ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

THE IMPACT OF FOREIGN AID ON PUBLIC SPENDING THE CASE OF ETHIOPIA A VECTOR AUTOREGRESSIVE APPROACH

BY

HENOK TSEGAYE

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfilment of the Requirement for the Degree of Master of Science in Economics
(Economic Policy Analysis)

JUNE 2010

ADDIS ABABA

ADDIS ABABA ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

"The Impact of Foreign Aid on Public Spending in Ethiopia: A Vector Autoregressive Approach"

By

Henok Tsegaye Ejebo

Approved by the Board of Examiners:

Syed Hasan
Advisor

Signature

Daniel Zerfu
Examiner

Signature

Alemel Boyrad
Examiner

Signature

ACKNOWLEDGEMENT

I would first like to thank my advisor Dr. Syed Hasan for his patience and constructive advice from the inception to the completion of the thesis. I also owe gratitude to different department staff members of MoFED. Arat Kilo Science Faculty Digital Library deserves appreciation for providing internet access throughout the year.

I would also like to thank all my family members. Without their encouragement, I do not think I would have maintained the motivation to finish the thesis. I could not have gotten through this thesis without the support and encouragement of my friends and classmates I would like to say thank you all.

Finally, I would like to thank African Economic Research Consortium (AERC) for giving us the opportunity to participate in the Joint Facility for Electives (JFE) and gain indispensable knowledge which is instrumental through out the development of the thesis.

TABLE OF CONTENTS

LIST OF TABLES

Tables

Page

LIST OF FIGURES

Figures **Page**

LIST OF APPENDICES

LIST OF ACRONYMS

BOPs	Balance of Payments
CRS	Creditor Reporting System
DAC	Development Assistance Committee
DCs	Developed Countries
EPRDF	Ethiopian People Republic Democratic Front
FRM	Fiscal Response Model
GDP	Gross Domestic Product
GFS	Government Financial Statistics
GMM	Generalized Method of Moments
GNP	Gross National Product
HDI	Human Development Index
IMF	International Monetary Fund
LDCs	Least Developed Countries
MDGs	Millennium Development Goals
MoFED	Ministry of Finance and Economic Development
MTEF	Medium Term Expenditure Framework
NGOs	Non Governmental Organizations
ODA	Official development Assistance
OECD	Organization for Economic Development and Cooperation
OLS	Ordinary Least Squares
PASDEP	Program for Accelerated and Sustainable Development to Eradicate Poverty
PBS	Protection of Basic Services

USD	United States Dollar
SDPRP	Sustainable Development and Poverty Reduction Program
3SLS	Three Stage Least Squares
SSA	sub Saharan Africa
SUR	Seemingly Unrelated Regression
VAR	Vector Auto Regressive
VEC	Vector Error Correction

ABSTRACT

Foreign aid is an important source of finance to a majority of developing countries since it supports the budgetary process and therefore enhances the development of these countries. In this paper, a welfare utility maximization function is used to determine how government spending and domestic revenue respond to aid flows. It employs a co-integrated vector autoregressive model to account for potential endogeneity and non stationarity problems. The empirical evidence supports the hypotheses that in Ethiopia, during 1966-2008, foreign aid has a positive effect on total government expenditure. But disaggregating the data into government development expenditure and recurrent expenditure, total aid has positive effect on recurrent expenditure where as program aid has negative effect on development expenditure.

In totality foreign aid is fungible in Ethiopia. Disaggregating the data in to recurrent and development headings also shows aid is more fungible under the recurrent expenditure heading than the development expenditure heading. The study also provides evidence that policy change increases development expenditure, and aid flow reduces domestic resource mobilization. Provided that foreign aid influences government expenditure and its fungibility the government has to design effective economic policy and improve institutional quality.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Sub Saharan Africa has long been the world's most aided region. Aid as a proportion of Gross Domestic Product there has averaged over 5% for much of the past two decades, has reached nearly 10% at times and still equals nearly 6% of the region's GDP (Batana, 2009). These proportions are much higher in many smaller African economies.

At the same time the development record of nearly all African countries has been highly disappointing. Because of low growth rates over the past four decades, coupled with high population growth rates average per capita income has fallen since 1970. Average per capita income in the region increased modestly in 1995-97. But despite this increase, average per capita incomes in the region were 15% lower in 1995-97 than they were in 1976-78. The tendency of high aid flows and low growth rates has encouraged many donors, recipient countries and the academic community to ask whether aid has been ineffective in Africa.

In the 1960s African states gained independence one after the other from colonial powers and marked the turning points in their national histories. But a deeper look at the period reveals continuity from colonialism to aid dependency that may not be immediately obvious. Many states, despite some initial success in development, quickly returned to dependence up on the previous colonial power or other developed countries as their foreign aid requirements grew. This aid or Official Development Assistance (ODA), as it is defined by Organization for Economic cooperation and Development (OECD) includes transfers of concessional resources

from one government either to another government or to an international aid agency or non-governmental organization which in turn transfers the resources to a poor country. ODA consists of grants, concessional loans (defined as loans that provide a grant element of at least 25 percent via the grace period, interest rate and repayment terms), other commodities provided on concessional terms, and debt relief.

Aid may be provided for a variety of reasons, including diplomatic, commercial, cultural and developmental. It is typically used to fund expenditures that further development (or at least justified in that way) in the country receiving aid. Most aid has been used to finance discrete investment projects – building roads, building schools, providing training and education etc. Since 1980, a significant proportion of aid has also been used as balance of payments and budget support of governments agreeing to adopt economic or political reform programs (Lancaster 1999).

At the start of foreign aid flow to LDCs development thinkers believed that, development assistance was seen as a positive agent for change and development Because, the capital market in many developing countries are thought to be almost nonexistent and incapable of assisting the growth process. Immediately after independence there was new optimism about the effect of aid on the recipient country. Gradually this optimism of aid financed government led projects were questioned and evidenced by the decline of centrally planned economies in the late 1980s.

One of the most enduring and important questions in economics is whether foreign aid helps countries grow. In fact, in the Millennium Declaration adopted in 2000, world Leaders state,

"We will spare no effort to free our fellow men, women and children from the abject and dehumanizing conditions of extreme poverty, to which more than a billion of them are currently subjected" and they resolve "to grant more generous development assistance, especially to countries that are genuinely making an effort to apply their resources to poverty reduction."(Millennium Development Declaration, 2000) As a result, the effort is on to mobilize billions of dollars of aid to help poor countries, especially those with good policies and institutions.

The question of whether aid helps poor countries grow in a sustained way is still mired in controversy. For instance (World Bank 1998, Burnside and Dollar 1997) has raised does aid work? The question raised has been answered. It can work, depending on policies. If they are good, aid will be efficient, if they are not, aid will be useless, at best. Aid has to be allocated to those countries pursuing good policies, to a larger extent, it is argued, than is already the case. Aid effectiveness and aid selectivity issues are thus simultaneously solved.

The World Bank report (1998) analyzed the relationship between aid and growth in countries with good monetary, fiscal and trade policies and found a strong positive association indicating that aid is indeed effective where economic policies are supportive of growth. The report also found that aid was not very effective in bringing about an improvement in the policy environment.

Concerning about the effectiveness of aid financed projects, on account of close scrutiny by donors it is associated not with corruption instead it is the issue of aid fungibility. How fungible is foreign aid?

Conflicts between the parties to aid transactions over the intended outcomes of their joint efforts are a fact of life. Most of the history of foreign aid relations might be read as a continual search by the donors to find ways to maximize their returns to their funds as judged by them, with recipients trying to make sure that their spending priorities – which have not always been the same as donors- prevail. Moreover, even though the World Bank argues for selectivity in choosing recipients (World Bank 1998) i.e. concentrating assistance in countries pursuing policies believed to be conducive for economic development. It seems unlikely that disagreement over the allocation of funds will vanish over night. Indeed being selective would not be necessary if a consensus existed among the parties involved on how the funds should be spent. Knowledge about what outcomes might be expected will therefore be helpful in designing aid policies.

An important issue for donors is the extent to which aid is fungible i.e. it can be redirected from the intended purpose by the recipient if it so wishes. If aid is fungible, the evaluation of its impact is complicated by the difficulty of assessing the inflow of funds. In turn this makes the task of designing aid policies harder. Even though redirecting money might improve outcomes from overall perspective – the donors might not always have the best interests of the recipient in mind- in order to make an informed judgment one needs to know into what activities funds have been allocated. In the end this is an empirical issue, but a solid theoretical understanding of the problem is an essential pre requisite for such investigations.

1.2 Statement of the Problem

Aid, purportedly given to supplement the domestic saving and foreign exchange earnings of a recipient country to enable it achieve some higher rate of growth, can lead to perverse results. As aid is given to governments, the effectiveness of aid will crucially depend on the fiscal response of the government to aid. This link between foreign aid and fiscal activities of the government is however, not straight forward, because some part of the aid is fungible. Critics across the political and academic spectrum have concluded that recipient governments can easily redirect the intension of aid donors by altering their expenditure patterns. Even advocate of foreign aid agree that it is highly fungible. For example, aid to satisfy basic needs, a concern of bilateral donors during the 1970s was under cut where funds targeted to increase the living standards of the poor are effectively diverted (Pack and Pack 1993).

In theory governments should maximize the social welfare that they can buy with the resources they can mobilize. In practice, benefits are hard if not impossible to measure, inter-sectoral trade-offs cannot be established, and government action is circumscribed by politics and prior commitments. Public expenditure is thus often divided into 'mandatory' outlays made inescapable by earlier promises, and 'discretionary' expenditures available for allocation in the current time period in furtherance of policy goals. Among several ways governments can mobilize resources from external sources through official development assistance.

More often foreign aid is given for the benefit of the poor in the recipient country with conditionality attached with it. However, it is very difficult for the donors to enforce the conditionality, foreign aid to all intents and purposes, is highly fungible (Pack and Pack 1993, Khilji and Zampeli1994, boone1996, Feyzioglu et al 1998, Swaroop et al 2000). This

fungibility is often the consequence of aid fatigue between donor and recipient countries[1]. Aid is said to be fungible if recipient countries redirect the fund from its intended purpose.

Ethiopia, like any other developing country is not in a position to mobilize enough domestic resources to finance government spending on different sectors of the economy. To finance the gap it resorts to external assistance. Earlier the aid-savings debate focused on the two gap model of Chenery and Strout (1966) which states foreign aid as an engine of growth. Critics of this model (white 1992) have argued that foreign aid substitutes domestic resources through declined savings, reduced government tax revenue and increased government consumption. With the renewal of the debate, the question remains whether external assistance complements or substitutes available domestic resources.

There is a need to analyze the impact of aid flows on the budget process by establishing the link between aid and public expenditure. A stronger association of with higher government consumption rather than with public investment would suggest both a flypaper effect and fungibility. This may imply that aid recipient governments view foreign aid like any other source of revenue and consequently use it for increased consumption, tax reductions or reduced fiscal deficits (future tax obligations). An interesting question would be what proportion of increased spending resulting from increased donor funds goes to either recurrent or development expenditures.

In light of the recent rethinking of foreign aid, brought on by 'aid fatigue in donor nations and questions of aid effectiveness, this paper examines the extent of aid fungibility in Ethiopia. The question is what does aid ultimately finance or what form of expenditure is supported by donor

[1] Developed countries agreed, after the publication the UN sponsored pearson commission report in 1969, to allocate 0.7% of their GNP as Overseas Development Assistance. But the actual figure for major donor countries is 0.25%.

funds? This is very important because some public spending have direct link with some macro economic variables like productivity and growth than others.

1.3 Significance of the Study

Most previous similar studies on aid fungibility were conducted in cross-country and single country basis. Cross country regression has a limitation of that a priory expectation that coefficient (effects of variables) will differ across countries. In the aid effectiveness literature the aspect of government behavior found to be most amenable to modeling fiscal behavior. From comprehensive review of studies on the fiscal impact of aid, McGillivray and Morrissey (2001) have classified those studies into two broad groups: (i) fungibility studies; and (ii) those estimating a fiscal response model (FRM). Whereas fungibility studies attempt to assess the extent to which aid is diverted from its intended purposes, studies estimating fiscal response models go further to capture the impacts of aid on tax effort, domestic borrowing by government and the different categories of government expenditure.

The study of foreign aid on a sectoral basis by cross country analysis doesn't allow us to clearly examine the sectoral impact of aid on sector's spending. In this respect, different countries have different result for the impact of aid on sectors spending. Hence, such work can usually be conducted in the context of country specific, to capture the different impact of earmarked aid on the sectors.

The literature of aid effectiveness on public spending contributed generally in the cross sectional analysis of Sub-Saharan Africa. However, in Ethiopian case, the number of studies done so far is limited in number and scope, Jifar (2002) has analyzed the fungibility of foreign aid across the different sectors of spending in Ethiopia, Martins (2007) studied the fiscal response of the government to aid inflow by adopting impulse response function and Wondwosen (2003) investigated aid growth relationship in Ethiopia using vector autoregressive model. Despite a number of empirical works has been done on aid in Ethiopia little has been done in analyzing the fungibility of aid at aggregated level using vector auto regressive technique, in which further study still required. Hence, the outcome to be obtained from this study could be useful in improving policy design, institutional set up, allocation and evaluation in the area of foreign aid allocation to public spending.

1.4 Objectives of the Study

In a broad spectrum, the objective of the study is to determine the impact of foreign aid on government expenditure and revenue.

Specifically, the paper's objective is:

- To determine the extent of foreign aid fungibility in the case of Ethiopia
- To assess how changes in the aid flow affect the budget process.
- To examine the effect of foreign aid on domestic resource mobilization

1.5 Scope of the Study

The paper uses government spending, domestic resources and GDP time-series data from 1966/67-2007/08 fiscal years. The paper will analyze the impact of aid on spending and revenue it doesn't look into the response of the government to it.

1.6 Limitations of the Study

The choice of the time period depends on the availability of data. There is a significance statistical discrepancy between domestic and international data sources, for instance ODA (OECD/DAC) is acknowledged to be an authoritative source on aid figures. Most of the annual figures reported by OECD/DAC are greater than those by MoFED. Never the less, in this study the data for aid variables are taken for OECD/DAC.

1.7 Organization of the Study

The rest of the thesis is organized as follows: chapter two deals with economic background of Ethiopia and the descriptive analysis of the data. The third chapter discusses the theoretical and empirical Literature. The fourth chapter presents the research methods followed including sources of data used to achieve the stated objectives. Econometrics results are presented and discussed in chapter five. The last chapter provides conclusions and policy implications drawn from the findings of the study.

CHAPTER TWO

MACRO ECONOMIC PERFORMANCE OF ETHIOPIA

2.1 General Over view of the Ethiopian Economy

Ethiopia is a land locked country(since may 1991) in the horn of Africa with estimated population of 79 million of which more than 80 percent living in the rural area using agriculture as their means of lively hood. Ethiopia's past history is characterized partly by socialism, civil war, recurrent draught and high population pressure. According to the World Bank development indicators (2008/09) Ethiopia has a per capita income of 161 USD[2]. This is a very low figure even compared with other LDCs.

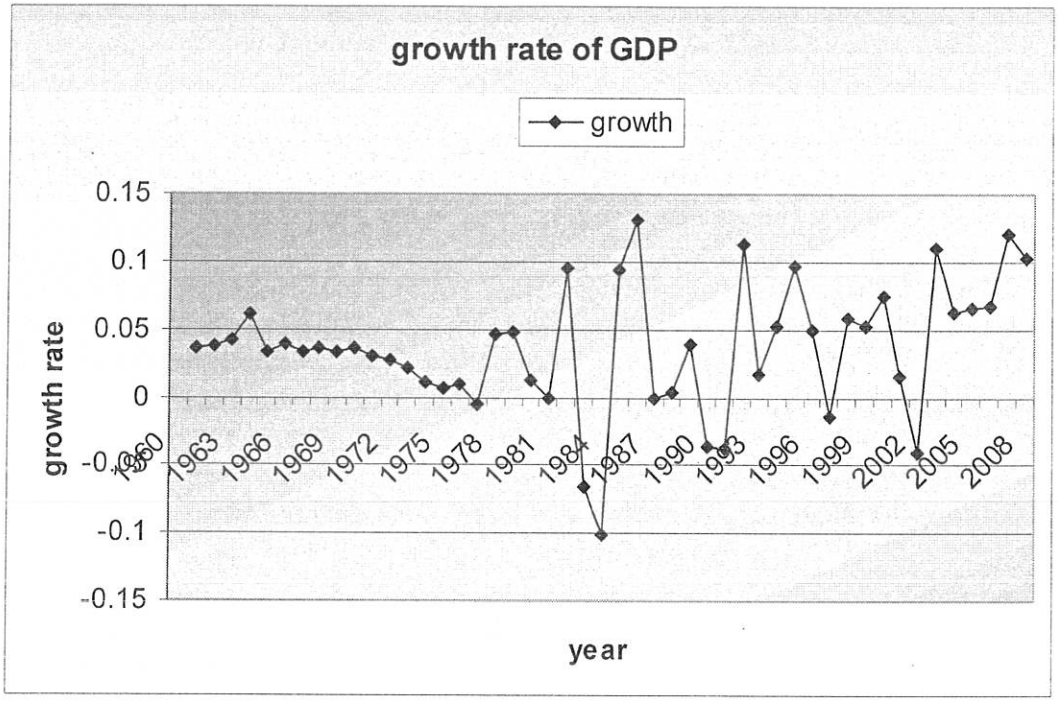
Table 2.1A Average growth rate of GDP (in percentage)

Period	Real GDP	GDP per Capita
1960/61-1973/74	3.61	1.34
1974/75-1990/91	1.4	-0.17
1991/92-2007/08	6.37	4.0
1960/61-2007/8	3.76	1.3

Source: Data from MoFED and own computation

[2] See World Bank African Development Indicators CD ROM

Figure 2.1 GDP growth rate



In political terms three main regimes in the recent history of the country can be identified: The Imperial era (until 1974), the Derg regime (1974-1991), and the EPRDF (1991-present).

Economic performance under the Imperial state was respectable with GDP growth by 3.61% on average during the period (1960-1974) while average growth per capita was 1.34% (see table 2.1A and figure 2.1). Never the less, several draughts afflicted the country causing wide spread famine and poverty. In the early 1970s a number of events fueled the discontent of the population.

In 1974 military coup led by a committee of junior army officers (Derg) deposed the Emperor. The new regime was characterized by socialist economic system. The Derg embarked on large scale nationalizations including land, private property, and financial institutions and manufacturing firms (Alemayehu 2007).

Economic performance under the Derg was poorer than in the past with GDP growing about 1.4% (1974-1991), while growth was negative in per capita terms (-0.17). The policy environment, erratic performance of agricultural sector and lengthy civil war were the main contributors to this sluggish economic record.

Another major change in the Ethiopian political and economic context occurred in 1991, when a coalition of forces Ethiopian People Republic Democratic Front (EPRDF) succeeded in overthrowing the military regime. The EPRDF reinstated the market economy system some of which included promotion of private sector development, replacement of quantity restrictions by tariffs, and liberalizing exchange rates. During this period Ethiopia's economic performance improved significantly albeit with considerable volatility. GDP has grown 6.37% per year and 4% in per capita terms.

2.1.1 Structure of the Economy

Like any other developing country agriculture takes the lion's share of contribution to GDP of the country. Even though, the share is declining agriculture is still dominantly contributing 45% of GDP, employing more than 80% of the population and contributing more than 90% of the country's export earnings.

The agricultural sector being dependent on rain, its growth performance depends on the weather. In addition to weather fragmentation of agricultural land and environmental degradation are regarded as the bottle necks of the agricultural sector.

Since agriculture is the dominant sector the fluctuation in the overall growth rate to a large extent depends on fluctuation in the agricultural sector. In the major draught years of 1984/85, 1996/97, 2002/03 there has been a major drop in agricultural production and there by decline in GDP.

Table 2.1B Sectoral Contribution to GDP (in percentage)

Sectors	The share of value added to GDP by period			
	1960/1 – 1973/4	1974/5 – 1990/1	1991/2 – 2007/8	1960/1 – 2007/8
Agriculture	67.7	55.5	49.61	56.09
Industry	9.28	11.5	12.49	10.90
Service	23.02	33	37.89	33.01

Source: Data from MoFED and own computation

As shown in table 2.1B the agricultural sector contributed 68%, 56% 49% and 56% of the real GDP during the periods 1960/61-1973/74, 1974/75-1990/1991 and 1991/92- 2007/08 and 1960/61-2007/08 respectively. The deterioration in the share of agriculture over the past four decades might witness that there has been a structural transformation in the national economy. The industrial sector accounted for 9.2%, 11.5% 12.49% and 10.9% and the service sector accounted for 23.02, 33, 37.89 and 33.01percent. However, due to high population pressure (growth rate of 2.6%) the growth rate of GDP has not been enough to improve the living conditions of the majority of the population. On average the growth rate of per capita GDP was 1.3 percent only over the past four and half decades.

In similar grounds the share of industrial sector stays around 10 percent the whole sample period.

2.1.2 The Public Sector

Government plays an important role in the development of any economy. The government intervention is justified in several grounds, such as for the provision of public goods and services, maintenance of peace and order and correcting market failures.

Common features of most developing countries are under developed physical and social infrastructure, low levels of saving and investment. These factors urge the government to intervene in the development activity and there by breaking the vicious circle of poverty.

Since Ethiopia is one of the LDCs it shares these features with other LDCs. The government has been involved in the economy to various extents in different times. Especially during the Derg regime the role of the government was so pervasive that it is beyond what the Keynesians recommended. The Derg confiscated private property, and engaged in production and distribution of goods and services directly which went far beyond the provision of basic infrastructure and social services. Recently, however, economic liberalization reduced the role of government. The government mainly concentrates on the provision of social services and infrastructure (roads, health, education, communication etc). But in both periods revenue from domestic sources has not been the sole means of financing government expenditure.

Generally, fiscal position of Ethiopia has revealed changes over the last four and half decades. The government budget was in surplus in the early 1960s but now the situation has changed in to a growing deficit. Even though, both revenue and expenditure has increased tremendously the deficit confirms that expenditure has grown at a faster rate than the revenue.

2.1.3 **Budgetary System**

To implement its economic functions government raise revenue through taxation, fees and charges and spend them in different activities and programs. This process of raising revenue and spending by the government is performed through budgeting. Budget, thus stand for the yearly plans of government revenue and expenditures. The budgeting process starts from the initial stage of preparing the annual revenues and expenditure forecasts and ends when it is actually

implemented following its approval by the respective government body. This budgeting process has passed through major modifications since the 1930s.

In this budgeting process the government plans both its revenues and expenditures. In Ethiopia the revenue budget is usually categorized in to three major headings ordinary revenue, external assistance and capital revenue, therefore the fund raised from these sources constitute the annual revenue for the country. Ordinary revenue includes both tax and non tax revenues. The tax revenue again has sub headings personal income tax, agricultural income tax, indirect taxes and foreign trade tax. Non tax revenue includes charges and fees, investment revenue and pension contributions.

In Ethiopia external assistance is the major item in the revenue budget it includes cash grants from bilateral and multilateral donors and technical assistance in personnel and material form. Similarly the capital revenue includes sale of movable properties, collection of loans, external loans for capital projects.

The Ethiopian government also spends for administrative and developmental goals which are handled through expenditure budget. These expenditures are categorized in to recurrent and capital expenditures. The recurrent budget which covers current expenditure is mostly covered in principle from domestic sources and the capital budget which incorporates the acquisition of newly produced assets in the economy is financed through external borrowing and grants.

Table 2.1C Summary of revenue and expenditure of the government as a share of GDP (in percentage)

Items	1960/61-1973/74	1974/75-1990/91	1991/92-2007/08	1960/61-2007/08
Tax revenue	0.05	0.16	0.58	0.33
Non tax revenue	0.08	0.058	0.28	0.12
Recurrent expenditure	0.054	0.22	0.69	0.4
Capital expenditure	0.011	0.095	0.47	0.24
External Assistance	0.031	0.11	0.11	0.085

Source: data from MoFED and own computation

2.1.4 The budgeting process

The budget process passes through various stages starting form forecasting annual revenues and expenditures to its approval by the parliament. The Ministry of Finance and Economic Development (MoFED) will prepare the macroeconomic and fiscal frame work identifying government priorities in the fiscal year. Next it will forecast the annual revenue from different sources and determine the expenditure budget ceiling. MoFED will also allocate the budget between federal and regional governments and current and capital budgets. After this MoFED sends budget call and ceilings to the concerned ministries and institutions, then the budget will be reviewed and hearing and defense will be conducted. In the hearing the budget request of ministries and institutions may be increased or decreased. Once the hearing s conducted and recommendations are included MoFED will submit the budget to council of ministers. The council of ministers will discuss on the budget together with the concerned bodies and pass it to

the parliament for approval. Once the parliament approves the budget it becomes budget proclamation and published in the Federal Negarit news paper.

For efficient implementation of the budget system the government uses Medium Term Expenditure Framework (MTEF). The MTEF, which is implemented in most developing countries, defines a three year rolling macro economic framework that outlines the overall resource envelope and forms the basis of setting national priorities and expenditure prioritization. In Ethiopia the base for this MTEF is the Program for Accelerated and Sustainable Development to Eradicate Poverty (PASDEP).

Table 2.1D proportion of current and capital expenditure from total expenditure

Ratio	Time			
	1966-1974	1975-1991	1992-2008	1966-2008
Current expenditure to total expenditure	0.776	0.7033	0.5851	0.6049
Capital expenditure to total expenditure	0.224	0.2967	0.4149	0.3951

Source: data from MoFED and own computation

Historically the proportion of capital expenditure from the total expenditure has shown an increasing trend. As shown in the above table during the imperial regime capital expenditure accounts only 22.4% of the budget and current expenditure account 77.6%. in the socialist Derg regime the proportion exhibits an increasing trend by jumping to 29.67% and 70.33% respectively. During the post Derg period the proportion further increased to 41.49% and 58.51% respectively. Increasing proportion of capital expenditure from the total expenditure shows that

through its budget government is planning to achieve a higher rate of economic growth by investing more on capital investment projects.

For budgeting purposes it is essential that donor funds are integrated in to the planning and budgeting process of a country. When a government is forecasting its revenue it also plans on foreign aid flow. Inclusion of aid flows in to government budget has become a key factor for sound finance management especially in those countries, such as Ethiopia, whose budget is largely dependent on external grants and loans. External resource supplements the government resources. At the same time however, aid flows are mainly directed towards capital expenditures and have important ramification on the government recurrent budget, which is mostly financed by domestic resources. All levels of public expenditure management require that donor funds should be integrated in to the planning and budgeting process of a country. Complete integration occurs when aid is treated as internal revenue at each stage of the budgeting process. Integrating aid in the budget system is essential on two grounds. First aid will be fully accounted at the planning and programming stages so as to ensure it is complementary to domestic resources and focused on the same national priorities. Second recording and reporting actual aid flows and can monitored effectively.

As a step towards strategic planning of budget, accurate forecasting of aid is necessary. Besides, government has to improve the dialogue in the planning and budgeting process by sharing the draft public investment program (PIP) and their support assumptions with the donors. This would give donors the opportunity to check and react to assumptions made by the government and external assistance.

2.2 Significance of foreign aid in the Ethiopian economy

Foreign aid, either official grant or concessional loan which is provided in currency or in kind are generally targeted to transfer resources from developed to developing countries and assist them in their development endeavor. It can be channeled in the form of project aid, technical assistance and budget support. It is intended to fill the resource gap in developing countries.

Ethiopia is one of the poorest nations in the world; it ranks 170 out of 177 countries in 2005 human development report. Thus, it needs external assistance to finance its developmental activities. Fortunately the foreign aid flow to the country is increasing. In recent years aid disbursement both from bilateral and multilateral donors is consistently increasing especially during the periods in which Ethiopia started to implement the SDPRP[3]. The external assistance which was 3.1 percent of GDP in the period 1960/61-1973/74 reached 11 percent of GDP in the period 1991/92-2007/08. Like any other developing country Official Development Assistance (ODA) has played an important developmental role in the Ethiopian economy. On account of weak productive capacity and competitiveness of the economy, Ethiopia has not been able to mobilize enough domestic resources to finance its development activities. ODA has played a key role in economic performance of Ethiopia under various regimes. During the imperial regime Ethiopia was receiving developmental aid from western countries, mainly the United States of America. However, during the socialist period Ethiopia had been receiving assistance from the eastern block particularly the Soviet Union and East Germany.

Similarly, in the post Derg period ODA continued to play a key role in basic social services as well as developmental projects. For instance, access to education, health and construction of hydro electric power plants. The heavy reliance of government expenditure in Ethiopia can also be confirmed by looking at aid dependence indicators.

[3] See MoFED quarterly bulletin 2005 pp15

Table 2.2 Aid dependency indicators (in percentage)

Period	Aid/GDP	Aid/total Expenditure	Aid/total domestic revenue
1960/61-1973/74	0.031137	0.54729*	0.576657
1974/75-1990/91	0.100722	0.331469	0.4838
1991/92-2007/08	0.111871	0.131361	0.19345
1960/61-2007/08	0.84649	0.3237	0.4096

Source: Data from MoFED and own computation.
*The ratio for this period is higher because of unavailability of data on capital expenditure for the period 1960-1964.

Table 2.2 clearly shows that developmental assistance continues to play a key role in the Ethiopian economy. Aid to GDP ratio has exhibited an increasing trend. It was 3.1 percent of GDP during the Imperial regime and 10 percent of GDP in the Derg period. In the period between 1991/92-2007/08 it accounts 11.2 percent of GDP. On the contrary aid to total expenditure ratio and aid to total revenue ratio has shown a decreasing trend over the three different regimes. This is because even if the amount of aid flow is increasing over time government expenditure and domestic revenue increase at a higher rate than foreign aid.

Since different kind of aid has different effect on the economy, one classification of foreign aid is based on the degree to which recipients have control over the disbursed aid fund. In this way aid can be classified as program and project aid. Program aid is defined as aid flow covering a range of areas like budget support, balance of payment support and debt relief. Project aid is defined as aid ear marked for a specific project with donors or their agents have much control on how the fund is to be used. Figure 2.2A shows trends of program and project aid flow to the country over

time. It reveals that aid flow is continuously increasing and project aid is greater than that of program aid.

Figure 2.2A Trends of program and Project aid

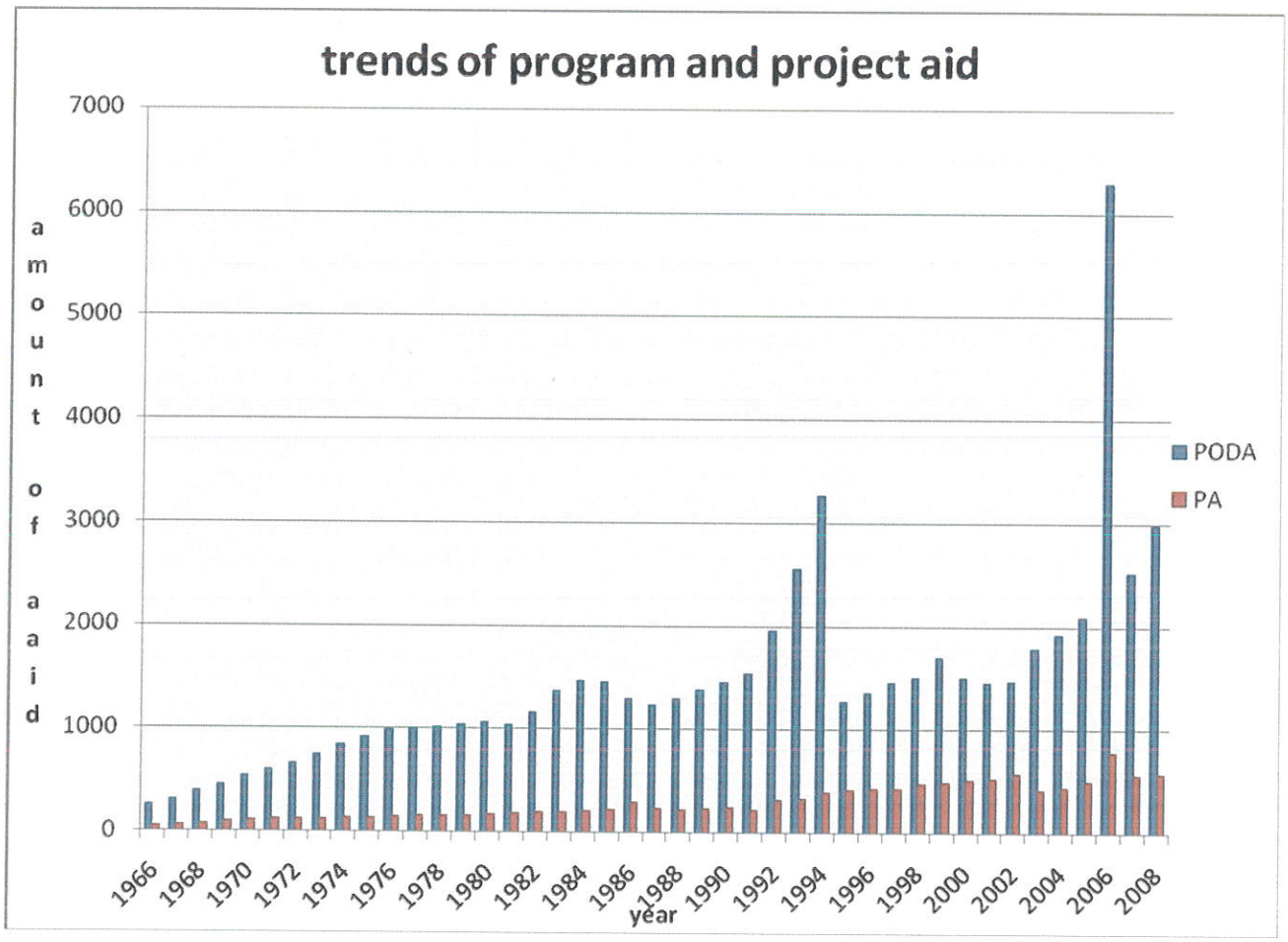


Figure 2.2B Trends in expenditure and revenue

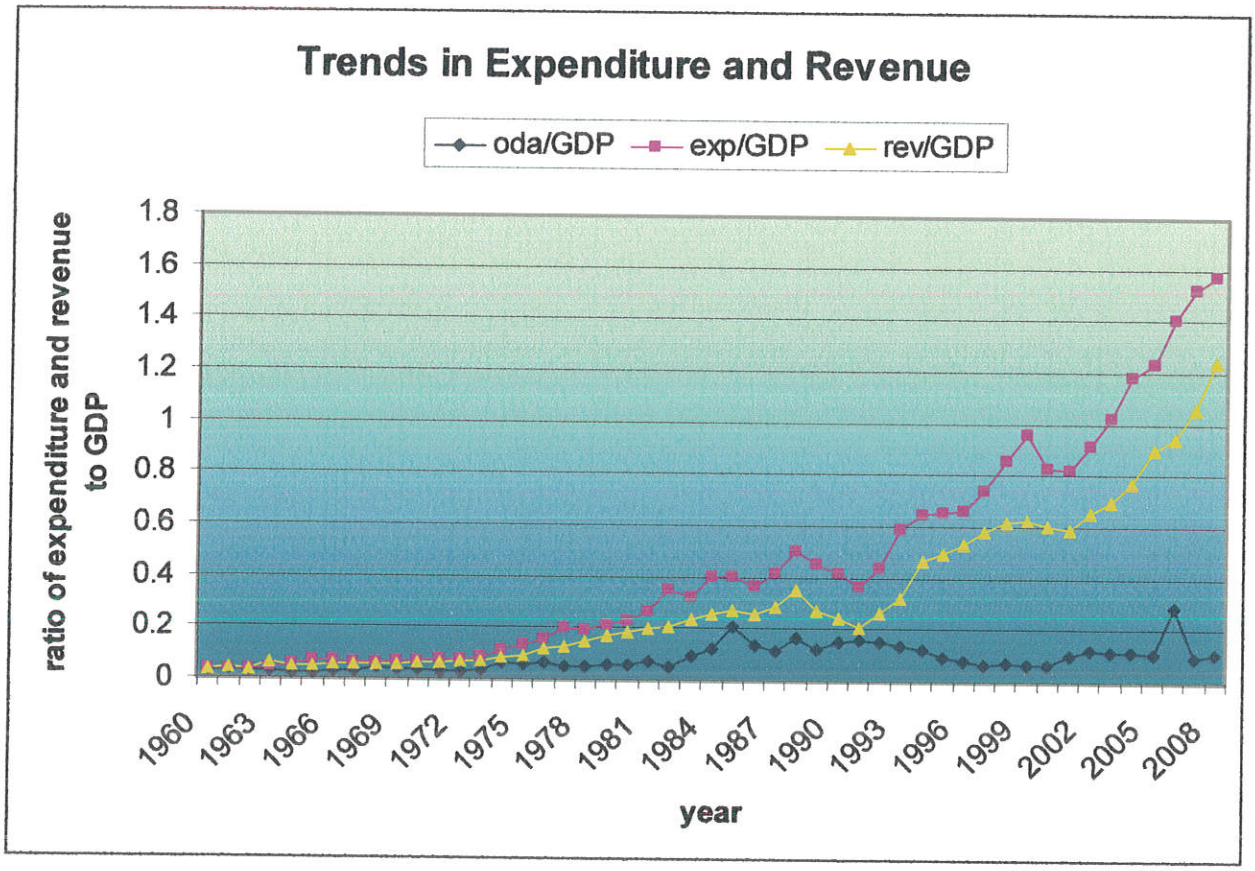


Figure 2.2 shows the indicators aid to GDP ratio, domestic resources to GDP ratio and total expenditure to GDP ratio. It implies that the Ethiopian economy has not been able to mobilize sufficient domestic resources to finance the government expenditure. The resource gap in domestic resource and expenditure has been filled by the flow of external resources to the country. This fact is explained in the graph as the aid to GDP ratio is filling the gap between domestic resource and expenditure.

CHAPTER THREE

LITERATURE REVIEW

3.1 Theoretical Literature

3.1.1 Definition of Foreign Aid

Foreign aid refers to transfer of real resources from governments or public institutions of the rich countries to governments of less developed countries (LDCs) on development grounds. The flow of foreign resources can be of many types and it is important to know the different elements. Foreign capital flows are generally divided in to two broad streams –official and private. The official capital flows are in turn subdivided in to bilateral and multilateral flows. Official bilateral flows consist of capital provided by government of donors to government of recipient countries. Multilateral flows consist of capital flows from multilateral organizations such as the World Bank, the United Nations, and the IMF. Both types of capital flows can take the form of grants, loans or grant like contributions.

Grants should be considered as the most desirable type of foreign aid since they represent a net addition to the resources available for development purposes. Some loans are given by the international lending agencies (such as World Bank) at interest rate which are lower than those in the capital markets. Where the loans are granted to LDCs at a concessionary rate for very long periods, say 40-50 years, the inflow of resources take the character of foreign aid.

Development Assistance Committee (DAC) defines foreign aid as official development assistance (ODA) and technical aid. Excluding military assistance, ODA flows must satisfy the following criteria

- Their primary objective must be developmental, thus it excludes military and private investment.

- ❖ They must be concessional that is the terms and conditions of the financial package must be softer than those available on commercial basis. DAC defines as ODA flows with a grant element of greater than 25%at 10% discount rate.
- ❖ The flows should come from governmental agencies and go to developing country governments.

3.1.2 Motives and Objectives of Foreign Aid

The success of Marshal Plan by the United States as a way of aid and development effort motivated the United States and other developed countries to provide LDCs with development aid. Least developed countries usually have a shortage of foreign exchange which is needed for importing the necessary capital and intermediate goods. External resources can play a crucial role in supplementing domestic resources in order to relieve savings or exchange bottlenecks. This is the theory of two gap analysis of foreign aid. Assuming LDCs have complementary domestic resources that allow them to undertake new investment projects, then foreign aid will overcome the foreign exchange constraint and raise the rate of economic growth. If LDCs have underutilized resources due to balance of payment constraints then aid disbursement will help them to fully utilize their resources.

Many economists searched the allocation and some determinants of foreign aid flows to developing countries and tried to answer two questions concerning foreign aid: 1) why do countries give foreign aid? And 2) what do the receiving countries do with it? For instance Gang and Khan (1990) looked at what factors determine how much aid a country gives. Where as, other researchers, like Mosley, Hudson and Horrell (1987) dealt with the second question. The economic objectives of foreign aid are to alleviate poverty and increase savings, investment and rate of growth of GNP in developing countries. However, development assistance has not always

succeeded in achieving these objectives because in many cases donor motives for giving aid and recipient motives for accepting it conflict with the economic objectives of foreign aid. There is no historical evidence that over large periods of time donor country assist others without expecting some corresponding benefits (political, economic, military) in return. As Todaro (1989) indicates, "There are likely to be fundamental differences in attitudes and motivations between donor and recipient countries". Thus, foreign aid is a complex term, especially, when it is used to cover a variety of resource transfers from developed countries to developing countries. Many of these may be military and/or political in nature and have nothing to do with assisting economic development.

3.1.2.1 Donor Motives for Giving Foreign Aid

There are several motives which inspire financial assistance from public bodies on concessionary terms, such as humanitarian, political, commercial, military and economic. The direction of U.S. aid shows that it is obvious that aid does not always go to the poor. Some development assistance may be motivated by moral and humanitarian desires to assist the less fortunate, but there is no significant evidence to suggest that over longer periods of time donor countries assist others without expecting some corresponding benefits.

The official aid reports generally point out the humanitarian aspect of foreign aid with its usefulness in promoting social stability in the recipient countries. However, the development motives of foreign aid still take large part in official reports of donor governments and the OECD Development Assistance Committee (DAC). Moreover, many donor countries consider their national economic interest, political and strategic interest as well.

A: Moral and Humanitarian Motives:

The objectives of most donors have an ingredient of moral obligation stressing that social welfare should be promoted in the LDCs so as to decrease the disparity between the two groups. Donors provide aid for moral and humanitarian reasons to assist the poor, like emergency food relief programmes. Others feel obliged to compensate LDCs for past exploitation and colonization.

On the other hand, the thesis that nations extend aid out of a sense of sympathy and charity has been rejected by Griffin and Enos (1970), and they say: "We believe there are other reasons for which foreign aid is given, and by which donor countries judge its effectiveness. Individuals may be human and disinterested, but nations are not. When people collect together to promote their own interests, they lose their sympathy for others.

B: Political, Commercial and Military Motives:

The donor's primary motive for giving aid is political rather than moral and humanitarian. Countries like Turkey, Egypt, Greek, and Israel are of geopolitical significance to the United States and thus receive more aid than the normal. The political purposes have been to obtain strategic advantages and to cultivate the aspirations of the donor such as democracy and communism, among others. The end of World War II witnessed the gradual emergence of liberated nations who required assistance for progress.

As Todaro (1989) said, the direction of total aid is not always in favor of the neediest countries. Less than half of bilateral development aid goes to the forty six countries with the lowest incomes. Most of the aid goes to well-off third world countries based on political and military considerations.

Bilateral assistances also often reflect political and military objectives (Thirlwall, 1989). Therefore, it can be said that especially the decision to grant aid to another country is

fundamentally a political decision. In other words, Economic aid from the powerful to the powerless countries is an instrument of power politics.

C: Economic Motives:

Apart from political and military motivations, there are also some commercial motives for giving aid as they procure economic benefits as a result of their aid programmes. This is apparent as donors are increasingly tending towards providing loans instead of grants. It is indicated that interest bearing loans now constitutes over 80% of all aid compared to less than 40% in early periods. Here, "tied aid" either by source (i.e. loans or grants have to be spent on the purchase of donor country's goods and services) or by project (funds can only be used for specific projects) can be an example of commercial motives (Todaro M.P, 1989). As it is stated by Thirlwall (1989), "there are some economic motives for developed countries investing in developing countries not only to raise the growth rate of developing countries, but also in their own self interest". In this case international aid can be mutually profitable.

In addition, some interest groups in the DCs get some benefits from aid. These interest groups include exporters of goods and services bought by aid-recipient countries, those who have extended loans and credits to aid-recipient governments whose ability to repay them depends critically on continuing to receive aid funds, and those engaged in the aid industry as politicians, administrators and experts.

If foreign aid is successful in stimulating the growth rate of national income in a developing country, the effect of foreign aid can expand the demand for goods and services of developed countries. Morrissey (1990) in his study showed that multilateral aid has greater impact on the donor economy than tied bilateral aid. Economically, the donor will also gain if it is able to penetrate into the markets of developing countries.

3.1.2.2: Recipient Motives for Receiving Foreign Aid:

It is well known that LDCs, at least until recently, have been very eager to accept foreign aid, even in its most stringent and restrictive forms. A primary motive for receiving aid is political as foreign aid provides greater political leverage to the existing leadership to maintain its power and suppress opposition.

Another major reason is clearly economic in concept and practice. According to Todaro (1989), developing countries have often tended to accept uncritically the proposition that foreign aid is a crucial and essential ingredient in the development process. There are some successful cases such as Israel, Taiwan and South Korea. Hence, foreign aid supplements the scarce domestic resources of developing countries; it contributes towards the economy transforming structurally. It also contributes to the achievement of developing countries' take-offs into self-sustaining economic growth. Therefore, the economic rationale for foreign aid in developing countries is largely on their acceptance of what they require to promote their economic development. Hence, conflicts generally arise, not out of any disagreement about the role of foreign aid, but over its amount and conditions. Todaro (1989) concluded that naturally, developing countries would like to have more aid in the form of outright grants or long term low-cost aid with minimum strings attached.

3.1.3Types of Aid

Aid comes in variety of forms or 'modalities'. Dollar and Svenson (2000) show development assistance shifted to a large extent in the 1980s from financing investment (roads and dams) to promoting policy reform. In the 1990s and 2000s the focus of aid once again shifted toward basic health and education. If Aid is disaggregated by sectors, its effectiveness will vary among different sectors. For instance, some types of aid (say to open natural gas refinery) can be expected to affect the economy in the medium term. Other types of aid (say investment in

primary education) can not be expected to have an economic payoff in the medium term, even if they are sorely needed and well spent. The different modalities of aid could include:

- Program and Project aid: includes investments in infrastructure, energy provision and industrial production.
- Technical Assistance: it includes the transfer of knowledge in the form of advice, training and problem solving. Some technical cooperation is aid in the form of personnel, including experts, volunteers, advisers and so on financed by the donor.
- Social sector support: this includes spending on education, health and education. The UNDP has frequently pushed for the so called '20-20 agreement' where donors pledge at least 20% of their aid to social sectors and recipients pledge at least 20% of their public sector budgets to these projects.
- Food aid: it frequently comes in the form of surplus grain produced in developed countries which is then sold in the recipient country at discount prices.

Cross country differences in aid flows are largely explained by variety of factors. Based on the work of Alesina and Dollar (2000) the variables that affect aid are: colonial past, UN friends, poverty level, openness to trade and democracy.

As world bank (1998) recognizes 'if foreign aid has at times been a spectacular success, it has also been at times an unmitigated failure'. In cognizant of this fact, the donor community (multilateral agencies, NGOs, bilateral donors), which generally disagree on the causes of such failure, seem to agree on one basic principle: aid alone (be it debt relief or development assistance) does not insure the implementation of successful poverty reduction policies. This implies that aid policies should be designed in a way that provides proper incentive for an effective implementation of social programs, and minimizes the risk that external assistance be misused.

Traditionally, funds have been disbursed either through aid linked directly to specific projects (project aid), or through providing support to the recipient government's budget (budget support, program aid) while imposing conditionality on how to allocate the available aid funds.

Program aid is a wide term covering a range of interventions including budget support, debt relief and balance of payments support (BOPs). Important features of financial program aid are that it: is directly channeled to partner governments; uses local accounting systems; is not linked to specific project activities; and is quick disbursing (Wilkes, 2001).

Direct budget support has two important categories. General budget support covers financial assistance as a contribution to overall budget with any conditionality focused on policy measures related to over all budget priorities. There is no formal limitation on which sector funds may actually be spent. Sector budget support covers financial aid ear marked to a specific sector or sectors, with any conditionality attached to it.

Technically, program aid grants involve the donation of foreign exchange which is converted in the recipient country to support a high level of government expenditure. It can be used either for import spending (BOPs) or for domestic spending. Initial experience shows that program aid was used for balance of payments to close the perceived 'foreign exchange gap' in a given financial year and to enable spending on key imports in the 1980s (Wilkes, 2001).

One obvious alternative to budget support and its short coming is project aid. With project aid it refers to a situation where the donor is in full control of all the inputs required in the production of some portion of the developmental good. Typical examples for such kind of aid is the implementation of large public infrastructures, financing of a number of smaller projects implemented directly by donors, NGOs, local communities e.t.c. Since the donor (or its agents) are in full control of the projects it is implicitly assumed that in project financing it is possible to

avoid diversion of aid funds by the recipient. However, this is not necessarily the case, there are several instances project funds have been redirected (Cordella and Ariccia, 2003).

3.2 Empirical literature

3.2.1 Aid Debate

The main economic rationale for giving aid seems to be the desire to help the recipient countries attain some higher rates of economic growth, and yet the empirical evidence on the effectiveness of aid in stimulating economic growth is mixed and the theoretical literature continues to be mired in controversy (McGillivary *et al.*, 2005). In part, the controversies are rooted in the different ideological stances and methodological approaches taken by the various researchers. White (1992) identifies critics of aid from both the left and right of the political spectrum. The perception that aid can promote sustainable economic growth is predicated on aid supplementing domestic savings and foreign exchange earnings in a recipient country. Hence, aid is said to be effective if an increase in aid raises savings and export earnings which enable a recipient country to increase investments and, in turn, economic growth. This line of enquiry of aid effectiveness is well known as the two-gap approach pioneered by Chenery and Strout (1966). They found that aid supplements domestic resources in their two-gap analysis. As outlined by White (1992), one criticism of the two-gap model has been the subject of the savings debate in which the 'radical' position has been that aid supplants domestic savings, thus lessening the impact on growth. And one question to emerge from this analysis is how recipient governments respond to aid inflows.

Theoretically, the efficacy of aid can be diminished if aid produces effects that are similar to Dutch Disease[4]. Consequently, aid may lead to the appreciation of the exchange rate, which in turn erodes the recipient's export earnings. Aid can also be less effective if it is fungible or is used for purposes other than what it was intended for. For example, aid may be used to invest in low-productivity sectors or to increase unproductive government consumption or to fund tax reduction or reduce borrowing. These can reduce domestic savings and investments through upward pressure on prices and interest rates (McGillivray and Morissey, 2001).

Another issue is the policy conditionality attached to aid. Since 1980s, aid donors have increasingly attached policy conditionality to most of their aid allocation. To qualify for foreign aid a country must adopt economic policies that are broadly in line with the set of policy prescriptions called the "Washington Consensus"[5]. This consensus requires recipient countries to achieve fiscal discipline, tax reform, trade liberalization, deregulation and privatization which implicitly assume that a "good" policy environment is a precondition for aid effectiveness, but this view is not shared by all commentators. The leading rival studies in the controversy are those authored by Burnside and Dollar (2000), who argue that good policies are a necessary condition for aid effectiveness. On the other hand Hansen and Tarp (2001), counter-argue that aid is effective regardless of the policy environment. However, Morrissey (2001) observes that a good policy environment improves aid effectiveness. And indeed, aid donors have recently provided

[4] This view suggests that aid can cause a boom in one sector (the non tradable sector) at the cost of a recession in another sector (the tradable sector). Dutch Disease in the context of aid dictates that a large in-transfer of aid to a poor country ultimately leads to a decrease in exports. Aid increases the supply of tradable goods and dampens their price. By the income effect it increases the demand for non-tradables. Scarce resources are then diverted from the export sector to the tradable sector.

[5] Washington Consensus is the name given to the ten policy prescriptions proposed by Williamson in 1990

aid packages designed to promote institutional reform. Good governance and capacity building are high on the policy dialogue agenda between donors and recipients.

It can be argued that the side effects of aid such as the Dutch Disease and fungibility issues are the consequences of how policies are designed to accommodate aid inflow which, in turn, depend on the institutional capability of recipient countries as well as the policy conditionality. In simulations implemented by Xayavong *et al.* (2005), a stable aid flow contributes to economic growth even when aid is fungible but policy conditionality leading to unstable aid flow impairs the effectiveness of aid. Tsikata (1998) highlights the importance of an appropriate macroeconomic policy mix to address the problems of the effect of aid on competitiveness and crowding out of private investment. Morrissey (2002) also suggests that government policies can play an important role in enhancing aid effectiveness through seeking to improve the productivity of investment. Hence the degree to which aid can stimulate economic growth depends critically on the behavior of the recipient government.

Recent arguments for doubling aid to Africa are based on the premise 'boosting public Expenditure—on vital areas such as education, health and infrastructure' (Commission for Africa, 2005). Foreign aid is of critical importance to achieving the international goal of providing basic services to all human being by 2015[6]. Research shows that aid increases spending on social sectors (health, education and sanitation) and contributes to improving

[6] (The eight millennium development goals are: (1) Eradicate hunger and poverty (2) Achieve universal primary education (3) Promote gender equality and empower women (4) Reduce child mortality (5) Improve maternal health (6) Combat HIV/AIDS and malarial diseases (7) Ensure environmental sustainability and(8) Develop a global partnership for development).

aggregate welfare, although in the poorest recipients the effectiveness of social spending in delivering welfare improvements is low (Gomanee et al., 2005). (Hagen and Hatelbakk, 2000) found that transfers from the bilateral donors tend to reduce the priority given to social spending. However, the 'soft' bilateral donors – those devoting more than 0.7%of their GNP to aid-succeeds in raising the budget share of social sectors by using ear marked aid. While the effectiveness of public spending is clearly an important issue, a prior concern is how aid affects spending and fiscal behavior more generally (including effects on tax effort and borrowing).

3.2.2: Fungibility of Foreign Aid

By providing assistance, foreign governments and international donor agencies attempt to influence the public expenditure policies of recipient governments. Similarly, in a federal system of governance, subsidies and grants are used by governments to influence the budget of a subsidiary government. Aid is also used to influence individual behavior. The link between aid and the recipient's budgetary allocation, however, is not straightforward because some aid may be "fungible." For example, if a government would have undertaken a donor-financed project in the absence of that financing, then donor funds simply relax the government's budget constraint and finance, at the margin, something else. In a federal structure of governance, aid earmarked for a subsidiary government could end up replacing funds that the federal government would have given in the absence of that aid.

There is a growing literature on how aid affects the fiscal behavior of governments (reviewed in McGvillivary and Morrissey, 2004). Studies in this area have been classified in to two groups. First fungibility studies are sought to analyze the effects of aid on the composition of government spending. Aid is said to be fungible if it is given for one purpose (say investment) and used for

another (consumption). While fungible aid is in general perceived as being less effective than aid used as specified, the outcome is mixed. These studies tend to be critical, typically finding evidence of considerable fungibility (aid is not necessarily allocated to the spending headings intended by donors).

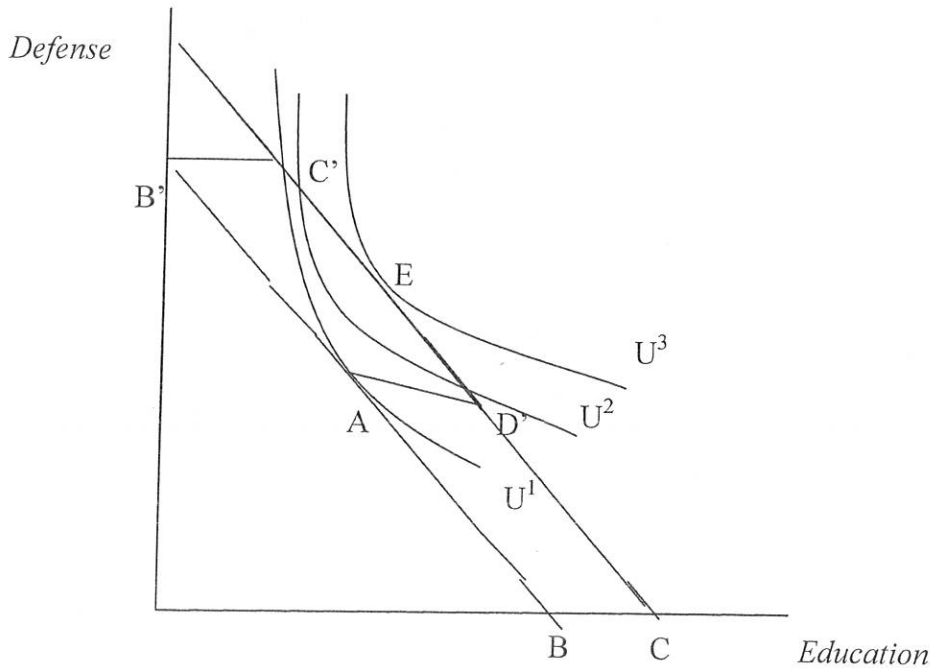
3.2.2.1 A Graphical Analysis of Aid Fungibility among Public Spending Categories

In most of the developing countries foreign aid constitutes a higher share of their budget. To analyze the effect of foreign aid on the recipient government's budget, fungibility of foreign aid plays an important role. Feyzioglu et al (1998) developed a fungibility model of foreign aid by assessing the recipient government's budgetary allocation under the flow of foreign aid for different sectors.

According to them public spending can be financed by domestic and foreign resources. Suppose donors provide aid to the education sector and the government has the option of allocating this aid fund between defense and education sector. They assume that aid does not affect the relative price of the sectors (i.e. it shifts the government's budget constraint out ward).

The pre aid optimal allocation of government budget is given at point A (figure 3.2). when there is foreign aid flow in the education sector, the recipient country may render a portion or full of the aid to be fungible or it may also use the aid as specified by the donors so that the aid is fully non fungible. If the recipient country totally diverts the aid it is said to be fully fungible. The fungibility parameter will be one ($\phi = 1$). It implies that the budget constraint shifts by the full amount of the aid and it is used to finance defense expenditure. The optimal mix of the two public goods will move from point A to E (figure 3.2).

Figure 3.2 ***Impact of Aid on a Country's Budgetary Allocations***



Source: Adopted from Feyzioglu et al (1998)

If the recipient country uses the aid as specified by the donor there will be no diversion of funds. All the aid money is used for the targeted sector. In such cases aid is said to be non fungible and the fungibility parameter will be zero ($\phi < 0$). The optimal mix of the two goods moves to point E (figure 3.2).

If aid is partially fungible the fungibility parameter will be between zero and one ($0<\phi<1$) the recipient government's budget constraint shifts out by the amount of fungible aid. The recipient will choose optimal mix in its new budget line. The optimal mix will lie between point E and D in figure 3.2.

Even though it seems easier to control fungibility of foreign aid, such monitoring is difficult in reality. According to Feyzioglu et al (1998) if a recipient country obtains foreign aid from several

sources under poor donor coordination and if recipient country's domestic resource is volatile, recipients can easily switch aid funds from the targeted sector.

Proponents of foreign aid for instance Devarajan et al(1998) argue that even under fungibility foreign aid has superior impact on the economy than domestic resources, because aid comes together with technical assistance and superior management skill of the rich nations. Thus, the outcomes of project under takings financed by aid funds have positive impact on several macro economic variables.

The objective of the categorical fungibility studies is to examine the extent to which aid is used in a fungible manner. These models attempt to show the actual extent to which aid, or some portion thereof, is used for purposes other than for which it was intended. As reviewed by Mcglivary and Morissey (2001) Categorical fungibility studies can be classified into two groups. The first group includes Feyzioglu *et al.* (1998), Swaroop *et al.* (2000) and Khilji and Zampelli (1994). Each of these studies have used a utility maximizing problem, and estimates a simultaneous linear expenditure system. The second group adopts a more *ad hoc* approach, in that it is not based on an explicit theoretical framework, but still estimates a set of simultaneous equations.

The most referred article from the first group is Feyzioglu *et al.* (1998). 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, ö (0 £ ö £ 1), and revenue from all other domestic and international sources, R. Citizens also consume goods that the government has to purchase with the non-fungible portion, 1 - ö, of aid. Aid is earmarked by donors for the purchase of K (£ S) specific goods so that ök is the fungible portion of aid earmarked for good k. Feyzioglu *et al.* define a representative agent's utility function in terms of these S goods and a single private good, cp, as follows:

$$W = U[C_p, g_1, g_1{}^{NF}, \ldots, g_K, g_K{}^{NF}, g_{K-1}, \ldots, g_s] \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.2.2.1)$$

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. specify (3.2.2.1) in a Stone-Geary form as follows:

$$W = F(C_p) + H\,[\sum_{K=1}^{K} g_K{}^{NF} + \prod_{S=1}^{S} (g_s - \gamma_s)^{\beta_s} \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.2.2.2)$$

Where, ãs are positive subsistence quantities of the public goods and the âs sum to one. The recipient government is thought to maximize (3.2.2.2) subject to the following constraint:

$$p_1 g_1 + p_2 g_2 + \ldots + p_S g_S = R + \sum_{K=1}^{K} \emptyset_k\, a_k \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.2.2.3)$$

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 ps, ök, R and ak are assumed to be exogenous, the government chooses S goods $(g_1, g_2, \ldots\ldots\ldots, g_s)$ to maximise (3.2.2.2). Maximizing (3.2.2.2) subject to the constraint, after some manipulation yields the following system of linear expenditure equations:

$$p_s \bar{q}_s = p_s \gamma_s + (1 - \emptyset_s + \beta_s \emptyset_s) a_s + \beta_s [\, G^N + \sum_{K \neq S}^{K} \emptyset_K a_K - \sum_{j=1}^{S} p_j \gamma_j$$

$$\bar{g} = g_s + g_s{}^{NF} = g_s + \left(\frac{1}{P_s}\right)[(1 - \emptyset_s) a_s] \quad \text{and}$$

$$G^N = R = G - A = \sum_{S=1}^{S} p_s g_s + \sum_{K=1}^{K} p_{Kg\,K}{}^{NF} - \sum_{K=1}^{K} a_K$$

This equation, supplemented with a vector of control variables and similar equations derived from variants of (3.2.2.1) and (3.2.2.2) (with a single variable - aggregate public expenditure - and expenditure divided into current and capital expenditures, respectively) are then estimated econometrically. Feyzioglu et al. (1998) estimated 36 equations 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, estimating 20 equations individually using OLS and four equations simultaneously using two-stage least squares (2SLS), but using 1970-95 time series data for India. Khilji and Zampelli (1991) also used time series data, but for 1960-86 US aid to Pakistan. Rather than estimating a relatively large number of equations, this study estimated a single system, containing three equations, using the full information maximum likelihood (FIML) approach.

Studies belonging to the second group 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), arguably the best known of these studies, 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 these equations:

$$D_{i,t} = f\left(GDP_t, FA_{i,t}, OFA_{i,t}, DUM\right) \quad \text{.....(3.2.2.4)}$$

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

$$C_i = f(GDP_t, FAT_i, DUM) \text{ and}$$

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

Where Di denotes various categories of public development expenditures, 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 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. Note that development expenditures typically include expenditure on such items as health and education, agriculture, infrastructure, and transport. Each of the equations in (3.2.2.4) are 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 Di, FI, C, FAi and R,M Pack and Pack (1993) estimate equations (4) simultaneously using the seemingly unrelated regressions (SUR) approach.

Devarajan *et al* [1998] analyzes the experience of sub-Saharan Africa-the region with the largest GDP share o f aid. Based on a data set of 18 sub-Saharan countries from 1975 through1995,the authors explore two issues:(i) the extent of aid fungibility in sub-Saharan Africa; and (ii) reasons why aid was fungible or not. In terms of the first question, they find that the broad pattern of aid fungibility observed in cross country and country-specific studies is reflected in their analysis of African countries. Specifically, they find relatively little evidence that aid leads to greater tax relief in Africa; every dollar of aid leads to a 90-cent increase in government spending. The effect

of aid on the composition of public spending between current and capital expenditures is also broadly consistent with international evidence: Aid in Africa leads to an increase in current and capital spending in equal amounts. The result that appears as striking is that an almost equal amount of aid-equal to the amount going for current and capital spending-goes towards repaying the principal on past loans. The argument that the inability to meet debt-service payments would have threatened many African countries with a complete cutoff from foreign capital, and therefore, the use of aid resources to relax this constraint could have been quite rational. In their analysis of sectoral aid fungibility, Devarajan, *et al.* find that sectoral aid in Africa is partially fungible: governments do not spend all sectoral aid in that sector, nor do they treat such aid as merely budget support.

Time series studies using individual countries (Levy 1987, McGuire1978, Gang and khan, 1990; Pack and Pack 1990) found no significant diversion and all agree that countries spend foreign aid funds on the designated purposes. Njeru (2003) using time series data on Kenya found that flow of foreign aid influence government spending patterns and yields high level of fungibility. Similarly Johannes (2006) using Heller's (1975) model for Cameroon found a relationship between government expenditure and foreign aid flow. In his analysis he decomposed government expenditure in to recurrent and development expenditure. Recurrent expenditure is further disaggregated in to spending on education, health, agriculture, communication and roads. The results show that there is a strong and positive relationship among total expenditure, recurrent expenditure, development expenditure and foreign aid. Domestic resources also affect the level of government spending but less than foreign aid.

Pack and Pack (1990), to test the fungibility hypotheses used three types of equations: non developmental current expenditure, developmental expenditures and revenues for Indonesia for the years 1966-1986 across five sectors namely agriculture, industry, transport and tourism, social sectors and others. These equations were also used to allow the cross sectional error correlation implied by the relation of the dependant variables through the budget constraint. The coefficient estimates are then used to stimulate the effects of a rupiah increase in aid per capita, which is spread over the sectors in proportion to their average share in project aid during the 1966-1986 period of the study. They used seemingly unrelated regressions, (SUR).

The result for Indonesia, as Pack and Pack (1990) put it, shows that a one rupiah increase in categorical aid apportioned according to average categorical aid values, stimulates an increase in total expenditure of 1.58 rupiah[7]. Half of the increase is financed by an increase in revenue raised by Indonesia from its own sources and suggested that the other half increase may come from a reduction in expenditures in the residual expenditure category namely to manpower and regional development.

Findings which state aid increases revenue collection is not in line with the fiscal response literature that taxes fall as aid rises. Taxes are raised rather than reduced in response to inflow of aid and hence, Pack and Pack (1990) put it, foreign aid didn't displace development expenditure and it rather stimulates total public expenditure. Moreover, most categorical aid was spent on the purposes for which donors intended it. No diversion of aid to other categories of development expenditure occurred. They also found no support either for diversion of developmental aid to current expenditures or foreign aid leads to a reduction in domestic revenue-raising effort.

[7] Fly paper effect is when a one percent increase in aid leads to more than one percent increase in spending

However, Pack and Pack (1993), in the Dominican Republic case study, found that, foreign aid is characterized by fungibility consisting of major shifts from developmental expenditures to deficit reduction, debt service and reduction in tax efforts.

How ever (jiffar2002) criticized the value of R^2 (0.99) reported on the Pack & Pack (1990) on the ground that there might be a probability of spurious regression. According to him the time series property of the data and the diagnostic tests are not incorporated to the model. Moreover, to capture the full range of aid fungibility, they didn't estimate the impact of foreign aid on non developmental expenditure by disaggregating into various types such as defense spending, debt servicing and other types of general expenditures, their work concentrated on assessing fungibility of developmental spending.

Feyzioglu et al. (1998) using cross country data from 14 developing countries found that aid is not fungible at aggregate levels in smaller samples, but that increasing the number of countries makes aid fungible. At sectoral levels, the study found that aid is fungible on ear marked concessional loans for agriculture, education and energy, but not for transport and communication sectors. Aid money increased government expenditures on a roughly one to one basis for the smaller samples. Increasing the sample to 37 countries changed the result. The evidence that aid money increases government expenditures means that recipient governments do use the increased resources as they choose- to increase spending, cut taxes, or reduce fiscal deficits.

The bulk of foreign aid is given to the governments of recipient countries. One would therefore expect an effect of aid to be higher levels of public spending. However, recipients can not in

general be expected to increase their spending one for one. Inflows of aid might result in tax relief if governments decide to use the assistance to generate greater consumption of private goods in stead of increasing public sector output. Swaroop et al (2000) focusing on expenditure of central government of India found that foreign aid substitutes for already ear marked government spending; the central government spends funds freed by aid on non-development activities. Aid merely softens the government's budget constraint.

Jifar (2002) using time series data on Ethiopia analyzed sectoral fungibility of foreign aid and he found that aid is fungible on transport and communication sector while it is non fungible in education and agriculture sector.

More often than not foreign aid is given for the benefit of the poor in a recipient country. In it self this implies some form of conditionality. However, it is well established that it is very difficult for donors to enforce conditionality, and foreign aid is, to all intents and purposes highly fungible. This fungibility is often blamed for the high degree of aid fatigue in donor countries. Admitting lack of rigorous literature on why this fungibility takes place Lahiri and Moller (2004) developed a political economy model of fungibility where a part of aid is diverted away from intended target by lobby groups. They tried to explain allocation of foreign aid with in recipient country by a domestic political process using political contribution model of Grossman and Helpman (1994). They analyzed cases where (i) donor provide aid in a discretionary way, i.e. play a simultaneous Nash game with the recipient government, or (ii) donor choose its commitment strategy and behave either as a leader or a follower. Comparing the equilibrium when the recipient government has first mover advantage with the one where the two

governments act simultaneously, and show that the former equilibrium yields a higher welfare for the poor in the recipient country than the latter one.

3.2.3 Fiscal Response Models

The second approach, using fiscal response models (FRMs), goes further and argues that aid has complex impacts on government fiscal behavior—on tax effort and borrowing in addition to effects on the allocation of expenditures. These studies tend to find that aid ultimately leads to increased spending, and total spending often increases by more than the value of aid (McGillivray and Morrissey, 2004). There is evidence that aid has had a beneficial impact on investment and recurrent spending in Sub-Saharan African countries (Commission for Africa, 2005). Fiscal response models describe the relationship between fiscal aggregates: governments raise revenue from different sources (e.g. taxes, aid, and borrowing) and allocate them to different expenditures (e.g. capital or recurrent), attempting to meet some revenue and expenditure targets. Franco-Rodriguez et al. (1998) provide a full description of fiscal response models in which aid is treated like the other forms of revenue. Governments have expected values (targets) for aid, other revenue and expenditures, and their fiscal behavior is an attempt to meet these targets subject to the budget constraint. The models explicitly recognize that the fiscal effects of aid can differ from country to country, so the literature has evolved as case studies.

A characteristic of fiscal response model (FRMs) that some might view as a serious limitation, is that they are not predictive theories, in the sense that they do not generate specific testable hypotheses of the effects of aid on fiscal behavior. For example, FRMs do not predict that aid will increase investment spending or will reduce tax effort; aid is posited to have effects as fiscal

variables are related, but in a manner that can only be determined empirically. It is more appropriate to think of FRMs as a representation of the fiscal relationships that suggest an empirical specification to test if aid leads to an increase (or not) in other fiscal variables. However, empirical applications of FRMs have their shortcomings. In particular, there are difficulties in estimating the targets for government expenditure and revenue, and the three-stage non-linear econometric techniques used can be difficult to implement and very demanding of data (McGillivray and Morrissey, 2004).

By applying fiscal response model (Fagernas et al for Malawi, 2004; Rahman, 2005 for Sirilanka; Saif and Omet for Jordan, 2004; Ossei et al for Ghana,2005) found that foreign aid is associated with increased government expenditure reduced borrowing and a mixed result on tax effort. In Sirilanka foreign aid has ambiguous effect on tax effort, for Malawi it doesn't discourage tax effort and for Ghana and Jordan foreign aid leads to increased tax effort.

The first empirical work on the impact of aid on government behavior was done by Heller (1975). His study has assessed the role of different category of aid (grant and loan; bilateral and multilateral) on different category of public spending (development and non development spending), government revenue and domestic borrowing. He examined this using data on 11 African countries and concluded that aid increased both government investment and consumption while reducing taxes and domestic borrowing. Total government spending has increased because aid increases the resources at the disposal of the government.

By disaggregating aid in to grant and loan, Heller(1975) found that grant has a strong pro-consumption bias while concessional loan has strong pro investment bias, implying that grant

increased public consumption and indirectly to private consumption by reducing taxes i.e. different kind of aid have different macro economic impacts.

Gang and Khan (1990) adopting Heller's (1975) model empirically examined the fiscal behavior of the Indian government to foreign capital inflows using time series data for the period 1961-1984. To investigate the links between aid and development they used a two step procedure first they concentrate on the fiscal impact of aid and second they dealt with examining impact of public investment and consumption on development. They empirically estimate their model using 3SLS and confirm Heller's initial finding that increased aid flow reduces tax revenue of the government and contradicts increased aid flow increases government expenditure.

Gang and Khan (1990) findings asserted that aid (both grant and loan) are used to finance investment is different from the finding of Heller which reported that only 36 to 76 percent of total loans and 41 to 53 percent of official grants directed to public investment. Contrary to the finding of Heller which reported that there is no statistical difference between the two sources of aid (Bilateral and Multilateral) they found that multilateral aid pulls resources out of government consumption while multilateral aid is used to finance both investment and consumption expenditure.

M. Amanja et al (2005) applying multivariate cointegration frame work for Kenya using time series data found that government spending has positive impact on growth and tax revenue has no direct effect on growth, but it may have indirect effect through government expenditure, and also they found that the effect of aid depends on whether one considers grant or loan. In line with this they found that grant have positive impact on growth on the long run where as loan appears to be a substitute for tax and finances fiscal deficits and therefore has negative impact in the long run.

The positive effect of aid on GDP growth rate seems to be derived from the incremental effect of aid has on government consumption expenditure, which is a component of GDP.

Mehret (2005) analyzed the impact of aid on pro poor spending and welfare for Ethiopia using time series data for the period 1965-2002 using infant mortality as a proxy to measure welfare and applying Johansen maximum likelihood procedure found a result which reveals that both domestic revenue and aid have significant effect on pro poor expenditure. The impact of aid on welfare confirms that aid improves welfare through funding pro poor spending however, in short run it is statistically insignificant due to the time lag implementation.

Mesfin (2007) used vector auto regressive approach to analyze the impact of aid on fiscal aggregates and economic growth for the period 1960-2004 found that government expenditure has significant impact on economic growth in Ethiopia while tax revenue appears to have insignificant direct influence on economic growth in the long run, but it may have indirect effect on economic growth through government expenditure. His work also shows that foreign aid has significant positive relationship with government expenditure and a negative one with tax revenue. With respect to the fiscal relationship the analysis shows that government expenditure worsen the budget deficit while foreign aid and taxation improve the fiscal stance of the government.

Similarly Birhanu (2007) using impulse response function in VAR frame work for Ethiopia found that increased flow of grants and foreign loan results in an increase of recurrent budget expenditure and a fall in capital budget expenditure, this implies the existence of fungibility. The result also shows increase in aid flow results in an increase in the domestic borrowing. More

over, increase in grant leads to increase in tax revenue and on the contrary increase in foreign loans results in a decrease in tax revenue but as the total effect is represented by the ODA a rise in ODA results in tax revenue.

Martins(2007) by applying FRM for the period 1964-2005 finds that foreign aid has had a positive effect on government investment while its effect on current expenditure has been less pronounced. More over, by disaggregating aid inflows in to grants and foreign lending he analyzed specific roles and impacts. Aid inflows increase public investment, with loans having stronger impact than grants. Both aid grants and loans have a strong negative effect on borrowing, suggesting that aid and domestic financing are close substitutes. It also supports higher aid flows displace domestic revenues.

Alemayehu (1996) examines the fiscal response to external assistance in Africa by using a time-series data from 21 countries for the period 1971 up to 1990. His study is different from the others since it disaggregates taxes as indirect and direct in order to analyze their separate effect. The result obtained by OLS regression of fiscal response model indicates that the impact of capital flows on taxes varies across the type of inflows, nature of taxes and by regions. Aid from bilateral sources has negative impact on direct taxes and it has significant impact on direct taxes. In the expenditure side, it is found that a capital inflow has strong positive impact on current government spending.

However, in his analysis the data on capital inflows and current expenditure is obtained from different sources which might have certain discrepancy. The data for capital inflows is obtained from IMF publication and the expenditure data is obtained from GFS (Government Financial

Statistics) in which government expenditure data is obtained from recipient country. There may be discrepancy in the foreign inflow data reported in IMF publication and recipient country financial tables. Also the fact that his study is different from the others in using standard econometric technique (stationarity and cointegration test) were used to analyze the fiscal response to external assistance, made this work different from the others.

CHAPTER FOUR

METHODOLOGY AND MODEL SPECIFICATION

4.1 Model Specification

To analyze government's response to aid flow Heller's (1975) utility model is adopted which assumes that the recipient country has an objective of maximizing the social welfare of its citizens under budgetary constraints. Funds from developed countries as development assistance can be used as an instrument to achieve the objective of the government. Njeru (2003) used the model to analyze the impact of aid on government spending for Kenya. Swaroop & Jha (1999) Feyzioglu et al (1998), Pack and Pack (1990, 1993), McGuire (1978) used a related utility maximization model to assess the impact of aid on government fiscal behavior.

To develop the model suppose that the government has an option of purchasing two types of public goods – non-development (G_{nd}) and development public goods (G_d) for its citizens. The welfare utility function is specified as:

Maximize U (G_{nd}, G_d) $= G_{nd}^{\alpha} G_d^{1-\alpha}$ 4.1.1

Where $\alpha's$ are the respective elasticities

The government can finance the provision of public goods through domestic and external resources. External sources include both program aid (balance of payments and budgetary support) and project aid. (Devarajan et al, 1998) found program aid is fully fungible while other disbursements will be fungible if redirected by recipient governments. The budget constraint of the government is:

$$R + PA + \varphi(PODA) = P_1 G_{nd} + P_2 G_d \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.1.2$$

Where: G_t is the total government spending

G_d is the actual governments spending on development activities and

G_{nd} is the actual government recurrent expenditures.

R is the total domestic revenue both from taxation and domestic borrowing.

PA is the program aid;

PODA is the project aid and φ is the portion of aid that is fungible.

P_i is prices of public goods where i=1,2

Program aid covers a range of interventions including budget support, balance of payment support and debt relief. Similarly project aid is defined as aid earmarked for specific investment projects. Aid data is used by taking the amount of aid disbursed in a given year.

Maximizing equation 4.1.1 subject to the constraint in equation 4.1.2generates a system of linear expenditure equations that can be estimated linking foreign aid and government expenditure as follows:

$$G_t = \delta_0 + \delta_1 R_t + \delta_2 PA_t + [\delta_2 \varphi + (1-\varphi)]PODA + \varepsilon_t \ldots\ldots\ldots\ldots 4.1.3$$

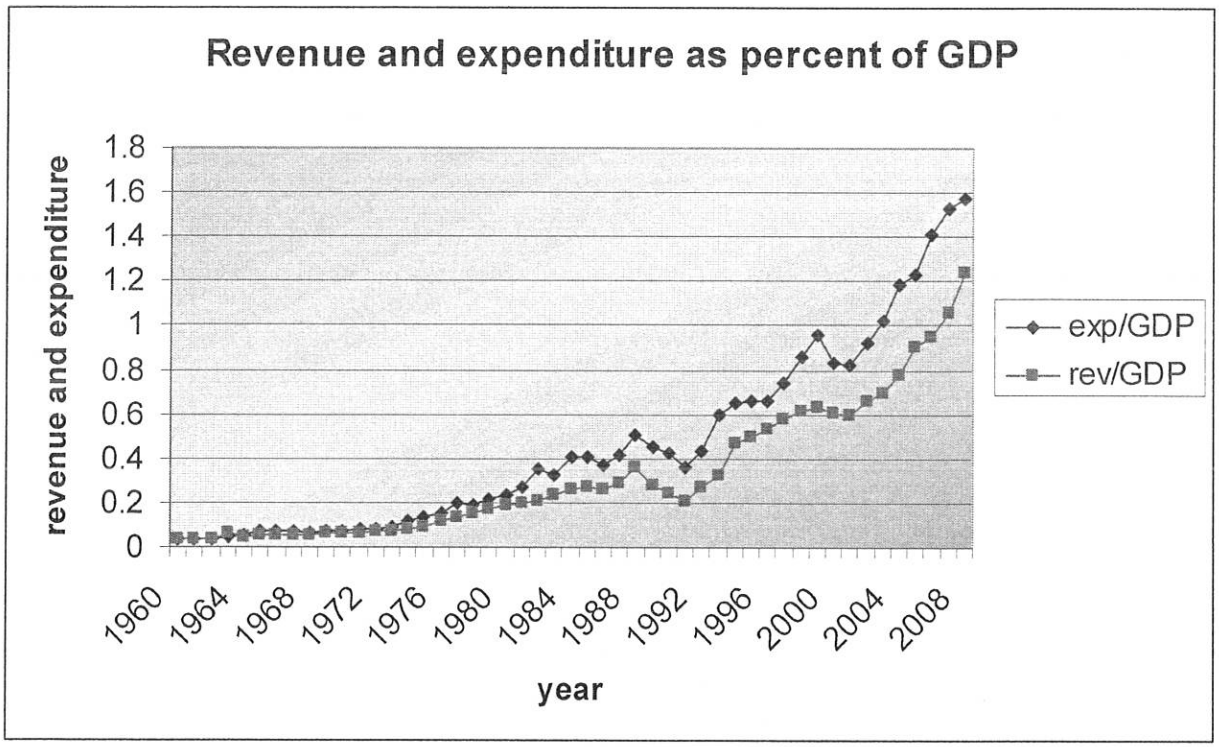
$$G_{tE_j} = \delta_0 + \delta_1 Rt + \delta_2 PAt + [\delta_2 \varphi + (1-\varphi)]PODA + \xi_t \ldots\ldots\ldots\ldots 4.1.4$$

Where j=1,2 j=1 for recurrent expenditure, j=2 for development expenditure

The portion of which is fungible, φ, can be calculated from the coefficients of project aid. Let β be the coefficients of ear marked aid, then $\beta = \delta_2 \varphi + (1-\varphi)$. Then the portion of aid which is fungible is $\varphi = \dfrac{\beta - 1}{\delta_2 - 1}$

Provided that the government uses domestic resources and donor funds to finance its current and capital expenditure, policy change has had its own impact on the expenditure, domestic revenue and external assistance of the government. After the demise of the Derg regime in may 1991the Ethiopian economic system has been changed from command economy to market based economy. This policy change has affected the capacity of domestic resource mobilization and expenditure of the government.

Figure 4.1 Revenue and Expenditure Trends



The above graphs show there has been a marked increase in domestic resource mobilization as well as the expenditure of the government since 1991. To capture the effects of policy change on public expenditure, an interactive term is introduced to measure the effect of policy change on public expenditure. Thus, the interactive term is defined as PCDUMMY (1 for post 1991 period 0

otherwise). This term captures the expenditure increase because of policy change and may have a positive effect on government expenditure. The estimable equation becomes:

$$G_t = \delta_0 + \delta_1 R_t + \delta_2 PA_t + [\delta_2 \varphi + (1-\varphi)]PODA + \delta_3 PCDUMMY + \varepsilon_t \quad \text{.....4.1.5}$$

$$G_{tE_j} = \delta_0 + \delta_1 Rt + \delta_2 PAt + [\delta_2 \varphi + (1-\varphi)]PODA + \delta_3 PCDUMMY + \xi_t \quad \text{.....4.1.6}$$

Where j=1, 2 it is 1 for recurrent expenditure and 2 for development expenditure

4.2 Standard Vector Auto Regressive Model

The structural approach to time series modeling uses economic theory to model the relationship among the variables of interest. Unfortunately, economic theory is often not rich enough to provide a dynamic specification that identifies all of these relationships. Furthermore, estimation and inference are complicated by the fact that endogenous variables may appear on both the left and right sides of equations.

These problems lead to alternative, non-structural approaches to modeling the relationship among several variables. These are the estimation and analysis of vector autoregression (VAR) and the vector error correction (VEC) models. The vector autoregression (VAR) is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. The VAR approach sidesteps the need for structural modeling by treating every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system.

The rationale for the VAR models is 'let the data speak for them selves because unlike the regression models in which Y_t is explained by the k regressors $X_1, X_2 ..., X_k$ in VAR models the

Y variable is explained by its lagged value and stochastic error terms. The VAR approach offer numerous advantages over single equation approach such as in VAR it is possible to deal with several endogenous variables and cointegrating vectors, the ability to test for weak exogeneity and to handle both I(1) and I(0) variables in one system. The VAR approach is data based and little economic theory is imposed directly (Sims 1980). Although the structure is not theoretical, economic theory is often used to select the appropriate normalization and to interpret the results. The VAR approach assumes all variables are potentially endogenous so that each variable is explained by its own lags and lagged values of the other variables.

The first difference between VAR modeling and those in structural approach is there is no priory classification of variables as endogenous and exogenous; all variables are considered as endogenous. Second no zero restriction is imposed and no strict economic theory with in which the model is based. Moreover, OLS estimation can be applied to each equation separately and combining the long and short run information by exploiting the cointegration property is the main reason for VAR to receive due attention in practical use. Fiscal aggregate are highly interlinked, and therefore likely to be endogenous. Unlike the structural variables, which make restrictions about the direction of causality between variables and can be difficult to estimate. In particular context we use these techniques to evaluate the impact of aid on government expenditure in Ethiopia.

Despite its numerous advantages, VAR models also have some drawbacks. VAR models can easily be over parameterized as each variable is allowed to affect each other variable at a number of lags. The results can also depend on the choice of lag length amidst significant tests can be used to determine the appropriate lag length.

4.2.1 The Standard VAR Model and Vector Error Correction Model

The multivariate autoregressive model based on Sims (1980) Johansen and Juslius (1992) can be represented in standard form by defining a vector X_t of n potentially endogenous variables involving up to k-lags of X_t as:

$$X_t = A_1 X_{t-1} + A_2 X_{t-2} + ... + A_k X_{t-k} + \beta w_t + \varepsilon_t \quad \text{.....4.2.1}$$

Where X_t= (nx1) vector of stochastic I(1) variables

w_t= (qx1) vector of deterministic variables

A_i= (nxn) matrix of parameters

$\beta = (nxq)$ matrix of parameters

$\varepsilon_t = (nx1)$ vector of normally and independently distributed disturbances with

with zero mean and non diagonal covariance matrix

Variables Used in the Study

G_t is the total government spending

G_d is the actual governments spending on development activities and

G_{nd} is the actual government recurrent expenditures.

R is the total domestic revenue both from taxation and domestic borrowing.

PA is the program aid;

PODA is the project aid and φ is the portion of aid that is fungible.

The ODA variables include the total amount of concessionary loans and grants disbursed in a given year[8].

Non stationary variables can lead to spurious regression unless at least one cointegration vector is present. It implies that some form of testing for cointegration is almost mandatory. Provided variables are (at most) integrated of order one I (1) and cointegrated also has an equilibrium error correction representation that is observationally equivalent but facilitates estimation and hypothesis testing, as all terms are stationary. This representation is given by:

$$\Delta x_t = \phi_1 \Delta x_{t-1} + - - - + \phi_{k-1} \Delta x_{t-k+1} + \Pi X_{t-k} + \psi w_t + \varepsilon_t \text{ ----------4.2.2}$$

Simplifying equation 4.2.2 yields

$$\Delta x_t = \sum_{i=1}^{k-1} \phi_i \Delta x_{t-i} + \Pi X_{t-k} + \psi w_t + \varepsilon_t \text{ .....4.2.3}$$

The term ΠX_{t-k} contains information about the long run relationship between the variables in the vector. Information about the number of co-integrating vectors is also found in the rank of Π (i.e. the maximum number of linearly independent stationary columns in Π).

Co-integration analysis begins by assuring the time series properties of the data series. Estimating a non stationary series leads to erroneous or spurious regression. So, the next important step is choosing the appropriate lag length in time series modeling. Once this is accomplished the estimation procedure passes through three distinct stages: determining the

[8] Aid **pledges** refer to donors promise to provide an agreed sum of money/resources to the government of Ethiopia. Pledges are turned into **commitments** when grant and loan agreements are signed. **Disbursement** is actual provision of cash or goods and services to the government of Ethiopia (MoFED quarterly bulletin 2005)

number of cointegrating vectors (r), factorization of the impact matrix and estimation and interpretation of the VAR model after cointegration is assured.

4.3 Stationarity and Unit Roots

The standard methods of estimation are based on the assumption that all variables are stationary[9]. However, most economic variables are not stationary. Models containing non stationary variables will often lead to the problem of spurious regression, where the results obtained suggest statistically significant relationship between the variables in the model. While, what obtained is evidence of contemporaneous correlations rather than meaning full causal relations. Inferences based on the standard statistical tests (i.e. the t and F tests) will be invalid. Therefore, it is necessary to test for stationarity of time series variables before running any regression.

Quite often non-stationary variables become stationary after differencing. Thus it is possible to estimate using difference of variables if the differences are stationary. But such a procedure lacks long run dynamics due to loss of considerable long run information. Among the methods of testing the presence of unit roots in a variable are Augmented Dickey-Fuller (ADF) and Phillip and Perron test. The Dickey Fuller (DF) test starts with the following autoregressive model

$$Y_t = \phi Y_{t-1} + U_t \quad \text{.....4.3.1}$$

Subtracting Y_{t-1} from both sides gives

[9] A given stochastic variable is said to be stationary if it has a constant mean, constant variance over time, and if the covariance between observations in two time periods depends only on the distance of the lag between the two period rather than the actual time that the covariance is computed (Gujarati 1995)

$$\Delta Y_t = \delta Y_{t-1} + U_t \ldots\ldots\ldots\ldots\ldots 4.3.2$$

Where $\delta = (\phi - 1)$

The test for stationarity is conducted on the parameter δ. If $\delta = 0$ it implies the variable Y is not stationary. The hypothesis is formulated as follows:

Ho= $\delta = 0$ or $(\phi = 1)$

H1= $\delta < 0$ or $(\phi < 1)$

If including a constant (drift) to equation 4.3.2 it becomes

$$\Delta Y_t = \Gamma + \delta Yt - 1 + U_t \ldots\ldots\ldots\ldots\ldots 4.3.3$$

Where Γ is a constant term

For the above equations the parameter δ is used to test stationarity and the decision is made using t-statistics. If calculated value of t is less than the critical value (reported by Dickey and Fuller) the null hypothesis is accepted other wise the null is not accepted. Rejecting the null hypothesis implies the existence of stationarity. If a variable which is non-stationary at level becomes stationary after nth difference, then it is said to be order n I (n). However, the DF test has a serious limitation in that it suffers from residual auto correlation. To correct this draw back the DF model is augmented with additional lagged first differences of the dependent variable. This is called Augmented Dickey Fuller (ADF) test. Thus incorporating lagged first differences of the dependent variable gives:

$$\Delta Y_{ti} = \delta Y_{t-1} + \sum_{i=1}^{k} \theta_i \Delta Y_{t-1} + \mu_t \ldots\ldots\ldots\ldots\ldots 4.3.4$$

Philips and Perron test

Phillips Perron test is less restrictive concerning the distribution of the error term. It can be applied to mixed processes in the same way as the DF tests. But there is no requirement that the disturbance term is serially uncorrelated or homogenous, instead. Philips-Perron test allows the disturbances to be weakly dependent and heterogeneously distributed. The Phillips-Perron test statistics are modifications of the DF test statistics that take into account the less restrictive nature of the errors Enders (1996).

4.4 Co-integration

Co- integrated variables assumes that a linear combination of their data set is stationary even though the individual series are non stationary. In such cases there is co-integration (long run relationship) between variables included in the model. To test for co-integration, the Engel-Granger two step procedures and the Johansen's maximum likely hood estimation procedure are often used.

In the Engel Granger two step procedure, variables entering the co-integrating vector are tested for integration of the same order, order one I (1). The initial task of Engel-Granger is pre testing the variables for their order of integration. The first procedure is estimate the long run equation and obtains the residual. If this residual, which is the linear combination of the variables, is stationary, then the variables are said to be co-integrated or they do have long run relation ship. The second procedure is to estimate the error correction model (ECM) i.e. the firs difference of the dependent variables regressed on the first difference of the explanatory variables with their appropriate lags and lag of the residual obtained in the first procedure. However, the Engel-Granger two step procedure has weaknesses in testing co-integration. First it assumes that there

is one cointegrating vector even though more than one equilibrium relationship exists. Second it categorizes variables as endogenous and exogenous implying simultaneity problem.

In this paper Johansen maximum likely hood estimation is used due to its practical superiority. The Johansen method does not require a priory distinction of endogenous and exogenous variables and it can also identify multiple co-integrating vectors. The Johansen procedure uses maximum likelihood procedure to estimate and determine the presence of co-integrating vectors in the VAR system.

In equation 4.2.2 and 4.2.3 the term ΠX_{t-k} has the information needed for the long run relationship between the variables in the vector. Information about the number of co-integrating vectors is also found in the rank of Π .in this connection there are three possible cases of co-integration. Where r is the number of cointegrating vectors and p is the number of variables

i. If the rank of Π is zero, r=0, then all elements of X_t are non stationary. Thus, there is no cointegrating relationship between the variables.

ii. If Π is a full rank matrix that is r=p, then all the elements of X_t are stationary and no error correction model is required.

iii. In the intermediate case r<p there are non-zero co-integrating vectors among the elements of X_t and p-r common stochastic trend. If non-zero relationship is indicated by the test, there exists a stationary long run relationship. In the case where 0<r<p, Π can be factored as $\alpha\beta'(\Pi = \alpha\beta')$ where, α and β are both pxr matrices.

This paper tries to establish, through identifying restrictions, any structural economic relationship explained by the long run model. Restriction on the beta's β help to determine which variables are relevant in the cointegrating vector(s). While, restriction on alpha's α help to determine

which variables are weakly exogenous to the system. The co-integrating matrix has a property of $\beta' x_t$ is I (0). Therefore, it can be interpreted as stationary relations among potentially non-stationary variables i.e. as co-integrating relations. Hence, in a VAR model consisting of p variables there can be r=p-1 cointegrating vectors.

In identifying the number of co-integrating vectors the Johansen procedure provides n eigen value tests denoted by λ (also called characteristics root) whose magnitude measures the extent of correlation of the co-integration results with the stationary elements in the model.

To identify the number of co-integrating vectors in the system, the Lambda max (λ max) and Lambda trace by (λ trace) statistics are used and determine the rank of Π, the maximum likelihood estimation procedure developed by Johansen (1998) are used. In the case where Π =r<p is true and we have $\Pi = \alpha\beta'$, the column of β' after normalization represents the long run parameters relating the variables in their equilibrium. The matrix α represents the error correction parameters which measures the speed of adjustment from temporary disturbance in the equilibrium.

The test for the number of eigen values that are not insignificantly different from unity can be conducted using these two test statistics.

λ trace (r) =-T $\sum_{i=1}^{n} \ln(1 - \lambda\hat{}\, i)$ ----------4.4.1

λ max(r,r+1)=-T $\ln(1 - \lambda\hat{}\, r + 1)$ ----------4.4.2

where $\lambda\hat{}$ are estimated eigen values obtained from estimated Π matrix and T is the sample size.

λ trace, tests the null hypothesis of the number of co-integrating vectors is $\leq$r against a general alternative. While λ max tests the null hypothesis that number of co-integrating vector is r against the alternative r+1.

Weak Exogeneity test

A likelihood ratio test (LR test) is employed to test for weak exogeneity by imposing zero restriction on the α coefficients. This is a test of whether the speed of adjustment α is significantly different from zero in the equations for the variables used.

4.5 Impulse Response

A shock to the *i-th* variable not only directly affects the *i*-th variable but is also transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. If the innovations are contemporaneously uncorrelated, interpretation of the impulse response is straightforward. The *i*-th innovation is simply a shock to the *i*-th endogenous variable.

The coefficients of VAR/VEC model only reveal the direct effects. They do not take into account the fact that the lagged explanatory variables in each equation are interlinked with a lag and there fore do not show the full impact of one variable on the other. For this reason the analysis uses impulse response functions to the total short run and long run impacts of an increase in aid. Impulse response functions capture both the direct and indirect or feed back effects caused by endogeneity over time.

The impulse response model is represented as:

$$X_t = \mu + \sum_{i=0}^{\infty} \phi i E_{t-i} \ldots\ldots\ldots\ldots\ldots\ldots 4.5.1$$

Where ϕi are one period response of X_t of unit change in E_{t-i}

The accumulated effects of unit impulses can be obtained by an appropriate summation of the coefficients of impulse response functions. Assuming X_t sequences are stationary the long run multiplier approaches a finite constant. This is true for all j and k

$$\sum_{i=0}^{\infty} \phi jk^2 \quad \text{(i) is finite}$$

Plotting the coefficients of $\phi jk^{(i)}$ against time after the initial simulated shock is a practical way to visually represent the behavior of X_t series in response to the various shocks.

Orthogonal impulse response functions could be used to examine a pure shock in one variable. These impulses however, depend on which variables are allowed to affect each other contemporaneously, and in which order. On the other hand, generalized impulse response functions do not require assumptions about contemporaneous causality, and do not depend on ordering of the variables. The generalized impulse response function takes full account of historical pattern of correlation of shocks. It has also an advantage of handling system of endogenous variables where they have contemporaneous effect on each other.

This study uses generalized impulse response functions, and in each case the shock to the variables is one standard error shock. The response functions estimated in this study are those of Pesaran and Shin (1998), where the initial shock occurs to a residual in one equation. The

impulse response function shows the increment to each variable due to one standard error shock in another variable. The accumulated impulse responses are expected to converge to a level that is consistent with the estimated long run co-integrating relationship.

4.6 Data Source

The necessary data for the paper are collected from various sources. The necessary data about the fiscal variables are collected from Ethiopian Economic association (EEA) data base CD Rom and Ministry of finance and Economic Development (MoFED). The data on aid variables are obtained from the Development Cooperation Directorate- Development Assistance Committee (DCD-DAC) and Creditor Reporting System (CRS) online data base.

CHAPTER FIVE

MODEL APPLICATION AND RESULTS

5.1 Model Description

In this section the empirical models developed earlier are confirmed with data and parameter estimates are estimated and interpreted. Therefore, to estimate the effect of aid on public expenditure three models are estimated. To recapitulate, the models are current expenditure, capital expenditure and total expenditure. But before model estimation, the first step is to determine whether the variables are stationary or non stationary. For this purpose the Augmented Dickey-Fuller (ADF) test and the Philips- Perron (PP) test is used. The results can be found in tables 5.1 and 5.2 respectively.

The ADF and Philip-Peron tests shows all the variables that are tested are non-stationary at level but stationary at first difference i.e. they are integrated of order one I (1).

In each of the models the optimal lag length is selected using the lag length criteria. Adding so many lags entails the estimation of additional coefficients and an associated loss of degrees of freedom. There exists appropriate lag length criteria to choose the lag length (K) of the VAR framework namely Akaike Information Criteria (AIC), Schwartz Criteria (SC) and Hannan-Quinn Criteria (HQ). Using these criteria particularly using the Schwartz criterion (SC) the selected lag length is one for all models. The issue of regime change has been addressed with the use of dummy variable. In what follows the estimated econometric models specified in equation 4.1.5 and 4.1.6 are presented and discussed.

The Dickey-Fuller type tests of unit root are sensitive to structural breaks in the data. Such data confuse structural break with non-stationarity (Alemayehu et al 2009). A truly stationary variable with some structural break may be labels non-stationary. Therefore, testing for the existence of structural breaks is essential to supplement the DF test and conduct impulse response analysis. Accordingly using EViews 6 Chow's break point test is performed for suspected years for structural breaks. The results show that the null hypothesis of no structural break is not rejected for all the variables in the model (see appendix 1)

Table 5.1A ADF test for unit roots

Variables	Constant (C) Trends (T) number of lags	Value of test statistic	99% critical value	95% critical value	Order of Integration
LGND	C,T,2	-1.9217	-4.1923	-3.521	I(1)
LGD	C,T,2	-2.0089	-4.1923	-3.521	I(1)
LGT	C,T,2	-1.2525	-4.1923	-3.521	I(1)
LR	C,T,2	-2.5915	-4.1923	-3.521	I(1)
LPA	C,T,2	-3.3185	-4.1923	-3.521	I(1)
LPODA	C,T,2	-3.4679	-4.1923	-3.521	I(1)

I (1) Non stationary and integrated of order 1 i.e. stationary at first difference

Table 5.1B Results of Philips-Perron test

Variabes	Constant (C) Trend (T)	Value of test statistics	99%critical value	95% critical value	Order of integration
LGND	C,T	-2.2024	-4.1923	-3.5208	I(1)
LGD	C,T	-2.0089	-4.1923	-3.5208	I(1)
LGT	C,T	-1.4979	-4.1923	-3.5208	I(1)
LR	C,T	-2.2942	-4.1923	-3.5208	I(1)
LPA	C,T	-3.3185	-4.1923	-3.5208	I(1)
LPODA	C,T	-3.4036	-4.1923	-3.5208	I(1)

I (1) Non stationary and integrated of order 1 i.e. stationary at first difference

5.2 Model I: Effect of Aid on Total Expenditure

$$G_t = \delta_0 + \delta_1 R_t + \delta_2 PA_t + [\delta_2 \varphi + (1-\varphi)]PODA + \delta_3 PCDUMMY + \varepsilon_t \quad \text{.....5.2.1}$$

The first model to be estimated uses the following variables total government expenditure, total domestic resource, program aid, project aid and a dummy to capture policy shift. AS all the variables have a unit root, they may be cointegrated. The Johansen trace and maximum Eigen value tests are used to test for the number of cointegrating relationships. The Johansen's reduced rank procedure enables to establish the number of unique co-integrating vectors spanning the co-

integration space. Therefore, it is necessary to impose restrictions on β_s to be able to unearth and interpret the underlying or structural model (Johansen, 1995).

Table 5.2A test for number of cointegrating vectors for Model I

RANK	Trace statistics	0.05 Critical Value	Maximum eigen statistics	0.05 critical value
R=0	73.83507	47.85613	44.38781	27.5434
	(0.0000)*		(0.0022)*	
R<=1	29.44726	29.79707	17.45415	21.13162
	(0.0548)		(0.1516)	
R<=2	11.99311	15.49471	10.33677	14.26460
	(0.1573)		(0.1907)	
R<=3	1.656342	3.81466	1.656342	3.81466
	(0.1981)		(0.1981)	

The numbers under the brackets are p values. The asterisk (*) on r=0 implies the null hypothesis of no co-integrating vector is rejected at 5% level of significance. This shows at most the VAR has one co-integrating vector.

The diagnostic test for the model indicates there is no problem of normality, hetroskedasticity and the VAR satisfies the stability condition. From the above results the null hypothesis of no cointegration is (P=0) among the variables is rejected by both λ trace and λ max at 5% level of significance. The λ trace, λ max, developed by Johansen (1988) identified one co-integrating vector. This implies there is only one relevant linear combination of the variables, represented by the first raw of the β' matrix.

Once testing for co-integration rank, the subsequent procedure is testing for weak exogeneity. Fully efficient estimation and inference can take place conditional on fundamentals if these

variables are weakly exogenous for the parameters of interest. A likelihood ratio (LR test) for weak exogeneity is employed by imposing zero restrictions on the α coefficients[10]. This is a test whether the speed of adjustment α is significantly different from zero in the equations for the variables tested. Table (5.2B) shows the LR test of zero restriction on the α coefficients, it indicates that the null hypothesis of $\alpha = 0$ is rejected at 1% confidence interval but not for other variables. The weak exogeneity test implies all explanatory variables seems to be weakly exogenous except the dependent variable which is expected to be endogenous. The validity of a unique co-integrating vector is confirmed by the weak exogeneity condition established for all the right hand side variables in the specified model.

Table 5.2B Test for zero restriction on α coefficients

Variables	**LGT**	**LR**	**LPA**	**LPODA**
Coefficient	0.05425	0.035781	-0.21154	-0.14314
LR-test	44.7962	1.0935	0.00902	0.99265
P-value	0.0000**	0.2953	0.976	0.0.3191

The next procedure is to test for the significance of long run coefficients. This is used to determine which variables uniquely contribute to co integrating vector. Table (5.2C) below shows the LR test of zero restriction on β coefficients.

---

[10] The LR test statistic used to test the restrictions is given by -2 log(Q)=Tr $\log\frac{(1-\lambda i^*)}{(1-\lambda i)}$ where Q=(restricted maximized likelihood)/(unrestricted maximized likelihood), T= number of observations, r=number of observations and $\lambda i and \lambda j$ * eigen values for unrestricted and restricted model, (Harris 1995)

Table 5.2C Test for zero restriction on β coefficients

Variables	LGT	LR	LPA	LPODA
Coefficient	1.000	1.51621	0.56362	0.787959
LR-test	15.17	14.612	8.8478	15.176
P-value	0.0001**	0.0001**	0.0029**	0.0001**

** rejection at 1% and level of significance

The co-integrating relation shows one co-integrating vector. The unrestricted co-integrating relation found is

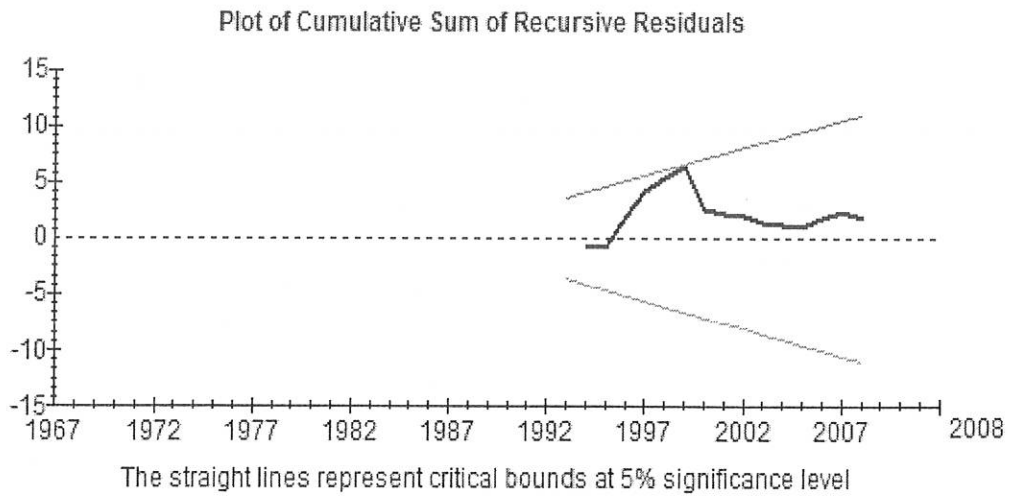
LGT=1.51621LR+0.56362LPA+0.781954LPODA+1.9056C.....5.2.2
(-23.9293) (-5.22086) (-6.81451)
The numbers in the bracket are t values

The cointegrating relation shows a long run relationship between the variables. It implies that in the long run, ceteris paribus, total government spending is positively influenced by the other variables. While domestic resource has a statistically significant high positive effect on total government spending, i.e. it indicates that domestic resources increase the government spending by 1.516 units. Program aid also has a significant effect on total government spending. Similarly, project aid has a positive effect on total government expenditure. This implies that foreign aid flow stimulates government expenditure positively.

Since the proportion of fungible aid is $\varphi = \frac{\beta - 1}{\delta_2 - 1}$, from the long run equation it is identified that using the project and program aid coefficient the government renders 33.32% of aid is fungible.

To supplement the co-integration analysis with a test of parameter stability, the paper used CUSUM test proposed by (Ouattara et al1975). Unlike the Chow test which requires break point(s) to be specified the CUSUM test can be used even if we do not know the specific break point. If the plot of the CUSUM stays within the 5% critical bound the null hypothesis that all coefficients are stable cannot be rejected. If however, either of the parallel lines crossed the null hypothesis if parameter stability is rejected at 5% significance level. Figure 5.2.1 shows the CUSUM plot stays within the 5% critical bound implying the parameters are stable.

Figure 5.2.1 parameter stability test



The fact that the variables are co-integrated indicates that a VEC model can be formulated to assess the linkage between the variables. The error correction term in the model will allow as identify which variables move to balance the long run relation.

Error Correction Model I

Table 5.2D Vector Error Correction Model I

	Dependent variables			
Explanatory variables	D(LGT)	D(LR)	D(LPA)	D(LPODA)
EC(-1)	-0.145319*	-0.897131*	-0.12646	-0.1125564
D(LGT(-1))	0.171487	0.082355*	-0.1448	-0.128142
D(LR(-1))	0.027238*	0.142712	0.020698	0.195224
D(LPA(-1))	0.169696*	-0.216373*	-0.113179	-.038402
D(LPODA(-1))	-0.028809	-0.101832	-0.07971	-0.304778
Constant	-0.031543			
Dummy	0.1879469*			

* Significant at 5% significance level

Table (5.2D) shows the results for the unrestricted VEC model: including the dummy variable. There are four endogenous variables which are affected by lags of themselves and the other endogenous variables. In the VEC representation a D in front of a variable stands for difference. The 5% significance level is used to conclude the significance of each coefficient in the VEC model.

The coefficients in the error correction model show the short run direct effects between the variables but not the total effect resulting from both direct and indirect impact. If the coefficient on the lagged error correction term EC (-1) in table 5.2D is significant that particular variable

reacts to deviations from the long run equilibrium relation occurring in period t-1 to the relationship identified in the long run model 5.2.2.

The results of different diagnostic tests do not detect a problem of hetroskedasticity, normality and auto correlation (see appendix 2. for diagnostic tests for the model).

The adjustment coefficient of the error correction term is significant for total government spending and domestic resources, which indicates that total government spending and domestic resources adjust towards the long run equilibrium.

From the error correction model a number of direct relationship between the variables can be identified. Domestic resource is significantly and negatively affected by lagged total government spending, and it is affected negatively by lag of program aid. Total government spending is positively affected by lags of domestic resource and program aid.
The positive sign of the dummy variable indicates the relevance of the policy change in affecting total government spending.

5.3 Model II Effect of Aid on Current Expenditure

$$LGND_{,} = \delta_0 + \delta_1 Rt + \delta_2 PAt + [\delta_2\varphi + (1-\varphi)]PODA + \delta_3 PCDUMMY + \xi_t \quad \text{.....5.3.1}$$

The second model uses the set of variables as model one but replaces total expenditure with recurrent expenditure of the government. It incorporates the following set of variables nod development government spending (GND), Domestic resources (R), Program Aid (PA), Project aid (PODA) and a dummy variable. Since all variables have unit root they may be co-integrated. Following the same procedure as model one it is identified the model has one co-integrating

vector. Estimating the model using EViews 6 the following test results are obtained on the number of co-integrating vectors.

Table 5.3A Test for number of co-integrating vectors for Model II

RANK	Trace statistics	0.05 Critical Value	Maximum eigen statistics	0.05 critical value
R=0	61.49565	47.85613	35.06378	27.58434
	(0.0016)**		(0.0045)**	
R<=1	26.43187	29.79707	14.34228	21.1316
	(0.1163)		(0.3376)	
R<=2	12.0896	15.49471	9.881513	14.2646
	(0.1527)		(0.2189)	
R<=3	2.208085	3.841466	2.208085	3.841466
	(0.1373)		(0.1373)	

The numbers under the brackets are p values. The asterisk (**) on r=0 implies the null hypothesis of no co-integrating vector is rejected at 1% level of significance. This shows at most the VAR has one co-integrating vector.

The diagnostic tests for this vector shows no problem of normality and the estimated VAR model is stable i.e. the estimated VAR is stable (stationary) if all roots have modulus less than one and lie inside the unit circle see Lutkepohl (1991).

The above result shows the null hypothesis of no co-integrating vector is rejected by both λ trace and λ max at 1% level of significance.

Once testing for co-integration is undertaken the next procedure is weak exogeneity test. A likelihood ratio test (LR test) for weak exogeneity test is used by imposing zero restriction on the α coefficients, which is testing whether the speed of adjustment significantly different from zero

for the variables included in the model. Results reported in table 5.3B shows the LR test of zero restriction on the α coefficients. It indicates that the null hypothesis $\alpha = 0$ is rejected at 1% level of significance but not for other variables. In other words the weak exogeneity test shows all explanatory variables happened to be weakly exogenous, except the dependent variable which is expected to be endogenous.

Table 5.3 B test for zero restriction on α coefficients

Variables	LGND	LR	LPA	LPODA
Coefficient	0.9566	0.9638	0.8331	0.7988
LR-test	24.7622	0.395778	1.23382	0.00875
P-value	0.0000**	0.5293	0.2667	0.9255

** Rejection at 1% level of significance

Testing the significance of the long run coefficients is another procedure in the VAR model. This is used to determine which variables uniquely constitute the co-integration vector. The LR test of zero restrictions on the coefficients is given in table 5.3C below

Table 5.3 C test for zero restriction on β coefficients

Variables	LGND	LR	LPA	LPODA
Coefficient	1.0000	1.07063	0.643036	0.732793
LR-test	10.208	9.8819	7.5055	9.6065
P-value	0.0014**	0.0017**	0.0062**	0.0019**

** rejection at 1% and 5% level of significance

The co-integrating relation shows one co-integrating vector. The unrestricted co-integrating relation found is:

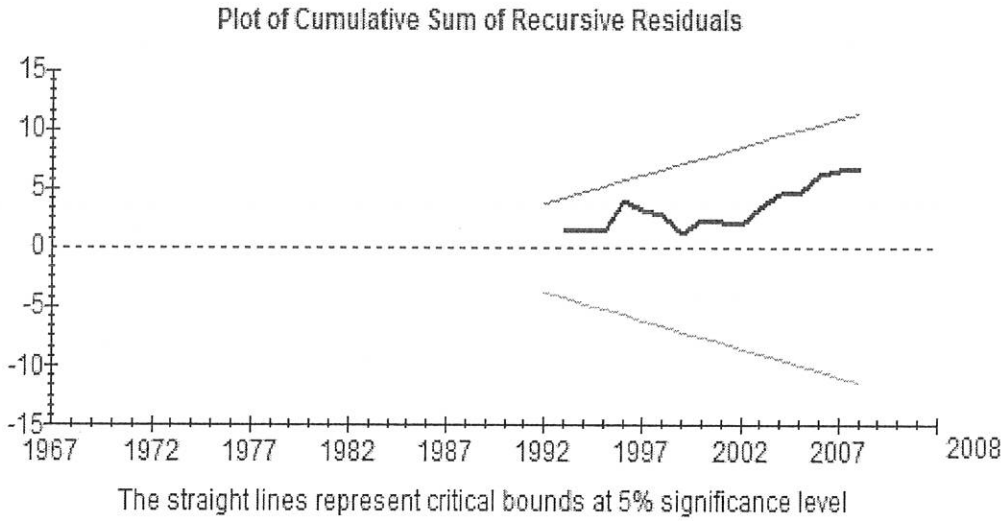
LGND=1.07063LR+0.643036LPA+0.732793LPODA+0.485484C.....5.3.2
(-14.6299) (-6.38435) (-4.81742)
The numbers in the bracket are t values

The cointegrating relation shows a long run relationship between the variables. It implies that in the long run, ceteris paribus, Non development (recurrent) government spending is positively influenced by the other variables. While domestic resource has a statistically significant high positive effect on total government spending, i.e. it indicates that domestic resources increase the government spending by 1.07 units. Program aid and project aid also stimulates non development government spending. This finding is the same as model one.

Since the proportion of fungible aid is $\varphi = \frac{\beta - 1}{\delta_2 - 1}$, from the long run equation it is identified that using the project and program aid coefficient the government renders 58.05% of aid is fungible.

Similarly for the second model To supplement the co-integration analysis with a test of parameter stability, the paper used CUSUM test proposed by (Ouattara et al1975). If the plot of the CUSUM stays within the 5% critical bound the null hypothesis that all coefficients are stable cannot be rejected. If however, either of the parallel lines crossed the null hypothesis if parameter stability is rejected at 5% significance level. Figure 5.3.1 shows the CUSUM plot stays within the 5% critical bound implying the parameters are stable.

Figure 5.3.1 Parameter Stability test



The fact that the variables are co-integrated indicates that a VEC model can be formulated to assess the linkage between the variables. The error correction term in the model will allow as identify which variables move to balance the long run relation.

Error correction Model II

Table 5.3D Vector Error Correction Model II

	Dependent variables			
Explanatory variables	D(LGND)	D(LR)	D(LPA)	D(LPODA)
ECC(-1)	-0.146161	-0.542631*	-0.030187*	-0.209516*
D(LGND(-1))	0.095275	-0.064664	-0.131325	-0.053174
D(LR(-1))	-0.076864	0.050833*	0.035814	0.104952
D(LPA(-1))	0.099631	-0.091976*	-0.200619	-0.22876
D(LPODA(-1))	0.092753	-0.014771*	-0.015905	-0.180996
Constant	0.054258			
Dummy	-0.03794			

* Significant at 5% significance level

The result of the unrestricted VEC model is shown in table 5.3D. There are four dependent variables that are affected by their lags and other endogenous variables. In the table D before the variables represent the difference of the variable. Conclusions about the significance of each coefficient are made on the basis of 5% level of significance.

The coefficients in the error correction model show the short run direct effects between the variables but not the total effect resulting from both direct and indirect impact. If the coefficient on the lagged error correction term EC (-1) in table 5.3D is significant that particular variable reacts to deviations from the long run equilibrium relation occurring in period t-1 to the relationship identified in the long run model 5.3.1.

The results of different diagnostic tests do not detect a problem of hetroskedasticity, normality and auto correlation (see appendix 3 for diagnostic tests for the model).

The adjustment coefficient of the error correction term is significant for domestic resource, program and project aid, which indicates that these variables adjust towards the long run equilibrium. From the error correction model a number of direct relationship between the variables can be identified. The domestic resource variable is statistically negatively affected by the lag of program aid and project aid coefficients but it is positively affected by its own lag. Besides, the dummy variable is statistically insignificant indicates the policy change has not been influencing recurrent spending of the government.

5.4 Model III effect of Aid on Capital Expenditure

$$LGD = \delta_0 + \delta_1 Rt + \delta_2 PAt + [\delta_2\varphi + (1-\varphi)]PODA + \delta_3 PCDUMMY + \xi_t \quad \text{.....5.4.1}$$

The third model to be estimated uses the same set of variables as the previous models except it uses capital expenditure as the dependent variable. As all the variables have unit root they may be co-integrated. Estimating the VAR model using EViews6 reflects there is one co-integrating vector for the model. The result in table 5.4A shows the null hypothesis of no co-integrating vector is rejected by both λ trace and λ max at 5% level of significance.

Table 5.4A Test for number of co-integrating vectors for Model III

RANK	Trace statistics	0.05 Critical Value	Maximum eigen statistics	0.05 critical value
r=0	68.07547	47.85613	37.31843	27.58434
	(0.0002)**		(0.0021)**	
R<=1	31.35704	29.7971	18.88527	21.1316
	(0.0528)		(0.1002)	
R<=2	12.47177	15.4948	10.81851	14.2646
	(0.1357)		(0.1635)	
R<=3	1.65326	3.8415	1.653263	3.8145
	(0.1985)		(0.1985)	

The numbers under the brackets are p values. The asterisk (**) on r=0 implies the null hypothesis of no co-integrating vector is rejected at 1% level of significance. This shows at most the VAR has one co-integrating vector.

A likelihood ratio test (LR test) for weak exogeneity is employed by imposing a zero restriction on α coefficients. This is nothing but the test of whether the speed of adjustment is significantly different from zero in the equation for the variables tested. Results reported in table 5.4B presents the LR test of zero restriction on the α coefficients. It indicates that the null hypothesis of $\alpha=0$ is rejected at 1%.

The validity of a single estimation of the unique co-integrating vector is already confirmed by the weak exogeneity condition established for all the explanatory variables in the model. Results reported in table 5.4B shows the LR test of zero restriction on the α coefficients. It indicates that the null hypothesis $\alpha=0$ is rejected at 1% level of significance but not for other variables. In other words the weak exogeneity test shows all explanatory variables happened to be weakly exogenous, except the dependent variable which is expected to be endogenous.

Table 5.4B Test for Zero restrictions on α coefficients for Model III

Variables	LGD	LR	LPA	LPODA
Coefficient	0.96253	0.95867	0.82463	0.89519
LR-test	29.0032	1.8233	0.0227	0.01516
P-value	0.0000**	0.1769	0.8802	0.902

** Rejection at 1% level of significance

The next procedure is testing the significance of the long run coefficients of the model. This is used to determine which variables uniquely constitute the co-integration vector. The results of LR test of zero restriction on the long run coefficients is given in table 5.4C

Table 5.4C Test for Zero restrictions on β coefficients for Model III

Variables	LGD	LR	LPA	LPODA
Coefficient	1.0000	1.722346	-0.261637	0.4738802
LR-test	13.134	11.075	0.61882	10.07
P-value	0.0003*	0.0009**	0.0515*	0.0015*

** and * rejection at 1% and 5% level of significance

The co-integrating relation shows one co-integrating vector. The unrestricted co-integrating relation found is:

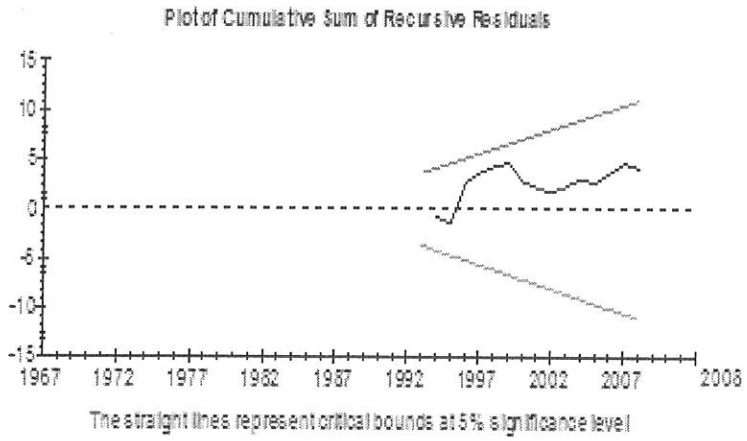
LGD=1.722346LR -0.262637LPA+0.4738802LPODA+5.584018C.....5.4.2
(-19.6496) (1.42937) (-3.69006)
The numbers in the bracket are t values

The cointegrating relation shows a long run relationship between the variables. It implies that in the long run, ceteris paribus, development (capital) government spending is positively influenced by domestic resources. While domestic resource has a statistically significant high positive effect on total government spending, i.e. it indicates that domestic resources increase the government spending by 1.72 units. Program aid affects development government spending negatively this because of the fact that program aid by their nature is allocated for recurrent spending like budget support and balance of payment support. Project aid stimulates government development spending as expected. The findings of this model differs from the previous two models on the result that program aid affects development spending negatively .given the fungibility of foreign aid it is not unnatural to expect different kinds of aid the fiscal variables in different ways.

Since the proportion of fungible aid is $\varphi = \frac{\beta - 1}{\delta_2 - 1}$, from the long run equation it is identified that using the project and program aid coefficients the government renders 41.7% of aid is fungible.

Similarly for the second model to supplement the co-integration analysis with a test of parameter stability, the paper used CUSUM test proposed by (Ouattara et al1975). If the plot of the CUSUM stays within the 5% critical bound the null hypothesis that all coefficients are stable cannot be rejected. If however, either of the parallel lines crossed the null hypothesis if parameter stability is rejected at 5% significance level. Figure 5.4.1 shows the CUSUM plot stays within the 5% critical bound implying the parameters are stable.

Figure 5.4.1 Parameter stability test



The fact that the variables are co-integrated indicates that a VEC model can be formulated to assess the linkage between the variables. The error correction term in the model will allow as identify which variables move to balance the long run relation.

Error Correction Model III

Table 5.4D Error correction model III

Explanatory variables	Dependent variables			
	D(LGD)	D(LR)	D(LPA)	D(LPODA)
ECC(-1)	0.174130	-0.616251	-0.198754*	-0.163203*
D(LGD(-1))	-0.256381*	-0.170567	-0.082022	-0.065072
D(LR(-1))	0.883376	0.262691*	0.044675	0.241075
D(LPA(-1))	-0.175368	-0.126539	-0.121205	0.018068
D(LPODA(-1))	0.038658	-0.028317*	-0.114599	-0.378715*
Constant	-0.043363			
Dummy	0.298505*			

* indicates significance at 5%

As all the variables specified are co-integrated it indicates that a VEC model can be specified to assess the linkage between the variables. The error correction term enable as to assess which variables move to balance the long run equilibrium. Four endogenous variables are used in the model, which are affected by lags of themselves and other explanatory variables; the VEC model includes a dummy. In the table the D in front of the variables stands for difference of the variables. Conclusion about the significance of each coefficient is based on 5 percent significant level.

The coefficients in the error correction model show the short run direct effects between the variables but not the total effect resulting from both direct and indirect impact. If the coefficient on the lagged error correction term EC (-1) in table 5.3D is significant that particular variable

reacts to deviations from the long run equilibrium relation occurring in period t-1 to the relationship identified in the long run model 5.4.1.

The results of different diagnostic tests do not detect a problem of hetroskedasticity, normality and auto correlation (see appendix 4 for diagnostic tests for the model).

The adjustment coefficient of the error correction term is significant for program and project aid, which indicates that these variables adjust towards the long run equilibrium.

From the error correction model a number of direct relationship between the variables can be identified. The lagged development spending has negative effect on development spending and the lagged project aid has negative impact on domestic resource similarly domestic resource is affected positively by its own lag and project aid affected negatively by its own lag.

The dummy variable has a positive sign signifying that the policy change has a significant effect on capital expenditure.

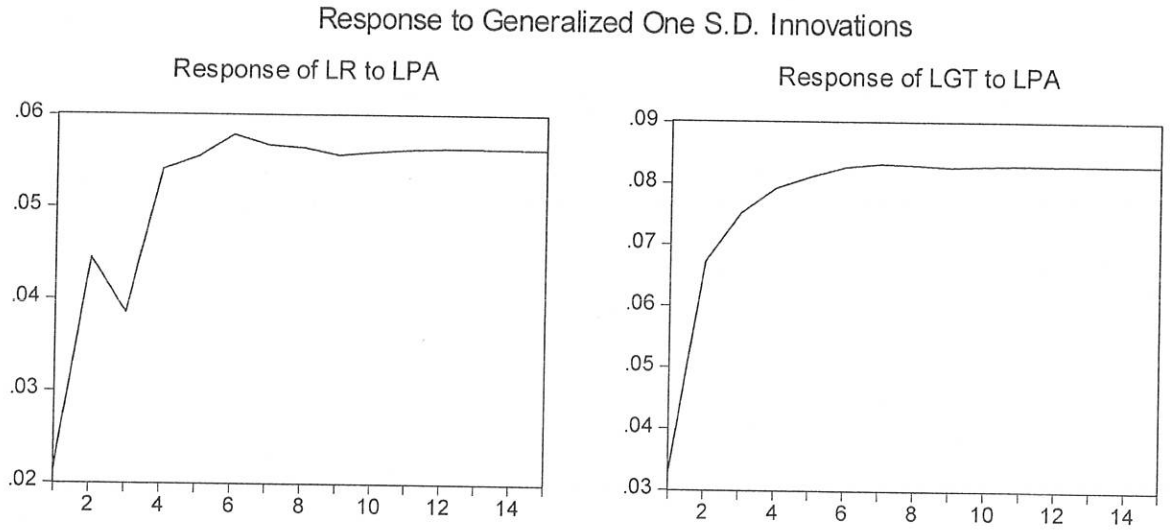
5.5 Impulse Response Analysis

This analysis show that the impulse response of such variables to a permanent one standard error shock in aid variables i.e. program aid and project aid. The impulse response coefficients (ϕi) which shows the increment to each variable due to additional increase in grants, taking in to account direct and indirect interactions between variables. The shock will have permanent effect on the levels of the other variables. But the impact gradually stabilizes at a new level that is

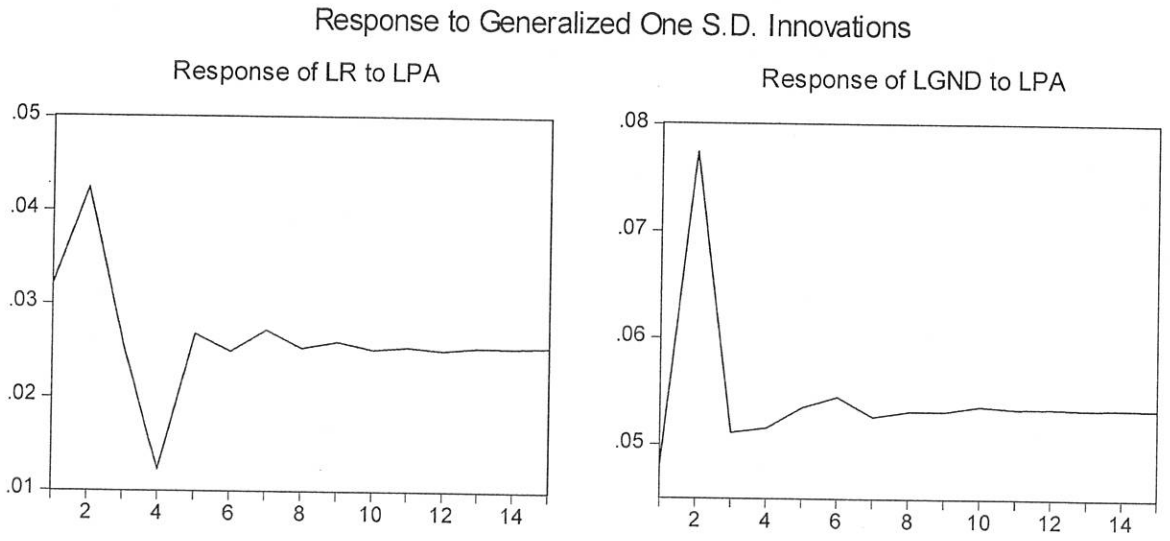
consistent with the long co-integrating relationship as a result of feedback effect from the other variables. The graphs for impulse response analysis are obtained from EViews 6 output.

Figure 5.5A Fiscal effects of program aid (the graphs are obtained from EViews 6 output)

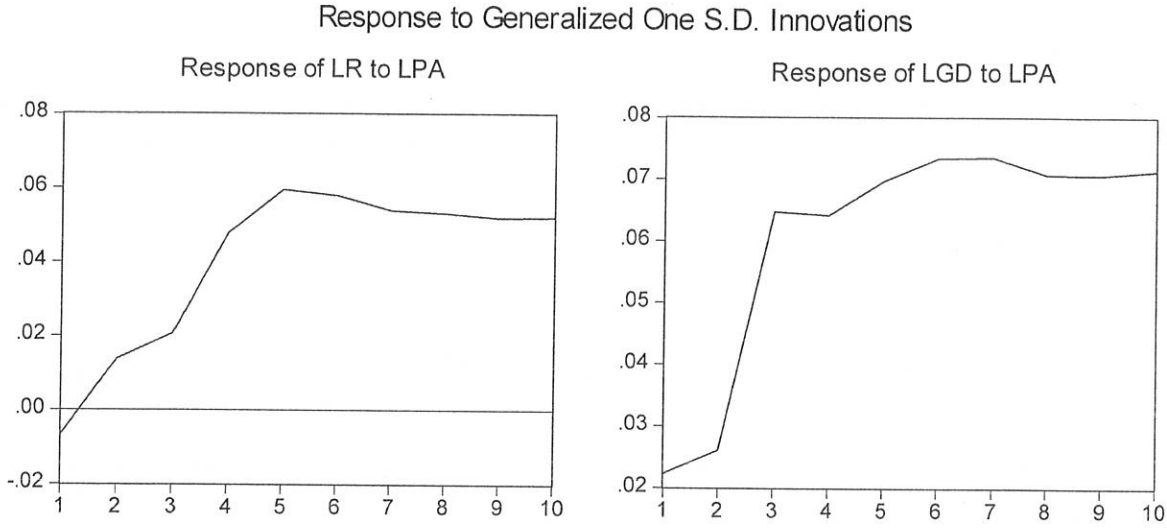
Panel A



Panel B



Panel C

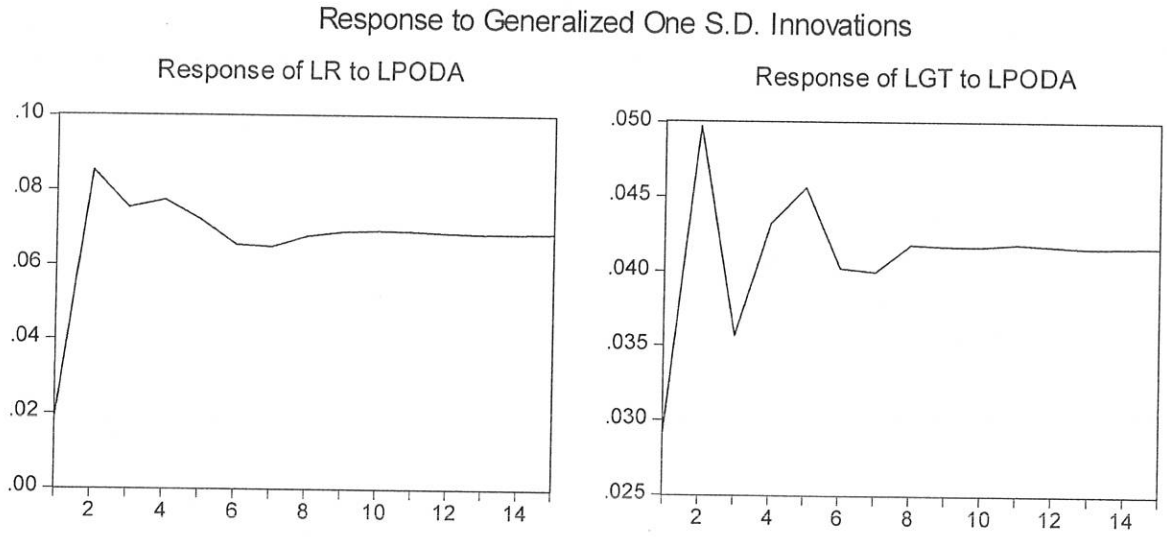


The vertical axis shows the impulse response coefficients and the horizontal axis stands for the number of years after the initial simulated shock.

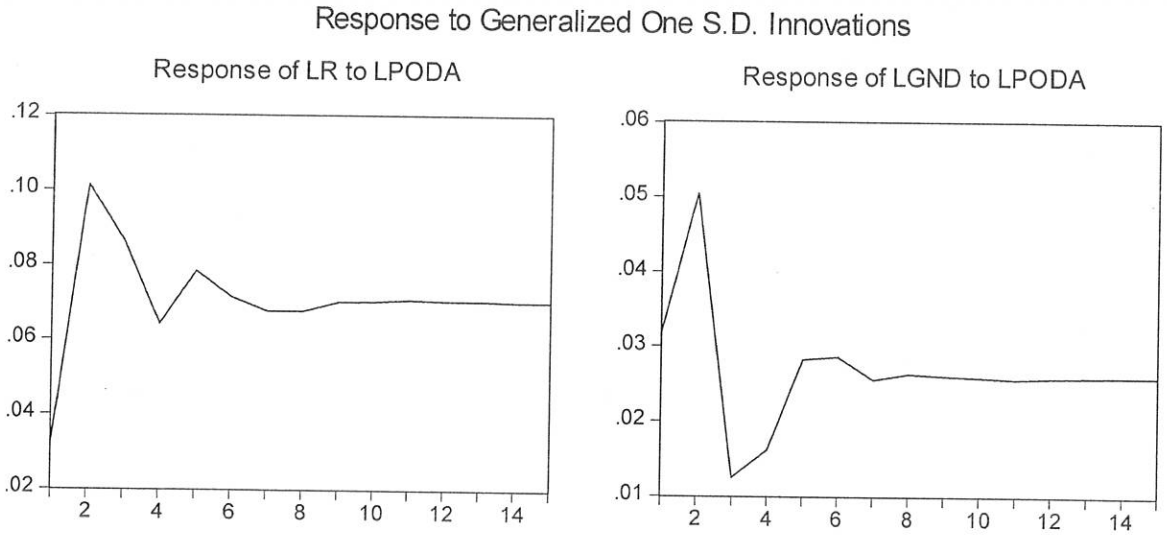
As shown in figure 5.5A panel A, B and C an increase in program aid support results in an increase in total government spending as well as increases in recurrent and capital expenditure of the government both in the short and long run. Panel A of figure 5.5A shows In the short run domestic resources increase up to period 4 and there by showing a declining trend in the long run. Similarly panel B and C show domestic resource exhibit a gradual decrease to a one standard error shock in program aid.

Figure 5.5B Fiscal effects of project aid (the graphs are obtained from EViews 6 output)

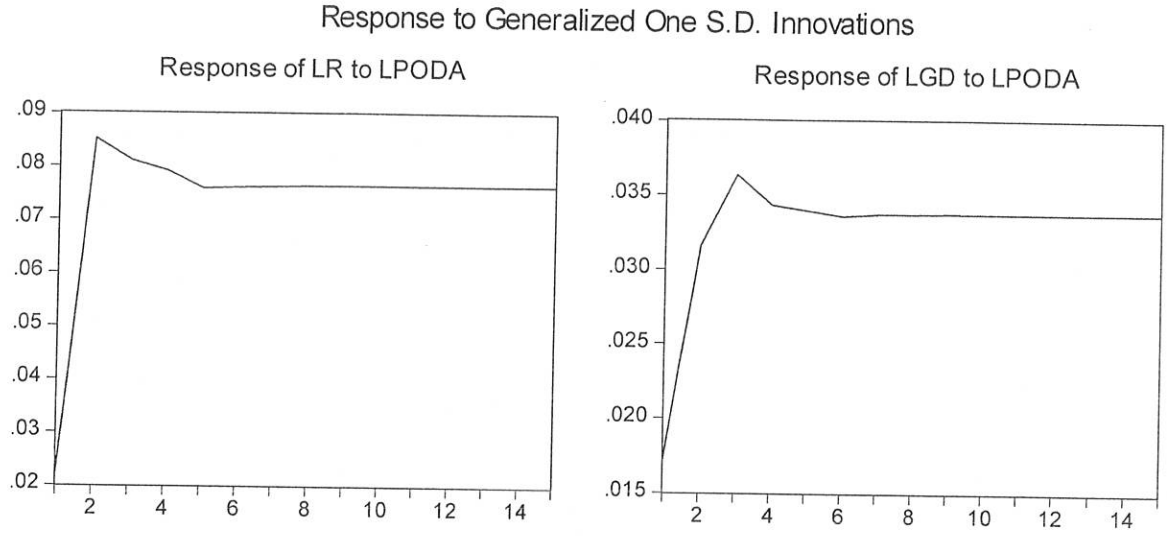
Panel A



Panel B



Panel C



Like program aid, project aid has a positive effect on total government expenditure, recurrent expenditure and capital expenditure. But at the initial simulated shock capital expenditure is even though at low level it is increasing which shows project aid is negatively affecting capital expenditure but in the long run it affects capital expenditure positively.

Impulse response in the early periods following a one standard error shock on project aid is highly volatile for domestic resource however; in the long run it has the reducing this implies that aid substitutes domestic resources.

Generally the impulse response function which shows the effect of shock on the aid variables indicates that aid in general has appositive effect on both development and non development spending of the government expenditure but it substitutes domestic resources i.e. it makes recipient governments lazier to mobilize domestic resources (see Xavayong, 2005 for Ghana,

Bahatari, 2007 for Nepal, P. Martins, 2007 for Ethiopia). Similarly, Heller (1975) using data from eleven SSA countries found that aid increases both government investment and consumption and reduces domestic borrowing. Aid increases total government expenditure because it increase availability of resource for the government to finance its expenditures

CHAPTER SIX

CONCLUSION AND POLICY IMPLICATION

6.1 Conclusions

The empirical results indicate that the flow of foreign aid does influence government spending patterns. However, on average an increase in foreign aid stimulates development spending by a lower proportion than does an increase in domestic resources. These results do concur with the finding by other country specific studies that on aggregate foreign aid lead to an increased government spending. Disaggregating expenditure into current and development spending, as shown in the estimates of the last two models, shows that foreign aid leads to increased government spending for both categories. Project aid increase government spending higher than program aid does. Aid also significantly influences the current expenditures even though most of the loans and grants to the country come under the heading of development expenditure vote.

Even though the general result shows that aid has a positive impact on government expenditure the negative sign on the coefficient program aid for capital expenditure estimate is the exception from the findings. This is so because by its nature program aid tends to increase routine expenditure (for instance Protection of Basic Services (PBS)) but not development expenditure. Thus, this aid only serves as a buffer to maintain a certain level of routine expenditure.

By definition project aid is intended to finance investment expenditures; however, it results in an increase in routine expenditure as well. This suggests that project aid is fungible: it creates extra resources available to increase non-discretionary spending. Thus, the effectiveness of project aid in stimulating growth through an increase in public investment is jeopardized.

In some instances project implementing agents do not follow the clear distinction between recurrent expenditure and capital expenditure modes of financing during the budgetary process set by the ministry of finance and economic development. This results in switching of spending portfolios as they need and yields foreign aid to be fungible. At an aggregate level foreign aid is fungible by 33.32%. Disaggregating expenditures in to recurrent and capital reveals aid is more fungible in the recurrent expenditure at 58.05% as opposed to 941.7% in capital expenditure. Previous researches have also confirmed aid to be fungible (for instance Pack and Pack 1993, Devarajan et al 1998, Feyzioglu et al 1998) found a result that aid finances general government expenditure not the targeted development activities.

There is no a clear cut view aid fungibility is bad for the economy in general. But fungibility of foreign aid may harm the economy in another way by creating aid fatigue between donors and recipients especially if donors and recipients preferences are not in harmony. Based on research finding aid works under good policy environment, donors focus on aid selectivity i.e. providing development aid for those recipients with good economic policies (Durbary et al, 1998, Burnside and Dollar, 2000). Recipients that have allocated aid as wished by the donors will be eligible for next year aid. Fungibility has negative effect on future aid flows.

After the down fall of the Derg regime in 1991, the EPRDF has reinstalled the market economy policy favoring the liberalization of markets to support economic growth. It also embarks on spending in different sectors of the economy to sustain economic growth. The increased effect of policy change is evident from the fact that the dummy coefficient is significant for total government spending and capital spending.

The impulse response analysis shows that a shock in the aid variables has negative relation with the mobilization of domestic resources. The availability of aid acts as a substitute for domestic revenue.

6.2 Policy Implication

A number of previous studies (among others S. Devarajan et al 1998, Njeru 2003, Johannes 2006) found aid flows results in increased government expenditure. It implies how effectively a recipient country is able to use the extra resources provided through aid. As it stated in the conclusion aid inflows have been associated with an increase in development and recurrent budget. This implies the existence of fungibility. This requires a policy measure to make open discussion between donors and the government on public investment projects and reduce the undesired outcomes of fungibility of foreign aid. The government by designing good and effective economic policy can reduce the diversion of foreign aid to consumption purposes.

The recipient's capacity to absorb and utilize aid depends in part, on the removal of supply constraints as well as various institutional constraints (especially of human capital and skills) and corruption. To increase the effectiveness of foreign aid it requires policy decision to improve institutional quality through capacity building (Burnside and Dollar 2000) and increase transparency in aid implementing organizations and ministries.

It is clear that development aid can never be a lasting substitute for the mobilization of domestic resources. Instead the objective broadly conceived, is to break some of the economic and social constraints on such mobilization and to bridge some of the gaps that might otherwise hinder or undermine the process. To do this the concerned authorities have to increase tax effort and improve institutional capacity.

REFERENCES

Abeba Siraj (2002), 'Macro Economic impacts of External assistance in Ethiopia,' unpublished MSC Thesis, Addis Ababa University

Alberto, A. and Dollar, D. (2000), 'Who Gives Foreign Aid to Whom and Why?' *Journal of Economic Growth,* Vol. 5, pp.33–63.

Alemayehu G. (1996), 'The Fiscal Response to External Finance in Africa: An Alternative Approach', *Institute of Social Studies Working paper*, The Hague, the Netherlands

Alemayehu Geda (2007), 'The Political Economy of Growth in Ethiopia 1960-2000' *The Political Economy of Growth in Africa*, Country Case studies , Cambridge University Press.

Alemayheu Geda, Njuguna Ndung'u and Daniel Zerfu (2009), Applied Time Series Econometrics: A Practical Guide for Macroeconomic Researchers with a Focus on Africa, Memo.

Batana, M.Y. (2009), 'Aid and Poverty in Africa', University of Montreal.

Birhanuu M. ,(2009) 'Fiscal impact of aid in Ethiopia using Fiscal Response Approach', *unpublished MSC the*sis Addis Ababa University.

Boone, P. (1996), 'Politics and the Effectiveness of Foreign Aid,' *European Economic Review*, Vol. 40, pp.289–329.

Bulir, A. and Hamann, J. (2003), ' Aid volatility an Empirical Assessment,' IMF *staff Paper* Vol. 5, Palgrave Macmillan

Burnside, C. and Dollar, D. (1997), 'Aid, Policies and Growth,' The World Bank, *Policy research working paper* 1777 (published in American Economic review 2000)

Burnside, C. and Dollar,D. (2000), 'Aid, Policies, and Growth, *American Economic Review,* No. 90 vol.4

Burnside, C.and Dollar,D. (1998), 'Aid, the Incentive Regime, and Poverty Reduction,'Policy WB *Research Working* Paper 1937

Camelia, M. and Sanjay, G. R. (2009), 'Development Aid and Economic Growth: A positive long run relation,' *IMF working paper* 09/118.

Chenery, H.B., and Alan M.S., (1966), 'Foreign Assistance and Economic Development,' *American Economic Review*, vol. 56, pp. 679–733

Clements, B., Gupta S., and Tiongson.E.(2004), 'Foreign aid Grants versus Loans,' Finance and Development, Vol.41 ,No. 3, pp 46-9.

Commission for Africa (2005), *Our Common Interest: Report of the Commission for Africa.*

Cordella, T. and Dell'Ariccia, G. (2003), 'Budget support versus project aid,' *IMF Working Paper* 03/88.

Devarajan, S. and Swaroop, V. (1998), 'The implications of foreign aid fungibility for development assistance,' *World Bank research Group.*

Dollar, D., and J. Svensson (2000): 'What Explains the Success or Failure of Structural Adjustment Programmes?,' WB *Economic Journal*, Vol.110 No.466), pp.894–917

Durbary, T. and Bernal, R.L. (1998), 'New Evidence on the Impact of Foreign Aid on Economic Growth,' *CREDIT Research* No 98/8, University of Nottingham

Enders, W. (1996), *Applied Econometric Time Series*, John wiley and Sons Ltd Chichester

Fagernas, S. and Schurich, S. (2004), 'The Fiscal Effects of Aid in Malawi,' ESAU *working paper* No.7.

Feyzioglu, T., Swaroop, V. and Zhu, M. (1998), 'A Panel Data Analysis of the Fungibility of Foreign Aid', *The World Bank Economic Review*, Vol. 12, pp. 29-58

Gang, I.N. and Khan, H.A (1990), 'Some determinants of foreign aid to India, 1960-85,' *World development*, Vol.18, No. 3, pp.431-442.

Griffin, K. and Enos, J. (1970), 'Foreign Assistance, Objectives and Consequences,' *Economic Development and Cultural Change,* Vol.18, pp. 313-337.

Hagen, .J. and Hatlebakk, M. (2002), 'Foreign Aid and Social Sector spending in Developing Countries,' SNF *Report* No. 661/02.

Hagen, J. Hattelbakk, M., (2000), 'Foreign aid and public sector spending in developing countries,'*SNF project*, No 2525, Norway

Hansen, H. and Tarp, F. (2001), 'Aid Effectiveness Disputed', *Journal of International Development,* Vol.12, No.3, pp 375-398.

Heller, S.P. (1975), 'A Model of Public fiscal Behavior in Developing Countries: Aid, investment and taxation,' *American Economic Review*, Vol. 65, No.3, pp.429-452

Islam, M.N. (1998), 'Fungibility of Matching Conditional Grants to Local Governments, '*Journal of RSAI, Vol.77*, pp.361-373

Jelovac, I. and Vandneninden, F. (2008), 'How Should Donors give Foreign Aid? Project aid versus Budget support,' *CREPP working paper* 2008/4.

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

Johannes, T. (2006), 'Foreign Aid and the Public Sector Budget Process in a Developing Country: the Case of Cameroon,' University of Dschang, Cameroon.

Johansen, S. (1995), 'Identifying Restrictions of Linear Equations with Applications to Simultaneous Equations and Cointegration', Journal of Econometrics, Vol. 69, pp. 111-132

Johansen, S. and Juselius, K. (1992), 'Maximum Likely- hood Estimation and Inference on cointegration-with application to the Demand for Money,' Oxford Bulletin of Economics and statistics, Vol. 52, No.2, pp.169-211.

Johansen,S. (1988), 'Statistical Analysis of Cointegrating Vectors', *Journal of Economic Dynamics and Control*, Vol. 12, pp.231-254

Jones, K. (2005), 'Moving Money: Aid Fungibility in Africa,' *SAIS Review* Vol. XXV No. 2.

Khilji, N. and Zampelli, E. (1991), 'The Fungibility of US Assistance to Developing Countries and the Impacts on Recipient Expenditures: A Case Study of Pakistan', *World Development*, Vol.19, pp.1095-106.

Khilji, N. M. and Zampelli. E. M. (1994), 'The fungibility of U. S. military and non-military assistance and the impacts on expenditures of major aid recipients' *Journal of Development Economics* No. 43, pp.345-362.

Lahiri, S. and Moller, P. (2004), 'Donor Strategy under the Funjibility of Foreign Aid,' *Journal of Economics and Politics,* Vol.16, No.2

Lancaster, C. (1999), 'Aid Effectiveness in Africa: the unfinished agenda,' *Journal of African Economies*, volume 8, number 4, pp 487-503.

Levy V. (1987), 'Anticipated Development Assistance, temporary relief Aid, and consumption behavior of low income countries,' *Economic Journal*, Vol. 97, No. 6, pp. 446-58.

Lutkepohl, H, Reimers, H.E. (1991), 'Impulse Response Analysis of Cointegrated Systems.'*Journal of Economic, Dynamics and Control,* Vol. 16: pp.53-78

M'Amanja, D., Lloyd, T. and Morissey, O. (2005), 'Fiscal Aggregates, Aid and Growthin Kenya: Avector Auto Regressive (VAR) analysis,' *CREDIT Research Papers*, No. 05/07.

Martins, P. (2007), 'The impact of Aid on Government Spending, Revenue and Domestic Borrowing in Ethiopia,' International Poverty Centre *Working Paper* No.41

McGillivray, M and Morrissey, O. (2000), 'Aid Fungibility in Assessing Aid: Red Herring or True Concern?,' *Journal of International Development,* Vol.12 No.3, pp. 413-428

McGillivray, M. (2005), 'Aid allocation and fragile states', WIDER *Discussion papers* DP 2006/01, UNU-WIDER: Helsinki.

McGillivray, M. and O. Morrissey (2001), 'A Review of Evidence on the Fiscal Effects of Aid,' *CREDIT Research Paper* 01/13, University of Nottingham

McGuire, M. C. (1978), 'A method for estimating the effect of a subsidy on the receiver's resource constraint: With an application to the U. S. Local governments 1964-1971,' *Journal of Public Economics,* Vol.10: pp.355-69.

Mesfin B., (2007)' Aid and Economic Growth in Ethiopia A Vector Autoregressive Approach,' *unpublished MSC thesis* Addis Ababa University

Morrissey, O. (2001), 'Does Aid Increase Growth?' *Progress in Development Studies*, Vol.1 No.1, pp. 37-50.

Morrissey, O. (2002), 'Investment and Competition Policy in the WTO: Issues for Developing Countries,' *Development Policy Review*, Vol. 20, pp. 63-73.

Mosley, P., Hudson, J. and Horrel, S. (1987), 'Aid, the Public Sector and the Market in Less Developed Economies', *The Economic Journal*, Vol.97, pp. 616-641.

Njeru, J. (2003), 'The Impact of Foreign Aid on Public Expenditure: the case of Kenya,' AERC *Research Paper* 135.

Osei, R., Morrissey, O. and Lloyd, T. (2005), 'Modeling the Fiscal Effects of Aid: An Impulse Response Analysis for Ghana,' *CREDIT Research Paper* No. 03/10, University of Nottingham

Ouattara, B(2005), 'Modeling the Long run Determinants of Private Investment in Senegal,' CREDIT Research *paper No. 04/05*, University of Nottingham.

Pack, H. and Pack, J.R. (1993), 'Foreign Aid and the Question of Fungibility,' Review *of Economics and Statistics*, No.75, pp. 258-265.

Pack, H. and Pack, J.R. (1990), 'Is Foreign Aid Fungible? The Case of Indonesia,' *Economic Journal*, Vol.100, pp. 188-219

Papenek, G.F. (1973a), 'Aid, Foreign Private Investment, Savings and Growth in Less Developed Countries,' *Journal of Political Economy.*

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

Rahman, A. (2005), 'Fiscal Effects of Aid,' Sirilanka University of Nothingham

Rajan, R.G and Subramanian, A. (2007), 'Aid and Growth what Does Cross Country Evidence show,' *Review of Economics and Statistics.*

Resolution Adopted by the General Assembly, 55/2 United Nations *Millennium Development Declaration*, 8th plenary meeting, September 8 2000.

Rodriguez, F., McGillivray, M. and Morrissey, O. (1998), 'Aid and the Public Sector in Pakistan: Evidence with Endogenous Aid,' *World Development*, No.26, pp. 1241-1250.

Saif, I. and Omet, G. (2005), 'The fiscal Impact of Aid in the Jordanian Economy'

Sims, C.A (1980), ' Macroeconomics and Reality,' Econometrica, Vol. 48, No.1, pp.1-48

Stephen, A. and Nelson,C.(2008), 'Is Foreign Aid Beneficial for Sub-Saharan Africa: A panel Data Analysis,' University of Illinois at Urbana- Champaign,

Swaroop, V. Shikha, J. and Rajkumar, A.S. (2000), 'Fiscal effects of foreign aid in federal system of governance: the case of India,' *Journal of Public Economics*, Vol. 77 No. 2000

Tamura, F. (2005), 'Spending substitution or Additional Funding? The Estimation of Endogenous Foreign Aid Fungiblity,' *Job market Paper,* Brown University.

Tarhan,F., Swaroop,V. and Zhu,M. (1998), 'A Panel Data Analysis of the Fungibility of Foreign Aid,' *World Bank Economic Review* Vol. 12, pp. 29–58.

Thrlwal A.P (1989), *Growth and Development with special Reference to Developing Economies*, Macmillan Press, London

Todaro, M., (1989*), Economic Development in the Third World*, Longman.

Tsikata, Tsidi M. (1998), 'Aid Effectiveness: A Survey of the Recent Empirical Literature' *IMF Paper on Policy Analysis and Assessment* 98/1

White, H. (1992), 'Foreign Aid, Taxes and Public Investment: A further Comment,' *Journal of Development Economics* Vol.45, pp. 155-163.

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

Wilkes, J. (2001), 'Evidence on Program Aid: what do we need to learn?,' Unpublished Background Paper.

Wondwossen Tefera,(2003), 'An Empirical Investigation of the Aid-Growth Relationship in Ethiopia,' Unpublished Master's thesis, Addis Ababa University.

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

Xavayong,V. and Obben. J (2005), 'Analysis of the aid fiscal Response and Growth Relationship: a Cointegrating VAR Approach,' *Discussion Paper* No.06/05

Xayavong, V., Gounder, R. and Obben, J. (2005), 'Theoretical Analysis of Foreign Aid, Policies and State Institutions', Department of Applied and International Economics *Discussion Paper*, No. 05/01, Massey University, New Zealand

APPENDICES

APPENDIX 1: STRUCTURAL BREAK TEST

Variable: LGND
Chow Breakpoint Test: 1975 1992
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1968 2008

F-statistic	0.335652	Prob. F(4,35)	0.8521
Log likelihood ratio	1.543352	Prob. Chi-Square(4)	0.8189
Wald Statistic	1.342606	Prob. Chi-Square(4)	0.8541

Variable: LGD
Chow Breakpoint Test: 1975 1992
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1968 2008

F-statistic	0.768378	Prob. F(4,35)	0.5531
Log likelihood ratio	3.451000	Prob. Chi-Square(4)	0.4854
Wald Statistic	3.073511	Prob. Chi-Square(4)	0.5456

Variable: LGT
Chow Breakpoint Test: 1975 1992
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1968 2008

F-statistic	0.290380	Prob. F(4,35)	0.8822
Log likelihood ratio	1.338547	Prob. Chi-Square(4)	0.8548
Wald Statistic	1.161519	Prob. Chi-Square(4)	0.8844

Variable: LR
Chow Breakpoint Test: 1975 1992
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1968 2008

F-statistic	0.169159	Prob. F(4,35)	0.9527
Log likelihood ratio	0.785067	Prob. Chi-Square(4)	0.9404
Wald Statistic	0.676637	Prob. Chi-Square(4)	0.9542

Variable: LPA
Chow Breakpoint Test: 1975 1992
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1968 2008

F-statistic	0.968245	Prob. F(4,35)	0.4372
Log likelihood ratio	4.303004	Prob. Chi-Square(4)	0.3665
Wald Statistic	3.872979	Prob. Chi-Square(4)	0.4235

Variable: LPODA
Chow Breakpoint Test: 1975 1992
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 1968 2008

F-statistic	0.697793	Prob. F(4,35)	0.5986
Log likelihood ratio	3.145828	Prob. Chi-Square(4)	0.5337
Wald Statistic	2.791174	Prob. Chi-Square(4)	0.5934

APPENDIX 2: DIAGNOSTIC ANALYSIS FOR MODEL I

Appendix 2.1 Lag length criteria for model I

Endogenous variables: LGT LR LPA LPODA DUMMY
Exogenous variables: C
Sample: 1966 2008
Included observations: 40

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-10.73472	NA	1.51e-06	0.786736	0.997846	0.863067
1	126.2656	232.9006*	5.65e-09*	-4.813280*	-3.546621*	-4.355296*
2	142.8676	24.07293	9.14e-09	-4.393382	-2.071172	-3.553744
3	161.7554	22.66535	1.46e-08	-4.087771	-0.710012	-2.866480

* indicates lag order selected by the criterion

Annex 2.2 Co- integration test for model I

Trend assumption: Linear deterministic trend
Series: LGT LR LPA LPODA DUMMY
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.676873	79.25433	69.81889	0.0073
At most 1	0.408594	34.06595	47.85613	0.4983
At most 2	0.183661	13.05584	29.79707	0.8890
At most 3	0.085144	4.938834	15.49471	0.8153
At most 4	0.033894	1.379268	3.841466	0.2402

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.676873	45.18838	33.87687	0.0015
At most 1	0.408594	21.01011	27.58434	0.2756
At most 2	0.183661	8.117002	21.13162	0.8964
At most 3	0.085144	3.559566	14.26460	0.9027
At most 4	0.033894	1.379268	3.841466	0.2402

Appendix 2.3Normality test for model I

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1966 2008
Included observations: 41

Component	Skewness	Chi-sq	df	Prob.
1	-0.206098	0.290254	1	0.5901
2	0.601228	2.470078	1	0.1160
3	0.545153	2.030807	1	0.1541
4	0.138644	0.131352	1	0.7170
5	0.627522	2.690854	1	0.1009
Joint		7.613345	5	0.1789

Component	Kurtosis	Chi-sq	df	Prob.
1	1.807602	2.428929	1	0.1191
2	3.469661	0.376826	1	0.5393
3	2.976022	0.000982	1	0.9750
4	2.783107	0.080364	1	0.7768
5	2.297348	0.843438	1	0.3584
Joint		3.730540	5	0.5888

Component	Jarque-Bera	df	Prob.
1	2.719183	2	0.2568
2	2.846904	2	0.2409
3	2.031789	2	0.3621
4	0.211716	2	0.8996
5	3.534292	2	0.1708
Joint	11.34388	10	0.3314

Appendix 2.4 VAR stability test for model I

Roots of Characteristic Polynomial
Endogenous variables: LGT LR LPA LPODA DUMMY
Exogenous variables: C
Lag specification: 1 2

Root	Modulus
1.022340	0.922340
0.861092 - 0.206518i	0.885510
0.861092 + 0.206518i	0.885510
0.096658 - 0.494419i	0.503779
0.096658 + 0.494419i	0.503779
0.409627 - 0.273846i	0.492733
0.409627 + 0.273846i	0.492733
-0.346052	0.346052
-0.144254 - 0.234337i	0.275178
-0.144254 + 0.234337i	0.275178

No root lies outside the unit circle.
VAR satisfies the stability condition.

Appendix 2.5 Heteroscedasticity test for model I

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Sample: 1966 2008
Included observations: 41

Joint test:

Chi-sq	df	Prob.
275.1297	270	0.4021

Individual components:

Dependent	R-squared	F(18,22)	Prob.	Chi-sq(18)	Prob.
res1*res1	0.388355	0.776032	0.7050	15.92255	0.5980
res2*res2	0.581130	1.695681	0.1192	23.82633	0.1608
res3*res3	0.630519	2.085721	0.0513	25.85128	0.1032
res4*res4	0.644444	2.215275	0.0389	26.42221	0.0905
res5*res5	0.751833	3.702779	0.0021	30.82516	0.0302
res2*res1	0.415376	0.868390	0.6157	17.03041	0.5210
res3*res1	0.297264	0.517012	0.9202	12.18783	0.8374
res3*res2	0.298473	0.520010	0.9184	12.23741	0.8347
res4*res1	0.439224	0.957297	0.5322	18.00819	0.4551
res4*res2	0.369537	0.716388	0.7618	15.15102	0.6516
res4*res3	0.597151	1.811722	0.0927	24.48318	0.1398
res5*res1	0.496285	1.204195	0.3357	20.34769	0.3136
res5*res2	0.727451	3.262191	0.0048	29.82549	0.0392
res5*res3	0.431202	0.926558	0.5605	17.67927	0.4770
res5*res4	0.460623	1.043767	0.4565	18.88555	0.3989

Appendix 2.6 Diagnostic test for Error correction Model I

sigma	0.0852153	RSS	0.225111183
R^2	0.982999	F(9,31) =	199.2 [0.000]**
log-likelihood	48.5205	DW	2.08
no. of observations	41	no. of parameters	10
mean(LGT)	9.10409	var(LGT)	0.322951
AR 1-2 test:	F(2,29) =	2.2337 [0.1252]	
ARCH 1-1 test:	F(1,29) =	0.010387 [0.9195]	
Normality test:	Chi^2(2) =	1.9975 [0.3683]	
hetero test:	F(17,13) =	0.69468 [0.7626]	
RESET test:	F(1,30) =	0.29680 [0.5899]	

APPENDIX 3: DIAGNOSTIC TEST RESULTS FOR MODEL II

Appendix 3.1 Lag Length Determination for Model II

Endogenous variables: LGND LR LPA LPODA DUMMY
Exogenous variables: C
Sample: 1966 2008
Included observations: 40

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-15.38759	NA	1.91e-06	1.019379	1.230489	1.095710
1	114.1889	220.2800*	1.03e-08*	-4.209445*	-2.942786*	-3.751461*
2	128.3232	20.49474	1.89e-08	-3.666160	-1.343951	-2.826523
3	147.6232	23.15996	2.96e-08	-3.381159	-0.003400	-2.159868

* indicates lag order selected by the criterion

Appendix 3.2 Co-integration test for Model II

Sample (adjusted): 1969 2008
Included observations: 40 after adjustments
Trend assumption: Linear deterministic trend
Series: LGND LR LPA LPODA DUMMY
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.660143	78.47413	69.81889	0.0087
At most 1	0.372528	35.30490	47.85613	0.4320
At most 2	0.236779	16.66263	29.79707	0.6648
At most 3	0.116438	5.854339	15.49471	0.7127
At most 4	0.022312	0.902573	3.841466	0.3421

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.660143	43.16923	33.87687	0.0030
At most 1	0.372528	18.64227	27.58434	0.4427
At most 2	0.236779	10.80829	21.13162	0.6664
At most 3	0.116438	4.951766	14.26460	0.7479
At most 4	0.022312	0.902573	3.841466	0.3421

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

Appendix 3.3 Normality test for model II

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 04/09/10 Time: 01:56
Sample: 1966 2008
Included observations: 41

Component	Skewness	Chi-sq	df	Prob.
1	-0.383131	1.003061	1	0.3166
2	0.876003	5.243771	1	0.0220
3	0.711961	3.463740	1	0.0627
4	0.148114	0.149909	1	0.6986
5	0.704981	3.396158	1	0.0653
Joint		13.25664	5	0.0211

Component	Kurtosis	Chi-sq	df	Prob.
1	1.702460	2.876168	1	0.0899
2	3.812821	1.128658	1	0.2881
3	3.696361	0.828402	1	0.3627
4	2.802184	0.066849	1	0.7960
5	3.145355	0.036094	1	0.8493
Joint		4.936171	5	0.4237

Component	Jarque-Bera	df	Prob.
1	3.879229	2	0.1438
2	6.372429	2	0.0413
3	4.292142	2	0.1169
4	0.216757	2	0.8973
5	3.432252	2	0.1798
Joint	18.19281	10	0.0518

Appendix 3.4 VAR stability test for Model II

Roots of Characteristic Polynomial
Endogenous variables: LGND LR LPA LPODA DUMMY
Exogenous variables: C
Lag specification: 1 2

Root	Modulus
1.019612	0.819612
0.827605 - 0.199119i	0.851222
0.827605 + 0.199119i	0.851222
0.413461 - 0.242405i	0.479281
0.413461 + 0.242405i	0.479281
0.115486 - 0.442193i	0.457025
0.115486 + 0.442193i	0.457025
-0.347475 - 0.045136i	0.350394
-0.347475 + 0.045136i	0.350394
0.287210	0.287210

No root lies outside the unit circle.
VAR satisfies the stability condition.

Appendix 3.5 Heteroscedasticity test for model II

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Sample: 1966 2008
Included observations: 41

Joint test:

Chi-sq	df	Prob.
279.7185	270	0.3293

Individual components:

Dependent	R-squared	F(18,22)	Prob.	Chi-sq(18)	Prob.
res1*res1	0.614171	1.945558	0.0694	25.18100	0.1200
res2*res2	0.620450	1.997968	0.0620	25.43846	0.1133
res3*res3	0.513003	1.287487	0.2837	21.03310	0.2777
res4*res4	0.557059	1.537110	0.1678	22.83940	0.1968
res5*res5	0.705410	2.926669	0.0091	28.92181	0.0493
res2*res1	0.467021	1.070969	0.4341	19.14787	0.3828
res3*res1	0.289944	0.499081	0.9306	11.88770	0.8530
res3*res2	0.211502	0.327842	0.9903	8.671587	0.9669
res4*res1	0.510669	1.275519	0.2907	20.93743	0.2826
res4*res2	0.561961	1.567988	0.1571	23.04038	0.1890
res4*res3	0.520823	1.328447	0.2608	21.35374	0.2619
res5*res1	0.351347	0.662024	0.8111	14.40522	0.7023
res5*res2	0.676771	2.559065	0.0190	27.74760	0.0660
res5*res3	0.372772	0.726388	0.7524	15.28366	0.6424
res5*res4	0.516816	1.307297	0.2724	21.18947	0.2700

Appendix 3.6 diagnostic tests for error correction model II

sigma	0.097957	RSS	0.297462813
R^2	0.967256	F(9,31) =	101.7 [0.000]**
log-likelihood	42.8073	DW	2.11
no. of observations	41	no. of parameters	10
mean(LGND)	8.71702	var(LGND)	0.221576
AR 1-2 test:	F(2,29) =	1.2796 [0.2934]	
ARCH 1-1 test:	F(1,29) =	10.319 [0.1832]	
Normality test:	Chi^2(2) =	5.1706 [0.0754]	
hetero test:	F(17,13) =	2.9754 [0.0860]	
RESET test:	F(1,30) =	2.4017 [0.1317]	

APPENDIX4: DIAGNOSTIC TEST RESULTS FOR MODEL III

Appendix x 4.1 Lag length determination for model III

Endogenous variables: LGD LR LPA LPODA DUMMY
Exogenous variables: C
Sample: 1966 2008
Included observations: 40

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-28.44455	NA	3.66e-06	1.672228	1.883338	1.748558
1	96.01853	211.5872*	2.56e-08*	-3.300926*	-2.034267*	-2.842942*
2	110.6086	21.15564	4.59e-08	-2.780431	-0.458222	-1.940794
3	133.3230	27.25723	6.06e-08	-2.666149	0.711610	-1.444858

* indicates lag order selected by the criterion

Appendix 4.2 Co-integration test for model III

Trend assumption: Linear deterministic trend
Series: LGD LR LPA LPODA DUMMY
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.659219	74.21081	69.81889	0.0214
At most 1	0.345036	31.15020	47.85613	0.6584
At most 2	0.223651	14.22322	29.79707	0.8279
At most 3	0.081655	4.097084	15.49471	0.8955
At most 4	0.017097	0.689794	3.841466	0.4062

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.659219	43.06061	33.87687	0.0031
At most 1	0.345036	16.92698	27.58434	0.5862
At most 2	0.223651	10.12614	21.13162	0.7327
At most 3	0.081655	3.407290	14.26460	0.9160
At most 4	0.017097	0.689794	3.841466	0.4062

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

Appendix 4.3 Normality test for Model III

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Included observations: 41

Component	Skewness	Chi-sq	df	Prob.
1	-0.005640	0.000217	1	0.9882
2	0.394584	1.063928	1	0.3023
3	0.639791	2.797102	1	0.0944
4	0.230325	0.362507	1	0.5471
5	0.721549	3.557656	1	0.0593
Joint		7.781409	5	0.1687

Component	Kurtosis	Chi-sq	df	Prob.
1	1.772793	2.572813	1	0.1087
2	2.763128	0.095851	1	0.7569
3	3.747038	0.953363	1	0.3289
4	2.640121	0.221251	1	0.6381
5	3.364906	0.227475	1	0.6334
Joint		4.070753	5	0.5393

Component	Jarque-Bera	df	Prob.
1	2.573030	2	0.2762
2	1.159779	2	0.5600
3	3.750464	2	0.1533
4	0.583758	2	0.7469
5	3.785131	2	0.1507
Joint	11.85216	10	0.2951

Appendix 4.4 VAR stability test for Model III

Roots of Characteristic Polynomial
Endogenous variables: LGD LR LPA LPODA DUMMY
Exogenous variables: C
Lag specification: 1 2

Root	Modulus
1.016773	0.916773
0.844303 - 0.219329i	0.872326
0.844303 + 0.219329i	0.872326
0.223713 - 0.473925i	0.524073
0.223713 + 0.473925i	0.524073
-0.426643 - 0.060799i	0.430953
-0.426643 + 0.060799i	0.430953
0.234292 - 0.080006i	0.247575
0.234292 + 0.080006i	0.247575
0.131290	0.131290

No root lies outside the unit circle.
VAR satisfies the stability condition.

Appendix 4.5 Heteroscedasticity Test for model III

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Sample: 1966 2008
Included observations: 41

Joint test:

Chi-sq	df	Prob.
275.6699	270	0.3932

Individual components:

Dependent	R-squared	F(18,22)	Prob.	Chi-sq(18)	Prob.
res1*res1	0.370670	0.719880	0.7585	15.19749	0.6484
res2*res2	0.808834	5.171303	0.0002	33.16221	0.0160
res3*res3	0.585546	1.726770	0.1115	24.00738	0.1548
res4*res4	0.602235	1.850502	0.0852	24.69163	0.1336
res5*res5	0.805602	5.065003	0.0002	33.02969	0.0166
res2*res1	0.521582	1.332494	0.2586	21.38486	0.2604
res3*res1	0.387453	0.773089	0.7079	15.88556	0.6005
res3*res2	0.305168	0.536795	0.9079	12.51188	0.8197
res4*res1	0.506614	1.254990	0.3031	20.77117	0.2911
res4*res2	0.491139	1.179656	0.3524	20.13670	0.3252
res4*res3	0.588440	1.747505	0.1066	24.12602	0.1509
res5*res1	0.734069	3.373785	0.0039	30.09682	0.0365
res5*res2	0.810325	5.221560	0.0002	33.22334	0.0157
res5*res3	0.459522	1.039151	0.4604	18.84040	0.4017
res5*res4	0.353112	0.667165	0.8066	14.47758	0.6975

Appendix 4.6 Diagnostic Test for Error Correction Model III

sigma	0.193	RSS	1.15472291
R^2	0.955795	F(9,31) =	74.48 [0.000]**
log-likelihood	15.0026	DW	1.85
no. of observations	41	no. of parameters	10
mean(LGD)	7.9119	var(LGD)	0.637121
AR 1-2 test:	F(2,29) = 0.64229 [0.5334]		
ARCH 1-1 test:	F(1,29) = 0.16397 [0.6885]		
Normality test:	Chi^2(2) = 0.64182 [0.7255]		
hetero test:	F(17,13) = 0.44057 [0.9426]		
RESET test:	F(1,30) = 0.029944 [0.8638]		