ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATES STUDIES

"THE FISCAL RESPONSE TO EXTERNAL AID: A VECTOR AUTOREGRESSIVE ANALYSIS (VAR) FOR ETHIOPIA"

BY

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ACRONYMS

AERC	*African Economic Research Consortium*
AAU	*Addis Ababa University*
CRS	*Creditors Reporting System*
DAC	*Development Assistance Committee*
ECA	*Economic Commission for Africa*
EEA	*Ethiopian Economic Association*
FRM	*Fiscal Response Model*
IMF	*International Monitory Fund*
IFS	*International Financial Statistics*
MOFED	*Ministry of Finance and Economic Development*
NBE	*National Bank of Ethiopia*
ODA	*Official Development Assistance*
OECD	*Organization for Economic Cooperation and Development*
OLS	*Ordinary List Square*
WB	*World Bank*
WDI	*World Development Indicator*
UN	*United Nations*
UNCTAD	*United Nations Conference on Trade and Development*
UNDP	*United Nations Development Programme*
VAR	*Vector Autoregressive Model*
VECM	*Vector Error correction Model*

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ABSTRACT

The main objective of this study is to access the fiscal response to external aid inflows in Ethiopia, specifically to study the impact of foreign aid inflows on public expenditure, revenue and domestic borrowing in Ethiopia. The paper provides a critical review of literature on the aid-fiscal relation, and then applies a VAR/VECM and impulse response analysis, using data for the period 1961-2007.The study is a good indication that disaggregated data utilization could point out which variables are responsive to changes in external shocks. By studying the particular fiscal dynamics in Ethiopia using three separate models, the study finds that foreign aid in the form of grant and loan has had a positive impact on government expenditure (loan being pro-investment and grant being pro-consumption), both have a negative impact on domestic borrowing (domestic borrowing being more elastic to a change in grant) and indirect tax collection and no effect on the direct one. Moreover, by incorporating total ODA inflow in a separate model, the study tried to analyze the joint impact of budgetary grant and loan, and that of off -budgetary ODA. The results support the conclusion that aid inflows increase public expenditure and are biased to be pro- investment. While total ODA flows have a negative impact on revenue of the government and borrowing from domestic sources, suggesting that aid and domestic borrowing are close substitutes and that higher aid flows displace domestic revenues. In the final analysis to mitigate the undesirable impacts of aid, building a better national capacity to collect domestic revenue and regulatory schemes by donors to avoid possible problems of aid fungiblity should be put in place.

CHAPTER ONE

Introduction

1.1 Background of the Study and Statement of the Problem

The origins of the current international aid system can be traced to several more or less simultaneous initiatives following the end of World War II. The largest aid package in history has 'Marshall Plan', which help the countries of Western Europe rebuild their economies after the severe devastation of the World War II (*Ali and Suliman, 1999).*[1]A system of international assistance developed after World War II in which several key procedural norms emerged to shape the aid regime as developed countries began to extend aid to developing countries. It is important to note that at this juncture 'aid' was perceived in the context of a specific 'developmental Paradigm', in which poor countries were viewed as being trapped in a low-income equilibrium and unable to generate adequate investment by themselves to promote capital formation and rapid growth *(Van de Walle, 1998).* It was believed that an influx of capital from outside was needed to provide the spurt of growth that would make economic 'take-off' possible (*Ali and Suliman, 1999).*

Africa's share of Official Development Assistance (ODA) to Gross Domestic Product (GDP) has been increasing since the inception of Marshall Plan. It was about 2.4% during 1972/73 and rose to 5% in 1983/84 and 9.8% in 1998 *(World Bank, 1998).* Moreover, *UNCTAD(2000)* report indicate that aid accounts for over 25% of GNP in 20 counties out of which 17 are in Africa.

Sub-Saharan Africa has long been the most aided major region of the developing world. Aid as a proportion of gross domestic product there has averaged over 5% for much of the past two

[1] *The Marshall Plan initiated after World War II for the reconstruction of and recovery of the economies of Western Europe devastated by the war was among the largest aid packages the world war has witnessed (Ali and Suliman, 1999).*

decades, has reached nearly 10% at times and still equals nearly 6% of the region's GDP. These proportions are much higher in the many smaller African countries *(Lancaster, 1999).*

At the same time, however, the development performance in nearly all African counties has been deeply disappointing *(Lancaster, 1999)*. Because of relatively low growth rate in most counties over the past four decades, combined with high and rising population growth rates, average per capita incomes have fallen since 1970. Average per capita income in the region increased modestly in 1995-7. But despite this increase, average per capita income in the region were 15% lower in 1995-7 than they were in 1976-8*(Lancaster,1999).*

The coincidence of high aid flows and low growth has prompted many aid agencies, African governments and the expert and academic community to ask whether aid has been ineffective in Africa, and if so, why. Some have asked whether aid might have been contributed to the poor development performance and if so, how *(Lancaster, 1999).*

In Ethiopia capital inflow has started around the 1950's following of the Marshal plan in Western Europe (*Berhanu, 2001)*. During the Period (1952-1974) of the Imperial regime, Ethiopia obtained 1021.6 million birr grant and 626 million Birr foreign loan, total 1647.60 million of aid. The ODA, during this period accounts for 60-70 percent of public sector programs. The ODA to GDP ratio of the period was 4.8 percent *(MOFED and OECD data base).*

The new government (the Derg) which took power throwing the Imperial regime has shifted its resource of ODA flows from a western capitalist domination to socialist (Eastern Europe) domination, mainly that of the Soviet's Block Aid (*Berhanu, 2001).* During the Derg regime (1974-1991) the country obtained birr 5526.87 millions of grant and Birr 5658.3 million of foreign loans, totally 11185.17 million of ODA. The ratio of aid to Public investment expenditure during the period was 72.5 percent, and ODA to GDP ratio in the period was 11.8 percent *(MOFED and OECD data base)*.

In the post-Derg Ethiopia, partly due to the new government intensified transaction with the international donor communities and changes in the paradigm of economic system, ODA flows has increased significantly*(Berhanu, 2001).* During (1991-2005) the country has received Birr 26980.9 million of grants and Birr 28225.5 million of foreign loans, in total 55206.4 million of aid. Compared to the pre-1991 period, the post 1991 aid surges are 77 percent greater and form 84.2% of the public investment expenditure. The ODA to GDP ratio has also increased to 20% during the same period *(MOFED and OECD data base).*

Given the importance of ODA in the Ethiopian economy, any study aimed at investigating aid effectiveness in promoting the desired goals should start form the question of aid –government relation .This is mainly because aid is given primarily to the government, and hence any impact of aid on the economy will be mediated by government behavior. Few studies have been conducted in Ethiopia to identify the fiscal response to external finance, each having their own problems. But most share the problem of short series of data, and omission of relevant variables in their model. Others used an aggregated data of the fiscal variables and that of aid, while it was found in other studies that disaggregated fiscal variables are affected differently by different aid modalities.

Furthermore pervious fiscal impact studies which use econometric analysis of time series data to demonstrate whether aid has been used primarily to increase public investment or consumption expenditure or to reduce the burden of taxation throw useful light on how aid may have affected growth process. They offer partial illumination of the aid-growth relationship, but still leave important parts of the story untold. For instance, their failure to take into account that some aid, though provided to governments, is not accounted for in the state budgets. This may be because of the deficiencies in budget process or inadequate provision of information by donors, leading to the omission form public accounts of some

donor-financed activities, Or as noted by Fragnance et al (2004) and 0sie et al (2003, 2005), it may arise because aid finances legitimately off-budget activities such as lending to Poor investment in, commercial enterprises and the financing of the work of non governmental agencies. Where the problem occurs, fiscal impact studies are able to focus only on how budgetary aid has affected reported fiscal aggregates and sub-aggregates. A final problem of the fiscal response studies conducted in Ethiopia that could be mentioned is the a prior endogenous-exogenous classification of variables and treatment of fiscal variables as if they are independently determined. Hence a fiscal response study which tries to minimize the aforementioned problems is needed, which this study tries to stands for.

1.2 Objectives of the Study

The main objective of the study is investigating the fiscal impact of aid in Ethiopia Thus the paper specifically tries to identify

a) The impact of budgetary grant on direct and indirect taxes, capital and recurrent expenditure and that of Domestic Borrowing

b) The impact of budgetary loan on direct and indirect taxes, capital and recurrent expenditure and that of Domestic Borrowing

c) The impact of total ODA inflow (both budgetary and off budgetary) on the fiscal aggregates of the government.

d) To highlight possible policy recommendation regarding the issue.

1.3 Significance of the study

Studies conducted so far on the fiscal response to external finance in Ethiopia, share the problems of a prior distinction of variables into endogenous and exogenous, and short series of disaggregated data ,Omitting important variable (such as domestic borrowing) .

This study using the multivariate econometric modeling approach tries to identify the fiscal response to external aid in Ethiopia. Using a longer series of disaggregated data and incorporation of most fiscal aggregates may be mentioned as the values of this paper; hence this study may be seen as an addition to further quest of knowledge in the area. It may also signals the policy makers not to overlook the problem of aggregation of variables; since aggregation may suppress information which the subject of policy analysis mainly stands for.

1.4 Research question

The study tries to answer the following questions:

a) Is aid associated with lower tax effort of the government (direct and indirect tax)?
b) Does aid increase the overall expenditure of the government?
c) What happens to the composition of government expenditure as aid surges increase into the economy?
d) Does aid substitute domestic borrowing?
e) What is the relationship between total ODA (both budgetary and off-budgetary ODA) with the fiscal aggregates of the government?

1.5 Organization of the study

The study has six chapters, following this introductory part, a brief review of Ethiopian economic outlook and fiscal trends will be presented. Chapter three is devoted to the critical review of theoretical and empirical literature of the aid-fiscal relation. Chapter Four outlines the basics of the methodology applied in this study. In chapter five estimation of the model and analysis of results will be presented. The last chapter (chapter six) then follows with its conclusion and policy recommendation part.

1.6 Scope and limitation of the Study

The study tries to identify the fiscal response to external aid in Ethiopian for the period 1961-2007.The problems of data inconsistency particularly that of ODA was critical. International Financial Statistics (IFS) of the IMF, the world development indicators (WDI) and DAC of the OECD on one hand, the fiscal account of the government on the other hand has reported two different figures of ODA. Both data's are used in the study. ODA data from budgetary accounts is used to identify the Budgetary ODA-fiscal relation. While that of DAC/OECD to identify the overall ODA-fiscal relation in the economy.

CHAPTER TWO

Background of the Ethiopian Economy

2 .1 Economic outlook

Ethiopia is one of the poorest countries in the world, with Gross National Income (GNI) at about $160 per capita, and ranked 170 out of 177 countries on the human development index. (World Development Indicators, 2007). The country is also one of the most populated countries in Africa, with over 73 million populations (UNDP, 2006).

The country has been landlocked since the independence of Eritrea in 1993 and the economy is highly dependent on the performance of the agricultural sector, which sustains over 80 percent of the population and accounts for nearly half of the Gross Domestic Product (GDP) and almost all exports (UNECA, 2002). Coffee remains the main source of export earnings, accounting for over 40 percent of total export in 2005(IMF, 2006). Ethiopia's development effort has been hindered by irregular rainfall (droughts), volatility in export commodity prices and costly wars (Martins, 2007).

In the recent history of the country three main political regimes can be identified: the Imperial regime (until 1974), the Derg regime (1974- 1991) and the Ethiopian People's Revolutionary Front (EPRDF) Coalition (1991 to present).

During the Imperial regime, the basic economic policy was the free market principle. The state was limited to its supervisory and control role. This role of the state was limited to small parts of the national economy such as the maintaining of order and the extraction of sufficient resources from the economy (through income taxes, import duties, excise taxes on urban consumers) to support an expanding state apparatus (Clapham, 1988).

Economic performance during the Imperial regime was respectable, with real GDP growing by four percent a year (on average), during the period from 1960 -1974, while average growth in per capita was about 1.5 percent (Alemayehu, 2008). Nevertheless, several droughts afflicted the country (e.g., 1958, 1966 and 1973) causing famine and wide spread poverty (Martins, 2007). In the early 1970s, a number of events fuelled the discontent of the population: a growing agrarian crises (Eshetu, 2004), the economic consequences of the 1973 oil shock (Martins, 2007), and concerns regarding the inequitable distribution of land.[2]

The country experienced a turning point in the course of history in 1974, when a military coup led by a committee of junior army forces (Derg) deposed of the Emperor. The new regime was characterized by a socialist (centrally planned) economic system with a strong military and discrimination against private property and entrepreneurship. Soon after its rise to power, the Derg embarked on large –scale nationalization, including all land, private property, and financial institution and manufacturing firms, leading to the "socialization" of production and distribution (Alemayehu, 2008). The Derg also introduced protectionist measures to control the flow of international trade, with a view to strengthening the state's role in export and imports, emphasizing strategic export sectors and closely monitoring the price, quantity and distribution of goods (Alemayehu, 2001).

The new government declared an economic policy which divided the economy into "areas of exclusive government activities, activities which might be undertaken jointly by the government and foreign capital, and activities which were to be left to the private sector". The first category included financial services and basic industries, expanding mainly to large scale enterprises. The second group encompassed sectors for which foreign expertise would be

[2] Political power was to a great extent related to the size and quality of land owned (Alemayehu,2008)

needed, including mining the manufacture of plastics and tourism. The third left in the private hands a wide variety of small scale activities (Clapham, 1988).

The establishment of expanded bureaucracy and state administration, and the conduct of endless campaigns have resulted in large public economy with a short span of time (Berhanu, 2001). To sum up; the government has curtailed the market and instituted central planning as a means of allocating resources.

Economic performance under the Derg regime was poorer than in the past, with real GDP growing about 1.9 percent per year (1974-1990), while growth was negative in per capita terms (-0.8).The policy environment, erratic performance of the agricultural sector (e.g., severe drought in 1984-1985) and a lengthy civil war were the main contributors to this sluggish economic record (Eshetu, 2004).

Another major change in Ethiopian political and economic context occurred in 1991, when a coalition of rebel forces (EPRDF) succeeded in overthrowing the military regime (Martins, 2007).The new government reinstated market economy policies and introduced major policy changes ,such as the promotion of private sector development, prudent fiscal policy (mainly through retrenchment of the army and civil servants ,tax reform and lower defense spending) ,monitory policies (limiting monetization of the fiscal deficit),a substantial correction of the overvalued nominal exchange rate ,decontrol of many prices, liberalization of foreign trade and foreign exchange regime, Autonomy of state(owned trading enterprises and privatization of small and medium enterprises, financial market reform, including the licensing of local private banks and insurance companies, and interest rate liberalization, and the ongoing reform program of the civil service sector(Berhanu ,2001).

During the period 1992-2000, Ethiopia‘s economic performance improved significantly, albeit with considerable volatility. GDP grew over four percent per year, and about two percent in

per capita terms (World Development Indicators, 2007).Nonetheless, the economy remains vulnerable to climatic conditions (e.g., bouts of poor rainfall, such as in 1998 and 2003 and also in 2008) and other external shocks (such as terms of trade shocks, oil price shock which contributed some to the double digit inflation in the country at present). The export sector is characterized by a lack of diversification, with a large share of export earnings accruing from a small number of commodities (mainly, more than the 90 percent of the export earning comes from the agricultural sector of which coffee takes the lions share). The historical reliance on the export of few agricultural commodities, with often volatile prices (such as coffee), have to some extent contributed to the instability of export earnings.

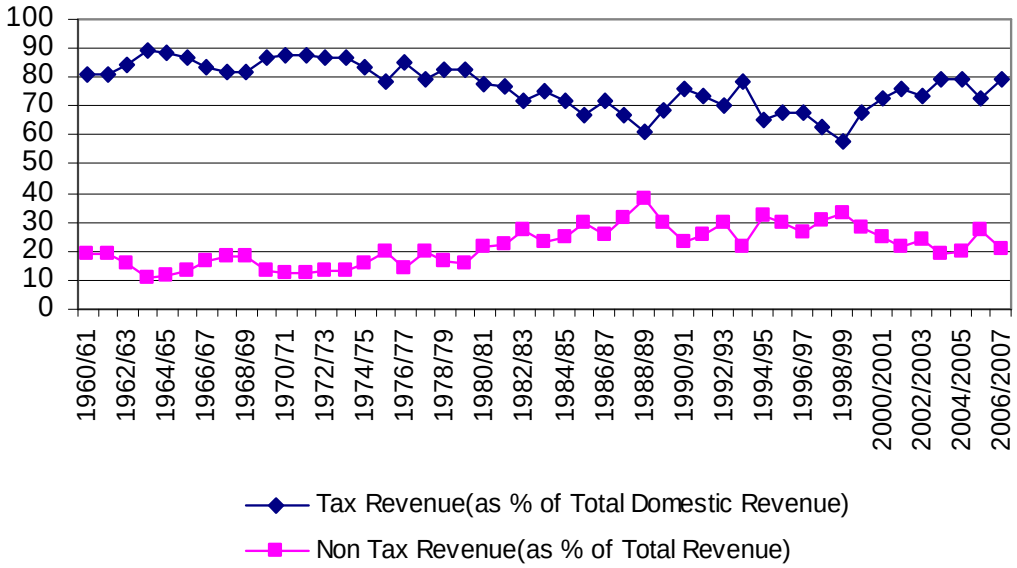
2.2 Fiscal trends

In this section a summary of the fiscal developments in Ethiopia during the past 46 years will be presented to provide a starting point for the empirical analysis, which follows later in this paper. To that end, government sources of revenue, expenditure and financing for the period 1960/61-2006/07 will be presented.

2.2.1 Revenue

Figure 2.1 below plots government domestic sources of revenue and its composition of tax and non tax for the period 1960/61-2006/07.As can be seen from the figure, with regard to the composition of domestic revenues, in the 1960s and 70s taxes made about 80-90 percent of the total domestic revenue. However, the relative importance of tax revenues declined throughout the 1980s, reaching as low as 60 percent in 1989/90.

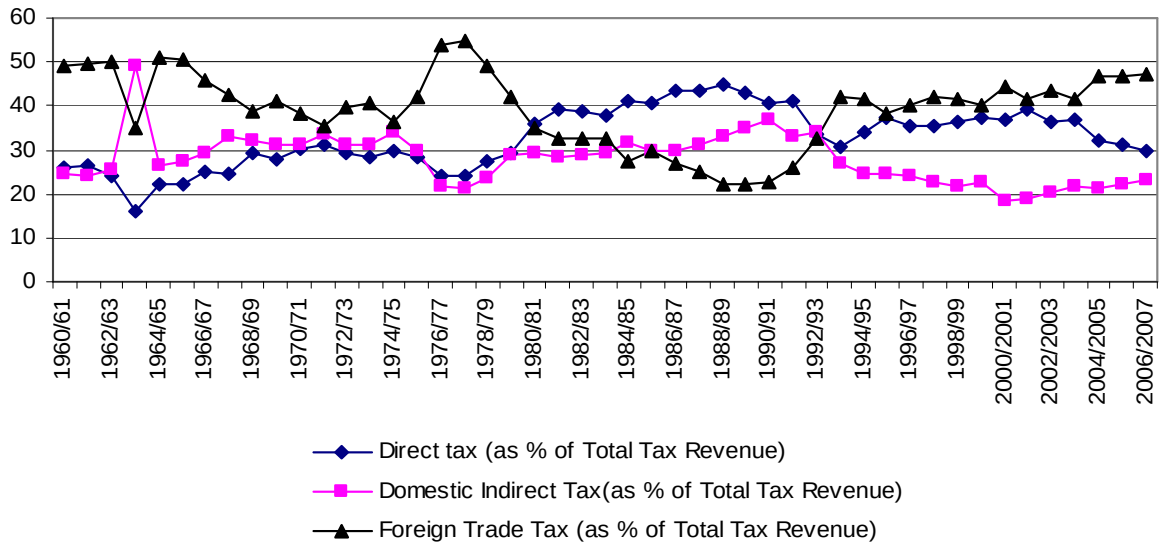
Figure 2.1 composition of total domestic revenue



Recent data suggests that this trend is now being reversed, with tax revenues increasing from 60 to 80 percent of total domestic revenues during the period 1999/00- 2006/07.As figure 2.2 below shows this reversal is mostly attributed to indirect taxes (i.e., foreign trade taxes, mainly import duties) as a consequence of sharp increase in imports in recent years, and the introduction of new taxes (such as revenue from urban land lease, mining income taxes ,rental income taxes and value added tax (VAT).While during the same period direct taxes experienced a declining trend in total tax revenue from 40 percent in 2000/01 to a stagnated level of around 30 percent from 2004/05 to 2006/07.

As can be seen from the figure below, during the Imperial regime indirect taxes (specifically foreign trade taxes) were more important in the share of total tax revenue. This was mainly because of the economic policy that the country was guided (free market economy and openness to the rest of the world).During this period foreign indirect taxes have an average share of 40 -45 percent in the total tax revenue.

Figure 2.2 Composition of total tax revenue



Contrary to the Imperial regime, in the Derg regime the importance of foreign indirect taxes in the total tax revenue becomes less and less important, while direct tax revenue become increasingly important in the total during the same period. This was mainly due to the inward looking economic policy (UNDP, 2006), which the country followed during the Derg regime. Immediately after the collapse of the Derg regime, we can see the revival of foreign indirect taxes, as an important component with a leading contribution, in the total tax revenue. The increasing importance of foreign indirect taxes in the total tax revenue is mainly due to a tremendous amount of import after the new government opened the door of the country (UNDP, 2006) to the rest of the world.

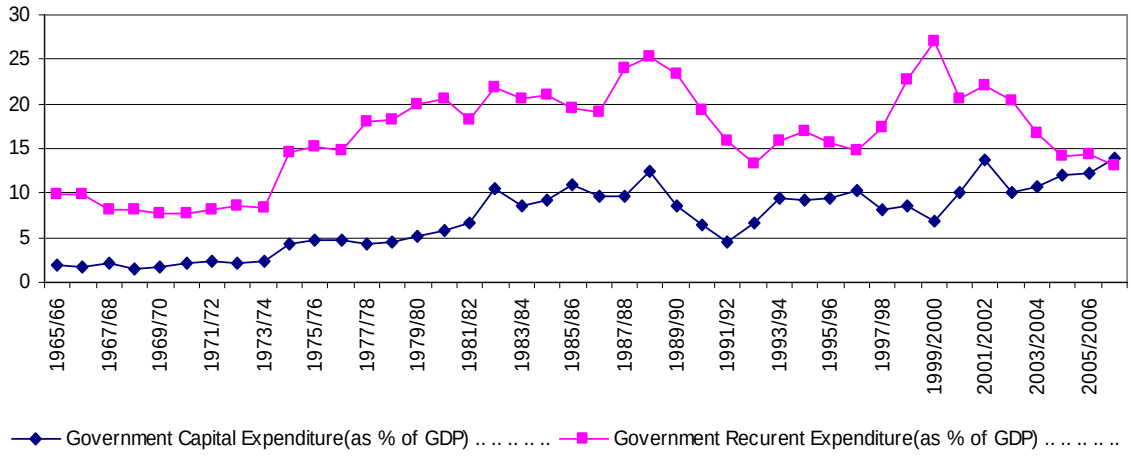
2.2.2 Expenditure

Turning to the composition of government expenditure, Figure 2.3 and 2.4 illustrates the composition of government expenditure trends for the period 1964/65-2006/07, the first as the ratio of GDP and the second as ratio total government expenditure.

In figure 2.3, we can observe that government consumption expenditure was kept at around 8-10 percent of GDP until 1974/75, while investment expenditure accounted for about 3-4 percent of GDP during the same period. After the rise of the Derg regime to power and as a consequence of its (socialist) policy measures (Berhanu,2001),government recurrent expenditure rose gradually to 25percent of GDP in 1988/89,while public spending on capital was near 13 percent in the same year. In 1982/83, government capital expenditure had almost doubled in nominal terms due to an increase in economic development expenditures (especially those related with agriculture and land settlement and manufacturing).This was also possibly due to the economic "Zemetcha" (Berhanu, 2001), mass mobilization campaigns.

Since the beginning of the 1990's there has been some volatility in these variables. The sharp reduction in both items of expenditures in the early 1990s was caused, to some extent, by the drastic fall in domestic revenues, mainly tax revenue, (see figure 2.1) and according to IMF (2006) due to the end of soviet bloc aid. In 1993/94, current expenditures increased, mainly due to wages and operating expenses, and as noted by the IMF (2006) due to the doubling of interest payments on internal debt. In 2003, a similar increase was due to a high level of external assistance (which more than doubled).

Figure 2.3 Composition of Total Government Expenditure as a percentage of GDP

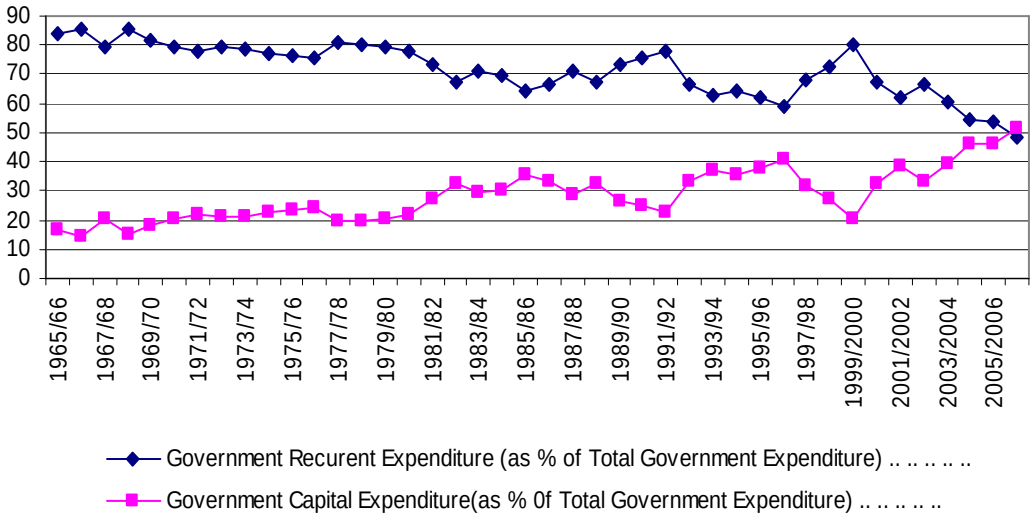


The Eritrean war (1997/98-1999/00) was responsible for a sharp increase in military spending, hence the strong increase of current expenditures as a percentage of GDP during this period (Figure2.3). Conversely, the fall in recurrent cost thereafter can be attributed to the scaling down of defense expenditure after the end of the war: they had been cut to less than half of their former level in nominal terms by 2002/03.

This represents a reversal of a long increasing trend, in which military spending went from around four per cent of GDP in the 1960s to an approximate average of eight percent of GDP in the 1980s, and a high of 15 per cent in 2000 (Alemayehu , 2008).

In 1999/00, the drop in capital expenditures was due to a reduction in both economic and social investments, like due to the severe drought (IMF, 2006) that afflicted the country in 1998/99-1999/2000.

Figure 2.4 *Composition of Total Government Expenditure as a percentage of Total Government Expenditure*



During the period 2000/01-2006/07, current expenditures declined relative to GDP while capital expenditures tripled. The main driving force behind this increase is a consistent increase in various items, such as for economic development (mainly agriculture and natural

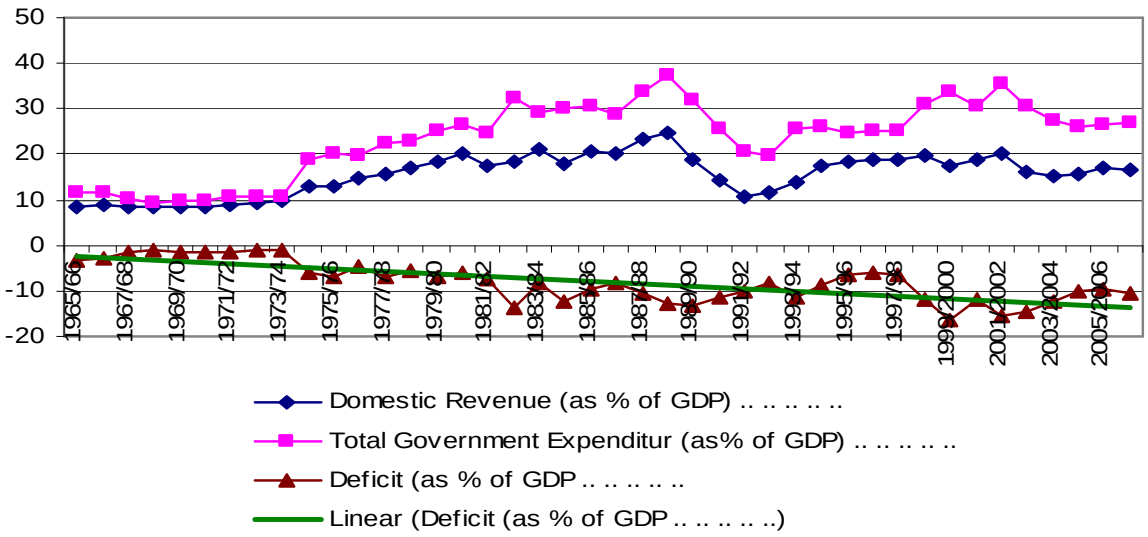
resources) and social development (mainly education and urban development and housing). Current spending on agriculture, natural resources and education was more than doubled.

Overall, it can be seen from figure 2.4 below that capital expenditures gradually increased as a share of total expenditure during the period 1964/65-2006/07.In 2006/07 since the government was heavily engaged in infrastructural developments, the share of capital expenditure in the total outlay of the government was equally important as that of the consumption expenditure in the same year.

2.2.4 Fiscal balance

Figure 2.5 below depicts the fiscal balance of the government in terms of domestic revenue, total expenditure and deficit, all in percentage of GDP, for the period 1964/65-2006/07.

2.5 Fiscal Balance



As can be seen from figure 2.5 above, during the Imperial regime (until 1974/75), fiscal deficit (before grants) was relatively stable and very low (at an average of one percent of GDP), but during the protracted civil war (IMF, 2006), the Dreg regime ran a higher fiscal deficit. In 1982/83, the government recorded a very large budget deficit, which is almost 14percent of GDP, mainly due to a sharp increase in expenditure (see figure 2.5).The high deficit in the

early 1990s corresponds to the last years of the regime, when the civil war worsened. The problem with tax revenue collection (IMF, 2006), which originated in reduction in domestic revenues, was not compensated by a proportional fall in expenditure (see figure 2.5 above).

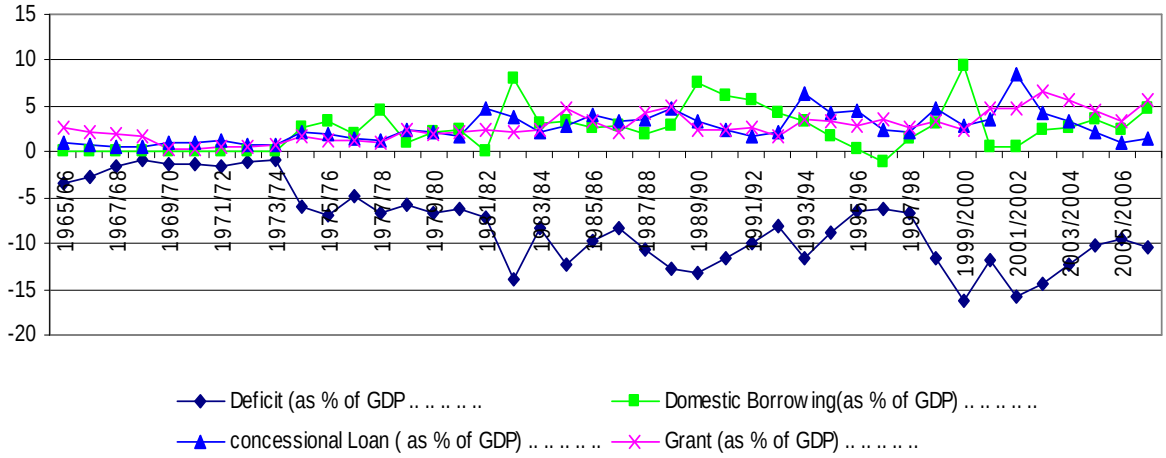
In 1999/00 and 2001/02 the high fiscal deficit was due to a strong increase in public expenditure as mentioned earlier (e.g. a sharp rise in military spending due to the war with Eritrea).After 2001/02 onwards (up to 2005/06), the budget deficit of the government shows a decreasing trend and reached a level of 10 percent approximately. Overall as the trend line shows the fiscal deficit before grants appears to be widening on average during the period 1964/65-2006/07.

2.2.4 Deficit Financing

Figure 2.6 below shows, trends in the composition of government financing of its budget deficit (before grants), for the period 1964/65-2006/07.

During the Imperial regime since fiscal deficit was very low, both domestic financing and foreign concessional financing was negligible (1 percent of GDP).After the rise of the Derg regime to power the fiscal deficit of the government started widening, which led to increased utilization of domestic and external menses .In 1982/83, the 15 percent of GDP fiscal deficit has led to a sharp increase in domestic borrowing. The high fiscal deficits in 1989/90and 1999/00 are also associated with a high percent of domestic borrowing in financing the gap. Noting the figure above indicates that, borrowing from domestic sources shows a very strong correlation with the budget deficit of the government before grants.

Figure 2.6 budget deficit (before budget grant) and financing



Even though, it is going to be tested empirically, at this point of discussion figure 2.6 casts some useful information. As can be seen from figure 2.6 above, in most of the years where there had been a higher fiscal deficit, if the flow of international resources (grant and concessional loan in this case) is high, government domestic borrowing show a downward trend. It is also true that, government domestic borrowing was high at times when the flow of such resources is low. Therefore, literally we can say that the government has used to some extent foreign official flows to substitutes domestic borrowing.

2.3 Trends in the Flow of ODA to Ethiopia.

International financial inflows should satisfy three main criteria to qualify as Official Development Assistance (ODA) [3](Ali et al, 1999).First such flows should originate in an official sector of the donor. Second, their main objective has to be the promotion of economic development or welfare. Third, they have to be provided on concessional terms, with a grant element of at least 25% on loans (Ali et al, 1999).According to this definition, ODA includes capital projects, food aid, emergency relief, and peacekeeping efforts technical cooperation,

[3] This definition of ODA used by the Development Assistance Committee (DAC) of the organization for Economic Co –operation and Development (OECD).The DAC is charged with the task of monitoring the task of monitoring the flow of all financial resources from its members, but its main concern is monitoring the flow of ODA (Ali et al, 1999).

contributions to multilateral institutions and concessional funding to multilateral development banks. It excludes military aid and non-concessional flows from official creditors, which are considered as "other official flows" (Ali et al, 1999). Hence ODA can be divided into Grant and loan.

Loans are an inflow of resources to be used for a specified period of time and they should be repaid sometime in the future. On the bases of terms of repayment, loans can classified as soft (concessional[4]) and hard (non-concessional) loans. The former has a lower interest rate than that of the market interest rate and are to be repaid in longer maturity dates than that of the commercially available loans, while the later represents loans that are available like any other private commercial loans (African Development Report, 2006).The DAC includes only that of soft loans as a component in the definition of ODA.

Grants are current transfers of capital, goods, or services to a foreign country that results in no current or future obligation to make a like transfer from the recipient country to the donor(African Development Report, 2006).This paper focuses on ODA to Ethiopia in the context of the DAC definition.

The data used, in this study, for ODA is found from two sources. one from the fiscal accounts of the government, and the other from the DAC of the OECD online data base .ODA found from the DAC is greater than the one read as the sum of pure concessional loan and pure grant but the two have a similar trend over the study period. As total ODA inflow reported according to the DAC in to is greater than ODA recorded in the budget, it indicates that total ODA inflow into the country has two destinations in the economy. One that goes to the budget, the other off - budget. However off-budgetary ODA may have an impact on the fiscal aggregates for two main reasons. First, if its figure is large (off-budgetary), it will have a

[4] Consessional flows are international lending on terms more favorable to the borrower than those obtainable through nominal market transactions, while non-concessional flows are lending on near terms prevailing in private financial markets (African Development Report, 2006).

considerable contribution in the aid –fiscal relation. Second, if off –budgetary ODA finances expenditure item that would have been financed from the budget otherwise, in the budget, it will have an impact on the resource boundary of the government which ultimately ends up affecting the fiscal aggregates. Therefore studying the importance of off -budgetary ODA is equally as important as studying budgetary ODA.

As can be seen from the graph above, official flows have increased over the study period on average. During the imperial regime flows in the official flows is very weak. It started to increase after the Derg regime came to power, and significantly improved during the EPRDF regime.

Figure 2.7 Trends in total net, pure grant and loan

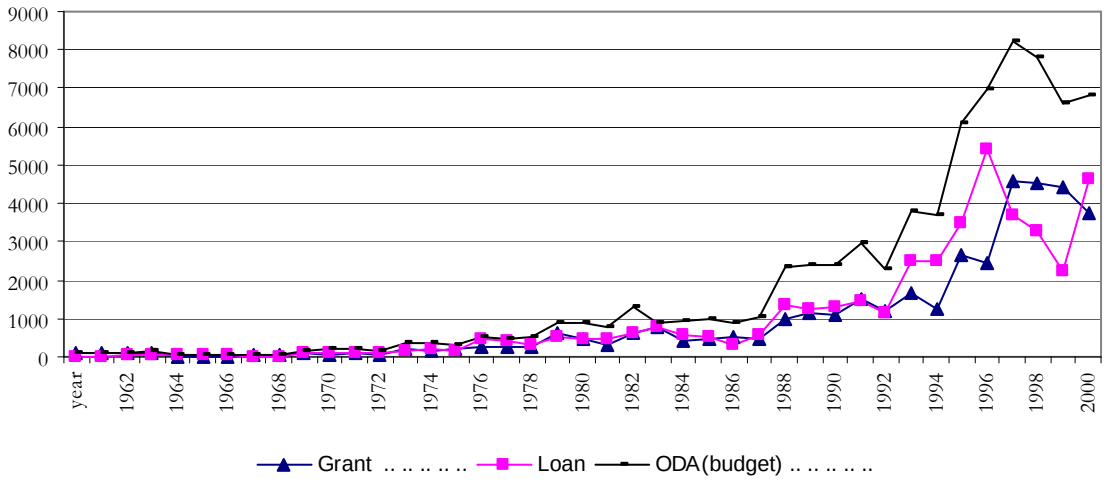


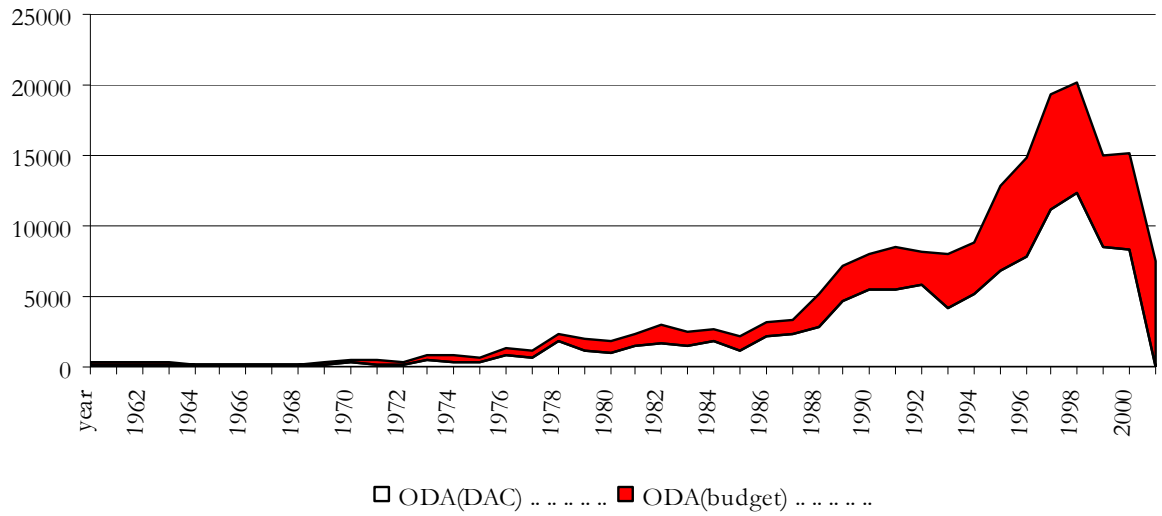
Figure 2.7 shows the volume of grant, loan and the sum of the two. As can be seen from the graph above, budgetary ODA has two components, grant and loan (using the DAC) definition. For most of the years of the inflows, loan ODA takes the lions share in the sum.

2.4 ODA from the government account Vs ODA from DAC/OEC

ODA from the government account comprises loan and grant, which meet the DAC criteria and recorded in the budget. While ODA from the DAC represents flow of official aid surges which meets the DAC criteria to be classified as ODA (aid)

As can be seen from the graph above, official flows have increased over the study period on average. During the imperial regime flows in the official aid surges is very weak. It started to increase after the Derg regime came to power, and significantly improved during the EPRDF regime.

Figure 2.8 ODA figure discipancies



As the figure above shows, the two sources of ODA data reported different amount of total ODA inflows to the economy, however the two sources have reported pretty much similar patterns of ODA inflows over the study period. The residual difference in ODA recorded in the budget and ODA recorded as per DAC/OECD account is claimed by the OECD as off – budgetary ODA (Marthins, 2007).

CHAPTER THREE

Review of Theoretical and empirical literature

3.1 Introduction

The underlying economic rationale for aid as a source of development finance can be traced back to the two-gap model of Chenery and Strout (1966): low income countries have insufficient domestic savings to finance the level of investment required to achieve their target growth rates, and/or insufficient foreign exchange earnings to finance required capital imports; these savings and foreign exchange gaps constrain growth. Capital inflows (of which aid is one form) are justified as, if they relax the savings and foreign exchange constraints, they can contribute to increased growth. (McGillivray, 2000)

Following the early work of Griffin (1970), who posited that aid inflows may discourage domestic savings, displace investment and be redirected into consumption rather than investment, and for all these reasons may not increase growth rates, much of the literature on the macroeconomic impact of aid used simple ordinary least squares regressions of aid on savings, investment and/or economic growth (Griffin, 1970 cited in Franco-Rodriguez et al, 1998).This literature has been comprehensively reviewed and justifiably criticized, on both theoretical and econometric grounds, by White (1992),and McGillivray and Morrissey(2000&2001). This notwithstanding, many studies continue to draw inferences on the impact of aid from cross-section regressions of aid on economic indicators; in an often cited recent study, Boone (1996) claimed that aid increased (government) consumption but had no significant effect on raising investment(Boone ,1996cited in Franco-Rodriguez et al, 1998).

A core deficiency of the aid-growth literature is that it fails to explicitly recognize that aid is given primarily to the government, and that hence any impact of aid on the economy will be mediated by government behavior (McGillivray and Morrissey, 2000&2001). Although the literature recognizes the importance of policy, the studies condition aid effectiveness on

policy, rather than examining how aid affects policy (Franco-Rodriguez et al, 1998; McGillivray, 2000; McGillivray and Morrissey, 2000&2001; and Osei et al 2003&2005). The issue of how aid affects policy, in terms of fiscal policy, has been addressed by two separate strands in the literature. First, by studies of fungibility that are concerned with identifying whether aid that is intended (by donors) to be spent on a particular expenditure item, such as health or education, is in fact allocated to that area. This is often referred to as categorical fungibility as the issue is the allocation of aid to expenditure categories and whether recipients allocate aid in the way donors intended when granting the aid (Osei et al, 2003&2005). The second is the so-called, "the fiscal response" [5] literature, which explicitly models how the impact of aid is mediated by public sector behavior. As such, these models are broader in coverage, considering not only categorical allocation but also the effects of aid on tax effort and public borrowing (Osei et al, 2003&2005). Both strands of the literature will be discussed in turn.

3.2 Categorical Fungibility Studies

3.2.1 Theoretical approach

Agenor et al (2006) defined aid fungibility in a general as an issue that focuses on whether a recipient has the ability to treat aid as a resource that can be spent as it wishes. If aid provided by donors to finance a specific activity can be as freely spent as aid provided as general budgetary support, then aid is said to be fungible.

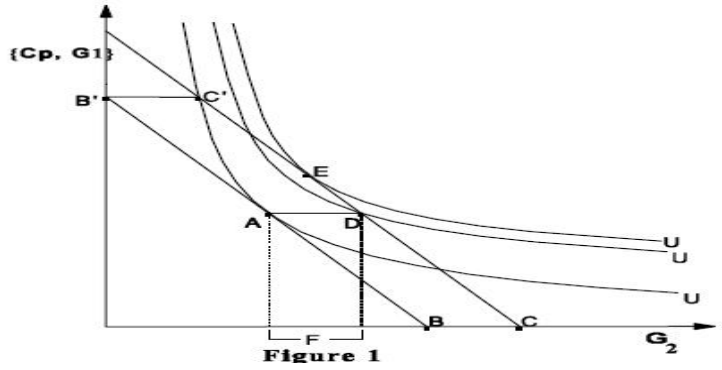
White et al (1998) elaborates the meaning of fungiblity by distinguishing between aggregate and categorical fungibility. The former is where the aggregate category (say, imports or government expenditure) does not rise in a one-for-one manner with an aid flow whose

[5] The term is attributed to Howard White (1992) study of "macroeconomic impact of development aid; a critical survey". See Alemayehu (1996&2002)

intended purpose is to increase that aggregate. Categorical fungibility occurs if the inflow increases any expenditure item within the aggregate other than those intended by the donor.

Devarajan and Swaroop (1998) defined aid fungibility in the following illustrative way: Suppose an aid donor gives money to build a primary school in a poor country. If the recipient government would have built the school anyway, then the consequence of the aid is to release resources for the government to spend on other items. Thus, while the primary school may still get built, the aid is financing some other expenditure (or tax reduction) by the government. In such a case, donor assistance is said to be fungible.

Figure 3.1Categorical aid fungiblity



(Source: Devarajan and Swaroop, 1998)

Devarajan and Swaroop (1998) elaborated this by supposing a country that spends its total resources on a single private good, C_p, and two public goods, G_1 and G_2. All three goods are normal (non-inferior). It pays for these goods by means of domestically generated resources. In addition to its own resources, the country receives earmarked assistance towards the purchase of good G_2 from a donor agency. For simplicity, assume that there is no impact of aid on the relative price of the two goods. Figure 1 captures this scenario. *BB`* represents allocation choices that can be financed from domestic resources, and given the preferences of the recipient country, point *A* represents the preferred resource allocation. An amount *F* of

earmarked foreign aid is given for G_2. The donor agency and the recipient country are assumed to have different preferences regarding how aid should be spent. (If they have identical preferences, then the distinction between earmarked aid and pure budgetary support has no meaning.) While the donor agency would like the aid funds to be spent on G_2 at the margin, for a variety of reasons, it is unable to monitor the intended pattern of public spending. Upon receiving aid, therefore, the recipient country is able to make it fungible by changing both the level and composition of its public expenditure program. If the recipient country can treat the entire aid amount as a pure supplement to its domestic resources, then aid is fully fungible. As illustrated in Figure 1, the post-aid resource constraint is *B`C`C;* the horizontal segment, *B`C`*, indicates that at least the aid amount has to be spent on G_2. The new optimal resource allocation is given by the point *E*. The latter indicates that in spending the acquired aid resources on good G_2, the country diverts some of its own resources from G_2 to C_p and G_1. Suppose, on the other hand, the recipient country does not divert any of its resources away from the aided good while spending the earmarked aid on it. This could be due to the donor agencies effective public expenditure monitoring process. In such a case, aid is fully non-fungible. The optimal allocation mix of the country's *own* resources is not influenced by the aid amount and point *A* (in Figure 1) continues to be the country's preferred mix. Aid to G_2, however, increases overall utility. The post-aid consumption point, *D*, is on a higher indifference curve U_2. This indicates that even if the aid was fully non fungible, the recipient country would still benefit. Finally, if the country can treat a portion, f ($0<f<1$), of the aid as a resource supplement, then aid is said to be partially fungible and the fungible portion of the aid is given by f. In such a case, the post-aid resource line (not drawn in Figure 1) moves out by the fungible amount. In choosing the optimal resource mix, the country includes the fungible amount as an additional resource supplement to be spent but disregards the non-fungible

portion, 1-f. Depending on the value of f, the final consumption point lies between points *E* (f =1) and *D* (f =0) in Figure 1. This is the basic model that has been applied to data, when the fungibility coefficient f is estimated (see Feyzioglu *et al*., 1998, for an application).

The fundamental objective of the categorical fungibility studies is to detect the extent to which aid in practice is used in a fungible manner. That is, they attempt to model the actual extent to which aid, or some portion thereof, is used for purposes other than for which it was intended(McGillivray and Morrissey,2000). Categorical fungibility studies can be divided into two groups (McGillivray and Morrissey, 2000&2001). The first and the commonest methodology used has been in the 'fiscal impact' or expenditure impact tradition ,which uses cross-country or panel data to look for associations between aid and expenditure on investment or consumption, and between sect orally directed aid and increases of (public) expenditure in the sectors for which it was intended(White,1998). The approach is to estimate a simultaneous linear expenditure system that is derived from a standard utility maximization postulate (McGillivray and Morrissey 2001). Examples of studies in this category are Feyzioglu et al. (1998), Swaroop et al. (2000) and Khilji and Zampelli (1991). Each of these studies began with a utility maximizing problem, and estimates a simultaneous linear expenditure system. The second groups of fungibility studies do not adopt an explicit theoretical framework, but still estimate a set of simultaneous equations in a more ad hoc way (McGillivray and Morrissey 2001).Examples in this category are Pack and Pack (1993), Cashell-Cordo and Craig (1990) and Gupta (1993).

A typical representative of the first group of studies is Feyzioglu *et al*. (1998), and we will discuss this model in detail in this discussion. The theoretical framework of this study posits that the aid receiving government buys *S* public goods ($g1... gs$) in the market to provide them for its citizens. It pays for these goods using the fungible portion of aid, φ ($0 \leq \varphi \leq 1$), and revenue from all other domestic and international sources, *R*. Citizens also consumer goods that the government has to purchase with the non-fungible portion, $1 - \varphi$, of aid. Aid is

earmarked by donors for the purchase of K ($\leq S$) specific goods so that φ_k is the fungible portion of aid earmarked for good k. Feyzioglu *et al* (1998) defines a representative agent's utility function in terms of these S goods and a single private good, c_p, as follows:

$$W = U\left[c_{p,} g_1, g_1^{NF}, ..., g_{k,} g_k^{NF}, g_{k+1}, ..., g_s\right] \qquad \textbf{(3.1)}$$

Where g_k^{NF}(k = 1,…,K) is the quantity of the K-good that the government has to purchase from the non-fungible portion of the aid earmarked for good k, and g_s (s = 1,…, k, k+1,…,s) is the quantity of the s^{th} good purchased from fungible aid supplemented by other revenues. Feyzioglu *et al* (1998) specify (3.1) in a Stone-Geary[6] welfare function form as follows:

$$W = F\left(c_p\right) + H\left(\sum_{k=1}^{K} g_k^{NF}\right) + \prod_{S=1}^{S}\left(g_s - \gamma_s\right)^{\beta_S} \qquad \textbf{(3.2)}$$

Where γ_s are positive subsistence quantities of the public goods, and the β_s sum to one. The recipient government is thought to maximize (3.2) subject to the following budget constraint:

$$p_1 g_1 + p_2 g_2 + ... + p_s g_s = R + \sum_{k=1}^{K} \phi_k a_k \qquad \textbf{(3.3)}$$

Where p_s are prices of the public goods, a_k is aid for good k and R is revenue from all other sources, both domestic and foreign. As p_s, $\varphi_{k,}$ R and a_k are assumed to be exogenous; the

[6] The Stone-Geary welfare function, originally conceived as a model of consumers' choice, provides a representation of the mandate-constrained public expenditure utility maximization problem. It is an alternative specification for the utility function that distinguishes between mandatory, entitlement or priority programmes to be defended against the vagaries of budget financing and discretionary or non-priority programmes, whose funding is allowed to be a function of financial availability. For elaborated discussion see ESUA (2004)

government chooses *S* goods (g_1, g_2... g_s) to maximize (3.2). Maximizing (3.2) subject to the constraint yields the following system of linear expenditure equations:

$$p_s \bar{q}_s = p_s \gamma_s + (1 - \phi_s + \beta_s \phi_s) a_s + \beta_s \left(G^N + \sum_{k \neq s}^{K} \phi_k a_k - \sum_{j=1}^{s} p_j \gamma_j \right)$$

Where

$$\bar{g} = g_s + g_s^{NF} = g_s + \left(\frac{1}{p_s} \right) [(1 - \phi_s) a_s] \quad \text{And}$$

$$G^N = R = G - A = \sum_{s-1}^{S} p_s g_s + \sum_{k-1}^{K} P_k g_k^{NF} - \sum_{k-1}^{K} \partial_k$$

These equations are then estimated econometrically.

Studies belonging to the second group (i.e., the group with no explicit theoretical set up) looking at categorical fungibility include those by Pack and Pack (1990, 1993), Cashell-Cordo and Craig (1990) and Gupta (1993). Pack and Pack (1990, 1993) for instance, assume that the government under consideration (or a 'collective decision making group') possesses a community indifference curve and is faced by a budget line. Various equations are then posited which represent the demand curves derived from the corresponding optimizing decisions. For the Dominican Republic (Pack and Pack, 1993) used the following set of equations:

$$D_{i,t} = f(GDP_t, FA_{i,t}, OFA_{i,t}, DUM)$$

$$FI_t = f(GDP_t, FAT_i, DUM)$$

$$C_t = f(GDP_t, FAT_i, DUM) \text{ And} \qquad \textbf{(3.4)}$$

$$R_t = f(GDP_t, FAT_i, DUM)$$

Where D_i denotes various categories of public development expenditures(i.e., typically include expenditure on such items as health and education, agriculture, infrastructure, and transport),

FI denotes financial and indirect investment (including transfers to state enterprises), *C* denotes total public current expenditure, *R* denotes total own source revenues (excluding aid), *GDP* is current price gross domestic product, FA_i is categorical foreign aid to expenditure category *i*, OFA_i is foreign aid to other expenditure categories, *FAT* is total foreign aid and *DUM* is a dummy variable capturing the presence of a structural adjustment program. Each of the equations in (3.4) is linked by and must satisfy the following budget constraint:

$$D_{i,t} + FI_t + C_t + DS_t = R_t + FAT_t + DEF_t$$

Where, DEF is the size of the deficit (or surplus) and *DS* is debt service, which is assumed to be exogenous. Recognizing this link, and the joint determination of D_i, *FI*, *C*, FA_i and *R*, Pack and Pack (1993) estimate equations (3.4) simultaneously using the seemingly unrelated regressions (SUR) approach (see McGillivray and Morrissey, 2000&2001and Osei et al , 2003 for an elaborated discussion).

3.2.2 Empirical approach and findings

Khilji and Zampelli (1991) using time series data, analyzed the fungiblity of US aid for the period 1960-86 to Pakistan, this study estimated a single system of equation containing three equations, using the full information maximum likelihood (FIML) approach. Khilji and Zampelli (1994) followed the same approach as they did in their 1991 study, but used cross-country data for eight aid recipients. Feyzioglu *et al*. (1998) ,rather than estimating a single system of equation ,a relatively large number of equations(36 equations) were estimated using cross-country data, for 14 aid recipients for the period 1971-80. Twenty-six of these equations were estimated individually using ordinary least squares (OLS) and 10 jointly using the generalized methods of moments (GMM) technique. Swaroop *et al.* (2000) followed a similar approach with Feyzioglu *et al*. (1998), and estimated 20 equations individually using OLS and

four equations simultaneously using two-stage least squares (2SLS), but using 1970-95 time series data for India.

A selection of results is shown in Table 2.1 as the table below demonstrates, the empirical evidence on the fungiblity of aid is mixed .Those reported by Pack and Pack (1990) for and Gupta (1993) for India shows that aid flows in these countries seem to increase developmental expenditure, which is of course more than proportionally, while the evidence on fall of revenue is very little. However, Pack and Pack (1993) and Khilji and Zampeli (1991) show that aid is highly fungible and has a negative impact on domestic revenues. Moreover, Pack and Pack (1993) for the Dominican Republic and Swaroop et al (2000) for India give evidence of a negative or insignificant impact of aid on developmental expenditures. Cashel-Cordo and Craig (1990) show a surprisingly large increase in domestic revenue (as well as total expenditure), while Feyzioglu et al (1998) presents a negative fungiblity coefficient. Never less as pointed out by McGillivray and Morrissey (2000), there are some atypical results, which cast some doubt on the reliability and robustness of this approach.

Table 3.1 Results of Selected 'Categorical Fungibility' Studies

		Incremental Impact of Aid on:							
Study	***Sample***	***Extent Of Fung***	***Domest. Rev.***	***Total Exp.***	***Devel. Exp.***	***Non-Devel Exp.***	***Health& Edu.Exp.***	***Inve. Exp.***	***Cons. Exp.***
Swaroop et al. (2000)	*India*	-	*0.00*	*0.00*	*0.00*	*0.90*	*0.00*	*0.00*	-
Feyzioglu et al. (1998)	*14 LDCs*	*-0.57*	-	*0.95*	*0.23*	-	*0.13*	*0.29*	*0.72*
Pack & Pack (1993)	*Dominicn Republic*	*0.79*	*-0.39*	*-0.27*	*-0.05*	*-0.31*	*0.002*	-	*0.08*
Gupta (1993)	*India*	*0.04*	*0.01*	*1.69*	*0.96*	*0.73*	-	-	-
Khilji & Zampelli(1991	*Pakistan*	*1.00*	*-0.01*	*0.26*	-	*0.74*	-	-	-
Cashel-Cordo & Craig (1990)	*46 LDCs*	-	*10.36**	*12.82**	-	-	-	-	-
		-	*4.25***	*-2.79***	-	-	-	-	-
Pack & Pack (1990)	*Indonesia*	*0.00*	*0.29*	*1.37*	*1.37*	*0.00*	*0.19*	-	*0.00*

Obs: - not reported (or cannot be inferred);* *African countries;* non-African countries
Source: McGillivray and Morrissey (2001)

To sum up, given the variation in results, there are few obvious conclusions from the fungibility literature. Clearly, aid is used in a fungible manner, although one cannot make any general comment regarding the extent of fungibility. Not only do the results vary (from zero in Indonesia to complete fungibility in Pakistan) but it is also true that in none of these studies is it known with any great precision how much aid was actually intended to finance specific types of spending. As shown in Table 3.1, the studies also imply mixed conclusions regarding the incremental impact of aid on spending: in some cases total spending increases by more than the amount of aid, and often development spending increases by more (or falls by less) than non-developmental spending. As argued by McGillivray and Morrissey (2001), some unwarranted conclusions have been drawn, notably that fungibility 'helps explain why large amounts of aid have had no lasting effect in highly distorted environments' (World Bank, 1998). Aid ineffectiveness is as likely to be due to low productivity of aid-financed investments as to aid being diverted to unintended uses. What the literature does suggest is that donors would be rather naïve if they tried to target aid accurately to specific expenditures, a point recognized in World Bank (1998). This does not mean that donors cannot influence how aid is used, rather that the influence will be less than complete (McGillivray and Morrissey, 2000a).

3.2.3 Limitations

Unfortunately, the available studies are subject to a number of limitations. Some of these studies (namely Feyzioglu, 1998) relay on cross section data, not accounting for countries specifities. This is an important issue since the dynamic response to a surge of aid is likely to be different even for countries with a similar degree of economic development and political structures (Martins, 2007). Most importantly, the fundamental deficiency of the categorical fungibility studies as noted by McGillivray and Morrissey (2001) , is that fungiblity studies are restricted to the observation of the impact of aid on the composition of government spending, diverting attention from the more fundamental issue, which is the broader fiscal impacts of aid

over time, such as on tax effort and borrowing and the interaction of expenditure and revenue variables .(Morrisey et al, 2000 ,and McGillivray and Morrissey ,2000) have also criticized this approach on their econometric methodology as being in appropriate.

3.3 The Fiscal response studies

The fiscal response literature relies on more formal modeling to identify how aid inflows may result in government behavior that undermines the intended growth effects of aid (McGillivray and Morrissey 1999b). Based on the theoretical and empirical methodology adopted, we can classify this strand of the literature in to three. The first group of study is the "traditional" fiscal response study, which uses Heller-type theoretical models to investigate the fiscal impact of aid. A number of studies on this group has appeared following the seminal paper by Heller (1975), including Mosley et al. (1987), Gang and Khan (1991), Binh and McGillivray (1993) and White (1993). Notwithstanding the theoretical and empirical econometric limitation inherent in the "traditional" fiscal response literature, two separate categories of literatures of the fiscal response strand were developed. The "alternative" approach by Alemayehu (1996,2002), and Vector Autoregressive (VAR) models and Vector error correction modeling(VECM), approaches of analyzing the fiscal response of aid on the recipient country ,by Osei et al (2003&2005),Fragrnas and Roberts (2004),Mamanja et al (2005),and Rahman(2005).

3.3.1 The "traditional" fiscal response models

3.3.1.1 Theoretical Framework

The point of departure in these studies is the Heller (1975) theoretical model in which there is a government utility function, where targets have been set for expenditure types (e.g. recurrent and capital), revenue (tax and non-tax) and borrowing (domestic and foreign). The government tries to maximize the utility function to attain these targets, subject to a budget constraint in

which aid inflows have traditionally been included as an exogenous variable (on the ground that aid levels are supply determined) (Osei et al ,2003). Recent specifications of the utility function include aid as an endogenous variable (e.g. Franco-Rodriguez et al., 1998 and McGillivray and Morrissey 1999b)[7] Estimation of the model is performed after deriving reduced form equations from the first order conditions for each endogenous variable (McGillivray and Morrissey, 2001)

Mosley *et al.* (1987) and Gang and Khan (1991), picking-up on an earlier paper by Heller (1975) built a model of the public sector fiscal response to foreign aid inflows. The Heller (1975) approach is predicated on the observation that a basic task facing public sector decision-makers in all countries is to allocate revenue among various expenditure categories subject to budget constraints. To keep the exposition simple we can distinguish two categories of public expenditure: recurrent expenditure or government consumption (G) and capital expenditure or public sector investment (I_g). Government revenue is obtained from domestic sources in the forms of taxation and other recurrent revenue (T) and borrowing (B). In these models, aid (A) is treated as exogenous; aid is an external source of revenue that enters the budget constraint. The utility function of public sector decision-makers can be represented as:

$$U = U\left(I_{g,} G, T, B\right) \qquad \textbf{(3.5)}$$

Public sector policymakers are assumed to act in a rational, utility-maximizing manner. In the standard approach, contributors have assumed that governments set targets for various expenditure headings and set revenue targets for tax and borrowing. Governments maximize their utility by attaining these revenue and expenditure targets (McGillivray and Morrissey, 2000).

[7] Including aid as an endogenous variable is based on the premise that, once donors have committed the aid money, recipients can in practice determine actual disbursements (total and among different expenditure types) (Franco-Rodriguez et al., 1998)

Following Mosley *et al* (1987)[8] and Binh and McGillivray (1993)[9], the utility function in (3.5) can be represented as a quadratic loss function:

$$U = \alpha_o - \frac{\alpha_1}{2}\left(I_g - I_g *\right)^2 - \frac{\alpha_2}{2}\left(G - G*\right)^2 - \frac{\alpha_3}{2}\left(T - T*\right)^2 \frac{\alpha_4}{2}\left(B - B*\right)^2 \qquad \textbf{(3.6)}$$

Where the asterisks denote exogenous target levels of the endogenous variables and $\alpha_i > 0$ for *i* = 1... 4. It is clear from (3.6) that government maximizes its utility if it achieves all targets, the maximum unconstrained value being α_o. Also, as $\alpha_i > 0$ the principle of diminishing marginal utility is ensured for all levels of I_g, G, T and B .What the government now wants to do is maximize U subject to the budget constraint that expenditures cannot exceed (all) revenues. In the standard Heller-type analysis the utility function given by equation (3.6) is maximized subject to the following constraints:

$$I_g = (1 - \rho_1)T + (1 - \rho_2)A + B \qquad \textbf{(3.7)}$$

$$G = \rho_1 T + \rho_2 A \qquad \textbf{(3.8)}$$

Where (1 - ρ_1) represents savings from the recurrent budget and ρ_2 represents the proportion of aid allocated to consumption spending. Equations ((3.7) and (3.8) are of course a decomposition of the overall public sector budgetary constraint:

$$I_g + G = T + A + B \qquad \textbf{(3.9)}$$

Standard traditional fiscal response studies maximized (3.6) subject to (3.7) and (3.8). There are two significant problems with this approach. The first is the interpretation given to ρ_2, which is taken to represent the extent of fungibility of aid. In other words, it is implicitly assumed that donors grant aid for investment purposes only (and that all investment

[8] Mosley (1987) adopts the core of Heller's model but includes production and investment functions to explore impact of the government response on the economy.

[9] Binh and McGillivray (1993), eliminated the linear term of the basic Heller (1975) model (see Alemayehu; 1996, 2000).

expenditures are captured in I_g) hence any aid allocated to G (proportion ρ_2) is an *ex post* measure of fungibility (i.e., $\rho_2 = 0$ *ex ante*). As there are elements of G which donors would be willing to support, notably various social sector expenditures, $\rho_2 > 0$ *ex ante* and the estimated value of ρ_2 is a measure of maximum fungibility. The second problem is that this representation over-constrains the model, not necessarily allowing the government to reach α_0 even in the case where aid revenues are sufficient to meet all targets. The problem arises because although total revenue may be sufficient to meet (3.9), the α's constrains allocation so that specific expenditure targets in (3.6) cannot be met. One possible solution is to use a single budget constraint like that in equation (3.9), which will always ensure that the model can attain α_0 when revenues are sufficient to meet each target. This solution does, however, result in intuitively unrealistic structural equations (McGillivray, 2000&Osei et al, 2003).

Gang and Khan (1991), unlike Mosley *et al* (1987) whose regressions were in the aid growth tradition, actually estimated the model, using time series data for India. This work has stimulated a debate on the appropriate basis on which to model public sector behavior in the presence of aid inflows (Binh and McGillivray, 1993; Gang and Khan, 1993, 1994, 1999; Khan, 1994; White, 1994; McGillivray, 1999). Recent studies indigenize aid (Franco-Rodriguez *et al*, 1998; McGillivray and Ahmed, 1999; Martins, 2007): governments have a target for aid revenue, and this expected revenue is incorporated into their fiscal planning. That is, when determining revenue and expenditure allocations, anticipated aid revenue is taken into account. Making aid endogenous does not require the assumption that recipients have control over the aid they are allocated by donors; instead it requires that they have effective control over the amount that is actually spent. The models with endogenous aid overcome many of the problems inherent in the standard fiscal response models (those earlier papers with exogenous

aid). One representative model of this category is Franco-Rodriguez *et al* (1998) where the loss function (3.6) is replaced by:

$$U = \alpha_0 - \frac{\alpha_1}{2}\left(I_g - I_g *\right)^2 - \frac{\alpha_2}{2}\left(G - G*\right)^2 - \frac{\alpha_3}{2}\left(T - T*\right)^2 - \frac{\alpha_4}{2}\left(A - A*\right)^2 - \frac{\alpha_5}{2}\left(B - B*\right)^2 \qquad \textbf{(3.10)}$$

The specification in (3.10) differs from standard traditional fiscal response models by treating aid as a choice variable for the recipient, and hence endogenous. The general justification for treating aid as exogenous from the perspective of recipients as argued by Franco-Rodriguez *et al* (1998) is that the level is determined by donors purely on the basis of supply-side criteria. In practice, however, donors commit a certain amount of aid to recipients each year, and it is ultimately up to recipients to determine how much of that commitment is disbursed (actually spent) in the year. Recipients do have large degrees of choice over the amount disbursed, and hence allocated among expenditure categories. Consequently, it is appropriate to treat disbursed aid as an endogenous variable. According to McGillivray &Morssey (2001) and Osei et al (2003), given this reasoning, A is disbursements while the target A^* can be represented by commitments. Under-spending an aid commitment in any given year is undesirable as it implies an inability to utilize all aid (limited absorptive capacity) and may result in decreased commitments in subsequent years. Overspending is also undesirable as, in practice, if disbursements exceed commitments it means either delayed spending of past commitments (suggesting limited absorptive capacity) or, more often, that emergency aid was granted during the year (thus, it is a proxy for an adverse shock such as famine) (McGillivray &Morssey, 2000&2001 and Osei et al, 2003).In principle, (3.10) is maximized subject to the constraints (3.7) and (3.8) with the attendant problems outlined above. One possible option may be to maximize (3.10) subject to (3.7).However, (3.7) alone implies no constraints on how revenues are allocated thus implicitly aid is completely fungible; this may not be a realistic representation of public sector fiscal behavior. Public sector fiscal decisions are subject to

pressures from a number of quarters: politicians, pressure groups and donors all seek to influence the allocation of revenues (and electoral considerations will be important if democratic institutions are effective) (McGillivray &Morssey, 2000&2001 and Osei et al ,2003). These pressures are likely to culminate in outcomes which are sub-optimal in terms of the government's own preferences. Such constraints on public sector fiscal behavior can be incorporated by replacing (3.7) and (3.8) with:

$$G \leq \rho_1 T + \rho_2 A + \rho_3 B \qquad \textbf{(3.11)}$$

The rationale for the inequality is that there are *external* constraints that limit the manner in which the public sector in developing countries allocates revenues. The actions of donors or domestic interests cause the values of the ρs in (3.11) to be imposed on those involved in setting targets and allocating revenue, with there being no guarantee that targets can be met even though revenues may satisfy (3.9) (McGillivray &Morssey, 2000&2001 and Osei et al ,2003). In other words, on the assumption that (3.11) is binding (the possible value of *G* is upper bound), these external constraints prevent the attainment of α_o (because at least one expenditure target cannot be met). The analysis of Franco-Rodriguez *et al* (1998) is premised on this assumption. If (3.11) is not binding the government is not prevented from reaching specific expenditure targets, utility is maximized subject to (3.9) only and the government can attain α_o if revenues are sufficient(McGillivray &Morssey, 2000&2001 and Osei et al ,2003).

In sum, the fiscal response model presumes governments to set revenue and expenditure targets, and to attempt to raise and allocate the revenues required to meet these targets so as to maximize utility. Aid, like tax and borrowing, is treated as one of the forms of revenue. If for some reason they fail to raise adequate revenue, for example a fall in commodity prices reduces export tax revenue, then clearly utility is not maximized. Similarly, if their discretion

to allocate alternative revenues across different expenditures is constrained, such that (3.11) is binding, utility will not be maximized (more strictly, in both cases, there is constrained maximization and α_o is not attained) (McGillivray &Morssey, 2000&2001; Osei et al, 2003).

3.3.1.2 Findings and estimation problems

Heller (1975) estimated the fiscal response model using two-stage least squares (2SLS) and cross-section data. This was appropriate to the extent that the equations contained endogenous regressors. Subsequent applications use time series data and the more efficient three-stage least squares (3SLS) method, which recognizes cross-equation error term correlations and accommodates the cross equation restrictions. On the other hand, 3SLS estimation can pose degrees of freedom problems by requiring more data points. This is, of course, a tremendous problem for empirical research on developing countries as time series are inevitably quite short (and of questionable quality). The shortness of many time series also leads one to question seriously the results of a number of fiscal response studies. Many studies report estimates of structural equations only and base all conclusions regarding the impact of aid on these estimates. However, the parameters of these equations show direct effects only and ignore feedback effects operating within the entire system of structural equations. Total (direct and indirect) effects are shown by reduced form parameters obtained by solving the system for each endogenous variable. White (1994) makes both points with respect to Gang and Khan (1991) and McGillivray (1994) makes the second with respect to Khan and Hoshino (1992). In both cases rather different interpretations of the impact of aid were drawn, than in the original studies, given that the direct impacts were quite different to the total impacts (Osei at al, 2003).

There are two other econometric problems with applications of Heller-type models. The first concerns the estimates of the ρ s. Those reported by a number of studies are not within the positive range of zero to unity. For example, Gang and Khan (1991) report a ρ_1 Of 1.08 and Heller (1975) reports a ρ_2 of -0.15 (although the estimate may not be significantly different from zero). The interpretation given to a negative ρ is that it indicates that the relevant revenue has pulled revenue from another category out of the consumption budget. The interpretation given to a value greater than one is that the corresponding revenue has pulled funds out of the investment budget (. Yet these interpretations would seem to be in error: one cannot allocate more than 100 percent of given revenue to some activity, nor can one allocate a negative proportion of some revenue to a given activity (McGillivray and Morrissey, 2000. This is not to say that a category of revenue cannot pull other funds away from another activity. For example, it is often the) case that recipients are required to supplement aid money with their own funds. But the effect of this on the particular expenditure category would be observed from a combination of structural parameters and not a single ρ. Of course, the studies would have not drawn such interpretations had they in estimation sought to restrict the relevant parameters within the range of zero and unity (McGillivray and Morrissey, 2000 b).

Arguably the greatest problem studies applying Heller-type models have faced concerns the target variables. None of these studies have used actual values for these variables due to the unavailability of data. Instead they have rather crudely estimated these variables or, in the cases of Heller (1975) and Khan and Hoshino (1992), substituted equations representing them into the structural equations prior to estimation. Both approaches are problematic (Osei at al, 2003).As argued by McGillivray and Morrissey (2001) the second effectively treats the target equations as identities, which is surely unrealistic. It essentially invokes an 'errors in variables' problem if the function fit obtained in estimating the targets is not one, and therefore adversely

affects the accuracy of the estimates of the structural equations. It also requires the estimation of many more parameters and this can be problematic given the typically limited number of time series observations available (McGillivray and Morrissey, 2001).

White (1994) criticizes the first approach on three general grounds. First, there is no guarantee that the resulting targets will be consistent with the constraint equations. Second, if the functional fits of the regressions used to obtain the targets is high and in particular close to one, then each regressor in the structural equations estimation will in effect be regressed on itself. The coefficient attached to each target will thus be either one or close to one and each other coefficient will be insignificant. Third, if these functional fits are low, then it is difficult to meaningfully interpret the fitted values as valid approximations of the targets. White (1994) makes a fourth point specifically with reference to Gang and Khan (1994), but which also applies to a number of other studies. He noted a number of the target equations contain lagged dependent variables. This introduces an implicit dynamic element into Gang and Khan (1994) which is suppressed in estimation.

Franco-Rodriguez *et al.* (1998) try to address some of these problems in their study of Pakistan, using data for 1956-95. In terms of the estimates for the ρs in (3.11), the results suggest that both aid and borrowing are allocated fairly evenly (about 50-50) between consumption and investment, whereas only some 15 per cent of tax revenue is allocated to investment. The direct effects of aid (inferred from the coefficients in the structural equations) suggest that the reduction in *G* more than offsets the reduction in tax revenue, so that less borrowing is needed. However, when the overall effects of aid are traced through the fiscal response model (by interpreting the reduced form coefficients), it appears that aid induces a slight overall increase in investment but a significant decrease in tax revenues that is more than offset by reduced consumption expenditures. Increased borrowing is needed to compensate for

the loss of tax revenue (see table 3.2). In the case of Pakistan, therefore, aid seems to increase investment, but to encourage reduced tax effort and greater borrowing.

Table 3.2 below reports selected results from a number of fiscal response studies. As can be seen from the table, it is difficult to see a consistent pattern of results. The impact of aid on government investment seems surprisingly low, sometimes even negative, as in the case of Rubino(1997),Franco-Rodriguez et al (1998) and McGrillivary and Ahmed (1999).The effect of aid on domestic revenue appears to be either negligible or negative, the latter finding supporting the hypothesis of tax displacement. The result for government consumption and borrowing seem inconclusive

Table 3.2 Selected results of fiscal response studies

Study	***Sample***	***Incremental Impact of Aid on***			
		T	I_g	*G*	*B*
Heller (1975)	*Cross-Section (Africa)*	*-0.4*	*1.1*	*-0.1*	
Gang & Khan (1991)	*India*	*0.0*	*0.0*	*0.0*	
Khan & Hoshiono(1992)	*Cross-section (Asia)*	*1.2*	*1.2*	*0.3*	
Rubino (1997)	*Indonesia*	*-1.4*	*-0.8*	*-0.7*	
Iqbal(1997)	*Pakistan*	*0.0*	*0.0*	*1.6*	
Franco-Rodriguez etal(1998)	*Pakistan* *Direct effects* *Total effects*	 *-2.9* *-3.6*	 *0.1* *0.1*	 *-2.0* *-2.4*	 *-1.1* *0.9*
McGillivray & Ahmed (1999)	*The Philippines*	*-0.1*	*-0.02*	*0.02*	*-1.81*
Franco-Rodriguez (2000)	*Costa Rica* *Direct Effects* *Total effects*	 *1.1* *0.05*	 *-0.36* *-0.02*	 *2.47* *0-07*	 *-1.27* *-0.08*

Source (Mark McGillivray and Oliver Morrissey, 2001)

3.3.1.3 Limitations

Alemayehu (1996, 2002), criticized the traditional fiscal response literature on four grounds. One the decision framework of utility maximization used in these studies is not only inconsistent, but also doesn't tally to the stylized facts of most developing countries with

regard to how decisions about financing are actually made. The other relates to the econometric methodology employed in these studies. According to Alemayehu (1996, 2002), the econometric methodology employed in these studies is extremely weak. Specifically, most series haven't been tested for stationarity assumption and hence suffer from the problem of spurious regression. Third, the tax variable used in these literatures relates to aggregate tax. Disaggregating tax variables into different categories yields quite different result, as it can be seen from his findings. Finally, problems of restricted sample size are also major limitations (Alemayehu 1996, 2002).

As noted by McGillivray and Morrissey (2001), fiscal response models are notoriously difficult to estimate, and highly sensitive to (and demanding of) the quality of the data. Frequently, as identified above, studies yield inconsistent estimates of ρ's and rarely can the underlying α's be recovered.

Franco- Rodriguez (2000) noted that, one inherent empirical problem in the traditional fiscal response models is that, it is necessary to estimate the targets, but there is no accepted theory regarding how governments form revenue and expenditure targets. Persson and Tabellini (2000) provide a range of contending models applicable to multi-party democracies, and there is no solid basis to accept any one (although none are actually inconsistent with the loss function representation provided in the fiscal response models). In an ideal world it may be possible to trawl government plans and budgets to obtain stated targets, but in practice this is not possible and target values are estimated econometrically, normally using actual values in some way (Franco- Rodriguez, 2000)

Another problem mentioned by McGillivray and Morrissey (2001) is that the structural equations are typically estimated using nonlinear least squares, which is not very robust. A third problem lies in the theoretical framework: a loss function such as (3.6) may not be a good

representation of government behavior (and is not directly derived from a utility optimizing framework). This latter problem is exacerbated as the targets are often estimated in an *ad hoc* manner (McGillivray and Morrissey, 2001).

Perhaps the most important problem as noted by Osei(2003), and probably also the most insoluble, is that the behavioral relationship being estimated is assumed fixed over the period. In practice, we would expect the impact of aid on fiscal behavior to change over time. Indeed, the rationale for attaching policy reform conditions to aid is to alter behavioral responses (Osei, 2003). Addison and Osei (2000) provide evidence of a fiscal-electoral cycle emerging in Ghana; to the extent that a country 'democratizes' during the period of study, one should anticipate a change in the behavioral response to aid. In estimating an impulse response function for Ghana, Osei (2001) finds that aid is associated with a reduction in domestic borrowing, consistent with donor admonitions for stricter fiscal management.

Osei (2001) also noted that, in econometric terms, one would expect structural breaks in many, if not all, of the series in the simultaneous equation framework. Furthermore, the way in which series co-move will change. However, given the problems inherent in estimating fiscal response identified above, it would not be possible to address these problems (Osei 2001).

3.3.2 The "alternative" approach

3.3.2.1 Theoretical framework

Notwithstanding the theoretical, econometric limitation inherent in the traditional fiscal response model, Alemayehu (1996&2002), developed an alternative approach based on the stylized facts in developing countries, typically Africa, and came up with the view that policy makers in these countries decide their ways of financing the desired levels of expenditures recursively, which moves from the less costly to high costly means. Alemayehu argued that,

policy makers first set 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 by levying taxes) and finally, if the desired level of expenditure cannot be financed by the two menses mentioned before, by resorting to deficit financing or expenditure reduction, which involves high political cost. Alemayehu (1996, 2002) theoretical model has three behavioral equations which focus on two types of taxes (direct and indirect) and government current expenditure

Direct tax (T_d) equation is set as a function of economic activity (Q) and capital inflow (F). This function in log-log form is given by

$$\ln T_d = \alpha_1 + \beta_{11} \ln Q + \beta_{12} \ln F \quad \text{Or} \qquad (2.12)$$

$$T_d = AQ^{\beta_{11}} F^{\beta_{12}} \quad \text{Where: } \alpha_1 = \ln A \text{ and } \beta_{11} > 0 \;\; ; \;\; \beta_{12} < 0$$

By increasing the tax base, economic activity (Q) is believed to have a positive impact upon tax revenue.

The second equation in Alemayehu (1996, 2002) is the indirect tax function which is assumed to be, in most African Countries, closely related with the level of external economic activity, and specifically to the level of exports (X) and imports (M). The level of these taxes is also assumed to be directly related to private consumption expenditure (C_p), since such taxes are usually imposed on privately consumed commodities. Finally, foreign inflows are also allowed to affect this type of taxation (Alemayehu, 1996, 2002).

Mathematically it is given as

$$\ln T_i = \alpha_2 + \beta_{21} \ln C_p + \beta_{22} \ln(X + M) + \beta_{23} \ln F$$

$$\text{Where: } \beta_{21} > 0 \;\; ; \;\; \beta_{22} > 0 \quad ; \;\; \beta_{23} < 0 \qquad (3.13)$$

Third behavioral equation in Alemayehu's (1996, 2002) alternative approach is the recurrent side of government expenditure, which is assumed to be positively related to total revenue (T) and foreign inflows (F). It is also specified to be positively affected by external interest payments on both concessional (i_{w*}) and nonconcessional (i_w) loans. He also allowed previous patterns of expenditures to affect current period spending patterns in order to portray the persistence of previous patterns of expenditure (Alemayehu's (1996, 2002)

$$\ln G = \alpha_1 + \beta_{31} \ln T + \beta_{32} \ln F + \beta_{33} \ln i_{w*} + \beta_{34} \ln i_w + \ln G_{t-1} \qquad (3.14)$$

Where: $\beta_{3i} > 0$; for $i = 1...4$

These three behavioral equations (3.12)–(3.14) are then closed by a public deficit (DEF) equation which equates the difference between government total expenditure (government current expenditure, G, and government investment, I_g) and total revenue (which is the sum of total tax revenue, $T_d + T_i$, other government revenue, T_o, borrowing from domestic banks Z_b, and resource transfer from the private sector, Z_p) with the total capital inflow. The last two items, Z_b and Z_p , are balancing items that could be derived by subtracting public saving, current revenue minus current expenditure, and foreign savings, F_g , of the government from public investment, I_g..This closure is given as equation (3.15).

$$Z = Z_b + Z_g = G + I_g - (T_d + T_i + T_O + F) \qquad (3.15)$$

In his study, Alemayhu (1996, 2002) tried to address some of the limitations of the traditional fiscal response literature. One of his contributions is disaggregating the tax variable into two, which all other 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 inflow but also the indirect effects coming through changes in income. He has also addressed the econometric side of the problem of the traditional fiscal response studies, like

non stationarity of the series and spurious regression by applying frontier econometric techniques (error correction modeling)

3.3.2.2 Empirical approach and findings

Alemayheu (1996,2002) using his alternative approach, analyzed the fiscal response behavior of recipient countries in North Africa (NA), East and South Africa and Western and Central Africa taking pooled time series and cross country data for the period 1970-90.He estimated three equations(see equation which attempt to capture the recipients fiscal response to external finance. His empirical finding show that (a) the effects of foreign capital inflows on taxes and consumption expenditure differ across regions ,nature of taxes and types of inflows.(b) although statically insignificant ,in all the regions of Africa ,capital inflow has got a negative coefficient in the direct tax equation showing that inflows tend to reduce direct tax.(c) regarding the indirect taxes, he also found a negative coefficient for the foreign capital inflows, but it is statically insignificant. While he also found that foreign capital inflow have a positive impact on government expenditure.

3.3.2.3 Limitations

However, Alemayhu (1996, 2002) isn't without limitations. (a) His study was limited on its expenditure side. He was limited to the analysis of government consumption leaving aside government capital expenditures. Given the importance of government capital expenditures as the main channel through which foreign inflows affect output growth, he should have also dealt with the problem of capital expenditures of the government. (b) strictly speaking, the recursive nature of the model specified by Alemayhu (1996, 2002) can be viewed as minimization of cost involved with the alternative sources of financing expenditure targets,

and hence compatible with the utility maximization specification used in the earlier fiscal response literatures. (c) The fact that his study was based on the pooled data of different African countries, drawing valid conclusions about a single country from such result is difficult.

3.3.3 The VARs approach

These models arose out of the criticism regarding the strong assumptions inherent in the traditional fiscal response models. They depart from the utility maximization assumption by applying techniques developed in the macro econometrics literature to estimate the dynamic structural relationship between aid and fiscal aggregates, rather than estimating the underlying structural form. In practice they use vector autoregressive (VAR) methods to estimate an impulse response function in order to simulate the dynamic effect of aid on fiscal aggregates (Martins, 2007).Vector autoregressive process proposes estimation of reduced forms than a complete structure. Since the traditional fiscal response literatures don't intend to investigate the dynamic impact of aid on government budget constraint, the reduced form is taken to be sufficient for fiscal policy studies. The main strength of the VAR is that it doesn't require the existence or estimates of unknown targets .Moreover Vector autoregressive process propose estimation of reduced forms than a complete structure. Since the traditional fiscal response literatures don't intend to investigate the dynamic impact of aid on government budget constraint, this reduced form is sufficient for fiscal policy studies. The main strength of the VAR is that it doesn't require the existence or estimates of unknown targets .Moreover, "exogeneity "assumptions can be tested using data and therefore, there is no need to impose "prior assumptions". Finally it can be applied to simulate the effect of aid injection under

impulse response analysis. Most importantly VAR provides the traceable framework to study the linkages of aid through various fiscal variables (Rahman, 2005)

3.3.3.1 Empirical findings

Osei et al (2003,2005), in his study of fiscal impact of aid in Ghana using a VAR analysis , suggested that aid to Ghana doesn't have a direct impact on the volume of government spending,but is treated as a substitute for domestic borrowing. Government spending does rise significantly following aid, but this is principally due to an indirect effect arising from higher tax revenue associated with aid inflows. Hence aid to Ghana has tended to be associated with reduced domestic borrowing and increased tax effort.

Fragernas and Roberts (2004) analyzed the fiscal response to aid for three African countries (Malawi, Uganda and Zambia) using the vector autoregressive approach. These results are presented in table 3.3 below.

Table 3.3, Fiscal impact of aid from Fragernas and Roberts (2004)

Impact of the aid variable on		*Development Budget*	*Recurrent Budget*	*Domestic Revenue*	*Domestic Borrowing*
Malawi	*Grants*	+ +	- -	+	- -
	Foreign Loans	+	*?*	+	- -
	ODA	+ +	- -	+	- -
Uganda	*Grants*	+ +	+	+	*0*
	Foreign Loans	+ +	+ +	+	*0*
	ODA			+	*0*
Zambia	*Grants*	+ +	+	- -	+
	Foreign Loans	+	+	- -	*0*
	ODA	+ +	+	- -	+

++ Strongly positive; + moderately positive; ? Ambiguous; 0 insignificant; - moderately negative; - - strongly negative
(Source: Fragernas and Roberts, 2004)

As the table above shows, foreign aid flows seem to have a strong positive correlation with the development budget of the three countries .the other fiscal impact vary according to the country under analysis. in Zambia ,aid inflows displace tax revenues ,have a moderately

positive impact on the recurrent budget and are associated with higher levels of domestic borrowing .in Malawi .aid is correlated with a lower recurrent budget and consequently with a lower domestic borrowing. Finally, in Uganda, aid raises both development and recurrent spending, but has only a negligible impact on domestic borrowing.

Mamanja et al (2005) analyzed aid, growth and fiscal aggregates using a VAR framework for Kenya. This study finds that grants appear to have a positive effect on long run growth while loans seem to substitutes for taxes and finance fiscal deficits, hence having a negative influence on growth. Government spending is found to have a positive long run influence on growth, while tax revenue has no significant direct effect (but might have an indirect an indirect impact through expenditure).the study concluded that aid to Kenya could be more effective if given in the form of grants and associated with fiscal discipline.

Rhaman (2005) also analyzed the fiscal impact of aid in Sri Lanka using a vector autoregressive approach. The study found that aid actually increased total expenditure. The short run effect of aid on tax revenue seems ambiguous and statically insignificant. Overall, aid encourages tax effort in the long run. It is also found that "aid illusions" has little influence on capital expenditure, which increased more than proportion of aid over the years. Finally it is also found that there is high positive correlation between aid and current expenditure.

In conclusion, it is difficult to identify a broad consensus about the impact of aid on public fiscal accounts. The empirical evidence and the theoretical predictions relating to the impact of foreign aid on fiscal variables are mixed. The results found tend to be country specific either because economic circumstances are different or simply because governments behave differently. It is also true that the results vary based on the specific type of empirical econometrics applied.

3.4 Ethiopian studies

Alemayhu and Befekadu (1998) analyzed the fiscal response to external finance in Ethiopia, using the alternative approach developed by Alemayehu (1996,).The authors found that, capital inflows in Ethiopia found to have their hypothesized relationship. The aid coefficient of the government revenue equation is not statically significant although the expenditure equations show statically significant coefficients with respect to aid. One of the limitations of this study is, it only concentrates on the recurrent expenditure side of the government. Once again the study can be criticized on the grounds that, most aid modalities have different impacts on the government accounts. Even a crude dichotomy of aid into grant and loan has different impacts. In the study, the authors used a non disaggregated data, which may hamper the quality of their findings.

The study by Daniel's (1998) was based on the model develop by Alemayehu (1996) as an alternative approach of the fiscal response to external finance. Since the variables are non stationary at levels, Daniel estimated the first difference of the variables .Daniel's (1998) results are similar to the result of Alemayehu (1996,) found for some African countries. The result showed that foreign financial flows have a negative impact on both direct and indirect taxes and a positive and strong impact on government expenditures (Daniel, 1998 cited in Abera, 2004).

Aberra (2004) also made a study on fiscal response to external finance recognizing the role of public sector on aid effectiveness and 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 model of Alemayehu (2002).the result from the neoclassical approach shows

that loans and grants from multilateral sources are pro –investments while loans and grants from bilateral sources are pro-consumption ,and have zero impact on domestic revenue. The result from non-neoclassical approach reveals that aid positively affect government investment and has a 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.

Martins (2007) used the basic model presented in Mavrotas and Outtara (2006) and McGillivray and Ahmed (1999), similar to the aid indigenized fiscal response model to see the fiscal impact of aid in Ethiopia. The model assumes that government decision makers wish to maximize a utility function encompassing variables such as government investment, government consumption, domestic revenue, foreign aid inflows, and domestic borrowing subjected to the traditional government budget constraint (i.e., total government expenditure must equal to total receipts of revenues and borrowing) and an external constraint that influence how governments allocate their resources amongst expenditure items. The model was complimented by co integration analysis. He has estimated two versions of the model .the first specification include a variable representing total aid inflows, while the other disaggregated this variable into aid grants and total loans. The main objective of the model is to examine how an increase in foreign aid inflows affects the recipient country's expenditure decision, namely, the allocation of public resources and borrowing for such purposes, and the extent to which foreign aid produces negative incentives in relation to revenue collection. According to the study foreign aid has a positive impact on public spending, with slight bias towards investment expenditure. The impact on domestic borrowing on both specifications indicates that both aid grants and loans act as a substitute for domestic borrowing. He has also

found that, even though it is not robust across the sample, an increase in aid flows have a negative impact on revenue collection.

In conclusion, even though we cannot make general conclusions from such few studies, we can make some general observation based on the empirical findings of studies made on Ethiopia. In most of the studies, aid has affected the revenue collection effort of the government negatively. It has also increased the expenditures side of the government, even though it is pro-consumption biased in the alternative framework and pro-investment biased in the traditional fiscal response literature approach. Aid also acted as a substitute for domestic borrowing. One can also see from the above empirical findings, the fiscal impact of aid also depends upon the particular econometric technique adopted by ones study, among other factors.

3.4.1 Limitations of Ethiopian Studies

The aforementioned studies conducted on the fiscal response to external finance in Ethiopia are not without limitations. The study by Alemayehu and Befekadu (1998), concentrates only on current expenditure side of the government .As it was discussed in the background chapter, the importance of capital expenditure has become more and more important in the total outlay of the government .Therefore in the recursive decision making framework of policy makers, capital expenditure side of the government should have been incorporated. It is also true that, domestic borrowing has become increasingly important in the decision of financing the budget deficit by the government, which this study overlooked. In addition Alemayehu and Befekadu (1998), concentrated on aggregate aid neglecting the fact that different aid modalities have different impacts on the fiscal variables of the government, as noted in Abera (2004) and Martins (2007), even a crude dichotomy of aid into grant and loan affects the fiscal variables

in different ways. The study can also be criticized for using short time series data. The other studies by Abera (1994) and Daniel (1998), also suffers from neglecting the capital expenditure side of the government and also short time series data.

In Martins' (2007) the limitations mentioned in the traditional fiscal response studies previously may also apply. As Alemyehu (1996, 2002) noted that government may not have the specified loss function, rather the government may decided its' financing decision recursively in the way the "alternative" approach articulates. Even disaggregating the tax variable into direct and indirect may well illustrate the tax impact of foreign aid in Ethiopia, which all the study lamped them together. Martins' (2007) can also be criticized on a number of grounds. (a) Martins (2007) used unrealistic formulation of government behavior in developing countries and the way targets are designed is not clearly specified[10]. (b) As noted by Osie (2003), the behavioral relationship being estimated is assumed to be fixed over the period of study. In practice however, we would expect the impact of aid on fiscal behavior to change over time. (c)The rationale for the use of quadratic loss function is not given. (d)It is also true that such a methodology requires the complete derivation of the structural equations which will make the model notoriously difficult to estimate. (e) As can be seen in Abera (2004), aid may have different impact on direct and indirect taxes, which Martins' (2007) lumped them together. Lastly, the a priori endogenous –exogenous assumption is also questionable, as fiscal variables are very much interrelated and simultaneously determined.

In line with the above criticisms, a fiscal response study which at least minimizes the problems of previous studies is needed. In order to do that, the following paper will try to see the fiscal response to external finance in Ethiopia using VAR/VECM modeling approach.

[10] For elaborated critics of such type of models see Alemayehu (1996 2002).

The VAR/VECM modeling strategy is used mainly

(a) To avoid *a priori* endogenous-exogenous determination of fiscal aggregates as fiscal variables are highly interrelated. Unlike structural models, which make restrictions about the sign and direction of causality between variables and can be difficult to estimate, a standard VAR method treats all variables in the model as endogenous and lets the data to speak for the nature of relationship. (b) To see the short and long run dynamic association of fiscal variables and aid during in the study period. (c)To alleviate the need to speculate about the appropriate specification of the utility/loss function to be maximized /minimized. (d) Unlike the case in the simultaneous equation models, ordinary least square (OLS) estimates for VAR are consistent. (e) The possibility to add exogenous variables (such as dummies for external shocks and policy changes)

The Use of VAR/VECM modeling approach and a longer series of disaggregated data on the tax variable (direct and indirect tax), inflow of aid (grant and loan),expenditure of the government (capital and recurrent), and further incorporation domestic borrowing may be mentioned as the values of this paper.

CHAPTER FOUR

Methodology of the Study

4.1 Theoretical framework

Following Fagernäs and Schurich (2004), in conventional government accounting, the basic budget identity is represented by

$$\mathbf{E - (T + G) = B + F} \qquad (4.1)$$

Where (E) is total expenditure, (T) is domestic revenue, (G) is foreign grants, (B) is domestic financing (domestic borrowing) and (F) is foreign financing (foreign loans). The left side of the identity is the government budget balance after grants, while the right side of the identity is the total financing requirement, which is a combination of domestic and foreign financing.

For the purpose of this study, identity 4.1 can be rearranged as

$$\mathbf{E - T = B + A} \qquad (4.2)$$

Where for simplification aid (A) is the sum of foreign grants (G) and foreign loans (F). (E – T) then becomes the deficit before grants.

While equation 4.2 does not reveal anything about the potential dynamic effects of aid on fiscal aggregates, it allows us to conceptualize the potential static effects. Assuming constant tax revenue, equation 4.2 implies that an increase in aid can be used either for spending purposes by increasing (E), or for financing purposes by reducing domestic borrowing (B), or a combination of both. The effect of aid on borrowing will depend on the net joint effect of aid on spending and domestic revenue. For example, if spending increases by more than the increase in aid, a rise is required in domestic borrowing to finance the deficit (assuming constant tax revenue). There is room for tax revenue to rise with increases in aid, if spending increases by more than aid or domestic borrowing falls. Tax revenue could also fall, however, if spending and domestic borrowing remains unchanged as a result of aid. Increases in aid

would in this case be viewed as an alternative to domestic revenue (Fagernäs and Schurich 2004; Fagernäs and Roberts, 2004)

It should be noted that the effect on taxes is likely not to be immediate and could be indirect, if the rise in taxes arises as a result of aid being spent in a productive, growth-enhancing manner. Secondly, it may often prove difficult to raise tax revenue instantaneously (Fagernäs and Schurich, 2004).

When providing aid, donors usually prefer certain fiscal outcomes to others. If the tax effort is feeble, they would not expect aid to be associated with lower domestic revenue (T), i.e. that aid would discourage tax effort. However, this effect may not be entirely undesirable, when the tax effort is already fairly high, as this may reduce distortions and could crowd-in private investment (Fagernäs and Schurich 2004).

Aid should, however, not perpetuate already high levels of aid dependency by discouraging domestic revenue mobilization efforts. Second, donors would not expect aid to be associated with increased borrowing. This could occur, however, if aid leads to higher than proportional increases in spending. This may happen due to 'aid illusion', a situation where the government misperceives the actual value of the aid inflow, or the spending conditions attached to the inflow (McGillivray and Morrissey, 2000 cited in Fagernäs and Schurich, 2004).This could easily arise in an environment of imperfect information and weak management of public expenditure. One possibility is that the aid on which the government bases its spending plans fails to be disbursed. It is not uncommon for donors to withhold funds at short notice in response to non-compliance with conditionality. If expected aid volumes are higher than the actual disbursements, the government will have to resort to higher domestic borrowing to finance the existing spending plans. Secondly, aid illusion may result if officials implementing expenditure plans disregard the limits set in the plans. Aid illusion may also cut the other way,

with aid inflows turning out to exceed expectations, resulting in the net effect of lower deficits (or, less commonly, higher surpluses). Aid might also be associated with higher borrowing, if aid inflows require matching recurrent spending, leading to larger deficits. A finding that aid leads to a reduction in domestic borrowing could imply effective conditionality, as donor conditionality often requires the aid recipient to reduce the budget deficit (McGillivray and Morrissey, 2001cited in Fagernäs and Schurich, 2004).

It should be noted that domestic borrowing is not necessarily detrimental, if it finances productive investment and initial borrowing levels are not high. The crucial issue is for the government to be in the position to fund both its recurrent and development expenditure needs in a predictable manner and without incurring unsustainable budget deficits that lead to high domestic borrowing, inflation and macroeconomic instability (Fagernäs and Schurich 2004).Government expenditure can enhance growth, for instance via improvements in public services and the provision and maintenance of adequate infrastructure to attract private investment as well as via investments in education and human capital formation. Even though investment spending is usually considered growth-enhancing, consumption spending can be vital as well. Therefore, care is also required in the distinction between the impact of government consumption and investment spending on growth. However, beyond a certain threshold, government consumption can become ineffective and wasteful (Fagernäs and Schurich 2004).

The simplified form of the fiscal account discussed above can be indicative to the potential impact of aid in Ethiopia. From our discussion in chapter two and our static theoretical framework,aid flows over the study period seem to have an inverse relation with that of domestic borrowing, though the significance of domestic borrowing as an item of last resort in deficit financing still remains considerable. It can also be said that aid has affected both kinds

of government spending positively. The aid- tax relation is difficult to be inferred a prior. However we should note that these are only a primary look generalization of the data. As macro variables are interrelated and most are jointly determined, inference at the final stage should be based on statistical evidences, which will be the task of the next chapter.

4.2 Econometric Model[11]

4.2.1 VAR/VECM

Vector autoregressive method has become a very popular tool for econometric analysis in recent years. Much of this popularity is due to the advantage it offers in the analysis of non-stationary data, which characterizes many economic time series. It overcomes some of the problems Fiscal Response Models pose. Specifically, it makes minimal restrictions upon the specification and makes less prone to fragility compared to the simultaneous equation approaches. The 'a theoretical' nature of VAR ensures that the existences of unknown variables are not required and that the 'exogeneity' assumption can be tested (Osie, 2003, 2005).The recent multivariate methods developed by Johansen (1998), Johansen and Juselius(1992) uses the VAR for testing and estimating the (long run) co-integrated relationships among non-stationary variables. The VAR is a reduced from representation for large class of dynamic structural models (Hamilton, 1994). It provides an important framework for analyzing both short and long run relationships through an equilibrium correction model and facilitates dynamic simulation of variables using *Impulse response analysis* (Sims 1980, Lutkepohl and Reimers, 1992). In the present context, we use VAR modeling approach to evaluate the relationship between foreign aid and fiscal aggregates over the period 1961 to 2007.

[11] The discussion on this section is taken from Alemayehu et. al(2007)Harris(1995),Johansson(1998),Johansson and Juselies(1992) ,and, Hamilton(1994)

We start with multivariate autoregressive (AR) model, where z_1 is a vector of *n* potentially endogenous variables. Here z_1 is modeled as an unrestricted vector auto regression (VAR) involving up to K lags and the data generating process in specified in the following way

$$z_t = A_1 z_{t-1} + ... + A_k z_{t-k} + u_1 \qquad u_t \sim IN(0, \sum) \qquad (4.3)$$

Where z_t is (nx1) and each of the A_i is an (nxn) matrix of parameters. Providing the variables in Z_t cointegrate, equation (4.3) can be formulated into VECM form:

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + ... + \Gamma_{k-1} \Delta z_{t-k+1} + \prod z_{t-k} + u_1 \qquad (4.4)$$

Where $\Gamma_i = (I - A_1 - ... - A_i)(i = 1,.....,k-1) and \prod = -(I - A_1 - ..... - A_k)$.

The above specification contains information on both short and long run adjustment to changes in Z_t, via the estimates of $\hat{\Gamma}_i$ and $\hat{\Pi}$, respectively. Provided co integration holds $\Pi = \alpha\beta'$, where α represents the speed of adjustments to disequilibrium and β is a matrix of long run coefficient such that the term $\beta' z_{t-k}$ embedded in (4.5 represents up to (n-1) cointegation relationships in the multivariate model which ensures that the Z_t coverage with their long run stead state solutions. Z_t is assumed to be a vector of non-stationary I(1) variables, which implies all the terms in (4.3) involving Δz_{t-k} are I(0) while Πz_{t-k} must also be stationary for $u_t \sim$ I(0) to be 'white noise'. There are three cases when the requirement $\Pi z_{t-k} \sim$I(0) is met.

First, when all the variables in z_t are stationary, which implies there is no problem of spurious regression and the appropriate modeling strategy is to estimate the standard Sims- type VAR in levels (i.e., equation 4.3).Secondly, when there is no cointegration at all, which means there are no linear combinations of z_t that are *I(0),* and consequently Π is an (nxn) matrix of zeros. In this instance, the appropriate model is a VAR in first differences involving no long run elements.Thirdly, another way for Πz_{t-k} to be I(0) is when there exist up to (n-1) cointegration

relationships $\beta' z_{t-k}$ ~ I(0). In this case, r≤(n-1) cointegration vectors exist in β (i.e., r columns β form r linearly independent combination of the variables in z_t each of which is stationary), together with (n-r) non-stationary vectors (i.e. n-r columns of β form I(l) common trends). Only the co integration vectors of β enters (4.4), otherwise Πz_{t-k} will not be I(0) meaning that the last *n-r* columns of α are effectively zero or insignificantly small. Determining how many r ≤((n-1)Co integrating vectors exist in β is similar to testing which columns of α are zero. Similarly, the rank or the number of r linearly independent columns in Π needs to be determined. If Π has full rank, that is when there are r=n linearly independent columns then the variables in z_t are I(0). On the other hand, if the rank of Π is zero, then there is no co integration relationship. However, the more interesting case is where Π has reduced rank, that is, there exist r ≤ (n-1) co integrating vectors. For the Johansen method of reduced rank regression we can re write (4.4) in the following way

$$\Delta z_t + a\beta' z_{t-k} = \Gamma 1 \Delta_{t-1} + ... + \Gamma_{k-1} \Delta z_{t-k+1} + u_t \qquad (4.5)$$

Equation (4.5) corrects for short run dynamics by ranking out their effects and by regressing Δz_t and z_{t-k} separately on the right hand side of (4.5). So the vectors R_{0t} and R_{kt} are obtained from

$$\Delta z_t = P_1 \Delta z_{t-1} + ... + P_{k-1} \Delta z_{t-k+1} + R_{0t} \qquad (4.6)$$

$$z_{t-k} = T_1 \Delta z_{t-1} + ... + T_{k-1} \Delta z_{t-k+1} + R_{kt} \qquad (4.6)$$

This can then be used to form residual matrices

$$sij = T^{-1} \sum_{i=1}^{T} R_{it} R'_{jt} \qquad \text{i,j = 0,k} \qquad (4.7)$$

The maximum likelihood estimate of β is obtained as the eigenvectors corresponding to be the r largest eigenvalues from solving the following equation:

$$\left| \lambda S_{kk} - S_{K0} S^{-1}{}_{00} S_{0k} \right| = 0 \qquad (4.8)$$

which gives the n eigenvalues $\hat{\lambda}_1 > \hat{\lambda}_2 > ..... > \hat{\lambda}_n$ and corresponding eigenvectors $\hat{V} = (\hat{v}_1 .....\hat{v}_n)$. The r. elements in $\hat{V}$ determines the linear combinations of stationary relationships that can be denoted as the cointegrating vectors, i.e. $\hat{\beta} = (\hat{v}_1 .....\hat{v}_n)$. This is because the eigenvalues are the largest squared canonical correlations between the 'levels' residuals R_{kt} and 'difference' residuals R_{0t}. This way, the estimates of all the distinct $\hat{v}_i z_t (i = 1,.....r)$ combinations of the *I(1)* levels of z_t that produce high correlation with the stationary Δz_t ~I(0) elements in (4.4).

Assuming that there exist other variables in the system that are weakly exogenous and insignificant in the long run co integration space such that we can condition on the set of such *I(0)* variables D_t. The latter will only affect the short run model and so re writing (4.4)

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + ... + \Gamma_k \Delta z_{t-k+1} + \prod z_{t-k} + \Psi D_t + u_t \qquad (4.8)$$

4.2.2 Stationarity and tests of stationarity

The first step of econometric analysis, prior to model estimation, is to analyze the time series properties of the data by estimating whether the fiscal variables used are stationary or not. Time series data needs to be non-stationary in order for there to exist a stationary co integration relationship and there is no problem of spurious regression. A variable is non-Stationary when its mean/variance is time-dependent and there is no long run mean to which the variables coverage. The assumption of the models estimated with ordinary least squares (OLS) method; require the variables to be stationary. If they are non-stationary, they have to be differenced before being included in the model.

The study has used the *Augmented Dickey Fuller* test to establish whether the variables are stationary or non-stationary. The persistence of shocks is very different with an I (1) series, that is difference stationary than I (0) series, that is trend stationary. If a variable contains a unit root, then it is non-stationary. Only when it is combined with other non-stationary series to form a stationary co integration relationship, then regression involving the series cannot imply the existence of a meaningful economic relationship. For example, we consider the following AR (1) model:

$$z_t = \mu + \phi_1 z_{t-1} + u_t$$

Or

$$z_t - z_{t-1} = \mu + u_t$$

When $\phi_1 = 1$ this is the random walk with drift, which is an I (1) series. If $|\phi_1| < 1$, then the series is *I (0)*. Rewriting the last equation with lag operator gives

$$(1 - \phi_1 L) Z_t = \mu + u_t$$

Dividing the term $(1 - \phi_1 L)$ by ϕ_1 gives $([1/\phi_1] - L)$. The root of this equation, is the value of L, denoted L*, which satisfies $([1/\phi_1] - L^*) = 0$. Then the solution for this equation is $L^* = (1/\phi_1)$ and this value is called the root of the equation. If $\phi_1 = 1$ the L* = 1 and the equation has a unit root. In this case the first difference of Y_t is stationary since substituting in for $\phi_1 = 1$ gives $z_t - z_{t-1} = \mu + u_t$ which is stationary. The I(l) series therefore has 1 unit root; where as the I (0) series has no unit roots.

The AR (1) DF model can be extended for the *p* process as follows AR (p):

$$z_t = \phi_1 Z_{t-1} + \phi_2 z_{t-2} + ... + \phi_k z_{t-k} + u_t$$

or

$$\Delta z_t = \phi * Z_{t-1} + \phi_1 \Delta z_{t-1} + \phi_2 \Delta z_{t-2} . + ... + \phi_k \Delta z_{t-k+1} + u_t$$

$$u_t \sim IID(0,\sigma^2)$$

Where $\phi^* = (\phi_1 + \phi_2 + ... + \phi_k) - 1.$ z_t contains a unit root if $\phi^* = 0$ against the alternative $\phi^* < 0.$ In order to test the null hypothesis, the DF t-statistics is calculated $[\phi_1 * / SE(\phi^*)]$, which is compared with critical values. The ADF test involves adding an unknown number of lagged first difference of the independent variable to capture auto correlated omitted variables that would otherwise, by default, enter the error term u_t.

CAPTER FIVE

Model Estimation and Presentation of Results

5.1 Description of the Model and Characteristics of Variables

The empirical estimation of the standard VAR model comprises the variables of the fiscal accounts of the government namely, Domestic borrowing***(DB),***government capital expenditure(GCE) **,**government recurrent expenditure***(GRE),***direct tax***(DTX),***indirect tax***(ITX)*,loan ***(l)***,grant***(g)*** and that of Official Development Assistance***(ODA)*** using annual data over the period 1961to 2007.The log transformation of the variables under study is used through out to exploit its' advantage of correcting skewed distribution and tackling possible hetroscedasticity(See Alemayehu,1996,2002).

Data for all variables were available for the period 1961-2007.Data on ***DB, GCE, GRE, DTX, ITX, L*** and ***G is*** available from the national accounts of the government at ministry of finance and economic development (*MOFED)* and National Bank of Ethiopia *(NBE*), and consistency was checked by triangularization of the data with the data used by *MOFED m*acro model developed by Alemayehu et al (2006) , by the data consistency framework outlined in chapter 4(as given in equation 4.2) and the *CD-ROM* of Ethiopian Economic Association. Data on ***ODA*** is from, Development Assistance Committee *(DAC)* of the Organization of Economic Cooperation and Development *(OECD)* online data base.

In the study three separate models are estimated to identify the fiscal response to external official inflows in Ethiopia during 1961 to 2007, each using a separate VAR/VECM and impulse response analysis. All models include the variables of the fiscal aggregates (*DB, GCE, GRE, DTX,* and *ITX*), as reported in government budgetary records. In addition, Model 1 includes foreign loan as recorded in the budget, but omits net foreign grant and ODA. Model

2, on the other hand, includes net foreign grant, but omits loan and ODA. However, aid disbursed outside the budgetary framework can also affect government spending decisions, for instance by lowering expenditure on items funded by non-budgeted aid inflows. Acknowledging this fact model 3 uses *ODA* as the measure for external assistance to capture the impact of aid inflows not recorded in the budget plus the joint effect the two. Modeling the impact of *ODA* may reveal something about the effects of off-budgetary aid on the budget.

Altogether three separate *VEC* models and impulse response functions are estimated to identify the fiscal effects of aid. Apart from *ODA*, the other variables used in the models added with the non tax revenue and external borrowing form a budgetary identity, as presented in equation 4.1 of Chapter 4. As non-tax components of revenue and external borrowing are omitted, and estimation of three separate models; one that includes grants, but omits foreign loans and *ODA*, and the other vice versa, we are not estimating an identity. Estimating grant, loan and *ODA* with fiscal aggregates separately is justified on both ground of saving degrees of freedom ,which otherwise make the *VAR/VECM* estimation easily over parameterized, and avoiding the possibility of estimating an identity which in the case of one co integrating vector including all variables in a *VEC*M renders the error correction term meaningless. There would be no other disequilibrium for the variables to adjust to, except that arising from data discrepancies. For this reason, one of the components of the budget identity is omitted in each model.[12]

Before getting into practical test of co integration, the variables in the study have been tested for the assumption of stationarity (and hence their order of integration) using augmented Dickey Flier (ADF) test. Furthermore to account for the possibility of structural break Phillip Peron (PP) test was conducted using General to Specific Modeling Approach. Accordingly,

[12] The argument for not including grant and loan in the model that contains ODA is to avoid the problem of possible multicollinirity since ODA figure contain the sum of the two read in the government account and off budgetary loan and grant.

both tests proved that all the variables considered in this study are found to be integrated of order one, I (1).

Table5.1 Unit Root Test ***ADF:*** $\Delta Y_t = \alpha + \beta T + \gamma Y_{t-1} + \sum_{i=1}^{p} \delta_t \Delta Y_{t-1}$

Y=variable		*Values for test stastics*	*Criticl Value**	*Lag legth*	*inferene*
lnDB	*Constant,no trend*	*-1.53126*	*-2.97*	*1*	*I(1)*
	Noconstant,no trend	*0.61559*	*-1.95*	*1*	*I(1)*
	Constant + trend	*-3. 00654*	*-3.57*	*1*	*I(1)*
lnGCE	*Constant,no trend*	*0.01684*	*-2.97*	*1*	*I(1)*
	Noconstant,no trend	*3.67132*	*-1.95*	*1*	*I(1)*
	Constant + trend	*-2.74416*	*-3.57*	*1*	*I(1)*
lnGRE	*Constant,no trend*	*-0.32353*	*-2.97*	*1*	*I(1)*
	Noconstant,no trend	*4.12949*	*-1.95*	*1*	*I(1)*
	Constant + trend	*-2.43324*	*-3.57*	*1*	*I(1)*
lnDTX	*Constant,no trend*	*-0.37975*	*-2.97*	*1*	*I(1)*
	Noconstant,no trend	*3.04439*	*-1.95*	*1*	*I(1)*
	Constant + trend	*-2.63475*	*-3.57*	*1*	*I(1)*
lnITX	*Constant,no trend*	*0.26514*	*-2.97*	*1*	*I(1)*
	Noconstant,no trend	*4.38570*	*-1.95*	*1*	*I(1)*
	Constant + trend	*-2.07345*	*-3.57*	*1*	*I(1)*
lnG	*Constant,no trend*	*-0.182727*	*-2.97*	*1*	*I(1)*
	Noconstant,no trend	*1.25981*	*-1.95*	*1*	*I(1)*
	Constant + trend	*-3.00257*	*-3.57*	*1*	*I(1)*
lnL	*Constant,no trend*	*-1.32893*	*-2.97*	*1*	*I(1)*
	Noconstant,no trend	*0.97456*	*-1.95*	*1*	*I(1)*
	Constant + trend	*-3.00509*	*-3.57*	*1*	*I(1)*
lnODA	*Constant,no trend*	*-0.29779*	*-2.97*	*1*	*I(1)*
	Noconstant,no trend	*2.381998*	*-1.95*	*1*	*I(1)*
	Constant + trend	*-3.06393*	*-3.57*	*1*	*I(1)*

Once checked for stationary, normality and is determined for the order of integration, the next step is the determination of the lag to be incorporated in the VAR system. The appropriate lag length (*k*) of the VAR is determined using standard model selection Criteria such as, *sequential*

modified LR test statistic (LR test), Final prediction error(FPE) Akaike Information Criteria (AIC),Schwarz Criteria (SBC)and Hannan-Quinn information criterion(HQ) test statistics .Furthermore when the selection criteria indicate different lag order to include in the VAR , the lag length selection is made on the general consideration of possible signs of auto co relation in case of shorter lags and easily over parameterization which erodes degrees of freedom in the case of longer lags. Adoption of general-to-specific modeling approach points to a *VAR* of order 1 as an adequate representation of the data.

5.2 The Fiscal Response to Loan

The first model in this study is the model which tries to capture the relationship of foreign loan and the fiscal aggregates of the government. Specifically, the variables entering in the model are, log of domestic borrowing *(lnDB),* log of loan *(lnL),* log of direct tax *(lnDTX*) ,log of government capital expenditure *(lnGCE)* ,log of government recurrent expenditure *(lnGRE)* ,and log of indirect tax *(lnITX).*

As noted in Alemayehu et al (2007), Gaussian error terms are very important building blocks for Johansson co integration test. Thus diagnostic tests, specifically tests for autocorrelation, hetroscedacticity and normality of the residuals must be performed before proceeding to the co integration test. Hence tests of autocorrelation using residual serial correlation LM tests and hetroscedasticity tests using White test of hetroscedasticity were conducted. Furthermore normality of the residuals was also checked by examining the skew ness and Kurtosis of their distribution and proved to be significantly normal as can be inferred from the Jarqu Berra test conducted.

Following the Johansen approach to co integration test ,the values of the rank test for both the trace test *(λtrace*) and the maximum egien value test *(λ max)* are used to determine the number of the co integrating vectors in this model. The result of these tests is summarized below in the tables.

Table 5.2 (a) and (b): Johansson Co integration Test of model

(a) Maximum Eigenvalue Test

Hypothesized		*Max-Eigen*	*5 Percent*	*1 Percent*
No. of CE(s)	*Eigenvalue*	*Statistic*	*Critical Value*	*Critical Value*
*None **	*0.637956*	*40.63961*	*39.37*	*45.10*
At most 1	*0.413099*	*21.31594*	*33.46*	*38.77*
At most 2	*0.350284*	*17.24882*	*27.07*	*32.24*
At most 3	*0.199018*	*8.876650*	*20.97*	*25.52*
At most 4	*0.156042*	*6.786078*	*14.07*	*18.63*
At most 5	*0.018348*	*0.740747*	*3.76*	*6.65*

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis (1999) p-values*

The maximum eigen value test starts with the null hypothesis of at most r co integrating vector against the alternative of r+1.The result for maximum eigen value test (table5. 2a) shows that the null of no co integrated vector(r=0) against the alternative (r=1) is rejected at 5% level of significance since the test statistic (*40.63961*) is greater than the 95% critical value (*39.37*) .This shows that there is at least one co integrating vector .The null of $r \leq 1$ against r=2 cannot be rejected implying a unique co integrating vector in our model.

In table (5.2 b) the trace taste of the null hypothesis also reports that there are at most $r \leq 0$ co integrating vector against the alternative of $r \geq 1$. Since the test statistic (*95.60784*) exceeds the 95% critical value (*94.15*) λ trace statistic, it is possible to rejects the null of no co integrated vectors and accept the alternative of one or more co integrating vectors. However the test of the null, $r \leq 1$ against the alternative of $r \geq 2$ cannot reject the null hypothesis, as the test statistic of *(54.96823*) is less than the 95% critical value (*68.52*)

(b) Trace Taste

Hypothesized		*Trace*	*5 Percent*	*1 Percent*
No. of CE(s)	*Eigenvalue*	*Statistic*	*Critical Value*	*Critical Value*
*None **	*0.637956*	*95.60784*	*94.15*	*103.18*
At most 1	*0.413099*	*54.96823*	*68.52*	*76.07*
At most 2	*0.350284*	*33.65230*	*47.21*	*54.46*
At most 3	*0.199018*	*16.40348*	*29.68*	*35.65*
At most 4	*0.156042*	*7.526826*	*15.41*	*20.04*
At most 5	*0.018348*	*0.740747*	*3.76*	*6.65*

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis (1999) p-values*

As can be seen from the table above successive tests can not reject the null also. Hence, this trace taste ensures the existence of only one co integrated vector at the 95% level significance. The Unrestricted beta (ϐ) and adjustment coefficients (α) are given in appendix 1.After normalization on domestic borrowing the single long run relationship is found to be (with t-value in parenthesis)

lnDB +0.21lnL +0.347lnDTX–3.27lnGCE –1.96lnGRE + 4.06lnITX +2.341 =0
[2.45561] [0.79462] [-7.28690] [-3.70193] 6.74438]

Eliminating insignificant variables will result

lnDB +0.21lnL –3.27lnGCE –1.96lnGRE + 4.06lnITX +2.341 =0 (5.1)
[2.45561] [-7.28690] [-3.70193] [6.74438]

The co integrating relation shows, a long run relationship between the variables. The long run estimates suggests that, *citrus paribus* indirect tax, direct tax and foreign loan are negatively related to domestic borrowing. While government capital expenditure and recurrent expenditure seem to have a positive relationship with that of domestic borrowing. As such our long run relation seems to represent a financing item in the government budget constraint. As expected this relationship is consistent with the fiscal identity (equation 4.2 of chapter 4).Since our normalization on domestic borrowing is *ad hock*, we can talk on any relationship that is in

our model[13]. Hence it can be said that in the long run, *citrus paribus,* domestic borrowing, direct and indirect tax have a negative relationship with foreign loan, while both types of expenditures are positively related with that of foreign loan. However at this stage we can not infer the direction of relationship (causality).

In sight into the role played by the variables in the fiscal response model of loan may also be gleaned form the VAR Granger pair causality / block exogeneity tests (reported in table 5.2 (c)) . As can be seen in the table below domestic borrowing tends not to be tends be weakly exogenous and not to cause the other variables. On the other hand loan seems to be weakly exogenous and strongly Granger causes domestic borrowing. In sum, what the above table tells as is that, the variable that is going to adjust for fiscal imbalances is domestic borrowing. This culminates as saying, the long run adjustment coefficient (α) in our VECM, should be significant only for domestic borrowing.

Table 5.2 (c) block exogeneity test[14]

Dependent variable: LNDB			
Exclude	*Chi-sq*	*df*	*Prob.*
LNL	*0.015661*	*1*	*0.9004*
LNDTX	*1.102118*	*1*	*0.2938*
LNGCE	*0.924706*	*1*	*0.3362*
LNGRE	*0.475085*	*1*	*0.4907*
LNITX	*0.848548*	*1*	*0.3570*
All	*20.80294*	*5*	*0.0009*

Backing to our long run relationship, we can give causality content for the interpretation of the coefficients. Since all variables in the model are in logarithmic form, the coefficients will have an elasticity interpretation. A percentage change in foreign loan is associated with a 0.21 percentage change in domestic borrowing. This indicates that domestic borrowing is not elastic

[13] Following the footsteps of Fagernas and schurich (2004) and it can also be verified by normalizing on the loan variable.
[14] Note:a test for block exogeneity is a test for the null of H_0=the variable mentioned at the top of the table is exogenous (here,lnG)If p-value is near to zero for all variables jointly we will reject the null otherwise we reject the alternative

for aid surges in the form of loan. This is not surprising, since most domestic borrowings are performed to finance recurrent spending, while most loans are investment biased in their nature (UNECA, 2002). This last issue can also be seen from our long run relationship, as the coefficient for recurrent expenditure is lower than the capital expenditure when aid surges are I the form of loan. It can also be inferred from normalization on GCE and GRE and comparing the coefficient of loan in the two equations[15].A percent increase in GRE and GCE is associated with a 3.27 &1.96l percentage increase domestic borrowing respectively ,asserting our argument of borrowing is more elastic to recurrent than capital spending. While direct tax is insignificant, a percent increase in indirect tax is associated with a 4 percentage decline in domestic borrowing. This again tallies with the stylize fact of the economy, as the proportion of indirect taxes is higher in the total revenue of the government (see subsection 2.2.1 of chapter 2),a reduction in indirect tax (hence revenue of the government),is likely to cause a higher domestic borrowing

5.2.1 Vector Error Correction Model (VECM) of the Loan Model

Table 5.2.1 shows the results of the unrestricted VECM .There are six endogenous variables. In the table the prefix D of a variable stands for difference.

The coefficients in the error correction model indicates the short run direct ,or *citrus paribus* impacts without taking into account the inter- relationship between the variables (i.e. the indirect impact).Therefore, conclusions on the fiscal impact of loan will be made based on the impulse response analysis ,which capture both the direct and indirect impact. If the coefficient on the lagged error correction term EC (-1) in table 5.2.1 is significant ,that particular variable

[15] Normalization on loan could also explain the fact. i.e lnl + 4.7lnDB + 1.7lnDTX – 9.4lnGRE -15.5lnGCE------=0. As the coefficient for lnGCE is greater than lnGRE, loan is strongly related to GCE than GRE.

reacts to deviations from the long run equilibrium relation occurring in period t-1 according to the relationship identified in the co integrating long run equation.

In the VECM context, the absence of Granger causality requires both the coefficient on the error correction term and the coefficients on the individual explanatory variables to be insignificant (Enders, 1995).Granger causality is a weaker condition than that of exogeneity .In general, variable y doesn't granger cause variable z, if lagged values of y don't explain z. Exogeneity would imply that values of y that are additionally present in the model would also not affect z.

Table 5.2.1 gives short-run dynamic relationships and the full set of short-run speed of adjustment coefficients in the VECM, which relates, for instance, the change in *lndb to* the changes in the variables such as *lnL, lnDTX, lnGRE, lnGCE,lnITX,* and the error term in the lagged periods. Here the lagged difference terms for d*lnL*, d*lnDB*, d*lnGRE*,dlnGCE,dlnDTX and d*lnITX* capture the short-run changes in the corresponding level variables. The statistics in Table 5.2.1 indicate that the short-run dynamic relationship for variables are significant *for dlnL(-1),dlnGCE(-1),dlnITX(–1).*In absolute terms, d*lnDB* is most sensitive with respect to d*lnGRE(-1)* , followed by dlnL(-1)

Table 5.2.1 vector error correction model of the loan model

Explanatory variable	Dependent Variables					
	D(lnDB)	D(lnL)	D(lnDTX)	D(lnGRE)	D(lnGCE)	D(lnITX)
Ec(-1)	-0.4804***	0.486162	- 0.053628	0.015443	0.161635	-0.033113
D(lnDB(-1))	0.05635	0.077956	- 0.004483	0.000375	-0.059609	-0.022073
D(lnL(-1))	- 0.0946**	-0.6443***	- 0.012563	-0.05425***	0.1159***	-0.01917*
D(lnTX(-1))	0.020198	0.289577	0.008303	0.324803	0.355219	0.127371
D(lnGRE(-1))	0.4445***	2.666148	0.112033	0.303283*	0.801668*	0.201656
D(lnGCE(-1))	0.0933**	2.146312	0.053338	0.114783*	0.125683*	0.040864
D(lnITX(-1))	0.04501**	- 4.833734	-0.116393	-0.379930	-0.439010	0.149217
C	0.2587***	0.229874	0.07594***	0.042826	0.071030	0.04959*
DUM	-0.200243	0.023124	0.065301	0.084395*	0.044636	0.028485

****, **,* significant at 1, 5 and 10 %*

Diagonistic tests; White hetroscedasticity test ; p-value (0.4667)
LM test ; p-value (0.9078)
Jarqu Berra ; p-value (0.4667
Schwarz (SIC); 1.408493
Akaike(AIC); 3.941812

This particular relationship suggest in the short-run domestic borrowing is sensitive with respect to L, GRE, GCE, and ITX. Furthermore, where as DB has little effect on other variables, it is much influenced by others. The speeds of adjustment coefficient is significant at 5 percent only in the equations for dlnDB supporting our test of weak exogeneity which indicated DB as an adjusting variable of last resort of budget imbalances. One other interesting result from the above table is that DlnL is largely not influenced by previous values of fiscal variables, while it's lagged value affecting most of them.

In Ethiopia, loan inflows exogeneity can be seen by comparing the data in government fiscal accounts of targeted with the actual realization of the variables in the same year. The data shows the government expected amount of aid surges in its budget [16].However at times when the expected official flows are short of, it was mainly due to the reduction in loan component

[16] *The fact that first setting targets and then looking out for foreign recourses may indicate that, these resources safe arrival here with us depends up on our friends multidimensional conditions. Talking about official flows, they are largely determined on institutional bases. Remember institutions are not easy to go with. Hence loan flow are going to be exogenious,since we have a minor say in the determination of the inflow, if we have a say at all actually.*

of the aid. The government tends to correct its budget imbalances during these periods by adjusting its expenditure, domestic revenue and mostly using domestic borrowing from the banking sector. Hence we can say that it is the fiscal aggregates that adjust to budget imbalances not external loan (e.g. The case in 2000 when the country was at war with Eritrea and the post election period in 2005 where foreign loan and grants fall short of expected , of which expected loan inflow has a greater deviation from the actual one ,and the government resorted to domestic financing).

Furthermore, this tends to suggest that the shock to foreign loan are exogenous to the system which offers statistical support for legitimacy of the impulse response analysis of loan shocks to which the study draws attention in the next section.

5.2.2 Impulse response Analysis of the fiscal response to loan

As the coefficients of the VEC models only reveal the direct effects, to capture both the direct and indirect effects (to estimate the total short and long-run impacts) of an increase in aid the study used impulse response analysis. Impulse response functions represent the time profile of the effect of a shock to one variable on the future values of all endogenous variables.

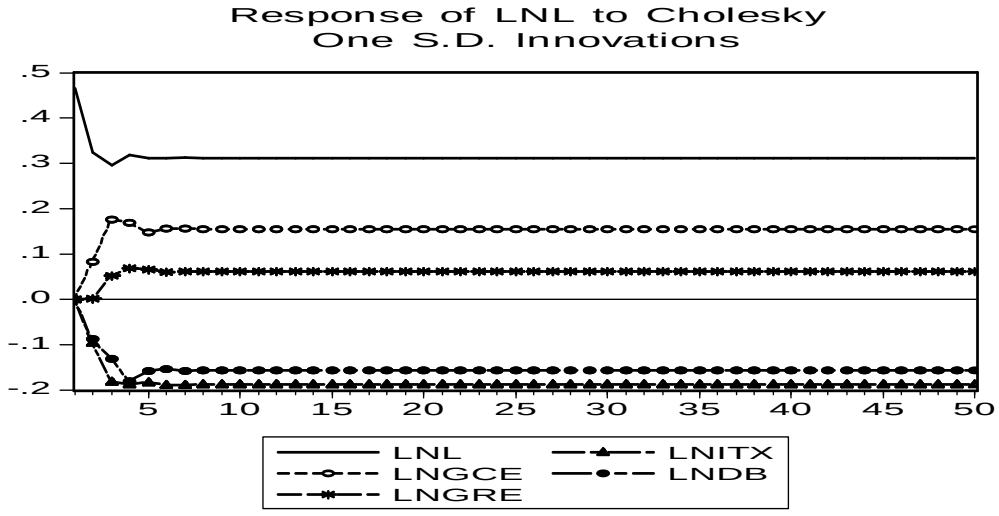
Before undertaking the actual analysis of impulse response analysis, however, the stability of the VAR should be tasted looking at Roots of Characteristic Polynomial and by checking weather all the roots are lying within a unit circle or not. For a VAR to be stable and have orthogonal error terms it has to have a modulus of less than one for all of its roots of polynomials, which in turn insures all roots to lie within a unit circle and hence inferences drown from the impulse response analysis would generally be valid.

Table 5.2.2 Roots of Characteristic Polynomial

Root	*Modulus*
0.020945	*0.020945*
0.805540	*0.805540*
0.612527	*0.612527*
0.543332	*0.543332*
0.290422 - 0.035977i	*0.292642*
0.290422 + 0.035977i	*0.292642*
No Root outside the unit circle.	
VAR satisfy the stability condition.	

As table 5.2.2 above shows the condition of stability of the VAR system is satisfied as all roots of the polynomial are less than one. Figure 5.2.1 shows the impact of a shock in the exogenous variable (loan) on the long run trend of the fiscal aggregates in the model.

Figure 5.2.2 impulse response to shock in loan



A positive shock occurring on loan has a positive impact on both types of government expenditure with a bias to capital side expenditure. On the other hand, domestic borrowing and indirect tax tend to decrease.

Therefore we can say that in the longer term, budgetary aid surges in the form of loan have a tendency of increasing, expenditure patterns of the government and they are pro-investment, while having a displacement effect on indirect tax and domestic borrowing.

5.3 The Fiscal Response to Grant

Model 2 uses the same set of variables as model 1, but replaces foreign loans with grants as recorded in the budget. As usual before running the co integration test, the variables entering in this model are tested for stationary and proved to be an I (1) series. The test summaries on the residuals also indicate that there is no problem of autocorrelation, hetroscedacticity, and non normality of residuals. Co integration test using the Johansson approach, by applying the same procedures as before, is made. Based on the bases of Akaike information criteria (AIC) and Schwarz information criteria (SC), appropriate lag length of the VAR is determined to be that of order one. Table 5.3 (a) and 5.3 (b) below shows that, there is only one cointegrating vector in both trace and maximum eigen value tests.

Tables 5.3(a) and (b) Johansson rank co integration test

(a) Trace Taste

Hypothesized		*Trace*	*5 Percent*	*1 Percent*
No. of CE(s)	*Eigenvalue*	*Statistic*	*Critical Value*	*Critical Value*
*None **	*0.672313*	*116.0501*	*114.90*	*124.75*
At most 1	*0.491439*	*71.42223*	*87.31*	*96.58*
At most 2	*0.371163*	*44.37544*	*62.99*	*70.05*
At most 3	*0.302631*	*25.82011*	*42.44*	*48.45*
At most 4	*0.191370*	*11.40246*	*25.32*	*30.45*
At most 5	*0.070072*	*2.905925*	*12.25*	*16.26*

Trace taste indicates one cointgrating equation at 0.005 level
**denotes rejections of the null hypothesis*

The trace taste given in table 5.3 (a) reports the test results of the null hypothesis that assumes the existence of r co integrating vector. Since the trace statistic (λ trace = *116.0501*) is greater than the 95% percent critical value (*114.90*) the λ trace result of the null r=0 is rejected

However the null of r=1 against $r \geq 2$ can't be rejected .The trace taste suggests that the null hypothesis of zero co integration relationship can be rejected in favor of one co integrating vector.

(b) Maximum eigen value test

Hypothesized		*Max-Eigen*	*5 Percent*	*1 Percent*
No. of CE(s)	*Eigenvalue*	*Statistic*	*Critical Value*	*Critical Value*
*None **	*0.672313*	*44.62786*	*43.97*	*49.51*
At most 1	*0.491439*	*27.04679*	*37.52*	*42.36*
At most 2	*0.371163*	*18.55533*	*31.46*	*36.65*
At most 3	*0.302631*	*14.41765*	*25.54*	*30.34*
At most 4	*0.191370*	*8.496540*	*18.96*	*23.65*
At most 5	*0.070072*	*2.905925*	*12.25*	*16.26*

Max–eigenvaluetest indicate1 cointegratingequation
**denotes rejection of the null hypothesis*
***MacKinnon-Haug-Michelis (1999) p-values*

The result in table 5.3(b) for the maximum test of the null hypotheses ,stating there are at most r co integrating vectors against the alternative r+1 .accordingly the test of the null of no co integrating vector r=0 against the alternative r=1 is rejected as the test statistic (*44.62786*) is greater than the 95 % critical value of (*43.97*).Furthermore the null of r=1 against r=2 can't be rejected in which case there would be at least one co integrating vector. Hence as both tests suggest there is only one unique co integrating vector. The Unrestricted beta (β) and adjustment coefficients (α) coefficients are given in appendix 2

The co integrating long run relation after normalization on grant[17] with t-values in parenthesis can be given as

lnDB + 0.33nG +0.33lnDTX + 4.76lnITX – 2.43lnGCE - 4.097lnGRE + 0.07T +4.86 = 0
[3.75631] [0.71741] [7.68840] [-4.05406] [-8.61970] [1.48401]

Eliminating insignificant variables will result

lnDB + 0.33lnG + 4.76lnITX – 2.43lnGCE -4.097lnGRE +4.86 = 0 (5.2)
[3.75631] [7.68840] [-4.05406] [-8.61970]

Following the same logic used in model 1, we can talk on any relationship with in the estimated co integrating relationship. Hence, the long run estimates suggests that, *citrus paribus,* the two types of government source of revenue (direct and indirect taxes) and domestic

[17] It could also be normalized on any other variable without affecting the model results

borrowing are negatively related to foreign grant. While government capital and recurrent expenditure seem to have a positive relationships with that of grant with a bias to the recurrent side of government spending. The relationship could also be seen with reference to the normalized variable, lnDB. Hence, the long run estimates suggests, *citrus paribus,* a negative relationship between domestic borrowing, with that of grant, and indirect tax. While the relationship between domestic borrowing and the two spending items of the government is positive. Once again our co integrating seems to represent a financing item of last resort in our identity (equation 4.2) of chapter 4.

Before interpreting the coefficients in our long run estimates, it is helpful to test block and pair wise granger causality of the variables in equation 5.2 .particularly, testing exogienty helps to identify the variable that adjust short run imbalances to reach at the long run equilibrium.

Table5.3 (c) block exogeneity test

Dependent variable: LNDB			
Exclude	*Chi-sq*	*df*	*Prob.*
LNG	*0.251090*	*1*	*0.6163*
LNDTX	*0.641361*	*1*	*0.4232*
LNITX	*1.237983*	*1*	*0.2659*
LNGCE	*1.434071*	*1*	*0.2311*
LNGRE	*0.893420*	*1*	*0.3446*
All	*20.50777*	*5*	*0.0010*

As reported in the table above domestic borrowing tends not to be weakly exogenous. As such, the result indicates that borrowing is an adjusting variable to budget imbalances to resort equilibrium in the long run.

Martins' (2007),for Ethiopia estimated a traditional fiscal response loss function which incorporates, a priori ,loan and grant aid as endogenous variables .According to the findings here, we can raise one more critics to Martins' (2007) study. In econometric terms,

misspecification of the model can be added to the stock of limitations we have in Martins' (2007).

Now we can attach economic meaning to the coefficients of equation 5.2.Accordingly, a positive percentage change in grant has approximately 0.33 percentage change in domestic borrowing. This indicates domestic borrowing will respond inversely to changes in grant. As can be seen domestic borrowing is more elastic to government recurrent expenditure changes compare to its response to a percentage change in recurrent expenditure. Comparing with model one results, here it is found in the presence of grant, domestic borrowing is more responsive to government recurrent expenditure. This indicates that most grant element is used for recurrent expenditure. On the other hand a percentage change in indirect tax causes a 4.76 percentage change in domestic borrowing in the opposite direction.

5.3.1 Vector of Error Correction Model for the Fiscal Response to Grant

Table 5.3.1 shows the results of the unrestricted VECM. As can be seen from the table below the adjustment coefficient on the error correction term is significant only for domestic borrowing. For the rest of the variables in the VECM it appears that they are largely insignificant. This indicates that borrowing is the residual variables in the fiscal system and acts as financing item of last resort.

As can be seen from the table, most of the variables of the model are affected by other fiscal variables, and even though it is not strong they are also affected by the lag of domestic borrowing. This last issue relates with interdependence of fiscal aggregates and there simultaneity determination. From our table we can also note that, most lagged differenced values of fiscal variables are significant for the differenced log borrowing equation, indicating the fact that domestic borrowing is ,in the short run, an outcome of interrelated operation of

the fiscal variables and largely will remain a non granger cause of the others. According to the error correction term, current period domestic borrowing, adjusts to last year's error at a rate of 35 percent. Since the VECM tells us only the direct effects, conclusion should be based on the impulse response analysis as it captures both effects.

Table 5.3.1 vector error correction model of grant

Explanatory variable	Dependent Variables					
		D(LNDB)	D(LNG)	D(LNDTX)	D(LNITX)	D(LNGCE)	D(LNGRE)
	EC(-1)	- 0.356***	0.1398	-0.0354	-0.0266	0.0092	0.1873
	D(LNDB(-1))	- 0.0151	0.1904*	-0.0107	-0.0214**	0.0172	-0.0688
	D(LNG(-1))	- 0.0187	0.6014***	-0.0076	-0.0168*	-0.0466**	-0.1191***
	D(LNDTX(-1))	0.3624	-0.5945	0.1173**	0.1674*	0.3450*	0.4177*
	D(LNITX(-1))	- 0.1118**	-3.7231	-0.0286	0.1670	-0.2828	-0.3697
	D(LNGCE(-1))	-0.1599**	1.9389	0.1210*	0.2017*	0.2623**	0.8652***
	D(LNGRE(-1))	0.7593***	1.7624*	0.0288	0.0205	0.0533*	0.2161
	C	0.2122	0.2928	0.0591	0.0503	0.0628	0.0468
	DUM	-0.0560	0.1066	0.1848	0.0432	0.0225	0.0818

****,**,&** significant at 1 ,5 ,&10%*

Diagonistic tests; White hetroscedasticity test ; p-value (0.1020)
LM test ; p-value (0.7165)
Paramount auto correlation; p-value (0.1026)
Jarqu Berra ; p-value (0.7204)
Schwarz (SIC); 3.931
Akaike(AIC); 1.355

5.3.2 Impulse response analysis of the fiscal response to grant

As it was argued previously, to infer the long run relationship of variables in the VAR system, it is not sufficient to look only at the long run *citrus paribus* estimates of the co integrating equation. As it only tells us the direct impact, inferences drown may be misleading as the indirect impact (the impact of all other variables on the other) is omitted from the model. Therefore, here in this section also impulse response analysis will be undertaken. The first step

in such approach is to see whether the roots of the characteristics polynomial is less than one, for the results found to be valid. As table below shows the condition of stability of the VAR system is satisfied.

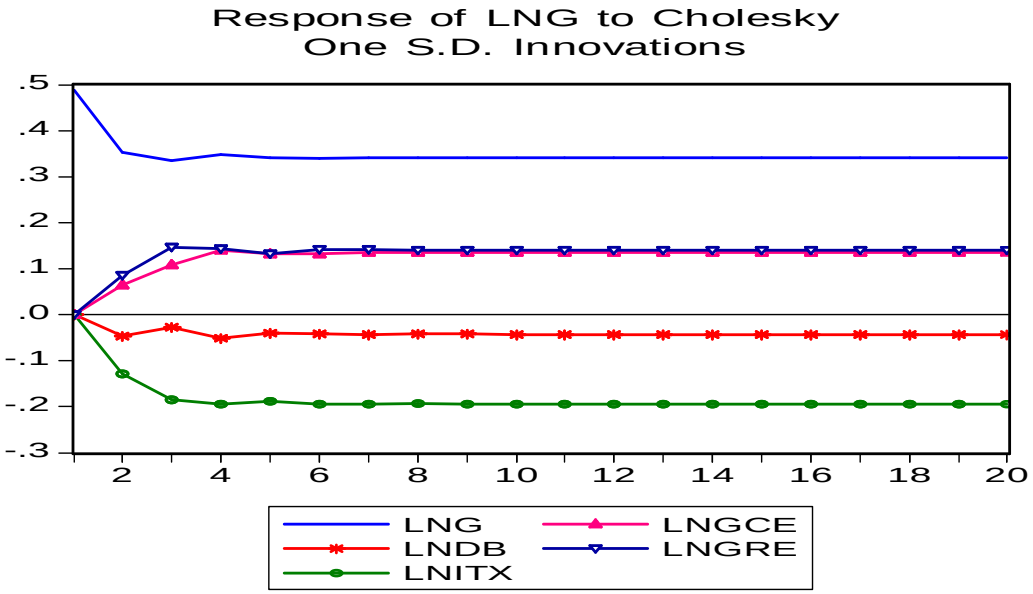
Table 5.3.2 roots of the characterstic polonomial

Root	*Modulus*
0.019809	*0.019809*
0.828149	*0.828149*
0.588172	*0.588172*
0.473746 - 0.077938i	*0.480114*
0.473746 + 0.077938i	*0.480114*
0.169103	*0.169103*
No root outside the unit circle.	
VAR satisfy the stability condition.	

As the roots of the Polynomial are less than one the VAR system is stable and inferences drown from the impulse response analysis are valid.

Figure 5.3.2 below depicts the impulse response functions of a shock in grant. A shock in grant has a strong increasing impact on government recurrent expenditure. On the other hand it also drives domestic borrowing down ward strongly. This may be ,since most borrowing are performed to finance recurrent expenditures and hence as grant surges are increasing and finance recurrent type spending ,borrowing will decrease significantly. It also tends to affect capital expenditure shock in grant, however, has a negative impact on indirect tax.

Figure 5.4.2 impulse response to a shock in grant



Generally we can say that, aid surges in the form of grant ,tends to affect both types of expenditure (with greater weight to recurrent expenditure)positively, while domestic borrowing and indirect taxes moves in the opposite direction as there is a positive shock in grant over the long run.

5.4 The Fiscal Response to ODA

The results in the previous sections are found using variables which are totally in the fiscal accounts of the government. However, there is also an official inflow surge into the country which is not recorded in the government account. Therefore studying the fiscal response to total official aid surges into the country may reveal something about the fiscal – aid relationship in the economy. This is mainly due to unrecorded official aid inflow may have an impact on the government accounts, for instance by financing expenditures which otherwise be financed from the government accounts, and leave resources free to be used for other purposes (either productive or non productive, or some combination of the two). Either way some or all the fiscal variables could be affected. This section is an attempt to capture the likely impact of

total official development assistance. As noted in chapter two ODA surges are greater than the sum of grant and loan read in the government accounts, therefore this section may tell us something about the joint impact of the two plus off budgetary ODA.

The variables included in this model are similar with the first and second model except here loan of the first model and grant of the second are substituted by ODA as read from the online data base of DAC of the OECD.

Before going to modeling of ODA impact, as usual tests of autocorrelation, hetroskedacticity and normality were performed and found that such problems are not present in the data. The lag length of the VAR system was determined using *Schwarz (SIC) and Akaike (AIC) criteria* and found to be *one*.

The Johansson test of co integration (table 5.4(a) and (b) shows), trace and maximum eiegen value tests indicates the existence of one co integrating vector

Table 5.4 (a) and (b) Johansson rank co integration test

Table 5.4 (a) Trace taste

Hypothesized		*Trace*	*5 Percent*	*1 Percent*
No. of CE(s)	*Eigenvalue*	*Statistic*	*Critical Value*	*Critical Value*
*None ** *	*0.638539*	*104.4840*	*94.15*	*103.18*
At most 1	*0.491273*	*64.79757*	*68.52*	*76.07*
At most 2	*0.387746*	*38.43967*	*47.21*	*54.46*
At most 3	*0.250641*	*19.30597*	*29.68*	*35.65*
At most 4	*0.186559*	*8.053004*	*15.41*	*20.04*
At most 5	*5.99E-06*	*0.000234*	*3.76*	*6.65*
**(**) denotes rejection of the hypothesis at the 5%(1%) level*				
Trace test indicates 1 cointegrating equation(s) at both 5% and 1% levels				

Performing the usual steps, Johansson trace test identifies one co integrating vector.

Table 5.4 (b) maximum eigen value test

Hypothesized		*Max-Eigen*	*5 Percent*	*1 Percent*
No. of CE(s)	*Eigenvalue*	*Statistic*	*Critical Value*	*Critical Value*
*None **	*0.638539*	*39.68640*	*39.37*	*45.10*
At most 1	*0.491273*	*26.35790*	*33.46*	*38.77*
At most 2	*0.387746*	*19.13371*	*27.07*	*32.24*
At most 3	*0.250641*	*11.25296*	*20.97*	*25.52*
At most 4	*0.186559*	*8.052770*	*14.07*	*18.63*
At most 5	*5.99E-06*	*0.000234*	*3.76*	*6.65*
**(**) denotes rejection of the hypothesis at the 5%(1%) level*				
Max-eigenvalue test indicates 1 cointegrating equation(s) at the 5% level				
Max-eigenvalue test indicates no cointegration at the 1% level				

Using the stapes followed in model one and two, maximum eigen value taste indicates the presence of one co integrating vector. Hence from the two Johansson rank co integration tests one co- integrating vectors is identified.(see appendix 3 for unrestricted beta and alpha coefficients).

The co integrating long run relation after normalization on domestic borrowing can be specified as (with t-values in parenthesis)

lnDB + 2.167lnODA + 4.75lnITX + 3.45lnDTX - 5.51lnGRE -5.12lnGCE - 2.94 = 0 (5.3)
[6.57143] [5.67663] [5.43110] [-8.54035] [-7.41917]

The co integrating equation shows the long run, *citrus paribus*; relationship between the variables of model 3.The long run estimates suggests that, *citrus paribus*, in the long run domestic borrowing is negatively associated with ODA inflows, direct and indirect taxes. On the other hand domestic borrowing is positively related with both types of the government expenditure. Following the footsteps of Fagernas and schurich (2004) and Rahamn(2005) ,since our normalization on domestic borrowing is *ad hock* ,we can talk the relationship of variables in our model with reference to anyone of them. Accordingly ODA, citrus *paribus*, is positively related

with that of government recurrent and capital expenditures, and negatively related with the two types of taxes and domestic borrowing.

In order to interpret and attach economic meaning to the coefficients of our long run estimate (equation 5.3), causality and exogeneity tests are performed.

Table 5.4(c) pair wise granger casualty/ block exogeneity test

Dependent variable: LNDB			
Exclude	*Chi-sq*	*df*	*Prob.*
LNODA	*1.448904*	*1*	*0.2287*
LNITX	*0.133796*	*1*	*0.7145*
LNDTX	*2.124493*	*1*	*0.1450*
LNGRE	*0.571118*	*1*	*0.4498*
LNGCE	*4.370157*	*1*	*0.0366*
All	*16.14913*	*5*	*0.0064*

Hence, as the table 5.4 (c) shows, domestic borrowing is not a granger cause the other variables and isn't also weakly exogenous.

Baking to our long run relationship (equation, 5.3), we can say that, a percentage change in ODA inflow causes a 2.16 percentage change of domestic borrowing in the opposite direction, *citrus paribus.* Hence domestic borrowing is elastic to a change in ODA inflows in to the economy. Borrowing is also found to be elastic for the change in the other fiscal variables of our model. However, conclusion based on this long run *citrus paribus* estimates cannot be made.

5.4.1 Vector of Error Correction Model (VECM) for ODA

In order to know the short run dynamics in our model a look on the VECM estimates is presented below. According to our VECM, current period borrowing is affected by four others variables differenced lagged values and own lagged difference value.

Comparing the short run coefficients for *dlnDB* equation, current period domestic borrowing is largely responsive to its own lagged value and lagged difference of ODA flows. Combining

the short run coefficients and the adjustment factor indicates that, ODA as being largely exogenous, while domestic borrowing is the adjusting variable for short run shocks to the budget balance and act as a financing means of last resort to resort the long run equilibrium.

According to the table's result, lagged period ODA inflows and lagged revenue from indirect taxes contributes to a reduction of current period domestic borrowing, while an increase in government spending tends to increase borrowing in the short run. On the other hand a higher lagged value of borrowing affects current periods borrowing negatively. This may be due to, if last period borrowing is high and overheated the economy, to avoid the consequences, government in the current period will resort to a lower level of borrowing by resorting to non inflationary menses.

On the other hand in $dlnODA$ equation, in the $dlnODA$ seems to be affected negatively by the lagged difference of recurrent expenditure. This may be due to donor's change of attitude conceiving most of their "charities" as being used in a fungible manner. This last concept is important as donors have a good memory regarding the use of aid funds for lags that are recent and tends to be responsive (such as lagged one period).

Table 5.4.1 Vector of error correction for ODA model

Explanatory variable	Dependent Variables						
		D(lnDB)	D(lnODA)	D(lnITX)	D(lnDTx)	D(lnGRE)	D(lnGCE)
	EC(-1)	-0.446239	-0.162416	0.016655	0.020495	0.022913	0.140218
	D(lnDB(-1))	-0.43151***	0.134976	-0.020827*	-0.011726	-0.056202	-0.12670
	D(lnODA(-1))	-0.42467**	-0.08901***	0.027253	0.069157	0.011909***	0.0805***
	D(lnITX(-1))	-2.567856*	0.822553	0.026351	-0.265618	-0.337023*	-0.224188
	D(lnDTX(-1))	-0.140838	0.139414	0.214562	0.139383*	0.280419	-0.318278
	D(lnGRE(-1))	0.601046**	0.381373**	0.282442**	0.225735	0.367349**	0.81336**
	D(lnGCE(-1))	0.260461*	-0.179903	0.117482*	0.154293	0.136849**	0.36856**
	C	0.360277	0.012053	0.032038	0.055789	0.043267	0.062855
	DUM	0.200143	0.176344	0.050176	0.054308	0.100496	0.099801

****, ** &* indicates 1, 5, & 10% significance level*
Diagnostic tests ; White hetroscedasticity test ; p-value (.6918) Akaike(AIC) ; 0.333227
LM test ; p-value (0.923) Schwarz (SIC); 2.892553
Jarqu Berra ; p-value (0.614)

As can be seen from the table above, the adjustment coefficient is only significant for domestic borrowing. Hence, indicating the adjusting variable for to resort the equilibrium in the long run.

5.4.2 Impulse Response Analysis of ODA Model

Checking the roots of the polynomial proved that inferences drown from the impulse response analysis would be largely valid, as all roots are below one.

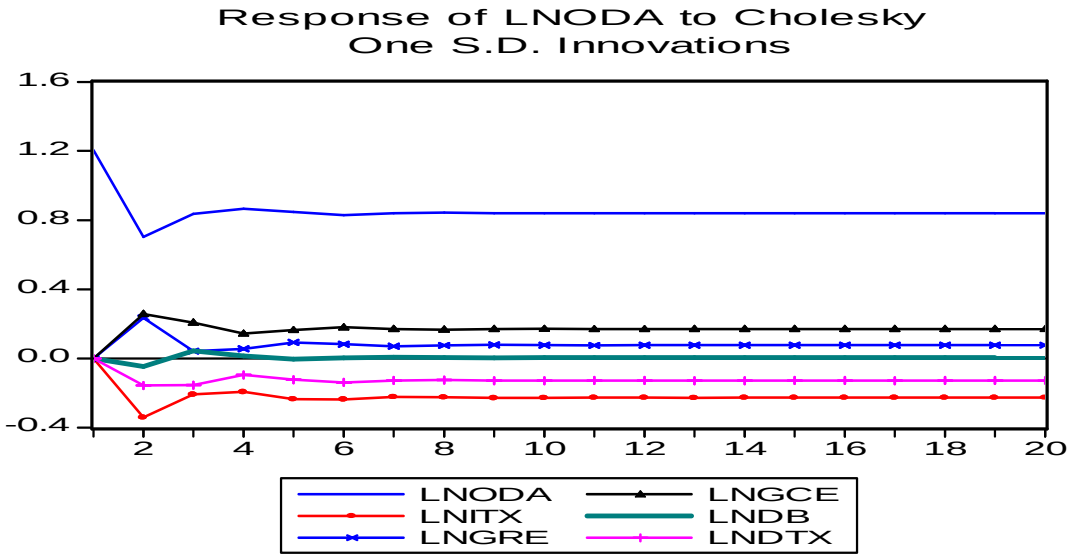
Table 5.4.2 *roots of the characteristic polynomial*

Root	Modulus
0.009579	0.009579
0.698753 - 0.172274i	0.719677
0.698753 + 0.172274i	0.719677
0.558887	0.558887
0.378186	0.378186
-0.027914	0.027914

No roots out side the unit circle
VAR satisfies stability condition

Once it is shown that the roots of the characteristics polynomial are less than one, we can make inferences from figure 5.4.2 below.

Figure 5.4.2 response of fiscal variables for a shock in ODA



As can be seen from the impulse response graphs of ODA, a shock in one standard deviation in ODA has a positive response on both types of expenditure, with a greater elasticity for the capital spending and a negative response from both sides of tax revenues, when all variables are allowed to vary as there is an exogenous shock in ODA. Domestic borrowing of the government also decreases significantly over the longer term, indicating the fact being substituted by ODA.

Hence we can say that ODA has a substituting impact of domestic revenue and that of borrowing, while government expenditure responds positively to an increase in ODA surges.

CAPTER SIX

CONCLUSION AND POLICY RECOMMENDATION

6.1 Conclusion

The main aim of this study has been to assess the fiscal response for external aid inflows to Ethiopia. It started by analyzing some of the most important economic development of the past 48 years, focusing its attention on the government sector. It then provided a detailed critical review of the recent debates surrounding the aid-fiscal relation, and then applied a sub-strand of fiscal response literature strand (the VAR /VECM modeling) to the Ethiopian data (1961-2007).

Three models were estimated using VAR/VECM and impulse response functions taking disaggregated data. The first specification included a variable representing grant aid inflows as recorded in the budget, while the other substituted this variable by foreign loan read in the budget ,keeping the fiscal aggregates unchanged. Finally the third model substituted loan of the first and grant of the second models by total ODA as recorded in the DAC/OECD account.

The first model suggests that ,aid surges in the form of loan has a tendency of increasing both kinds of government spending(with some bias to the capital spending side), and also tends to substitute indirect taxes and that of borrowing, while having no effect on direct taxes. Results from the second model suggest a similar result with that of the first, except here in the second model it is the recurrent spending of the government that is more elastic for grant aid than capital spending. The third model findings also support the results of the previous models, except with the incorporation of both budgetary and off-budgetary ODA, capital spending is found to be more positively responsive than the recurrent spending of the government and direct taxes also found to show a declining trend as there is a positive increase of total ODA inflows into the economy..

Overall, the results suggest that foreign aid has a clear positive impact on public spending, with a slight bias towards investment expenditures. As Aid flows (especially loans) are often earmarked to specific investment projects, while governments are likely to use tax revenues to pay for most recurrent costs. According to UNECA (2002), roughly half of the Ethiopian government's capital spending was financed through external sources, while most of the re current budget was paid for by domestic revenues. It is therefore predictable that an increase in aid inflows would have a stronger positive impact on the capital budget than on current expenditure.

Finally, the evidence that an increase in aid will have a negative impact on revenue collection, might fuel concerns about external dependency and the lack of the long-term sustainability of such dynamics.

Moreover, the empirical model presented here indicates that aid flows have not only induced an increase in government expenditures but also, subject to some caveats of a reduction in domestic revenues which resulted in the widening of the fiscal deficit before grant (see figure in chapter 2),though increased aid surges stimulated a cut in domestic borrowing.

6.2 Policy Recommendations

The priority of increased aid surges should be on financing new capital spending, which can contribute not only to enhancing human development but also expanding the economy's productive capacity. But care should be taken in the assumption that investment expenditure increases the long run welfare and classifying recurrent expenditures as growth retarding, as the later have stimulating impact on the economy in the short run. And if this short run is not well behaved, the expected "good" long run may not be feasible, as Keynes (1936) noted in the long run we may all be dead. While using foreign aid to pay off onerous domestic debt can

serve a useful purpose at least in the short run, the medium-term purpose of aid should clearly be expand MDG- related government spending.

Moreover, donors should channel more aid into building up national capacities to mobilize domestic revenue. Otherwise, developing countries such as Ethiopia will have difficulty in graduating from reliance on external aid. With regard to the tax disincentive impact of aid; care should be taken in interpreting results. If the tax is already high, the tax displacement effect may be beneficiary, as it increases the allocative efficiency of the economy, which culminates into a crowd –in of private investments.

In the final analysis an ideal aid system (institution) in the economy that could bring about the desired aspirations of long term economic development, needs to be formulated and put in place. Effective monitoring of donors to avoid aid fungebility and little interference in the domestic affair and keeping themselves from recommending mega policies are essential gradients for effective implementations of an ideal aid system

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ANNEX -1 Unrestricted Cointegrating and adjustment Coefficients

*Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):*

LNDB	*LNL*	*LNDTX*	*LNGCE*	*LNGRE*	*LNITX*
2.413382	*0.506945*	*0.838307*	*-7.880649*	*-4.739134*	*9.798008*
0.793624	*-0.883595*	*-0.351651*	*4.337216*	*-0.993685*	*-3.973502*
-1.010299	*-0.142838*	*0.378775*	*-0.449835*	*-3.986953*	*5.643522*
0.198112	*1.027443*	*6.471665*	*-0.426614*	*-6.926772*	*-0.249513*
-0.988895	*-0.697678*	*2.619618*	*-1.825569*	*4.911390*	*-2.684309*
-0.611475	*-0.233631*	*-3.405306*	*1.616086*	*2.682573*	*-1.388917*

Unrestricted Adjustment Coefficients (alpha):

D(LNDB)	*-0.199067*	*-0.138464*	*0.124077*	*0.035804*	*0.084738*	*-0.006637*
D(LNL)	*0.201444*	*0.527061*	*0.338174*	*-0.086966*	*0.094663*	*-0.019161*
D(LNDTX)	*-0.022221*	*0.005574*	*-0.028653*	*0.011447*	*-0.001868*	*-0.013449*
D(LNGCE)	*0.066975*	*-0.042827*	*-0.004968*	*0.022782*	*0.022831*	*-0.020021*
D(LNGRE)	*0.006399*	*0.030011*	*0.046026*	*0.033427*	*-0.006925*	*-0.001056*
D(LNITX)	*-0.013721*	*-0.002488*	*-0.032008*	*0.032023*	*0.014967*	*-0.000624*

ANNEX- 2 Unrestricted Cointegrating and adjustment Coefficients for grant model

*Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):*

LNDB	*LNG*	*LNDTX*	*LNITX*	*LNGCE*	*LNGRE*	*@TREND(62)*
2.173286	*0.722232*	*0.721898*	*10.35199*	*-5.285030*	*-8.904913*	*0.149260*
0.727910	*-1.062602*	*0.233290*	*-0.809347*	*3.313329*	*1.809621*	*-0.471348*
1.560405	*0.237363*	*-0.298661*	*-5.131488*	*-0.704519*	*1.604681*	*0.177074*
-0.440439	*-0.202984*	*-0.485837*	*-2.180845*	*8.875007*	*-1.612768*	*-0.336210*
-0.386572	*0.503156*	*6.980168*	*-1.464620*	*-2.539477*	*-1.169446*	*-0.123057*
0.463768	*0.704602*	*0.022767*	*2.868877*	*-2.134452*	*1.292653*	*-0.451436*

Unrestricted Adjustment Coefficients (alpha):

D(LNDB)	*-0.163924*	*-0.107194*	*-0.189050*	*0.037706*	*0.073220*	*-0.038507*
D(LNG)	*0.064307*	*0.560064*	*-0.145464*	*-0.344434*	*-0.028319*	*-0.074414*
D(LNDTX)	*-0.016278*	*-0.033416*	*0.039322*	*-0.013655*	*0.002763*	*-0.017507*
D(LNITX)	*-0.012222*	*-0.012935*	*0.029355*	*0.011666*	*0.035072*	*-0.002745*
D(LNGCE)	*0.004240*	*0.002932*	*-0.013905*	*-0.059205*	*0.023692*	*0.005585*
D(LNGRE)	*0.086203*	*-0.055536*	*0.006906*	*-0.007440*	*0.022452*	*-0.035835*

ANNEX- 3 Unrestricted Cointegrating and adjustment Coefficients for ODA model

UNRESTRICTED BETA COEFFICIENTS

LNDB	*LNODA*	*LNITX*	*LNGRE*	*LNGCE*	*LNDTX*
1.659686	*3.595090*	*7.876099*	*-8.503413*	*-9.136746*	*5.734192*
0.437131	*1.154021*	*1.010034*	*-3.597570*	*4.989990*	*-3.859247*
-0.535025	*-1.257179*	*7.558174*	*-3.977048*	*2.073726*	*-2.840381*
-0.697578	*0.831655*	*-3.244555*	*-2.150581*	*4.990725*	*0.837335*
-0.317744	*2.738712*	*1.892769*	*-0.509914*	*-0.953193*	*-3.433144*
-0.079015	*-0.683323*	*-0.646944*	*-0.599570*	*-0.148930*	*3.822006*

Unrestricted Adjustment Coefficients (alpha):

D(LNDB)	*-0.268870*	*-0.553193*	*0.266463*	*0.116038*	*0.208294*	*0.000276*
D(LNODA)	*-0.097859*	*0.050776*	*0.050141*	*-0.030094*	*-0.071966*	*0.000228*
D(LNITX)	*0.010035*	*-0.001320*	*-0.035655*	*0.023709*	*-0.027301*	*1.93E-05*
D(LNGRE)	*0.084485*	*0.023943*	*0.030598*	*0.041163*	*-0.005645*	*0.000266*
D(LNGCE)	*0.013805*	*-0.075045*	*0.000515*	*-0.017383*	*-0.003635*	*6.92E-05*
D(LNDTX)	*0.012349*	*0.014514*	*-0.039615*	*0.016461*	*0.008391*	*0.000207*

ANNEX-4 COINTEGRATING EQUATION OF THE LOAN MODEL

1 Cointegrating Equation(s): Log likelihood 62.41722

Normalized cointegrating coefficients (std.err. in parentheses)

LNDB	*LNL*	*LNDTX*	*LNGCE*	*LNGRE*	*LNITX*
1.000000	*0.210056*	*0.347358*	*-3.265396*	*-1.963690*	*4.059866*
	(0.08554)	*(0.43714)*	*(0.44812)*	*(0.53045)*	*(0.60196)*

Adjustment coefficients (std.err. in parentheses)

D(LNDB)	*-0.480425*
	(0.17751)
D(LNL)	*0.486162*
	(0.46228)
D(LNDTX)	*-0.053628*
	(0.04987)
D(LNGCE)	*0.161635*
	(0.08092)
D(LNGRE)	*0.015443*
	(0.05171)
D(LNITX)	*-0.033113*
	(0.04259)

ANNEX- 5 COINTEGRATING EQUATION OF THE GRANT MODEL

1 Cointegrating Equation(s): Log likelihood 64.48037

Normalized cointegrating coefficients (std.err. in parentheses)

LNDB	LNG	LNDTX	LNITX	LNGCE	LNGRE	@TREND(62)
1.000000	0.332322	0.332169	4.763287	-2.431815	-4.097441	0.068679
	(0.08847)	(0.46301)	(0.61954)	(0.59985)	(0.47536)	(0.04628)

Adjustment coefficients (std.err. in parentheses)

D(LNDB)	-0.356253
	(0.16863)
D(LNG)	0.139758
	(0.42267)
D(LNDTX)	-0.035377
	(0.04204)
D(LNITX)	-0.026563
	(0.03848)
D(LNGCE)	0.009214
	(0.04861)
D(LNGRE)	0.187343
	(0.06891)

ANNEX -6 COINTEGRATING EQUATION OF THE ODA MODEL

1 Cointegrating Equation(s): Log likelihood 84.19869

Normalized cointegrating coefficients (std.err. in parentheses)

LNDB	LNODA	LNITX	LNGRE	LNGCE	LNDTX
1.000000	2.166126	4.745534	-5.123506	-5.505104	3.454985
	(0.32963)	(0.83598)	(0.69058)	(0.64460)	(0.63615)

Adjustment coefficients (std.err. in parentheses)

D(LNDB)	-0.446239
	(0.32437)
D(LNODA)	-0.162416
	(0.07247)
D(LNITX)	0.016655
	(0.02975)
D(LNGRE)	0.140218
	(0.04920)
D(LNGCE)	0.022913
	(0.03540)
D(LNDTX)	0.020495
	(0.03476)