on Cointegration–with Application to the Demand for Money', Oxford Bulletin of Economics and Statistics, 52(2): 169-211.

Johansen, S. (1995), 'Identifying restrictions of Linear Equation With Application to Simultaneous Equation and Cointegrations', Journal of Econometrics, 69:111-132.

Johnston, J. and DiNardo, J. (1997) Econometrics Methods, 4th edition, Singapore, McGraw-Hill Companies Inc.

Khan, H.A. (1998), 'Aid and development': What Can Africa Learn from the Macroeconomics of Foreign Aid in Some South East Asian Economies', Downloaded from Website www.du.edu/gsis/hkhan on April 25, 2006.

Khan, H.A. and Hoshino (1992), 'Impact of Foreign Aid on the physical Behavior of LDC Governments', World Development, 20(10): 1481-1488.

Krueger and Anne, O.(1986), 'Aid in the Development Process', Research Observer, Vol.1, No. 1

Kweka, J.P. and Morrissey, O. (2000), 'Government Spending and Economic Growth in Tanzania', CREDIT Research Paper No. 0016(2000).

Landu, D. (1983), 'Government Expenditure and Economic Growth: A Cross Country Study', Southern Economic Journal, 49 (4): 942-963.

Levy, V. (1997), 'Anticipated Development Assistance, Temporary Relief Aid, and Consumption Behavior of Low income Countries', Economic Journal, 97:446-458.

Lewis, A. (1954), 'Economic Development with Unlimited Supplies of Labor', in Agrawala A.N. and A.P. Singh(ed), The Economics of Under Development, Oxford University Press.

M'Amenja, D. Lloyd, T. and Morrissey, O. (2005), 'Fiscal Aggregate, Aid and Growth in Kenya: A Vector Autoregressive (VAR) Analysis', CREDIT Research Paper No. 05/07, University of Nottingham.

McGillivray, M. (1994), 'The Impact of Foreign Aid on the Fiscal Behavior of Asian LDC Government: A comment on Khan and Hoshino (1992)', World Development, 22(12): 2015-2017.

McGillivray, M. and Morrissey, O. (2001), 'A Review of Evidence on the Fiscal Effects of Aid', CREDIT Research Paper No. 01/13, University of Nottingham.

McGillivray, M. and Morrissey, O. (2000), 'Aid fungibility in Assessing Aid: Red Herring or True Concern?' Journal of International Development, 12: 413-428.

Meheret Lemma (2005), 'Aid, Pro-poor Spending and Welfare in Ethiopia', M.Sc. Thesis, Addis Ababa University.

Milesi-ferretti, G.M. and Roubini, N. (1995), 'Growth Effects of Income and Consumption Taxes: Positive and Normative Analysis', NBER Working Paper Series, WP5317.

Ministry of Finance and Economic Development (2000a), 'Development and Poverty Profile of Ethiopian', Welfare Monitoring Unit, Addis Ababa.

Morrissey, O., Osei, R. and Lloyd, T. (2002), 'Modeling the Fiscal Effects of Aid: An Impulse Response Approach for Ghana', HWWA Discussion Paper, Institute of International Economics, Hamburg.

Mosley, P. and Hudson, J. (1995), 'Aid Effectiveness: A Study of Effectiveness of Overseas Aid in Main Countries Receiving ODA Assistance', mimeo, November.
Mosley, P. and Hudson, J. (1987), 'Aid, the Public Sector and the Market in Less Developed Economies', Economic Journal, 97(181): 616-641.

Nurkse, R. (1958), 'Some Aspects of the Problem of Economic Development', in Agrawala A.N. and A.P. Singh(ed), The Economics of Under Development, Oxford University Press

OECD (2005) 'Geographical Distribution of Financial Flows to Developing Countries', Data on CD-ROM and Online Database, Paris

Osei, R., Morrissey, O. and Lloyd, T. (2003), 'Modeling the Fiscal Effect of Aid: An Impulse Response Approach for Ghana', CREDIT Research Paper No. 03/10, University of Nottingham.

Otim, S. (1996), 'Foreign aid and Government Fiscal Behavior in Low-income South Asian Countries', Applied Economics, 28: 927-933.

Papenek, F.G. (1992), 'The effect of Aid and Other resource Transfer on Savings and Growth in Less Developed Countries', Economic Journal, 82:934-950.

Pesaran,.H. and Shin, Y. (1998), 'Generalized Impulse Response Analysis in Linear Multivariate Models', Econometric Letters Vol.58, pp.17-29.

Rosenstein-Rodan, P.(1961), 'International Aid for Underdeveloped Countries', Review of Economics and Statistics, 43:107-138

Sims, C.A. (1980), 'Macroeconomics and Reality', Econometrica, 48(1):1-48

Stoneman, C. (1995),' Foreign Capital and Economic Growth', Applied Economics, Vol. 25, pp. 481-488.

Tadesse Getachew (1994), 'An Economic Analysis of the Performance of Development Aid in the Ethiopian Economy', Unpublished M.Sc. Thesis, Addis Ababa University.

Tefferi Mequaninte. (2004), 'Aid and Dutch Disease in Ethiopia', Unpublished M.Sc. Thesis, Addis Ababa University.

Rodan, R. (1961), 'International Aid for Underdeveloped countries', Review of Economics and Statistics, 153(2): 107-136.

Tsikata, M.T. (1998), 'Aid Effectiveness: A Survey of the Recent Empirical Literature', IMF Working Paper on Policy Analysis and Assessment, IMF, Washington D.C.

Weisskopf, T.E. (1972), 'The Impact of Foreign Capital Inflow on Domestic Savings in Under Developed Countries', Journal of International Economics, 2:25-38.

White, H. (1992), 'The Macroeconomics Impact of Development Aid: A critical Survey', Journal of Development Studies, 28(2): 163-240.

White, H. (1993), 'Aid and Government: Dynamic Model of Aid, Income and Fiscal Behavior', Journal of International Development, 5(3): 305-312.

White, H. (1994), 'Foreign Aid, Taxes and Public Investment: A Further comment', Journal of Development Economics, 45:155-163.

Wondwossen Teffera (2003), 'The Role of Economic Policy in the Aid Growth Relationship', M.Sc Thesis, Addis Ababa University.

World Bank (1998), 'Assessing Aid: What Works, What Doesn't and Why', Oxford
University Press.

World Bank (2005), World Development Indicator, Data on CD-ROM

WWW.Americanhistory.com, Accessed on September 10, 2006.

Xayavong, V. (2002), 'A Macro econometrics Analysis of Foreign Aid Economic Growth in Least Developed Countries: The Case of Lao People's Democratic Republic', Massey University, New Zealand.

Xayavong, V. and Obben, J. (2006), 'Analysis of the Aid, Fiscal Response and growth Relation: A Cointegrated VAR Approach', Discussion Paper No. 06/05, Downloaded from Website http://econ.massey.ac.nz, Massey University, New Zealand.

Appendices

Appendix 1. Lag Length Determination (Summary)

F-test on regressors except unrestricted: F(50,121) = 13.8192 [0.0000] **

F-tests on retained regressors, F(5,26) =

LYR_1	3.99979 [0.008]**	LYR_2	3.980799 [0.008]**
LLA_1	3.44111 [0.016]*	LLA_2	3.05774 [0.027]*
LGE_1	3.14866 [0.024]*	LGE_2	3.894286 [0.006]**
LTR_1	3.87869 [0.009]**	LTR_2	3.346889 [0.040]*
LGA_1	4.71701 [0.003]**	LGA_2	6.77883 [0.001]**

Progress to date

Model	T	p		log-likelihood	SC	HQ	AIC	Lag
SYS(4)	41	30	OLS	152.18403	-3.2713	-4.7329	-5.7218	1
SYS(3)	41	55	OLS	173.28403	-3.4713	-4.9329	-5.7700	2
SYS(2)	41	80	OLS	196.42974	-2.3359	-4.4620	-5.6795	3
SYS(1)	41	105	OLS	220.02228	-1.2224	-4.0128	-5.6108	4

Tests of model reduction (please ensure models are nested for test validity)

```
System 3 --> System 4: F(25,  94) =   1.7058 [0.0348]*
System 2--> System  4: F(50,  94) =   1.1650 [0.2596]
System 1 --> System 4: F(75,  76) =   1.0491 [0.4175]
System 3 --> System 2: F(25,  75) =  0.73208 [0.8077]
System 4 --> System 2: F(50,  71) =  0.79836 [0.7988]
System 4 --> System 3: F(25,  57) =  0.88420 [0.6229]
```

Appendix 2. Granger Causality /Block Exogeneity Test

Dependent Variable	Excluded	Chi-Sq.	Degree freedom	Probability
	LLA	7.66536	2	0.0217
LYR	LGE	15.12356	2	0.0345
	LTR	1.910091	2	0.3848
	LGA	10.08416	2	0.0065
	ALL	21.86558	8	0.0052
LLA	LYR	2.0365	2	0.3612
	LGE	5.7745	2	0.0105
	LTR	6.0551	2	0.0088
	LGA	7.2402	2	0.0273
	ALL	15.105	8	0.057
LGE	LYR	0.536129	2	0.7649
	LLA	7.565531	2	0.0257
	LTR	7.177945	2	0.02760
	LGA	5.006161	2	0.0825
	ALL	14.1252	8	0.0786
LTR	LYR	5.3860	2	0.01101
	LLA	5.6114	2	0.0116
	LGE	4.6995	2	0.0212
	LGA	2.2498	2	0.3247
	ALL	25.892	8	0.0013
LGA	LYR	0.33875	2	0.8442
	LLA	2.6560	2	0.0948
	LGE	1.7563	2	0.41555
	LTR	6.05074	2	0.04585
	ALL	18.9675	8	0.0150

Appendix 3. Cointegration Analysis

Eigenvalue	loglik for rank	
	-104.056	0
0.687244	-78.4851	1
0.618406	-57.2903	2
0.26049	-50.6515	3
0.212246	-45.4029	4
0.0797629	-43.5742	5

Ho:rank=p	-Tlog(1-\mu)	using T-nm	95%	-T\Sum log(.)	using T-nm	95%
p == 0	51.14**	39.52**	33.5	121**	93.47**	68.5
p <= 1	42.39**	32.76**	27.1	69.82**	53.95**	47.2
p <= 2	13.28	10.26	21.0	27.43	21.2	29.7
p <= 3	10.5	8.111	14.1	14.15	10.94	15.4
p <= 4	3.657	2.826	3.8	3.657	2.826	3.8

Standardized \beta' (β) eigenvectors

LYR_t	LLA_t	LGE_t	LTR_t	LGA_t
1.0000	-0.4238	-0.6872	-0.1980	-0.2841
-0.3872	1.0000	-0.5449	0.4423	0.2164
0.2738	-1.2228	1.0000	1.4478	2.0570
0.2642	3.2159	-0.4440	1.0000	0.7164
-0.1277	-2.832	0.3053	1.326	1.0000

Standardized \alpha (α) coefficients

LYR_t	-0.27261	-0.11450-	-0.17292	-0.02927	0.03902
LLA_t	-0.64881	-0.67523	-0.11895	0.022451	0.06926
LGE_t	-0.11569	-0.10030	-0.15282	-0.15556	-0.10030
LTR_t	-0.44710	0.04720-	-1.11705	-0.02176	0.04866
LGA_t	0.56140	-0.25810	-0.04229	-0.14533	0.01437

Appendix 4 Diagnostic Test (Co-integration test)

LYR :Portmanteau 5 lags= 2.152
LLA :Portmanteau 5 lags= 3.7771
LGE :Portmanteau 5 lags= 8.0642
LTR :Portmanteau 5 lags= 6.649
LGA :Portmanteau 5 lags= 4.9738
LYR :AR 1- 2 F(2, 30) = 1.0822 [0.3517]
LLA :AR 1- 2 F(2, 30) = 1.0278 [0.3700]
LGE :AR 1- 2 F(2, 30) = 1.8516 [0.1745]
LTR :AR 1- 2 F(2, 30) = 0.0743 [0.9286]
LGA :AR 1- 2 F(2, 30) = 0.81499 [0.4522]
LYR :Normality Chi^2(2)= 5.3225 [0.0699]
LLA :Normality Chi^2(2)= 0.66054 [0.7187]
LGE :Normality Chi^2(2)= 2.4052 [0.3004]
LTR :Normality Chi^2(2)= 1.43 [0.1033]
LGA :Normality Chi^2(2)= 3.1842 [0.2035]
LYR :ARCH 1 F(1, 30) = 0.046548 [0.8306]
LLA :ARCH 1 F(1, 30) = 1.4799 [0.2333]
LGE :ARCH 1 F(1, 30) = 7.0989 [0.0523]
LTR :ARCH 1 F(1, 30) = 0.24893 [0.6215]
LGA :ARCH 1 F(1, 30) = 0.0064558 [0.9365]
LYR :Xi^2 F(20, 11) = 0.66918 [0.7905]
LLA :Xi^2 F(20, 11) = 0.31231 [0.9885]
LGE :Xi^2 F(20, 11) = 0.81527 [0.6677]
LTR :Xi^2 F(20, 11) = 1.1832 [0.3986]
LGA :Xi^2 F(20, 11) = 0.4434 [0.9451]

Vector portmanteau 5 lags= 86.696
Vector AR 1-2 F(50, 85) = 1.0663 [0.3912]
Vector normality Chi^2(10)= 1.3 [0.567891]
Vector Xi^2 F(300, 7) = 0.050351 [1.0000]

Appendix 5.1 Parameters Significance Test (Exclusion test on βs)

Variables	Output Relation		Fiscal Relation	
	$\chi^2(1)$	P-Value	$\chi^2(1)$	P-Value
LYR_t	------	-----	-----	----
LLA_t	14.63	0.0001**	----	-----
LGE_t	5.9578	0.0147*	24.199	0.0000**
LTR_t	-----	-----	26.652	0.0000**
LGA_t	7.1915	0.0073**	10.334	0.0115*

**, * Represents significance at 1% and 5% level.

Appendix 5.2 Test of weak exogeneity (restriction on αs (α =0))

Output Relation

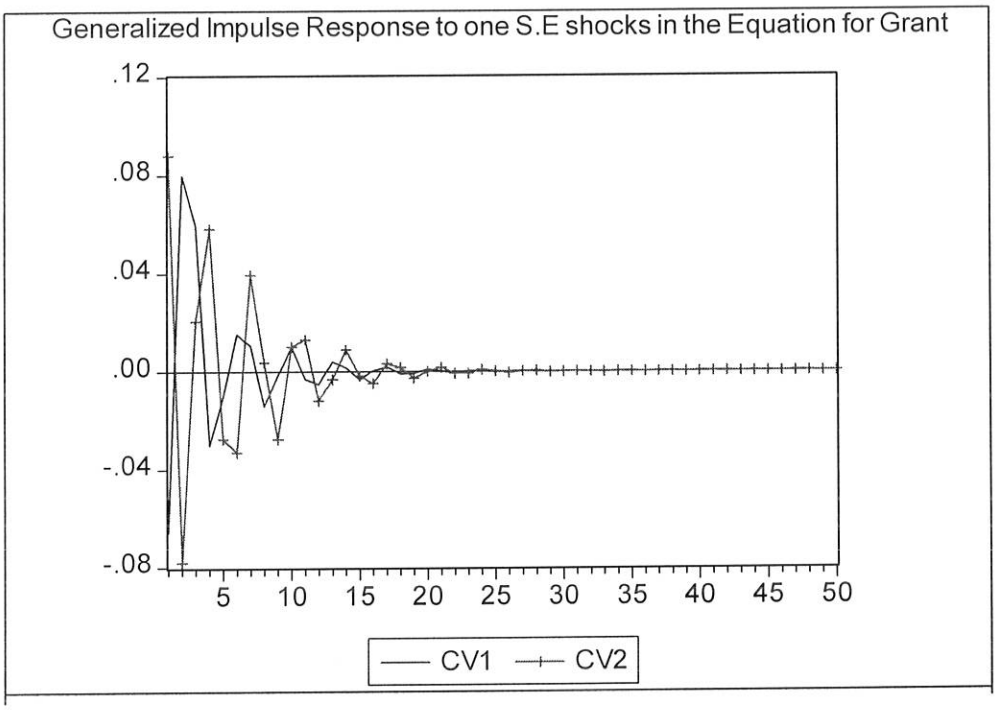
	LLA_t	LGE_t	LTR_t	LGA_t
α	-0.64881	-0.11569	-0.44710	0.56140
$\chi^2(1)$	2.6793	1.162	9.175	0.2154
P-Value	0.1017	0.2907	0.0025**	0.6448

Fiscal Relation

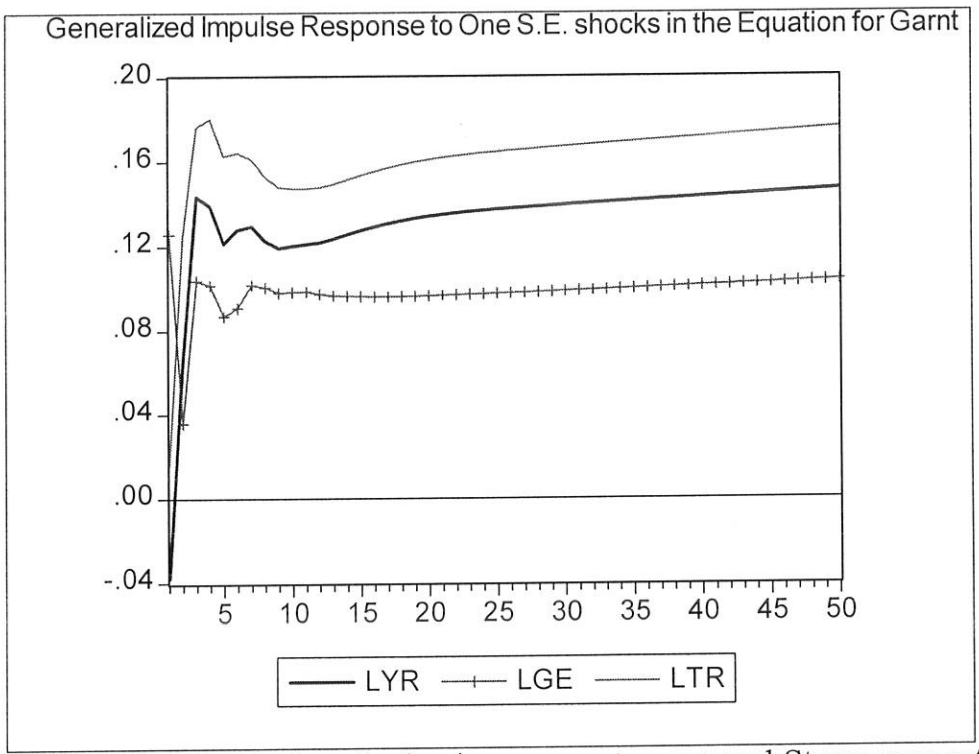
	LYR_t	LGE_t	LTR_t	LGA_t
α	-0.03902	-1.1003	-0.04866	0.01437
$\chi^2(1)$	5.6171	0.4995	2.8993	1.2719
P-Value	0.0178*	0.4795	0.8860	0.2594

**, * Represents significance at 1% and 5% level.

Appendix 6.1. Effects of Shock in Grant on Cointegrating Vectors



Appendix 6.2 Effects of a shock in Grant on the other variables



Note: Horizontal and vertical axis represents year and St.err, respectively.

Appendix 7. Summary of Estimated Unrestricted Reduced Form by OLS

Correlation of URF residuals (standard deviations on diagonal)

	DLYR	DLLA	DLGE	DLTR	DLGA
DLYR	1.000				
DLLA	0.24727	1.000			
DLGE	0.16320	0.15451	1.000.		
DLTR	0.20874	0.10459	0.02396	1.000	
DLGA	-0.12058	0.08816	0.19513	0.099200	1.000

```
Standard deviations of URF residuals

            DLYR         DLLA         DLGE         DLTR         DLGA
        0.042222      0.30207      0.11768      0.11170      0.32146

loglik = 464.16643  log|\Omega| = -22.6423  |\Omega| = 1.46754e-
010  T = 41
log|Y'Y/T| = -13.9903
R^2(LR) = 0.9651  R^2(LM) = 0.573645

F-test on all regressors except unrestricted, F(35,120) = 13.819
[0.0000] **
Variables entered unrestricted:
  Constant

F-tests on retained regressors, F(5, 28)
      DLYR_1      3.99979 [0.0080] **
      DLGE_1      3.14866 [0.0236] *
      DLTR_1      3.87869 [0.0093] **
      DLGA_1      4.71701 [0.0034] **
      DLLA_1      3.44111 [0.0161] *
      ECT1T_1     3.94914 [0.0089] **
      ECT2T-1     3.05774 [0.0266]  *

Correlation of actual and fitted
      DLYR         DLLA         DLGE         DLTR         DLGA
      0.75276      0.57282      0.68150      0.64636      0.63285
```

Appendix 8. Diagnostic Test for (Error Correction Model)

DLYR : Portmanteau(5): 5.45746
DLLA : Portmanteau(5): 3.94556
DLGE : Portmanteau(5): 3.12773
DLTR : Portmanteau(5): 5.10273
DLGA : Portmanteau(5): 7.0997
DLYR : AR 1-2 test: F(2,35) = 2.9419 [0.0659]
DLLA : AR 1-2 test: F(2,35) = 1.9768 [0.1537]
DLGE : AR 1-2 test: F(2,35) = 0.78066 [0.4659]
DLTR : AR 1-2 test: F(2,35) = 0.26509 [0.7687]
DLGA : AR 1-2 test: F(2,35) = 2.0578 [0.1429]
DLYR Normality test: Chi^2(2) = 1.5066 [0.2118]
DLLA : Normality test: Chi^2(2) = 1.6924 [0.1852]
DLGE : Normality test: Chi^2(2) = 0.11476 [0.9442]
DLTR : Normality test: Chi^2(2) = 5.8363 [0.0540]
DLGA : Normality test: Chi^2(2) = 2.1939 [0.3339]
DLYR : ARCH 1-1 test: F(1,35) = 1.8918 [0.1777]
DLLA : ARCH 1-1 test: F(1,35) = 0.079160 [0.7801]
DLGE : ARCH 1-1 test: F(1,35) = 0.053213 [0.8189]
DLTR : ARCH 1-1 test: F(1,35) = 2.8734 [0.0989]
DLGA : ARCH 1-1 test: F(1,35) =0.00089295 [0.9763]
DLYR : hetero test: F(10,26) = 1.8240 [0.1061]
DLLA : hetero test: F(10,26) = 0.67969 [0.7332]
DLGE : hetero test: F(10,26) = 0.77775 [0.6490]
DLTR : hetero test: F(10,26) = 0.95822 [0.5004]
DLGA : hetero test: F(10,26) = 0.21272 [0.9929]
DLYR : hetero-X test: F(20,16) = 2.1173 [0.0663]
DLLA : hetero-X test: F(20,16) = 0.27855 [0.9960
DLGE : hetero-X test: F(20,16) = 0.75656 [0.7257]
DLTR : hetero-X test: F(20,16) = 0.46088 [0.9486]
DLGA : hetero-X test: F(20,16) = 0.65684 [0.8146]

Vector Portmanteau(5): 99.9094
Vector AR 1-2 test: F(50,108)= 1.1246 [0.3026]
Vector Normality test:Chi^2(10)= 9.420 [0.5131]
Vector hetero test: F(150,118)= 0.96161 [0.5916]
Vector hetero-X test: F(300,67)= 0.79576 [0.8966]

Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all sources of materials used for the thesis have been duly acknowledged.

Declared by:

Name: MESFIN GULELAT

Signature

Date 10/03/2007

Confirmed by the advisor:

Name: Dr. Syred Hasan Oayed

Signature

Date 19/4/07

Place and date of submission: Addis Ababa, March 2007