

**JIMMA UNIVERSITY**  
**SCHOOL OF GRADUATE STUDIES**

**THE ROLE OF FOREIGN AID IN REDUCING  
POVERTY: TIME SERIES EVIDENCE FROM  
ETHIOPIA**

**BY**  
**HANA WOLDEKIDAN**

**JUNE, 2013**

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in Economics (Economic Policy Analysis).**

**JUNE, 2013**

**JIMMA**

### Declaration

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

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## **Acronyms**

2SLS – Two Stage Least Square

ADF – Augmented Dickey Fuller

AIC - Akaike Information Criteria

CSA – Central Statistics Authority

DAC – Development Assistance Committee

ECT – Error Correcting Term

EDA – Effective Development Assistance

EEA – Ethiopian Economic Association

EFW – Economic Freedom of World

GDP – Gross Domestic Product

GNI – Gross National Income

GNP – Gross National Product

HCI – Head Count Index

HDI – Human Development Index

HDR – Human Development Report

HICE – Household Income Consumption Expenditure

HQIC- Hannan-Quinn Information Criteria

LDCs – Least Developed Countries

LR – Likelihood Ratio

MDGs – Millennium Development Goals

MoFED - DPRD – Ministry of Finance and Economic Development - Development Planning and Research Directorate

MoFED – Ministry of Finance and Economic Development

ODA – Official Development Assistance

OECD – Organization for Economic Cooperation and Development

OLS - Ordinary Least Square

PASDEP - Plan for Accelerated and Sustained Development to End Poverty

PGI – Poverty Gap Index

PP - Philips-Perron

PPE – Pro Poor Expenditure

PRSP – Poverty Reduction Strategic Paper

PSR – Poverty Severity Ratio

SDPRP - Sustainable Development and Poverty Reduction Program

SIC - Schwarz Information Criteria

SSA – Sub-Saharan Africa

UNDP – United Nations Development Program

VAR - Vector Autoregressive

VECM – Vector Error Correcting Model

WWII – World War the Second

## Abstract

*Being one of the developing countries Ethiopia had received a large amount of foreign aid (ODA) since WWII, which was targeted towards fostering economic development and poverty reduction. Driven by recent shifts in international financial flows towards poverty reduction and the concentration of previous studies on aid economic growth relationships, this study took a new metric to investigate aid's effectiveness, that is poverty reduction. Accordingly, the study has examined the role of foreign aid in reducing poverty in Ethiopia over the period 1974/75 to 2009/2010 using multivariate cointegration analysis.*

*Based on the unit root test result which confirmed that all the variables considered are integrated of order one ( $I(1)$ ), the Johansen maximum likelihood procedure have been employed to test for the presence and rank of cointegration. The test was conducted for three models each having different measures of poverty - infant mortality rate, gross primary enrollment ratio and real household consumption expenditure. Conducted for the three models, the cointegration tests indicated the presence of one cointegrating equation in each model. And by applying the weak exogeneity test the variables that are endogenous to the system were identified. As to the results of weak exogeneity test the three measures of poverty found to be endogenous in each model.*

*The empirical results from the cointegration analysis indicated that foreign aid has a significant effect on poverty reduction, by reducing infant mortality rate and increasing household consumption expenditure. On the other hand, its impact found to be negative when poverty is measured by gross primary enrollment ratio. Nonetheless, when augmented by macroeconomic policy index the impact turned to be positive. Furthermore the result indicated the presence of diminishing returns to the inflow of foreign aid. The results also revealed that economic growth has a significant contribution for poverty reduction, while poor quality of governance exacerbates poverty. Thus, to achieve the poverty reduction objectives, measures have to be taken in the area of aid allocation, quality of governance and macroeconomic policies that can ensure sustainable economic growth.*

# CHAPTER ONE

## INTRODUCTION

### 1.1. Background of the Study

Failing to bring nationwide and equitable wellbeing improvements through economic growth, international financial flows shifted their emphasis towards supporting poverty reduction schemes in recent periods; the Millennium Development Goals (MDGs) are one of such programs. In line with MDGs goal one, 'Eradicate Extreme Poverty and Hunger', strong efforts towards poverty reduction in Ethiopia were initiated in 1994/95 with a very high level of national poverty; 49.5% of the total population were under the poverty line. In order to achieve this goal, the government has developed and implemented different poverty reduction strategies, such as Sustainable Development and Poverty Reduction Program (SDPRP - 2002/03-2004/05) and Plan for Accelerated and Sustained Development to End Poverty (PASDEP - 2005/06-2009/10). In addition to this, the government has significantly increased its expenditure and redirected fiscal policy towards poverty oriented sectors, such as agriculture, education, health, water and road development (from 57 % in 2004/05 to 66.7% in 2009/10) (MoFED, 2010).

As the result, poverty levels have declined steadily from 38.7 percent in 2004/05 to 29.6 percent in 2010/11, while inequality has remained static: 0.29 in 1995/96 and 0.298 2010/2011 (MoFED, 2010; MoFED-DPRD, 2012). Poverty measured in other dimensions has also experienced some decline. For example, the percentage of population with improved sanitation has shown a substantial improvement (from 3 in 1990 to 21 in 2010) while access to clean water has increased by more than 3 fold (from 14 in 1990 to 44 in 2010). Similarly, life expectancy and adult literacy rate have experienced increments from 38 in 1960 to 59 in 2011 and from 27 % in 1994 to 30 % in 2008, respectively. These figures, taken together with significant reductions in maternal and infant mortalities, are indicative of the countries status with regard to achieving the MDGs (UNDP, 1990; UNDP, 2011).

In spite of all the efforts made and encouraging achievements gained in welfare improvements, poverty continues to be a major challenge as millions are still living in chronic poverty. For instance, based on UNDP's human development indicator, Human Development Index,

Ethiopia is under the low human development category as it was two decades ago (UNDP, 1993; UNDP, 2011).

This has mainly emanated from the rudimentary structure of the economy. Like many other developing economy, the Ethiopian economy is characterized by the following interlinked economic scenarios. Low level of productivity, which is consumption oriented and hence low income levels. The later implies limited opportunities in domestic resource mobilizations for saving and investment. This leads to a vicious cycle where saving and investment would be suboptimal leading to limited investment on productive sectors and then to persistent poverty. In such circumstances financing poverty reduction objectives domestically becomes difficult and forces the country to seek external assistance.

The other problem is related with the agricultural sector and rural poverty. According to the income /consumption poverty analysis by CSA (based on 1999/00 HICE ) poverty is a rural phenomenon as indicated by the contribution of rural areas to the poverty head count index which was 90 % in 1995/96 and 88.7 % in 1999/00 (MoFED, 2002). Due to the sheer size of the rural sector and its heavy reliance on agriculture, enhancing the productivity of this sector becomes the key for accelerated growth and wide scope poverty reduction. This desired growth within the agricultural sector can emerge from improvements in crop production and productivity, livestock productivity, diversification of agricultural production, agricultural research and extension services, supply of agricultural inputs such as fertilizer and improved seeds, expansion of small and medium scale irrigation schemes and the management and utilization of natural resources. It is not questionable that the implementation of all these strategies heavily depends on government expenditure on the agricultural sector. However, data (EEA database, 2012) on the status of government expenditure for this sector indicates that it is almost static in addition to its limitedness (8 % in 1990/91 and 9.4 % in 2010/11); given the fact that agriculture is the cornerstone of the economy. This scenario again indicates the financial constraint that the economy is facing. As mentioned in the above paragraph, it is not feasible to raise the required money from domestic sources, thus implying the countries demand for foreign aid.

In addition to the above problems, the dependence on export of primary commodities has made the country to face foreign exchange constraint. For instance, in 2001/02 the exports of goods and services amounted to 8.15 billion birr while the imports of goods and services amounted to 16.11 billion birr which resulted in a foreign exchange gap of 7.96 billion birr. This appears not to have eased for several years; in 2011, for example, the import bill was about 163 billion birr, with export earnings of 45 billion birr, again resulting in a trade deficit of 118 billion birr (MoFED, 2012). While this has an important bearing for diversification and promotion of exports, it also calls for foreign finance to complement the limited foreign exchange earnings to import capital goods along with other commodities.

High levels of budget deficit and public (national) debt are also two of the characteristics of the Ethiopian economy. While the government's expenditure in developmental projects has been ballooning, its revenue has remained insufficient to finance such massive projects. Additionally, servicing the debt has imposed a huge burden by diverting the money from being used on domestic development activities. This inadequacy of domestic revenue to finance the deficit by itself also makes inflows of foreign capital an important source to mitigate the challenge.

## **1.2. Statement of the Problem**

Foreign aid was first began as international post-war assistance in the late 1940s with the statement of the Marshal plan in which its purpose was to reconstruct the war- torn economy of Western Europe. After the success of the Marshal plan, foreign aid was repackaged as development assistance and continued to be the main feature of international relations between the developed and developing countries. As stated by Hampton (2010), in the period that followed, often dubbed as 'the cold war', "foreign aid decisions were primarily strategic and politically motivated and throughout this period, foreign aid was seen as a means for political dominance between the former USSR and the United States" (pp 4-5). The birth and expansion of bilateral programmes, multilateral institutions and Non-governmental organizations (NGOs) was also another important event in the period from 1960s to early 1990s (Hjertholm and White, 1998; United Nations, 2006). The end of the Cold War and the breakup of USSR in 1991, brought a change on the motives of giving aid; a change which can be described as a shift from providing aid for the purpose of restricting the expansion of communism to using foreign aid for

building strategic alliances, fighting terrorism and reducing poverty (Oskooee and Oyolola, 2009; Hampton, 2010). The inauguration of the MDGs in 2000, to halve world poverty by 2015, further increased the attention of the donor community towards concentrating on aid for poverty reduction in a way that helps poor countries to achieve the goals.

Generally, from the time foreign aid had begun, developing countries continued to receive large amounts of aid from both multilateral and bilateral sources. According to World Bank (1998) these financial flows have two broad objectives; promoting long term growth and poverty reduction in developing countries and promoting short-term political and strategic interests of donor countries.

The amount of foreign financial assistance that is given to the developing countries in general and for African countries in particular has been increasing from time to time. In Africa, the share of Official Development Assistance (ODA) in GDP has significantly increased over the years. Based on World Bank's 1992 data, Yohannes (2011) stated that "aid flows has drastically increased from 1.9 percent in 1960/61 to 2.9 percent in 1970/71 and to 5 percent in 1983/84 and reached 9.6 percent in 1990/91". United Nations Development Program (UNDP) report in 2011 also shows that, the Sub Saharan Africa (SSA) is receiving higher aid than any other region and has the highest amount of net official development assistance as percent of GDP in 2009(9.9%).

According to Getnet (2009), following the change in political regime in 1991 and the adoption of the structural adjustment program in 1992/93, Ethiopia has enjoyed a significant amount of aid. A large and growing inflow of concessionary loans and grants has occurred since 2001, following the issuance of the first poverty reduction strategy paper<sup>1</sup>, from different multilateral and bilateral sources.

The country has continued to be one of the major recipients of international aid in recent times also. Based on Organization for Economic Cooperation and Development - Development Assistance Committee (OECD-DAC) statistics, net ODA to Ethiopia amounted to USD 3.563 billion in 2011, making the country the largest non-war destroyed aid recipient among aid receiving developing countries. The World Bank database shows that net ODA as a percentage

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<sup>1</sup> Sustainable Development and Poverty Reduction Program prepared by MoFED in 2002



of gross national income (GNI) is still significant and high relative to many developing countries (13.43% on average from 2000-2010 reaching a peak of 19.15 in 2003). The share of ODA in total government expenditure is also very high accounting more than 50 % in 2000s.

Given the large volume of aid the country had received for decades several empirical studies, using periodic data, have been conducted on the impact of foreign aid (ODA). However, these research works tried to investigate aid's effectiveness in stimulating economic growth. Consequently they have concentrated only on macroeconomic variables - investment, saving, government spending - that determine economic growth (Abeba, 2002; Tasew, 2011; Yohannes, 2011; Tofik, 2012). Unlike these studies, this paper focuses on investigating aid's effectiveness on its ability to reduce poverty in Ethiopia.

With similar objective as in the above studies, a number of scholars had also analyzed the impact of foreign aid using a time series as well as a cross-country data for decades. However, the literature on the role of aid in poverty reduction is highly limited: which is mainly because studies with the main objective of investigating the effectiveness of foreign aid in reducing poverty, begun to emerge only recently. In addition to being limited and cross-country data based, the results of these studies have been also found to be contradictory. For example, some studies have shown that aid has resulted in poverty reduction in poor countries and there by contributed significantly to their development progress (e.g. Mosley *et al*, 2004; Gomanee *et al*, 2003; Asra *et al*, 2005; Masud and Yontcheva, 2005; Alvi and Senbeta, 2011).

In contrast, opposing strand of literature argue that foreign aid has a negative impact on growth and even worsens poverty (e.g. Bauer, 1968; Boone, 1996; Easterly, 2005; Magnon, 2012). The evidence brought to be on this contention is that many countries are still desperately poor after 50 years of assistance and that many parts of the developing world made rapid progress long before the advent of the official development assistance<sup>2</sup>. These critics also state that international assistance may support governments who are pursuing policies that are obstructing development; and by increasing the power of government, assistance breeds corruption, in efficiency and tensions in the society which retards development and encourages irresponsible

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<sup>2</sup> Supporting this justification, Salmonsson (2007), stated that, "when foreign aid was introduced, the target was to reduce poverty with 50% within 10 years. After more than 50 years and more than a 2.3 trillion USD spent on foreign aid, more than 2 billion people still are living in extreme poverty situations"(pp-1).

financial policies. They also mentioned that if the assistance is free (pure aid) there may be no incentive to use resources productively. Some even argue that if foreign aid were indispensable for emergency from poverty, the rich countries of today could not have developed because they didn't receive foreign aid (Dorn, 2004; Niaz, 2011). Some scholars, again say it has a positive and significant impact in a good policy environment and relates aid's effectiveness with political sphere (Collier and Dollar, 1999; World Bank, 1998, 2002; Burnside and Dollar, 2000). This controversy underscores the need to undertake a study at country level and investigate empirically whether aid have positive, negative or no relation (depends on other factors to be effective) with poverty reduction.

Recent shifts in emphasis of the international development community towards measuring development and effectiveness of foreign aid in terms of poverty reduction as manifested in global initiatives like the MDGs has also motivated the concern to conduct a study in this area.

In view of the above statements, this study is expected to come up with empirical findings that will help to identify the role of foreign aid on poverty reduction in Ethiopia.

### **1.3. Objectives of the Study**

#### **1.3.1. General Objective**

The main objective of this study is to investigate the macroeconomic impact of foreign aid in reducing national poverty in Ethiopia.

#### **1.3.2. Specific Objectives**

The specific objectives include analyzing:

- ♣ The conditional effectiveness of aid on macroeconomic policy; whether the relationship between aid and poverty is conditional on macroeconomic policy stance.
- ♣ The impact of aid when different measures of poverty are used. Does the measure matters?
- ♣ Whether aid's effectiveness depend on its size or not.

#### **1.4. Scope of the Study**

Foreign assistance may take different forms like financial aid, debt relief, technical assistance, food aid and so on, targeted either for emergencies, military objectives, or poverty reduction and economic development. However, the scope of this paper is limited to the analysis of official development assistance - which embraces loans and grants with concessional terms from both bilateral and multilateral donors which are given for the purpose of promoting economic development and welfare in developing countries, and excludes military assistance, food aid, technical assistance, cultural and peace keeping supports - and its role on poverty reduction. Besides, poverty being multi-dimensional to measure using a single index, this study is confined to three of its indicators, namely, infant mortality rate, gross primary enrollment ratio and real household consumption expenditure. Finally the study covers the period from 1974/75-2009/10 with the findings and the conclusions applicable to Ethiopia and low income countries with similar features.

#### **1.5. Significance of the Study**

The research work and previous literature on aid poverty relationship was mainly based on cross country data/analysis in which each country is treated as a sample. However, this method only shows the average impact of aid in the countries considered by taking the impact of foreign aid as it is the same in all LDCs. This study, therefore, provide some insights about aid's effect on poverty reduction when a single country is treated.

In the Ethiopian case, the studies conducted so far tried to investigate the impact of foreign aid from the economic growth side. Those conducted on poverty are limited in number and scope, thus this study will add on to the existing literature in this area. In recent times, much of aid being offered to financially support the poverty reduction efforts of the country, investigating the marginal impact of aid would thus provide some policy direction. Additionally, this study will be used as a ground for further country specific analysis of aid - poverty relationships.

## **1.6. Limitation of the Study**

Although this study attempts to investigate the impact of foreign aid on poverty reduction, it suffers from some limitations. One of the limitations is that the study does not include all the explanatory variables which are expected to affect poverty reduction. The other limitation lies in the time span considered; which might be short for time series analysis. These limitations mainly rose from the inconsistency and also unavailability of data. And the other reason for the first limitation is to avoid statistical complications which will be faced due to using large number of variables with limited time period.

## **1.7. Organization of the Paper**

The paper consists six chapters. The first chapter has introductory nature which explains about the study with the second chapter reviewing literature regarding the role of aid on poverty reduction. Chapter three is devoted to the discussion on methods of data analysis. Over view of the macroeconomic conditions, which are related to the subject under study have briefly reviewed in chapter four. The subsequent chapter discusses results of econometric analysis and the final chapter concludes this paper and presents possible policy recommendations.

## **CHAPTER TWO**

### **REVIEW OF LITERATURES**

The main concern of this chapter is to review the related literature on the impacts of foreign aid on poverty reduction. It is classified in to four sub sections, in which the first three sections discuss issues related to poverty and foreign aid. The final section presents the theoretical arguments and empirical findings from previous works, on aid's role in reducing poverty.

#### **2.1. Definitions of Poverty**

Being a multi-dimensional, time variant, culturally and socially determined phenomena, proposing one internationally accepted definition for poverty continued to be a challenge as it was in previous periods. Driven by this problem, different bodies have proposed different definitions over the decades. Nevertheless, Most of the definitions stressed on the lack of resources to meet the minimum requirements of subsistence.

In line with this, The United Nations Development Program (1998) identified six typologies of poverty.

- Human Poverty - implies lack of essential human capabilities such as being literate or adequately nourished.
- Income Poverty - this is related with the lack of minimally adequate incomes or expenditure.
- Extreme Poverty - this type of poverty is specified as the inability to satisfy minimum food requirements.
- Overall Poverty - refers to a less severe level of poverty usually seen as the inability to satisfy essential non-food as well as food needs of which the former varies considerably across societies.
- Relative poverty - is defined by standards that change across countries or overtime often in terms of the capital income and often loosely used to mean overall poverty.
- Absolute poverty - this is defined using an international standard of \$1.25 per day as the poverty line.

United Nation (1998) stated the definition of poverty as follows:

“Fundamentally, poverty is a denial of choices and opportunities, a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and clothe a family, not having a school or clinic to go to; not having the land on which to grow one’s food or a job to earn one’s living, not having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence, and it often implies living on marginal or fragile environments, without access to clean water or sanitation”.

World Bank (2000) defines poverty in a more condensed but similar way as, lack of basic necessities of life and opportunities for human development and stated that it is a complex human phenomenon associated with unacceptably low standard of living with multiple dimensions, manifestations and causes.

The Ethiopian government has defined poverty as a multi-dimensional phenomenon extending beyond the low level of income. According to the definition there are four dimensions of poverty: material deprivation (lack of opportunity), low achievement in education and health (low capabilities), vulnerability (exposure to risk or low level of security) and voicelessness (powerlessness) (Tassew, 2004).

Asmamaw (2004) defined Poverty as “a situation in which the underprivileged do not have adequate food and shelter, lack access to education and health services, are exposed to violence, and find themselves in a state of unemployment, vulnerability and powerlessness”.

## **2.2. Definition and Classifications of Foreign Aid**

Economists have defined foreign aid as any flow of capital to Least Developed Countries (LDCs), particularly the capital flows to LDCs that meets two criteria:

- Its objective should be noncommercial from the point of view of donors and
- It should be characterized by concessional terms that are the interest rate and repayment period for borrowed capital should be softer than commercial terms.

Eroğlu and Yavuz (1997) have defined it in more general form as the transfer of real resources from developed countries to less developed ones, based on the general concession that aid helps for the promotion of economic development in poor countries. It can also be defined as, an international flow of financial, physical and human capital either from multilateral institutions or bilateral donors to complement economic development in poor countries or to avoid temporary shocks like natural disasters, wars etc (Bayala, 2006).

Confined under the above definitions, foreign aid can be classified in to several categories.

On the basis of origin, aid can be Government (official) aid - aid organized by the government or Non-government (unofficial) aid, which is provided by non-government organizations (NGOs).

Depending on whether the flow go directly to the recipient country or whether it's channeled via multilateral agencies Government (official) aid, again classified into bilateral and multilateral aid. Bilateral aid is administered by agencies of donor governments. Multilateral assistance on the other hand funded by contributions from wealthy countries and administered by agencies such as the UNDP and WB (Michael and Walster, 1997).

On the basis of purpose, aid can be:

Humanitarian aid – this is a short term aid given to countries which are victims of natural disasters, such as floods, famines and epidemics. It also includes aid for reconstruction and rehabilitation (repairing pre-existing infrastructure as opposed to longer-term activities designed to improve the level of infrastructure) and disaster prevention and preparedness.

Development aid – this is aid given by governments and other agencies to support the economic, environmental, social and political development of developing countries. It is distinguished from humanitarian aid by focusing on alleviating poverty in the long term, rather than a short term response.

Financial Aid - is the provision of convertible foreign exchange to less developed countries. It is further divided into various sub-categories:

- Tied Aid: when the donor country sets restriction in the use of aid. Tied aid is of two types:

- Nation Tied Aid: is given to the recipient country on the condition that it will spend that aid in the donor country to solve the balance of payment problems of that country and to stimulate exports, i.e., if Ethiopia is given aid by US and is asked to import from US only then it is 'nation tied aid'.
  - Project Tied Aid: is given only for specific projects and the recipient country cannot shift it to other projects.
- Untied Aid: is aid which is not attached to any project or nation. It is much desired than the tied one as it gives a freedom to the recipient country on the allocation and usage of the foreign resources.
  - Grants: A grant is that form of foreign aid which does not entail either the payment of principal or interest. It is a free gift from one government to another or from an institution to a government.
  - Loans: It is the borrowing of foreign exchange by the poor country from the rich country to finance short-term or long-term projects. They are further sub-divided into two types:
    - Hard Loans: Hard loans are also called short-term loans. In order to finance industrial imports they are given usually for a period less than five years, and they are paid in the currency borrowed. It contains no concessional element but interest rate is usually lower than the prevailing rate of interest in the international market.
    - Soft Loans: Soft loans are also known as long-term loans. Soft loans are made for 10-20 years and it is repaid in the currency of recipient country. Interest on these loans is lesser than hard loans and often these loans invoice grace period. Concessional elements are comparatively higher in soft loans.
  - Commodity Aid - is another type of tied aid, which relates to agricultural products, raw materials and consumer goods. Under commodity aid, the donor country has much political influence on the recipient country. Commodity aid may be received in cash form or simply in the form of food grains.
  - Technical assistance aid - is designed to disseminate knowledge and skills rather than goods or funds. Under this aid programme, training facilities are provided by the donor country's government by bearing all the expenditures involved in the training of advisory technocrats. It can be through recruitment or through scholarships and training facilities.



- Official development assistance (ODA) - is the widely used measure and indicator of international aid flows. It was coined by DAC of the OECD and for first time used in 1969. As of DAC – OECD, ODA is defined as

“Flows of official financing administered with the promotion of the economic development and welfare of developing countries as the main objective, and which are concessional in character with a grant element<sup>3</sup> of at least 25 percent (using a fixed 10 percent rate of discount) comprising contributions of donor government agencies, at all levels, to developing countries (“bilateral ODA”) and to multilateral institutions”.

### 2.3. Why Donors give Aid to Developing Countries?

Starting from the 1940s until the present time foreign aid has been used as a means of transferring resources from economically prosperous countries to the less developed ones (Yohannes, 2011). However, there is no single dominant reason as to why donors provide foreign aid. Moral obligations to help the poor, economic, political, cultural and religious motives and historical relations like former colonies have all been cited as reasons for helping the less developed countries (Higgins, 1968; Fuller, 2002; Sagasti, 2005).

In search of justifications for the motives behind providing aid, theories have been developed leaving grounds for further studies. Discussed in Fuller (2002), there are three empirically supported theories that explain donor motivations.

Idealist theory - states that donors give aid to solve poverty and underdevelopment problems in third world countries and to enhance the spread of democracy and human rights.

Realist theory – scholars supporting this theory argue that foreign aid decisions are made depending on strategic concerns of donor countries, such as national security and self - preservation motives.

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<sup>3</sup>The grant element for a given loan is calculated using the formula  $GE = \left[ 1 - \frac{\int_0^T Pte^{-rt} dt}{L} \right] * 100$  Where, L is loan, P<sub>t</sub> is the annual payment and r is the discount rate. It implies that the present value of the loan must be at least 25 percent below the present value of a comparable loan at market interest rates, for that loan to be considered as aid (Radelet, 2006).

Neo-realist theory – according to this theory, donors use aid in a way that promotes their economic interests, which might be in terms of export destinations, raw material sources and investment opportunities.

Depending on these theories, Fuller (2002) has conducted a study using data on four major donors and 37 African countries as aid recipients over the period 1990-1999. After an empirical analysis she concluded that, donors are primarily motivated by the humanitarian need. Strategic military importance and economic importance of the recipient countries are found to be second major motives for giving aid.

Sagasti (2005), have also discussed the rationales for ODA under the following three categories.

International solidarity and religious motivations – this is based on altruism, ethical and humanitarian concerns of donor countries to assist the poor in developing countries.

Narrow and enlightened self-interest – which includes strategic and security interests in a way that responds to geopolitical and security considerations of donor countries: Political interests, which focus on obtaining political support for foreign and domestic policies and economic and commercial interests, which emphasize direct commercial and financial benefits to the donor country.

Provision of international public goods – this one is driven by two factors: emergence of regional and global problems such as global and regional environmental threats, global population growth and imbalances and health threats and crime, drug traffic, money laundering and terrorism and maintaining stability of the international system, which aims at providing assistance to specific countries and regions to secure a stable world order and to foster the long-term interests of donor countries.

From the above discussions, the motives behind foreign aid generally can be stated as moral and humanitarian motives, political, military and historical motives as well as economic and commercial motives of developed countries.

## 2.4. Foreign Aid and Poverty Reduction

The success of the Marshall plan in the post WWII period led to the development of more optimistic thinking about the role of foreign aid. This thinking proposes that, with such an access to transfer of resources, low income countries and/or the LDCs could come to the development track as Western Europe countries did. In addition to this, foreign aid was also setted as an essential prerequisite for the economic advancement of developing countries by supplementing the domestic savings (which is low due to the vicious cycle of poverty) and propelling the economy out of “low-level equilibrium trap”<sup>4</sup>. Based on these general propositions the more affluent countries and international organizations have provided large amounts of aid targeted to be used in large scale investments to bring the desired level of economic growth and well being in the low income countries.

However, despite the substantial amount of aid that the developing countries received for decades, they remained poor and some even experienced worse conditions. This unexpected outcome, led to the rise of questions on the role of aid which eventually developed in to controversies and doubts about aid’s effectiveness (Asra *et al*, 2005; Radelet, 2006; Tasew, 2011).

Given this controversies, a number of studies have been conducted in the last fifty years. In general, these literatures can be classified in to two as studies which considered foreign aid’s impact on economic growth and those conducted to analyze whether aid can reduce poverty or not. Despite this classification most of the available literature is dominated by the analysis of aid – growth relations. Studies on aid-poverty relations begun to emerge very recently, mainly driven by the shifts in the attentions of multilateral and bilateral donors towards poverty reduction and targeting of pro-poor expenditures. In addition to being limited, most of the studies on aid - poverty relationships, employed multi country analysis considering the LDCs and low income counties in general. Given these constraints the following two subsections review the main theoretical arguments and empirical findings of different studies with efforts to present the available country level literature.

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<sup>4</sup> Low – level equilibrium trap refers to an economic condition where the change in capital labor ratio ( $K\Delta/\Delta L$ ) is constant. This implies that the change in percapita income is zero (Subarata, 2005).

### 2.4.1. Theoretical Reviews

As mentioned in the forgoing discussion, large volume of the available literature on the role of foreign aid in poverty reduction considered the issue from multi - country level by treating all LDCs or low income countries.

However, there is no firm conclusion reached by these theoretical literatures. Some described Foreign aid as an important catalyst for change because it is helping to create conditions in which poor people are able to raise their incomes and to live longer, healthier, and become more productive (Asra *et al*, 2005). Others, on the other hand, argue that foreign aid have failed completely as a poverty reducing mechanism even, is worsening conditions further.

The following sub section discusses the theoretical literatures beginning from those appreciating foreign aid.

World Bank's analysis ( 2002: pp, XVII) on the role and effectiveness of development assistance stated that "Well-allocated foreign aid has been an effective means of supporting poor countries and poor people in their efforts to improve their lives; and with improved allocation and better design and delivery, aid is more effective today than ever before" in tackling poverty. This study further recommended a continued learning and improvements in the allocation, design, and delivery of foreign aid with increasing amounts, to alleviate the pervasive poverty in sub Saharan Africa; the region where living standards remained very poor, even worsen despite receiving aid more than any other developing region.

Sachs (2009)<sup>5</sup>, the leading proponent of increased foreign aid, argues about the importance of foreign aid by raising the various successes aid has achieved so far. As to him, aid has helped greatly in the national and international efforts that were made to promote economic development in the last five decades: the biggest successes being achieved in Asia as manifested in the rapid economic growth periods in China, India, Korea, and many other countries along with public investments in health, education, infrastructure and massive improvements in living standards. He pointed out the following events as the great success stories of development assistance; the Asian green revolution during the 1950s and 1960s, smallpox eradication in 1967,

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<sup>5</sup> 'Can Foreign Aid Reduce Poverty?' CQ Press, 2009

family planning during the 1960s, the campaign for child survival in 1982, and treatment for AIDS, TB, and malaria and supports to meet the MDGs in the 1990s and 2000s. Finally he concluded that ODA is truly a development tool.

Contrary to the above statements, Bauer (1991:pp.45-46) cited in Lensink and White (2001:pp, 4), stated that,

“Aid does not descend indiscriminately on the population at large, but goes directly to the government. Because aid accrues to the government it increases its resources, patronage, and power in relation to the rest of society. The resulting politicization of life enhances the hold of government over their subjects and increases the stakes in the struggle for power. This result in turn encourages or even forces people to divert attention, energy and resources from productive economic activities. Foreign aid has also enabled many governments to pursue policies that plainly retard economic growth and exacerbate poverty”.

He argues, again, that development aid is not necessary to rescue poor societies from a vicious circle of poverty. Rather it's more likely to keep them in that state. Supporting this argument Dorn (2004), stated that aid has worsened poverty in SSA, Latin America and elsewhere, leaving no reason to think aid to be the miraculous solution to the widespread poverty. According to him, rather than depending on ODA it would be better to increase economic freedom, in order to move to prosperity. As an example, Dorn mentioned Hong Kong, as a country that received almost no aid, but found to be one of the strongest economies through increased economic freedoms of free trade policies, limited government intervention and protection of property rights.

Ayittey (ibid), on the other hand, does not accept the 'resource gap filling' role of foreign aid in Africa. Stated in his words,

“More than \$450 billion in foreign aid—the equivalent of six Marshall Plans—has been pumped into Africa since 1960, with negligible results....It may sound uncaring, but the truth is that Africa really doesn't need foreign aid. In fact, the resources it desperately needs can be found in Africa itself. Providing more aid to Africa is the same as pouring

more water into a bucket that leaks horribly—obviously, plugging the leaks ought to be the first order of business. But even then, the provision of more foreign aid will make little difference unless it is coupled with meaningful reform. So far, African leaders have shown little interest in reforming their abominable political and economic systems”.

According to him, much of Africa’s money is lost due to corruption (taking the lion share), capital flight, food imports, expenditures on arms and the military and civil wars. He also mentioned the problem of huge brain drain which is forced by political and bad governance in most of African countries.

Niaz (2011) , in her analysis of US aid to Ethiopia, argued that aid is not intended to help developing countries with the problems of poverty from the very beginning rather it is based on political interests of the donors ( specially US). In Niaz’s words,

“Various political, strategic and economic arguments make for the case of criticizing aid programs. These include, first that foreign aid does not, actually, contribute to economic progress in developing countries because the aid that is intended to cater to developmental needs diverts the money to non-profit activities and is pocketed by the corrupt top-leaders.... Secondly, aid is usually transferred to the governments of these countries, which increase the power of the government itself. ...Thirdly, the aid is not for all, in fact it is for a certain identified groups of people that can benefit the donor”.

Easterly, one of the major opponents of foreign aid to developing countries strongly criticizes the effectiveness of aid by examining the impact of different actions undertaken by the major bilateral and multilateral aid donors in different periods on following grounds;

The big push model: says SSA is poor because it is stuck in a poverty trap. To get out of this trap, they need a large aid financed increase in investment. However, many studies failed to find the existence of poverty trap as supposed by the big push model. The studies also show the negative relationship between aid and economic growth.

Project interventions: education, health and infrastructure – increasing external financial support in these sectors have brought a significant improvement; however, it does not bring the desired level of improvements in economic wellbeing and overall poverty reduction.

Models of policies and growth: This was based on the argument that SSA is poor because its governments have chosen bad policies that are very destructive of economic development. But the strategic adjustment loans initiated by IMF aiming adjustment with growth failed again; no study found that aid creates good policies rather aid will be effective in good policy environment.

Aid, institutions and development: many literatures on institutions and development suggested that Africa is poor because it has poor institutions, thus in order to end African poverty the west needed to promote good institutions. However, evidences from different studies suggest that aid actually increases corruption, decreases democracy and makes governance worse.

Abuzeid (2009), among the critics of foreign aid, has different standing points about the reasons why aid failed to achieve its intended targets. According to her, although foreign aid flows from developed to developing countries have been hailed as the solution to world poverty, half a century of historical evidence of aid flows to Sub-Saharan Africa suggests that this “big push” paradigm does not actually work in practice. She noted that, SSA has attracted a substantial amount of aid as it hosts most of the world’s poor. However, rather than helping the poor these massive inflows into the region ended up with more harm than good in several circumstances. The reasons she raised for the failure of aid emanate from the aid itself as it opens many ways that can make corruption possible as foreign aid perpetuates existing corruption, creates multiple distortions in the public sector and delays pressures for reform. Similarly, Moyo (2012)<sup>6</sup>, another notable opponent of development aid, stated that aid leads to expansion of corruption, aid-dependency and a series of detrimental economic effects and eventually vicious downward spirals of development.

As can be seen from the above arguments, a large number of the theoretical literatures imply that the role of foreign aid in the low income countries is more negative rather than helping them to achieve their development and poverty reduction objectives.

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<sup>6</sup> [http://en.wikipedia.org/wiki/Aid\\_effectiveness](http://en.wikipedia.org/wiki/Aid_effectiveness)

## 2.4.2. Empirical Reviews

Several empirical studies have been conducted in assessing the aid-poverty relations, mainly driven by two factors; the increasing interest of identifying aids direct impact on poverty than through the channel of economic growth and the controversies on aid's effectiveness.

Paul Collier and David Dollar (1999) with the objective of deriving a poverty-efficient allocation of aid and comparing it with actual aid allocations, tried to see the impact of foreign aid on economic growth and poverty. They start from estimating the current impact of aid on growth to arrive at the impact of aid on poverty reduction. To estimate growth they use data from 1974-1997 for over 100 countries on initial income, institutional quality, Aid/GDP, CPIA<sup>7</sup>, (Aid/GDP) x CPIA, (Aid/GDP)<sup>2</sup>. And their findings show that aid have no impact on economic growth measured by growth rate of per capita GNP while (Aid/GDP) x CPIA and (Aid/GDP)<sup>2</sup> have a significant impact with a positive and negative signs respectively. After they made mapping from growth to poverty reduction they found that, even though the actual allocation of aid is not efficient still with the existing allocation, aid is effective in lifting around 16 million people per annum sustainably out of absolute poverty. With a poverty-efficient allocation this would increase to around 30 million people. They have also estimated that an across-the-board increase totaling \$10 billion would lift 2 million people out of poverty. An efficient increase, on the other hand, would raise more than three times as many people -- about 7 million -- out of poverty.

Gomanee *et al* (2003) have conducted a study which directly considers the relationship between aid and poverty reduction. Their objective was to empirically test whether aid can improve the welfare of the poor or not. Using a pooled panel data of 38 countries over the period 1980 to 1998 and Human Development Index (HDI) and infant mortality (IM) as measures of poverty they conducted estimation with a random effects method. They proposed a transmission channel, that aid finances pro-poor public expenditures, either directly or indirectly (by releasing other revenues to be used for such purposes), and these expenditures increase welfare, which benefits the poor. After identifying public expenditure on social services (sanitation, education and health) as the relevant pro-poor expenditures, they formulated a model with poverty measures as dependent variable and income, military spending, aid, pro-poor public expenditures that are not

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<sup>7</sup> CPIA - Country Policy and Institutional Assessment-criteria of measuring economic policy performance and quality of governance setted by World Bank.



financed by aid and regional dummies as regressor. Finally, they found considerable evidence that higher PPE on sanitation, health and education spending is associated with improved welfare proxied by HDI and infant mortality rate; and through supporting such spending, aid can benefit the poor, independent of any effect of aid on growth. Their findings supported the findings of Gomanee and Morrissey (2002), in a study that used the same theoretical procedures and estimations except the use of social service expenditures in place of sanitation and the number of countries (57 countries).

Morrissey *et al* (2004) have also conducted a similar study; the sample considered and the method of estimation employed being the differences. The latter used 104 countries for the period 1980-2000 and a fixed effect estimator. Using the same dependent and independent variables as in Gomanee *et al* (2003), they have obtained different results; that is aid improves welfare indicators, and this effect is predominantly through direct impacts (aid provides incomes or social services) or growth. Although they found evidence that aid tends to increase PPE for low-income countries, the various measures of PPE they considered have no significant effect on aggregate welfare for such countries. Only for middle income countries is PPE associated with increased welfare, and here only for the HDI measure, but aid is not a significant determinant of PPE levels.

Asra *et al* (2005), to quantitatively estimate the impact of aid on poverty reduction, formulated a model in which head count ratio (income below \$2 per day measured in purchasing-power parity dollars) used as a measure of poverty and initial conditions, aid, policy variables, governance and region dummies were explanatory variables. The estimation used a panel data on 49 countries from 1960 to 1998 and the results show that both aid and aid-squared have significant coefficients with different signs (positive for aid and negative for aid-squared). The coefficients they estimated indicate that for every 1 percent increase in effective development assistance (EDA) as share of GNI, poverty incidence drops by 1.2–1.6 percent. They also found that macro policy environment and the quality of governance have direct impacts on poverty reduction, but the effectiveness of aid is not critically contingent on these variables as the coefficient on the interaction variable become statistically insignificant.

Oskooee and Oyolola (2009) conducted another cross-country analysis using data on 49 developing countries over the period 1981-2002. They estimated three models starting from the simple model of poverty, poverty as a function of economic growth, income inequality and aid to an extended one which included social programmes (expenditures on education and health) and institutional quality (economic and political institutions) as an additional determinants. Their results from the two stages least square (2SLS) regression of a fixed effect model indicated that, aid, measured by ratio of bilateral aid to GDP, have a significant positive impact on poverty reduction (head count ratio) as that of economic growth. The study also found that income inequality, social programmes and institutional quality exacerbated poverty in the countries treated in the study period. However, this study didn't differentiate the source of government expenditure on the social programs whether it comes from aid or from only domestic source, given its strength with the model specifications and estimations. Alvi and Senbeta, (2011) have also assessed whether aid directly impacts poverty after controlling for income, income distribution and other covariates that are relevant to the determination of poverty. The difference from the above studies lies on their method of estimation and measures of poverty used; this paper employed generalized methods of moments (GMM) estimation using head count index (HCI), PGI (poverty gap index), and squared PGI for 79 countries over the period 1981–2004. In addition to total aid, they also used disaggregated aid by source and type to check if there are any systematic differences between the impacts of different categories of aid. Their empirical results proved the existence of consistent negative association (implying aid can reduce poverty) between exogenous components of aid and the chosen poverty measure, despite the inconclusive effect of aid on growth.

In contrast to the above conclusions, Boone (1996), cited in Alvi and Senbeta (2011), using data from 97 developing countries, found that aid has no significant impact on infant mortality, primary schooling ratio or life expectancy, arguing that aid is mainly used for consumption purposes, which tend to benefit the political elite but not the poor.

A study by Arimah (2004) came up with a different method and slightly different variables. He considered commitment to human development, political stability, percent of adults living with HIV/AIDS and being landlocked as determinants of poverty reduction in addition to expenditure on health and education, external debt, foreign aid, economic growth and quality of governance.

He used three measures of poverty<sup>8</sup> over the period 1995-2001 for all variables except that of Economic growth (1975-1998). Using OLS estimation the study found that all the explanatory variables have a significant and positive role on poverty reduction in the region with the exceptional negative coefficients on external debt burden and foreign aid. Foreign aid even found to be statistically insignificant regressor in an equation where poverty was measured by human poverty index (HPI). Despite the strength of treating variables which are more related to prominent features of the region, this study will be criticized on the time period it considers and the relationship between expenditures on health and education and foreign aid. Similarly, Nakamuray and McPhersonz (2005), examining the relationship between foreign aid and poverty reduction using cross-sectional and panel data with disaggregated foreign aid and several poverty indexes, found that aid has no significant effect on poverty reduction. The same conclusion had produced by Chong *et al* (2009) after analyzing impact of foreign aid in reducing income inequality and poverty as their estimates failed to be statistically significant.

Very recently, Connors (2012) has also arrived at a similar conclusion that aid is ineffective in reducing poverty. With two objectives of empirically determining impact of foreign aid on economic freedom and its contribution to the reductions in poverty, Connors used data on ODA as a share of GNI over the period 1976-2005 for 86 aid recipient countries. Using pooled OLS regressions he estimated different models; change in economic freedom (measured by the Economic Freedom of the World (EFW) Index) and change in poverty reductions( measured by the percentage of a country's population that lives on \$1.25 and \$2 per day, respectively, in 2005 international dollars) being the dependent variables. The economic freedom is considered with the assumption that; if aid exerts an influence upon institutions this suggests both a direct and indirect channel through which aid can reduce poverty. Geographic, locational as well as democracy variables are also included as explanatory variables. The results of these regressions showed that the impact of foreign aid in enhancing economic freedoms, during the period considered, is negative and significant at the 10 percent level. The coefficient is small and indicates that a one percentage point increase in ODA as a share of GNI corresponds to a 0.02

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<sup>8</sup> Percent of population living below the national poverty line, Percent of population living on less than US\$1 per day and Human Poverty Index for 30, 33 and 46 African countries respectively

decrease in the EFW index. However, the foreign aid variable in representing the previous<sup>9</sup> ten-year period is not significant. But, this result found not to be robust as the inclusion of democracy, geography, and location variables eliminated all significance of the aid variables. Therefore, it does not appear that aid influences poverty indirectly through increases in economic freedom. Using change in poverty as dependent variable the coefficient on the aid found to be -0.15 which is significant at the ten percent implying that higher levels of aid correspond to smaller reductions in poverty. However, the coefficient found to be no longer significant after controlling for the level of economic freedom and political institutions. Similar results have also obtained using lagged aid. Magnon (2012) considering SSA countries, have also found insignificant coefficients on different measures of foreign aid flows which were considered as regressors in three measures of poverty (HCR, PGR and PSR). This result is found using cross-sectional data. With panel data regression, however the same coefficients found to be negative and significant implying foreign aid exacerbated poverty in SSA measured by head count and poverty severity indexes.

The findings of the above empirical literatures are very controversial. While, studies conducted in the early 2000s found a positive role of foreign aid either directly through pro-poor expenditures or indirectly through economic growth most very recent studies led to mixed conclusions as some proved that aid is totally ineffective and others in contrast found aid having a significant positive impact on poverty reduction. These deviations may be credited to the differences in methods of analysis, measures of poverty used and countries and length of data considered. Confined to the methods of analysis and the variables treated, the conclusions forwarded by the studies in early 2000s were highly criticized. They almost consider similar variables, time periods, channels of aid transmission and estimation methods. In addition, they ignored other variables which are prominent features of the low income countries like internal and external conflicts, quality of governance and geographic locations which are given emphasis in studies conducted in recent periods. But, all the above empirical studies have one limitation in common; being multi country investigations, which makes country level conclusions difficult.

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<sup>9</sup> Lagged values of aid were used as regressor for two reasons; First, to reduce the level of bias resulting from endogeneity between foreign aid and poverty. Second, if foreign aid does exert an impact on poverty it is most likely to do so over an extended period of time.

Driven by this problem studies have been conducted as case studies by considering single developing country, though they are few.

Carlsson *et al* (2000), undertaken such a study in Zambia with the objective of examining the development of foreign aid and poverty in Zambia during the 1990s. They used data and documents of major European bilateral aid donors to Zambia to check how these donors are working with poverty reduction projects in the country. In addition to this, they have conducted smaller surveys in two districts to understand the perception of households about impacts of aid on their wellbeing. But, the result they get from the case studies indicated that of a limited impact of foreign aid on poverty reduction. Another study, conducted by Oduor and Khainga (2009) using secondary monthly data set from July 2003 to December 2008 on 69 districts in Kenya have come up with a positive result on ODA's effectiveness in reducing poverty. To evaluate the impact of ODA on poverty, they stated a counterfactual; "What would have been the poverty levels in the districts had the ODA-funded projects not been initiated in the districts?". As a method of analysis this paper employed the difference-in-difference methodology after classifying the districts into treated (district with an ODA-funded project, specifically identifiable to poverty reduction objective) and control district (district with no ODA-funded project). Poverty gap and poverty severity indices, calculated from national poverty lines, were used as measures of poverty. Finally their finding showed that ODA has significantly reduced poverty in the district with the ODA-funded projects.

Very recently study by Mapango (2012), conducted in Burundi, however, come up with different results: foreign aid found to have a positive and significant role on poverty reduction indicated by its impact on child mortality and primary school enrollment. This study considered three indicators of poverty; mortality rate, primary school enrollment and primary completion rate, and extreme poverty measured by population living below \$ 1.24 per day over the period 1900-2011. Despite of the results, making generalizations based on this study is a bit difficult. It used a very simple model specification and estimation and it has also a data limitation problem.

Lamb (2010), have also examined the relationship between aid and poverty using a time series data (1970-2007) on life expectancy and ODA per capita of the Dominican Republic. After employing OLS and robust regressions, this study found a statistically significant negative

relationship between the two variables. Implied, a percentage change in the amount of aid per capita to GDP per capita received by the Dominican Republic in the study period, resulted in a decrease in life expectancy of the population by 9.69%. In addition to this, the study also found a positive and negative effect of Civil Liberties and Political Rights on poverty reduction, respectively while the policy index and aid-policy interaction variables found to be statistically insignificant.

Although these country - case studies have the strength of analyzing the impact of aid using single country data, they have also some limitations. If we take the first study by Carlsson *et al* (2000), being a cross sectional study, analyzed the aid - poverty relations in the 1990s which the results can indicate only the short run relationships. The other study by Mapango (2012) can also be criticized with regard to the model specification, method of estimation, length of time and also the treatment of the variable headcount ratio. The study used aid as the only determinant of poverty and constructed a simple linear regression model. Given the justification from theoretical and empirical literature that the effectiveness of aid depends on other macroeconomic conditions, considering aid only might not indicate the whole scenario. The other limitation is the period of time which is only a time series of 21 years. In addition to this, the headcount ratio which is collected once in five years treated as a continuous time series with no explained justifications. Similarly, the study conducted by Lamb (2010), in spite of considering relevant variables that can determine poverty reduction and aid's effectiveness and longer period of time, she also employed OLS estimations. Though it is possible to apply OLS estimation, it should be backed by tests about the time series nature of the data. That is, after stationarity tests, if the data found to be stationary, it would be reasonable to apply OLS but, if the data found to be non-stationary the appropriate transformations have to be done before going to estimations. But unfortunately this study ignored such test; which might be the reason behind the statistical insignificance of most of the estimated coefficients.

Looking at the Ethiopian case, the empirical studies conducted so far analyzed the impact of aid only on economic growth, fiscal balance, investment and domestic saving<sup>10</sup>. Their results however, found to be contradictory and mixed as some found a positive contribution while others concluded its impact as either adverse or insignificant, which is also different in the long run and

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<sup>10</sup> See Abegaz, 2001; Abeba, 2002; Jifar 2002; Yohannes, 2011; Gashawtena, 2011; Tasew, 2011; Tofik, 2012.

short run. The other literature related to aid and poverty reduction is the one which have been conducted by individual bilateral donors as an impact analysis of the aid they donated to the specific regions or sectors in the country. Furthermore, these cross sectional assessments considered the gross aid they donated (no decomposition) within a given period of time. Due to this fact making generalizations about the impact of ODA on national poverty level, based on these studies would be misleading. Thus, in order to arrive at a firm conclusion on how aid (ODA) affected poverty in Ethiopia, it's necessary to undertake an empirical investigation.

Given this factor and the limitations in the above country case studies, this paper tries to investigate the aid-poverty relation using the appropriate model specification and method of estimation after applying the relevant tests.

## **CHAPTER THREE**

### **METHODOLOGY**

The general framework of data analysis and the procedures that are going to be used in the empirical estimations are discussed in this section. Classified in to three sub sections, it presents the sources of data, description of variables followed by model specifications and finally methods of estimations.

#### **3.1. Data Type and Sources**

The study is conducted using a secondary country level macroeconomic-data covering the period from 1974/75 to 2009/10. The time period is chosen based on the availability of relevant data. The data used in this study is collected from various sources which can be grouped in to two main categories as data from government organizations and online databases. Accordingly, the first category includes National Bank of Ethiopia (NBE), Central Statistical Authority (CSA) of Ethiopia, Ministry of Finance and Economic Development (MoFED) and Ethiopian Economic Association (EEA) database (2012). And the online data sources include United Nations Development Program (UNDP), World Bank (WB), Organization for Economic Cooperation and Development (OECD) and Freedom House databases.

#### **3.2. Description of Variables and Model Specification**

Before going to issues related to the specification of the regression models, a brief description of the variables and relevant concepts that are used in the poverty equation is discussed in this sub section.

Poverty: is the main dependent variable in this study. Poverty, being a multidimensional phenomenon has no single stated unit of measurement. The Foster–Greer–Thorbecke (FGT) index (class of poverty measures) is one of the widely used measure of poverty in empirical works. Generally, this enables to calculate three indexes; poverty head count index, poverty gap index and poverty severity index using the following expression:

$$P_{\alpha} = \frac{1}{N} \sum_{i=1}^q \left( \frac{Z - Y_i}{Z} \right)^{\alpha}$$



Where  $Y_i$  is real per-adult (per capita) household expenditure,  $Z$  is poverty line,  $N$  is the total population, and  $q$  is the number of poor.  $\alpha$  takes the value of zero for the headcount index, 1 for the poverty gap and 2 for the squared poverty gap (MoFED, 2012). However, the figures which are inputs to calculate this index are often collected from household surveys which are conducted in a four or five year intervals. Thus, this index is more favorable for panel data analysis and is not used in this study.

Among the monetary indicators of poverty (income and consumption), consumption expenditure is the widely used and accepted variable to measure poverty. Consumption rather than income is viewed as the preferred welfare indicator because consumption better captures the long-run welfare level than current income. Household income, for example, by its very nature could fluctuate widely while consumption could be smoothed out over time through various coping mechanisms (MoFED, 2012).

Consumption may also better reflect households' ability to meet basic needs. However, using consumption expenditure as an only measure of poverty to analyze the impact of foreign aid on poverty may end up with a poor proxy. This is due to the fact that poverty is associated not only with insufficient consumption but also with insufficient outcomes with respect to health, nutrition, and literacy, and with deficient social relations, insecurity, and low self-esteem and powerlessness (Coudouel *et al*, 2002).

Due to the problems with the above measures, a number of recent research works start the utilization of indices that take into account the human development or deprivations aspects of individuals (households) in addition to the conventional measures of poverty. Their use is based on the general argument that improvements or a reduction in these measures implies indirectly the wellbeing and the status of the people in that country. These measures include the Human Development Index, Human Poverty Index (introduced very recently), infant mortality rate, life expectancy, literacy rate, asset holdings, and percentage of the population with access to safe water and adequate sanitation as well as other non monetary measures. For instance Nakamura and McPherson (2005) used life expectancy, primary school enrollment, infant mortality, and headcount poverty index<sup>11</sup>; Gomanee *et al* (2003) and Morrissey *et al* (2004) considered Human

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<sup>11</sup> The proportion of people living on less than \$ 1 per day

Development Index and infant mortality as proxy for poverty levels across countries. Similarly Moser and Ichida (2001) used life expectancy, infant mortality rate and gross primary enrollement in the study that analyzed economic growth and poverty reduction in SSA. In a country case study, Mapango (2012) and Lamb (2010) have used time series data on child mortality rate, primary school enrollment and completion rate, extreme poverty; and life expectancy respectively as measures of poverty.

Accordingly, this paper used infant mortality per 1000 live births and gross primary enrollment ratio with private consumption expenditure, as measures of poverty. Gross primary enrollment refers to the ratio between the total enrollment at a particular level of education regardless of age, and the population corresponding to the official age (5 to 9 years) at that level. As of Baluch and Shahid (2008), this ratio can be computed using the following formula:

$$GRE_{pt} = \frac{TR_{pt}}{TP_t}$$

Where,  $GRE_{pt}$  = Gross enrollment at primary level of education in year t,

$TE_{pt}$  = Total enrollment at primary level of education in year t (regardless of age) and

$TP_t$  = Total population of corresponding official age group (5-9 years) in period t.

Economic growth: is measured by real GDP. Several studies, e.g. Roemer and Gugerty (1997), Moser and Ichida (2001), Adams (2003), Feeny (2003), Zaman *et al* (2011) indicated that there is a positive correlation between sustained economic growth and poverty reduction. According to Feeny (2003), increases in economic growth are expected to benefit the poor due to their participation in economic activities, and lead to larger tax revenues and higher government expenditures. These expenditures might include transfers to the least well off as well as increasing access to services such as health and education, although, the assumption is dependent on growth exceeding population growth and on a stable distribution of income. Supporting this, Handley *et al* (2011) stated that economic growth and improved productivity are necessary for widespread and sustainable poverty reduction. Similarly, research conducted by World Bank (2002) indicated that poverty reduction highly depends on sustained economic growth. According to this study, countries such as China, India, Vietnam, and Uganda, with rapidly growing economies, managed to reduce the share of their people in absolute poverty by 5

to 8 percent per year in the 1990s. Other empirical studies by Arimah (2004) and Oskooee and Oyolola (2009) have also found a positive and significant impact of economic growth on poverty reduction. Thus, real GDP, as a measure of economic growth, is included in this study to explain poverty reduction.

Aid: as variable of interest in this study, is measured by annual receipts of official development assistance (ODA) as a percentage of RGDP.

Many decades have passed since economic research begun to consider foreign aid as an important variable in poverty reduction equations. Similarly, international development organizations emphasized that foreign aid has a tangible role in the poverty reduction strategies of low income countries. In line with this World Bank (2002: pp, ii) stated that, “Foreign aid is increasingly a catalyst for change, and it is helping to create conditions in which poor people are able to raise their incomes and to live longer, healthier, and more productive lives”. Foreign aid, used as a regressor in a number of cross-country studies that consider poverty reduction as a dependent variable, found to be a significant factor in reducing poverty (Gomanee *et al*, 2003; Asra *et al*, 2005; Alvi and Senbeta, 2011). On the other hand studies by Boone (1996); Arimah (2004) and Chong *et al* (2009) concluded that foreign aid is ineffective in reducing poverty, as they found insignificant aid coefficient. Again, Lamb (2010) and Magnon (2012) found results that indicate adverse impact of aid on poverty reduction.

Government expenditure in pro-poor sectors: is measured by expenditures on education and health as percentage of total government expenditure. Based on experience and analysis on the economic growth trends of different economies, World Bank (2002: pp, vi) stated two mechanisms that enable countries to reduce poverty rapidly: “one by creating a good investment climate... and two through empowering and investing in poor people—by giving them access to health, education, infrastructure, financial services, social protection, and mechanisms for participating in the decisions that shape their lives”. This implies government expenditure targeted towards the poor can be a good approach to reduce poverty. However, different empirical studies have revealed seemingly contradictory findings. For instance Oskooee and Oyolola (2009) found negative and significant coefficient while a study by Arimah (2004) indicated a positive and significant role of social expenditures for poverty reduction. More

recently Zaman *et al* (2011) found expenditure on education as a significant poverty reducing factor while expenditure on health is not. Government expenditure on health as well as government expenditure on education (both as percentages of government expenditure) used in this study as determinants of poverty reduction.

Aid interacted with Macroeconomic policy: an interaction between policy index (Pt) and aid (ODA) is used to capture the conditional effectiveness of aid on macroeconomic environment in reducing poverty. The general theoretical argument in relation to this issue is that good macroeconomic condition makes aid more effective to achieve its predetermined objectives. In this paper policy index is developed out of a regression result obtained from growth (captured by logarithm of real GDP) equation which included three explanatory variables as in Burnside and Dollar (2000): trade openness, budget surplus/deficit excluding grants (defined as government revenue - expenditures) and inflation rate. Specifically, the trade openness index is computed using the ratio of export plus import to GDP, and using the regression coefficients from the estimated growth equation, the policy index is constructed as:

$$P_t = 0.026452openness + 0.0054728inflation + 0.0043453b.deficit \dots\dots\dots (1)$$

Quality of governance: another potential factor that is presumed to reduce poverty is the quality of governance. In line with this, Adejumobi (2006: pp, 7) stated that “getting “governance right” is at the heart of poverty reduction”. Justifying this, several empirical studies have indicated that good governance have influential impact on poverty reduction efforts of low income countries (Collier andDollar, 1999; Arimah, 2004; Asra *et al*, 2005; Lamb, 2010). The quality of governance variable is used in this study and measured by the average of political right and civil liberty<sup>12</sup> indices. These measures are chosen based on the availability of time series data that fits the study period.

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<sup>12</sup> Political rights and civil liberties which are produced yearly by the freedom house are some of measures of democracy and human rights that are used by researchers and policy organizations (Armstrong II, 2011). Like the widely known measures of governance which were developed by Kauffman *et al* (1999), consisting of Control of Corruption, Government Effectiveness, Regulatory Quality, Rule of Law, Voice and Accountability and Political Stability, these freedom house indices are also developed based on seven indicators: Electoral Process, Political Pluralism and Participation, Functioning of Government for political liberties and Freedom of Expression and Belief, Associational and Organizational Rights, Rule of Law, Personal Autonomy and Individual Rights for civil liberties. Political Rights and Civil Liberties are measured on a one-to-seven scale, with one representing the highest

**Table 3.1: Description of Variables**

Variable	Description	Measurement
IMR	Infant mortality rate	Number of deaths before first birth day out of 1000 live births
GPI	Gross primary enrollment ratio	Out of 100 %
RHFCE	Real household final consumption expenditure	In millions of birr
RGDP	Real GDP	In millions of birr
ODA	Official development assistance	% of real GDP
PODA	Policy index interacted with ODA	ODA * policy index
GEOE	Government expenditure on education	% of gov't expenditure
GEOH	Government expenditure on health	”
ODA <sup>2</sup>	Squared ODA	
GOV	Indicators of quality of governance	1-7
L	Log form of the variable	

Based on the above description and related literatures, the general form of the model is structured as follows:

$$\text{Log (Poverty measure)}_t = \alpha + \beta_1 \log \text{RGDP}_t + \beta_2 \log \text{ODA}_t + \beta_3 \log \text{PODA}_t + \beta_4 \log \text{GE}_t + \beta_5 \log \text{GOV}_t + \beta_6 \log \text{LODA}^2_t + \varepsilon_t \dots \dots \dots (2).$$

As noted above, in this study, poverty is measured by three different indicators, implying estimation of three models. Thus, the models are specified as follows:

1) Poverty measured by Infant Mortality Rate

$$\text{L(IMR)}_t = \alpha_1 + \beta_1 \text{LRGDP}_t + \beta_2 \text{LODA}_t + \beta_3 \text{LPODA}_t + \beta_4 \text{LGEOH}_t + \beta_5 \text{LGOV}_t + \beta_6 \text{LODA}^2_t + \varepsilon_t \dots \dots \dots (3).$$

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level of Freedom and seven the lowest. According to the freedom houses calculations, countries whose combined average ratings for Political Rights and for Civil Liberties fell between 1.0 and 2.5 were designated "Free"; between 3.0 and 5.5 "Partly Free," and between 5.5 and 7.0 "Not Free."

2) Poverty measured by Gross Primary School Enrollment Ratio

$$L(\text{GPI})_t = \alpha_2 + \gamma_1 \text{LRGDP}_t + \gamma_2 \text{LODA}_t + \gamma_3 \text{LPODA}_t + \gamma_4 \text{LGEOH}_t + \gamma_5 \text{LGEOE}_t + \gamma_6 \text{LGOV}_t + \varepsilon_t \dots 4.$$

3) Poverty measured by Real Household Final Consumption Expenditure

$$L(\text{RHFCE})_t = \alpha + \delta_1 \text{LRGDP}_t + \delta_2 \text{LODA}_t + \delta_3 \text{LPODA}_t + \delta_4 \text{LGOV}_t + \delta_5 \text{LODA}^2_t + \varepsilon_t \dots 5.$$

Except in the first model, poverty reduction is indicated by improvement (increment) in the values of the poverty indicators. Accordingly, all the explanatory variables except the governance indicator are expected to contribute positively in the two models. With regard to the first model, when infant mortality declines it can be said that poverty is reduced. Thus, in this model, except that of governance indicator, all coefficients on the explanatory variables are expected to have negative signs.

Observed from previous studies (Lensink and White, 2001; Asra, 2005), the impact of aid on poverty reduction found to depend on the size of aid rather than being constant. Thus, to examine the existence of nonlinear relationship between aid and poverty reduction, the variable  $\text{ODA}^2$  is incorporated in the above models. Accordingly, the coefficient on  $\text{LODA}^2$  is expected to be positive in the first model and negative in model 3<sup>13</sup>, implying that aid (ODA) improves the poverty condition but too much aid might not have a proportional effect in reducing poverty.

### 3.3. Method of Data Analysis and Estimation Techniques

Since the data used is time series, preliminary tests have to be conducted before proceeding to estimation. The tests include unit root tests, cointegration tests and weak exogeneity tests. To estimate the long run relationships and the short run dynamics simultaneously, vector error correcting model (VECM) is used.

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<sup>13</sup>  $\text{Loda}^2$  – is excluded from model 2 for the sake of statistical simplicity and model robustness.

### 3.3.1. Unit Root Tests

Given that most economic time series data are non-stationary, the first step is to test whether the variables are stationary or not. A time series,  $y_t$ , is weakly stationary if the mean and variance are the same for all  $t = 1, 2, \dots, T$ , and if the auto covariance,  $\gamma_s = \text{Cov}(y_t, y_{t-s})$ , depends on  $s$  but not on  $t$ , where  $s$  subscript individual observation and  $t$  proxies time (Nielsen, 2007). If a time series failed to have the above properties, then it is a non-stationary process. In other words, a non-stationary time series will have a time varying mean or a time varying variance or both (Gujarati, 2004).

Tests for stationarity are required due to the reason that, if variables used in a regression are not stationary the results obtained using ordinary least squares (OLS) techniques would be incorrect. The assumption that the variables used in a regression are stationary is crucial for the properties of standard estimation and inference. For instance, to show consistency of the OLS estimator, it is assumed that when the sample size increases sample co-variances converge to population co-variances. However, the same pattern does not hold for non-stationary variables because in this case the time series do not fluctuate around a constant mean. Similarly, a problem arises when two unrelated non-stationary time series are regressed each other. The results from these regressions are likely to be characterized by high  $R^2$ , highly autocorrelated residuals and high regression coefficients in relation to their standard errors. Such results may be due to the fact that the variables share common trends. This phenomenon is known as nonsense or spurious regression, as the results have no economic meaning (Granger and Newbold, 1974). Consequently, the conventional  $t$  and  $F$  tests would tend to reject the hypothesis of no relationship when, in fact, there might be none (Verbeek, 2004).

To test for a unit root, a number of tests with varying approaches have been developed. Some of such tests include Dickey-Fuller, Augmented Dickey-Fuller, Phillips-Perron, and KPSS. In this paper, unit root test is conducted using the Augmented Dickey-Fuller (ADF) and Phillips-Perron tests. ADF test has an advantage over the other tests for it takes care of error autocorrelations by including lagged values which is, for instance, not applicable in Dickey-Fuller tests.

The ADF unit root test requires the estimation of the following regression model:

$$\Delta y_t = \alpha + \beta y_{t-1} + \delta T + \vartheta_1 \Delta y_{t-1} + \vartheta_2 \Delta y_{t-2} + \dots + \vartheta_k \Delta y_{t-k} + \varepsilon_t \dots \dots \dots (6)$$

Where  $\alpha$  is intercept,  $\delta$  is trend coefficient,  $T$  is time or trend variable,  $\varepsilon_t$  is a pure white noise error term and  $k$  is the number of lags specified. This is the general form of the ADF regression as it incorporated the time trend (T) as well as an intercept/drift ( $\alpha$ ) which enables to check if the variable have deterministic trend and weather the true value of  $y_0$  is zero or not, respectively.

The null hypothesis of the ADF and PP tests are that the variable contains a unit root, and the alternative is the variable is generated by a stationary process.

$$H_0: \beta = 0$$

$$H_1: \beta < 0$$

After estimating the above model decision is made using t-statistics. If the calculated t-statistic is greater than the critical value from Dickey-Fuller distribution the null hypothesis will be rejected. On the other hand, failing to reject the null hypothesis implies the presence of unit root, i.e., the series is non stationary.

### 3.3.2. Cointegration Test

One mechanism of attaining stationarity is differencing and the number of unit roots a given variable possess determines how many times the variable should be differenced in order to make it stationary ( Gujarati, 2004). However, differencing variables might generate a model that does not show the long run behavior of the variables, i.e., despite being individually non stationary, a linear combination of two or more time series variables can be stationary, implying the presence of cointegration and long run relationship among the non stationary variables in the system (Tasew, 2011).

A stochastic process is said to be integrated of order  $p$ , abbreviated as  $I(p)$ , if it needs to be differenced  $p$  times in order to achieve stationarity. More generally,  $xt$  and  $yt$  are said to be co-integrated of order  $CI(d, p)$  if  $xt$  and  $yt$  are both integrated of order  $d$ ; but there exist an  $\alpha$  such that  $yt - \alpha xt$  is integrated of order  $d-p$ . For the  $I(1)$ , a vector of  $I(1)$  variables  $yt$  is said to be cointegrated if there exist a vector  $\beta_i$  such that  $\beta_i y_t$  is trend stationary. If there exist  $r$  such



linearly independent vectors  $\beta_i, i = 1, \dots, r$ , then  $y_t$  is said to be cointegrated with cointegrating rank of  $r$  and the matrix  $\beta = (\beta_1 \dots \beta_r)$  is called the cointegrating matrix (Sorensen, 2005).

One method of cointegration test is by using the maximum likelihood estimator from the Johansen maximum likelihood procedure. This method allows for testing the presence of more than one cointegrating vector and also gives asymptotically efficient estimates of the cointegrating vectors (the  $\beta$ 's) and of the adjustment parameters (the  $\alpha$ 's). To conduct a test for co-integration in a multivariate framework using Johansen's maximum likelihood procedure, first a general VAR (Vector Autoregressive) model has to be formulated. Considering  $k$  lags, a general VAR ( $k$ ) model is formulated as:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_k Y_{t-k} + \mu + \varphi D_t + \varepsilon_t \dots \dots \dots 7$$

Where  $Y_t$  is an  $(n \times 1)$  vector of stochastic  $I(1)$  variables,  $A_i (i=1, \dots, k)$  is  $(n \times n)$  matrix of parameters,  $\mu$  is a vector of deterministic component (i.e., a constant and trend),  $D$  is a vector of dummies and  $\varepsilon_t$  is a vector of normally and independently distributed disturbances with zero mean and non-diagonal covariance matrix (vector of white noise disturbance terms).

However, as noted by Granger (1981) and Engle and Granger (1987), cited in L'Utkepohl and Kr'Atzig (2004), if cointegrating relations are present in a system of variables, the VAR form is not the most convenient model setup. In that case, it is useful to consider specific parameterizations that support the analysis of the cointegration structure. The models that can capture such relationships are known as the vector error correction models (VECMs) or vector equilibrium correction models.

By subtracting  $Y_{t-1}$  from both sides of equation 7 and rearranging terms, the general form of VECM can be formulated as:

$$\Delta Y_t = \Pi Y_{t-1} + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} \dots + \Gamma_{k-1} \Delta Y_{t-k+1} + \mu + \varphi D_t + \varepsilon_t \dots \dots \dots 8$$

In a simplified form,

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{j=1}^{k-1} \Gamma_j \Delta Y_{t-j} + \mu + \varphi D_t + \varepsilon_t \dots \dots \dots 9$$

Where,  $\Pi = -[I - \sum_{i=1}^k A_i]$

$\Gamma_i = -[I - \sum_{j=1}^i A_j]$ .....with  $i=1,2,\dots,k-1$  and I an identity matrix.

The long run relationship among the variables is captured by the term  $\Pi Y_{t-1}$  and the  $\Gamma_i$  coefficients estimate the short run effects of shocks on  $\Delta Y_t$ . According to the Johansen (1988) procedure, determining the rank of  $\Pi$  (i.e. the maximum number of linearly independent stationary columns in  $\Pi$ ) provides the number of cointegrating vector between the elements of  $Y$ . Given this; there are three cases that should be pointed out.

- i. If the rank of  $\Pi$  is zero it points that the matrix is null which means that the variables are not co-integrated. In such case the above VAR model is used in first difference, with no long run information,
- ii. If the rank of  $\Pi$  equals the number of variables in the system (say  $n$ ) then  $\Pi$  has full rank which implies that the vector process is stationary. Therefore the VAR can be tested in levels,
- iii. If  $\Pi$  has a reduced rank-i.e.  $1 < r(\Pi) < n$  then it suggests that there exists  $r < (n-1)$  cointegrating vector where  $r$  is the number of cointegrating equations in the system.

Then the matrix  $\Pi$  is given by,  $\Pi = \alpha\beta'$  where  $\alpha$ (adjustment parameters) and  $\beta$ (cointegration parameters) are  $n \times r$  matrices, representing the speed of adjustment to the long run equilibrium after certain shocks and the long run relationship between the variables in the system, respectively. To identify the number of cointegrating vectors, the Johansen procedure provides  $n$  eigenvalues ( $\lambda$ -characteristic roots) whose magnitude measures the degree of correlation of the cointegration relations with the stationary elements in the model.

Two test statistics ( $\lambda$ -trace and  $\lambda$ -max) are used to test the number of cointegrating vectors, based on the characteristic roots. The statistics are calculated using the following formula:

$$\lambda_{max} = -T \log (1 - \lambda'_{r+1}), r= 0, 1 \dots n-1$$

$\lambda_{trace} = -T \sum_{i=r+1}^n \log(1 - \lambda'_i)$  Where  $T$  is the sample size and  $\lambda_i$  is the estimated eigen values.

$\lambda_{\text{trace}}$  tests the null that the number of cointegrating vectors is less than or equal to  $r$  against an alternative of  $(r+1)$ .  $\lambda_{\text{max}}$  statistics, on the other hand, tests the null that the number of cointegrating vectors is  $r$  against an alternative of  $(r+1)$ . The distribution of both test statistics follows  $\chi^2$  distribution.

The other issue related with cointegration analysis is that of identifying the endogenous and exogenous variables in the model. This is because the VAR analysis treats all variables in the model as they are endogenous. This can be done by applying the weak exogeneity test. As stated in Juselius (2006), weak exogeneity test with the null hypothesis of, “a variable has influenced the long-run stochastic path of the other variables in the system, while at the same time has not been influenced by them”, gives an indication for treating that variable as endogenous or not. According to kurita (2006) also, Weak exogeneity allows to model a partial/ conditional system alone, instead of a full system, for the purpose of making efficient statistical inferences about parameters of interest, i.e. if a variable is weakly exogenous, then it appears on the right hand side of the VAR model and its error correction term does not appear in the error correction model implying that the dynamic equation for that variable contains no information concerning the long run relationship in the system. Test for weak exogeneity is conducted by imposing zero restriction on the relevant  $\alpha$ -coefficients, and failing to reject the null hypothesis implies the variable is weakly exogenous.

### 3.3.3. Error Correcting Model

As to the above discussion, two variables that are non-stationary in levels might have a stationary linear combination which implies that the two variables are cointegrated. Existence of cointegration allows for the analysis of the short run dynamic model that identifies adjustment to the long run equilibrium relationship through the error correction model (ECM) representation.

Given that the cointegrating rank, endogenous as well as exogenous variables are identified, using the lagged first difference of the endogenous variable  $Y_t$ , the current and lagged first differences of the weakly exogenous variables and the error correcting term, the Error Correction Model (ECM) can be formulated as:

$$\Delta Y_t = \alpha + \sum_{i=1}^k \beta_i \Delta Y_{t-i} + \sum_{i=0}^k \theta \Delta X_{jt-i} + \delta ECT_{t-1} \dots\dots\dots 10$$

Where,  $\Delta Y_{t-i}$  is the lagged first differences of the endogenous variable,  $\Delta X_{jt-i}$  is the current and lagged first differences of the explanatory variables and  $ECT_{t-1}$  is the error correcting term whose coefficient measures the speed at which prior deviations from equilibrium are corrected.

The short run dynamic model is estimated using the above ECM specifications. In order to arrive at a parsimonious, model the general to specific modeling strategy, which allows step by step elimination of insignificant regressors (starting from the highly insignificant one) is applied.

In the following sections, descriptive analysis and the results of econometric tests and estimations are presented. All the empirical estimations are conducted by using the econometric soft ware packages PC Give 10 and STATA 11.

## CHAPTER FOUR

### OVERVIEW OF ECONOMIC GROWTH, SOCIAL DEVELOPMENT AND FOREIGN AID IN ETHIOPIA

Ethiopia is a low income country with a percapita GDP of USD 374 in 2011 ranking 184<sup>th</sup> out of 190 countries (World Bank, 1900-2011 data). Despite this fact, the economy has grown rapidly for eight consecutive years registering a real GDP growth rate of 11.2 % in the year 2010/11. The overall economic performance, measured by growth in real GDP, between 2003/04-2010/11, registered an average annual growth rate of 11.4% making the country one of the fastest growing economies in Africa (MoFED, 2012). This growth performance was also in excess of the population growth rate and the 5.7 percent economic growth rate required for attaining the MDG goal of halving poverty by 2015 (PRSP, 2002).

In terms of sectoral contribution, the economy is dominated by the agricultural sector, as it employs 85% of the labor force and accounts about half of the GDP and 90 % to the total export. The high dependency on the agricultural sector, whose performance is highly determined by rainfall availability and weather conditions, combined with poor policies and civil war in the past have made it impossible to bring about structural change in the country(MoFED, 2012).

#### 4.1. Economic Growth

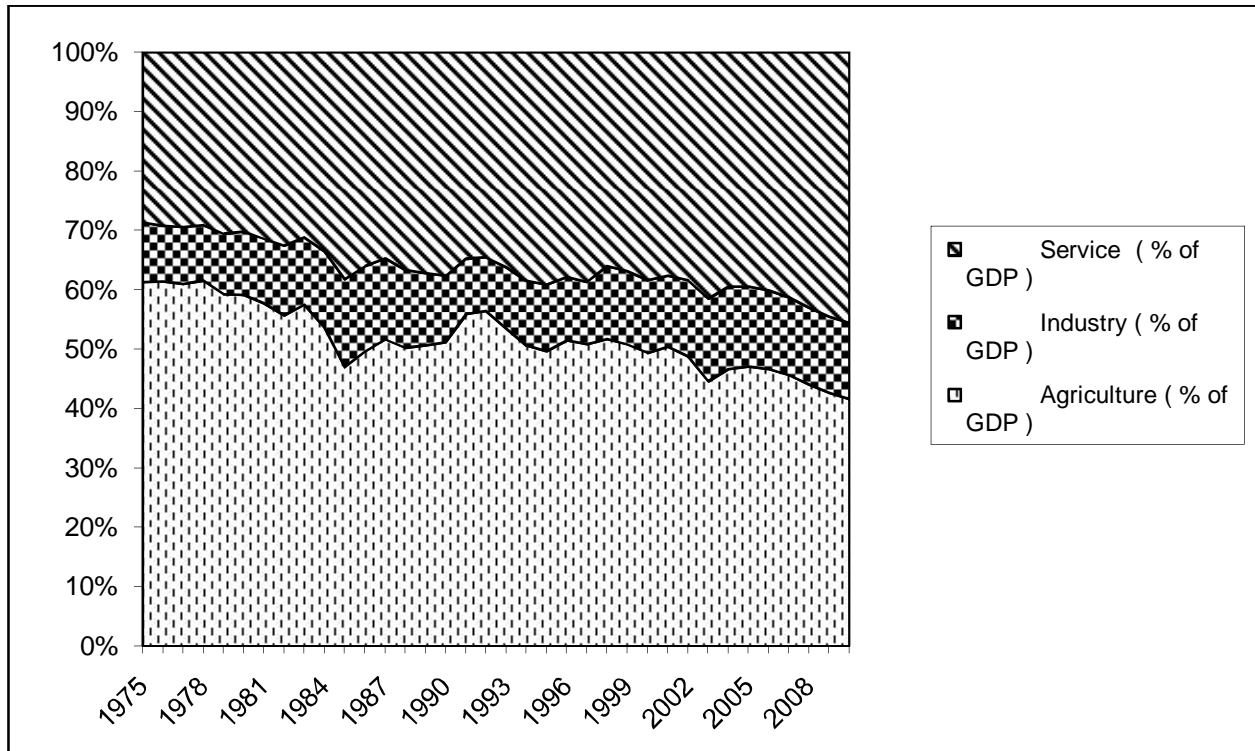
**Table 4.1: Average Growth Rate of RGDP per capita and Sectoral contributions to GDP**

Macro variable	1974/75-1990/91	1991/92-2010/11	Average
Growth rate of real GDP	1.4	7.4	4.4
% of agriculture	55.58	48.44	52
% of industry	11.43	12.26	11.84
% of service	32.98	39.88	36.43
Population growth rate	2.6	2.7	2.65
Growth rate of real GDP percapita	-1.2	4.7	1.7

Source: own computation using MoFED (2012) data.

During the Derg regime (1975-1991), real GDP and population were growing at annual average growth rate of 1.4 and 2.6 percent respectively, implying a negative annual average growth rate of real GDP percapita (see Table 4.1). Previous studies claim that this unsatisfactory economic performance was the result of the prolonged civil war, recurrent drought, high population growth rate and inappropriate economic policies. In post 1991 period, the economy showed a relatively good performance as can be seen from the increasing figures of average real GDP and average real GDP per capita growth rates, which became 7.4 and 4.7, respectively. Development of the private sector and relative political stability can be mentioned as some of the factors contributing to the economic improvements.

Among the three economic sectors, agriculture takes the lion's share in the Ethiopian economy. In the period 1975 to 2011 the share of the agricultural sector in the total GDP, on average, was 52 percent which is higher than the total contribution of the other sectors combined. The traditional farming system together with high dependency on natural conditions has slowed down the progress in the agricultural sector, which in turn retarded the pace of structural transformation. The sectoral decomposition depicted in the following figure shows this fact.



**Figure 1: Percentage Share of the Three Sectors in GDP**

Source: own computation using MoFED (2012) data.

The above figure, (figure 1), shows how the agricultural sector dominated the Ethiopian economy for a long period of time. However, this has been changing in recent periods as the share of agriculture is declining while the contribution from the service sector is increasing; for instance, the share of the agricultural sector and that of the service sector was 41.1 % and 46.6 % in 2011, respectively. Unlike, the two sectors, the share of the industrial sector remains unchanged in the two regimes. On average terms, it was 11.43 % in the DERG regime and 12.26 % in that of EPRDF.

#### **4.2. Trends of Poverty Indicators**

Despite the good economic performance - measured by growth rate of real GDP - the country has experienced in the past decade, poverty is still pervasive in Ethiopia. Continuous internal and external conflicts, famines, back ward production system which led to low agricultural production, low non-farm income, low education and poor health, high population growth and weak institutional structures has been mentioned as the constraints that kept the country in mass

poverty (Enquobahrie, 2004; Niaz, 2011). According to world development indicators report, Ethiopia was ranked 174<sup>th</sup> out of 187 countries in 2011 by human development index with a value of 0.363, a value which is much lower than the SSA average of 0.463. Based on the recently developed poverty measure, the multi-dimensional poverty index<sup>14</sup>, Ethiopia was ranked 174<sup>th</sup> again out of 187 countries having 56.2 % of its total population in multidimensional poverty (UNDP-HDR, 2011).

Although, international comparisons show how Ethiopia is poor, encouraging progresses have recently been realized in reducing national poverty. The following table shows the trends of the overall poverty.

**Table 4.2: Trends of National Poverty**

Index	National Poverty indices over time				Percentage change		
	1995/96	1999/00	2004/05	2010/11	1999/00 over 1995/96	2004/05 over 1995/96	2010/11 over 2004/05
Headcount index	0.455	0.442	0.387	0.296	- 2.9	-12.4	-23.5
Poverty gap index	0.129	0.119	0.083	0.078	-7.76	-30	-5.5
Poverty severity index	0.051	0.045	0.027	0.031	-11.8	-39.8	14.4

Source: MoFED, Interim report on poverty analysis study 2010/11.

As shown in the above table, the proportion of total population below the national poverty line (poverty head count index) in the country was 29.6% in 2010/11, declining significantly from 45.5% in 1995/96. The poverty gap index, which measures how far the poor are from the poverty line, have also experienced a decline by 39.5 % within the period 1995/96-2010/11 reaching 7.8% in 2010/11. Similarly, the national level poverty severity index stood at 3.1% in 2010/11 from 5.1% in 1995/96. The national poverty data prior to the period 1995/96 is not available due to the reason that HICEs, which are the sources of information to calculate these indices, only begun to be collected in 1995.

<sup>14</sup>Multidimensional Poverty Index - implies Percentage of the population that is multidimensionally poor adjusted by the intensity of the deprivations. It is computed by considering different aspects of deprivations- such as poor health, lack of education, inadequate living standards, lack of income, disempowerment, poor quality of work and treat from violence.



The non income dimensions of poverty, including those stated in the MDGs have also shown substantial improvements, implying how promising the country's prospect is in meeting the MDGs on time. The decline in the infant and maternal mortality rates together with the increasing trends in life expectancy and primary school enrollment ratios can be mentioned as indicators of the improvements.

**Table 4.3: Trends of Poverty Indicators**

Indicator	1990	1996	2000	2006	2011
Infant mortality rate Per 1000 live births	123	98	97	77	59
Maternal mortality rate per 100,000 live births	871	-	673	676	590
Life expectancy	46	49	52	55	59
Gross primary enrollment rate	31	35.5	58.9	91.6	95.9(2009/10)
Net enrollment ratio	-	19.4	33.8	-	86.5(2009/10)
Adult literacy rate	-	26	29.9	38	36 (2009/10)
Population with access to safe water	-	-	25.3	35	53.7
Population with toilet facility	-	-	19.1	38	62

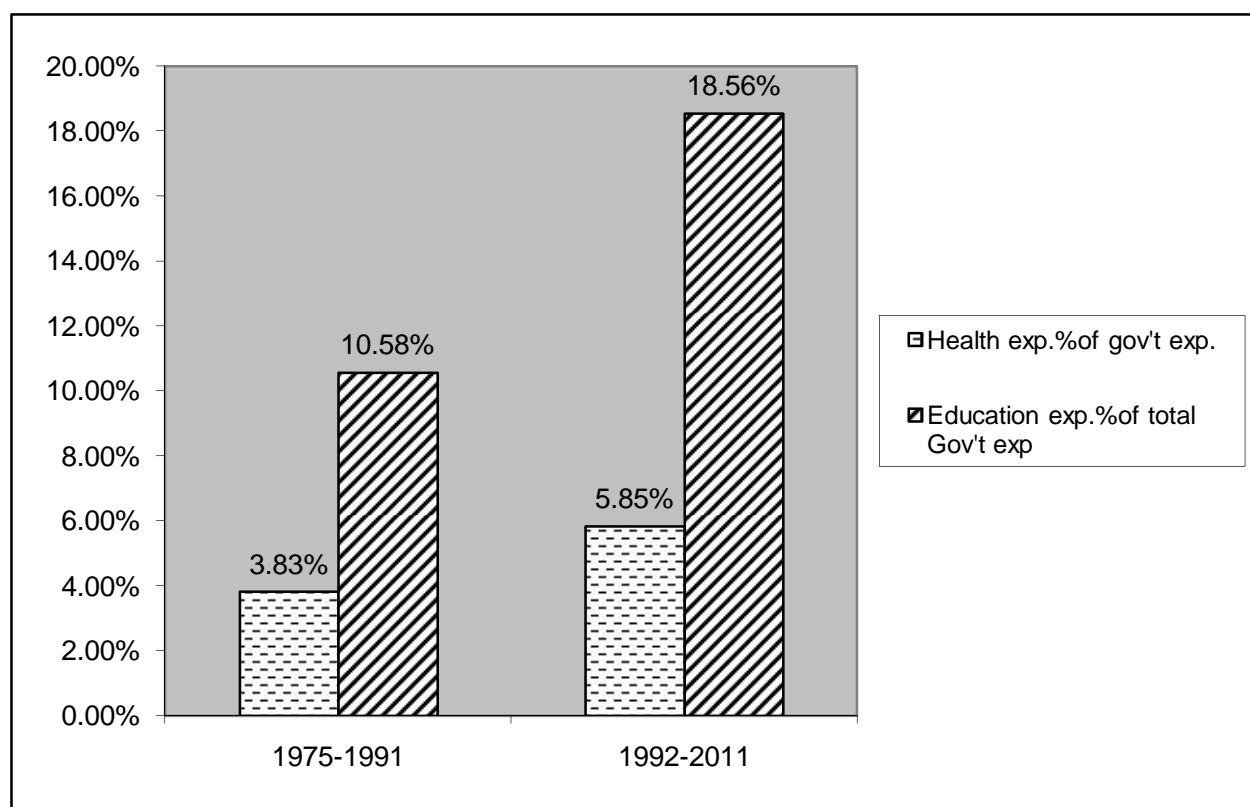
Source: EDHS report 2000, 2005 and 2011; MoFED, 2010; PRSP, 2002.

According to the analysis conducted by MoFED and CSA on poverty reduction, the development and implementation of the various development policies and strategies in a way that accounted the MDGs, helped at large to the reductions in the national poverty level as well as the improvements in the indicators of human development. The increasing emphasis given to the pro-poor sectors, health and education, has also been stated as another significant factor.

### **4.3. Government Expenditure in Health and Education Sectors**

Studies on economic growth and poverty reduction have indicated that investing in human capital is one way to achieve the development goal in a given economy. As to this fact, government expenditure on education and health has substantially increased in the EPRDF

regime as compared to DERG period. This can be seen from the following figure which depicted percent of government expenditure consumed by health and education sectors in the study period. The share of the education sector has increased, on average, to 18.56 % in EPRDF regime from 10.58 % in the DERG period. In 2011 it consumed 26.84 % of the total government expenditure. Similar trend had been experienced by the health sector as well, as it increased from 3.83 to 5.85 in average terms between the two political regimes; in 2011 it was 7.25 % of the total government expenditure.



**Figure 2: Percentage of Government Expenditure Allocated to Education and Health Sectors**

Source: own computation using data from EEA database (2012).

Although emphasis has been given to these sectors by increasing the budget allocated to them, the economy is faced with a problem of limited scope for increasing domestic resource mobilization, either from government revenue or export earnings, to finance such expenditures. Consequently, this unsatisfactory potential of internal finance forced the country to depend and seek external development assistance either in terms of grants or loans.

#### 4.4. Official Development Assistance (ODA) flows to Ethiopia

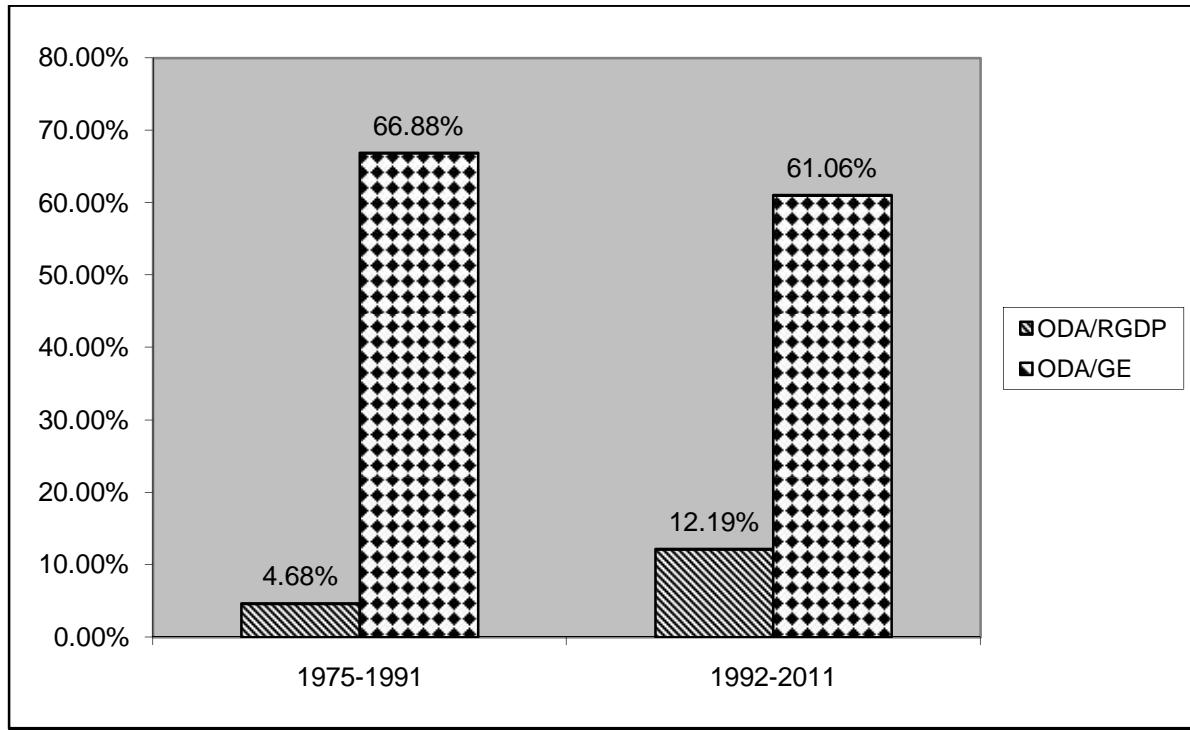
Official development assistance is one way of transferring resources to poor countries in the form of grants and concessional loans. Consequently, being one of the poor countries, Ethiopia had received a large amount of aid from different sources beginning from the end of WWII. Originally the United Kingdom was the primary source of this aid. However, they were replaced by the United States in the early 1950s. Between 1950 and 1970, it was estimated that Ethiopia received almost US\$600 million in aid, \$211.9 million from the US, \$100 million from the Soviet Union and \$121 million from the World Bank. This aid dried up under the military regime that followed the Ethiopian revolution, except for food aid during the mid-1980s. The Soviet Union was the major aid partner in the Derg regime together with other socialist countries such as East Germany, Yemen and Cuba. However, aid at that period was predominantly in the form of either military aid or ideological education. With the change of political regime and economic ideology in 1991, the country began to receive more aid, in which the United States, the European Union, OECD, Japan, The People's Republic of China, the World Bank, and the African Development Bank were the main donors in the EPRDF period. According to OECD data, Ethiopia has received 3,529 million USD in 2010 as official development assistance, making the country one of world's top five ODA recipient and the 1<sup>st</sup> from African countries. The following table shows the net ODA Ethiopia received under the study period. On average, it experienced significantly increasing trends between 1970s and 1980s and in post 2000 period.

**Table 4.4: Net ODA Received from 1970-2010 (In million USD)**

Year	1970-1979	1980-1989	1990-1999	2000-2010
Net ODA received	377	1,110	1, 292	2, 395
% of increment	-	194	16.4	85.4

Source: OECD 2012

In line with this the share of ODA as a percentage of GDP and government expenditure has also increased substantially in the post 2000 period, implying the country's dependency on external finance.

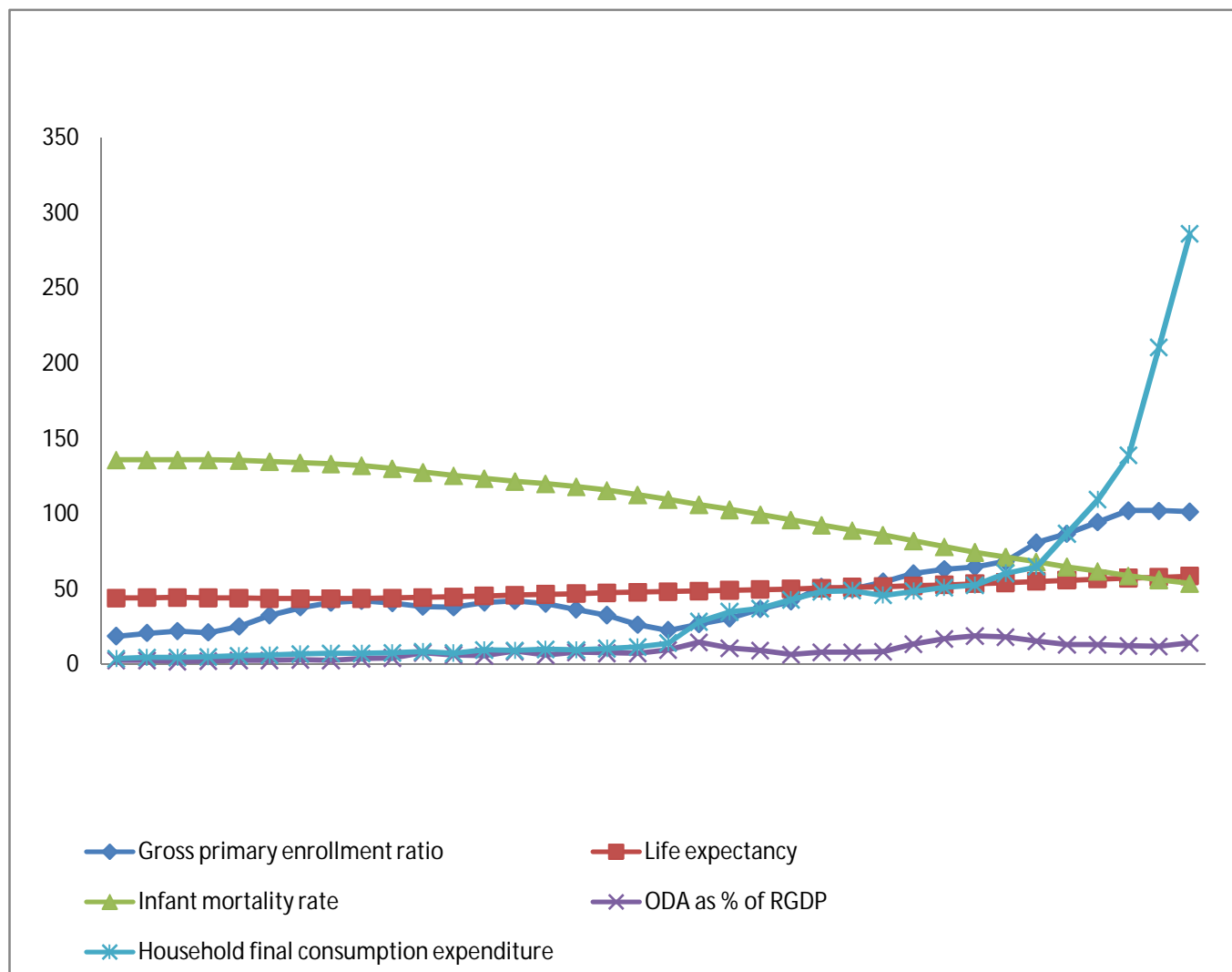


**Figure 3: ODA as a Percentage of RGDP and Government Expenditure**

Source: own computation using data from MoFED (2012) and OECD (2013).

As can be seen in the above figure ODA as a percentage of RGDP is higher in the current regime than it was in the military period, credited to the aforementioned reasons. On the other hand, in average terms, ODA as percentage of gov't expenditure remained relatively constant.

Looking at the sectoral distribution, in the period 1997-2002, 19 % of ODA went to the pro-poor sector which incorporated health, education and social development (UNDP, 2006). According to OECD data, of the total ODA that Ethiopia received in 2010, 34 % has been committed to these three sectors. Due to lack of data on how much ODA is allocated for the pro-poor sectors it's not possible to show whether the disbursement to these sectors have increased or not and contributed for the improvements in the poverty indicators, with the increase in total ODA. In spite of this fact, it's possible to see the trends in total ODA the country have received and the indicators of poverty, to have some insight about the relationship between poverty and ODA inflows.



**Figure 4: Trends of ODA as Percentage of RGDP and Indicators of Poverty.**

Source: own computation using data from MoFED, 2012; OECD and UNDP 2013 databases.

The above figure (figure 4) shows the trends in total ODA as percentage of GDP and indicators of poverty in the study period. All indicators have experienced significant improvements reaching 69, 58 and 100% in 2010 from 139, 44 and 18.9% in 1974 for infant mortality, life expectancy and gross primary enrollment ratio, respectively, with a similar increase in ODA. The same is true for the real house hold final consumption expenditure too. Based on the general argument that ODA is planned for tackling poverty, these improvements might be related to the increasing ODA flows to the country. It's expected that more convincing pattern would emerge after testing the relationship using data. The following section would take up these issues.

## **CHAPTER FIVE**

### **RESULTS AND DISCUSSIONS**

Using the estimation methods described in section three, this part presents test results and outputs of the estimated models with their interpretations. It includes the test results on the presence of unit roots, cointegration, weak exogeneity as well as the outputs of estimated long run and short run relationships among the cointegrated variables.

#### **5.1. Unit Root Test Results**

To investigate whether the data series is stationary in levels or stationary in differences this paper employed the Augmented Dickey-Fuller (ADF) test primarily and the Phillips-Perron (PP) test for confirmation. Given the condition that the unit root tests are sensitive to the presence of deterministic trends, in ADF test there are three models. The general model which includes intercept and time trend is estimated first, followed by the restrictive models; i.e. with an intercept and without intercept and trend. The null hypothesis in all the three models claims that the time series variable under investigation has a unit root or is a non-stationary process. Conversely, the alternative states that the series has no unit roots or is stationary. The results from all the three estimations are presented in the following table and the results of PP test are reported in Appendix A.

**Table 5.1: Unit Root Test Results**

Variables	Constant	P-value	Trend and constant	p-value	No trend and constant	Order of Integration
LIMR	2.708	0.9991	-1.544	0.8136	-8.091	I(1)
DLIMR	-5.409	0.0000*** <sup>15</sup>	-7.402	0.0000***	-1.768	
LRHFCE	0.431	0.9826	-2.157	.5143	2.007**	I(1)
DLRFHFCE	-4.268	0.0005***	-4.406	0.0021***	-3.445	
LGPI	-1.008	0.7502	-2.109	0.5413	1.140	I(1)
DLGPI	-3.000	0.0349**	-2.950	0.1466	-2.689***	
LRGDP	2.272	0.9990	.717	1.0000	-2.030	I(1)
DLRGDP	-4.692	0.0001***	-6.371	0.0000***	-3.115***	
LODA	-1.350	0.6058	-2.267	0.4524	0.782	I(1)
DLODA	-4.236	0.0006***	-4.343	0.0027***	-4.008***	
LPODA	-1.069	0.7272	-3.067	0.1144	0.731	I(1)
DLPODA	-4.061	0.0011***	-4.025	0.0081***	-3.523***	
LODA <sup>2</sup>	-1.610	0.4788	-2.797	0.1981	0.275	I(1)
DLODA <sup>2</sup>	-3.729	0.0037***	-3.710	0.0217**	-3.586***	
LGEOE	-0.499	0.8923	-2.939	0.1499	0.688	I(1)
DLGEOE	-6.132	0.0000***	-6.350	0.0000***	-6.133***	
LGEOH	0.949	0.7715	-2.763	0.2108	0.358	I(1)
DLGEOH	-4.834	0.0000***	-5.108	0.0001***	-4.790***	
LGOV	-0.108	0.9487	-1.872	0.6690	-1.196	I(1)
DLGOV	-4.825	0.0000***	-4.765	0.0005***	-4.080***	

As can be seen from the above table and appendix A, the null hypothesis of unit root is not rejected for all series at their level (original value). Since all the variables are non stationary at levels, a regression analysis using ordinary least squares (OLS) may produce spurious results. However, all the series found to be stationary after first differencing. By taking first difference of these I(1) variables, OLS method can be used in regression analysis and estimation. However,

<sup>15</sup> \*\*\* and \*\* indicates the rejection of the null hypothesis at 1% and 5% level of significance, respectively

there is a problem with this approach of differencing: the possibility of losing long-run information present in the variables (Mallik, 2008). By applying cointegration technique such problems can be avoided, since this method considers the long-run relationship among the non stationary series.

## **5.2. Cointegration Analysis and the Long Run Models**

The unit root test indicated that all the variables are non-stationary at level, indicating that the presence of long run relationships (cointegration) between the variables should be checked. Given the possibility to find zero to  $k-1$  linearly independent cointegrating relations for  $k$  endogenous variables it is necessary to determine the number of cointegrating equations (rank of cointegration). The cointegration test can be conducted by applying the Johansen cointegration test. However, in order to apply the Johansen cointegration test, the order of the VAR model has to be identified first i.e. the optimal number of lags to be included in the model needs to be selected. There are many tests that can be used to choose appropriate lag length. The Akaike information criteria (AIC), the Schwarz information criteria (SIC) and the Hannan-Quinn information criteria (HQIC) are the most widely used conditions of lag selection. Based on these criteria lag length 2, 1 and 1 are selected for models one, two and three, respectively.

Using the selected optimal lag length for the three models, the Johansen cointegration test is applied to identify the presence and rank of cointegrating equations among the variables in each model. Consequently the test indicated the existence of one cointegrating equation in each model. As can be seen from Table 5.2, the null hypothesis of zero cointegrating equation against one or more cointegrating equations is rejected at 1%, 5 % and 5% level of significance for model 1, model 2 and model 3, respectively. But, the null of one against two or more cointegrating equations failed to be rejected in all the three models.



**Table 5.2: Results of Johansen Cointegration Test**

Rank =>H0	Eigen value	Log lik	Trace test	P – value
Model 1: Variables: LIMR, LRGDP, LODA, LPODA, LODA <sup>2</sup> , LGEOH and LGOV				
0		225.5237	174.51	[0.000] ***
1	0.90667	265.8406	93.875	[0.065]
2	0.71070	286.9257	51.704	[0.565]
3	0.43803	296.7230	32.110	[0.610]
4	0.39396	305.2367	15.082	[0.778]
5	0.23310	309.7486	6.0587	[0.692]
6	309.7486	312.3943	0.76722	[0.381]
7	0.022313	312.7779		
Model 2: Variables: LGPI, LRGDP, LODA, LPODA, LGEOH, LGEOE and LGOV				
0		153.8556	158.65	[0.015] **
1	0.79680	179.3523	107.66	[0.181]
2	0.69945	198.5866	69.192	[0.541]
3	0.56834	212.0286	42.308	[0.764]
4	0.43382	221.1301	24.105	[0.830]
5	0.35595	228.1697	10.026	[0.917]
6	0.16915	231.1345	4.0962	[0.728]
7	0.12015	233.1826		
Model 3: Variables: LRFHCE, LRGDP, LODA, LPODA, LGOV and LODA <sup>2</sup>				
0		121.5140	119.08	[0.039] **
1	0.71989	143.7844	74.536	[0.341]
2	0.53639	157.2368	47.632	[0.526]
3	0.49572	169.2178	23.669	[0.848]
4	0.33300	176.3047	9.4957	[0.938]
5	0.15024	179.1538	3.7976	[0.768]
6	0.10282	181.0526		

The presence of a single cointegrating vector points to estimate the long run equation along with its associated coefficients ( $\beta$ ) and adjustment parameters ( $\alpha$ ) which are important for further analysis. The corresponding  $\beta$  and  $\alpha$  coefficient vector, taken from the  $\beta$  and  $\alpha$  matrix<sup>16</sup>, are reported below.

**Table 5.3: Normalized Long Run Coefficients**

Long run coefficients ( $\beta_s$ ) for model 1						
DIMR	LRGDP	LODA	LPODA	LGEOH	LODA <sup>2</sup>	LGOV
1.0000	0.23940	0.20394	-0.057932	0.012457	-0.024060	-0.54116
Long run coefficients ( $\gamma_s$ ) for model 2						
LGPI	LRGDP	LODA	LPODA	LGEOE	LGOV	LGEOH
1.0000	-1.9347	0.53692	-1.2048	0.49250	0.23888	-0.13755
Long run coefficients ( $\delta_s$ ) for model 3						
LRHFCE	LRGDP	LODA	LPODA	LGOV	LODA2	
1.0000	-2.8727	-5.0343	1.7554	7.9608	0.91887	

**Table 5.4: Adjustment Coefficients ( $\alpha_s$ )**

$\alpha_1$ s: for model 1		$\alpha_2$ s: for model 2		$\alpha_3$ s: for model 3	
LIMR	-0.32709	LGPI	-0.27181	LRPFCE	-0.12253
LRGDP	-0.36161	LRGDP	-0.070730	LRGDP	0.018571
LODA	-0.4054	LODA	0.29878	LODA	-0.094067
LPODA	0.7303	LPODA	0.40857	LPODA	-0.16835
LGEOH	0.54001	LGEOE	-0.047760	LGOV	-0.035188
LGOV	0.69122	LGOV	-0.052175	LODA2	-0.57560
LODA <sup>2</sup>	-0.4524	LGEOH	0.0074818		

The adjustment coefficients ( $\alpha_s$ ) which are obtained from the cointegration equation show the speed of adjustment of the variables towards the steady state following a deviation from the long run equilibrium. The values of adjustments coefficients for model one, ( $\alpha_1_s$ ) (second column in Table 5.4), indicate that LODA<sup>2</sup> has higher tendency to adjust itself to the long run equilibrium

<sup>16</sup> The  $\beta$  and  $\alpha$  matrix for each model are reported in appendix B.

after a certain shock than the other variables in the model. However the  $\alpha$  coefficients of LPODA and LGPI found to be positive indicating the extent to which these variables deviate from the long run steady state path after a certain shock. In the second model, with adjustment coefficient of -0.27, LGPI found to adjust faster than the other variables in the model. On the other hand the  $\alpha$  coefficients of LODA and LPODA found to be positive indicating the extent to which these variables deviate from the long run steady state path after a certain shock. Similarly, the estimated adjustment coefficients for model three indicated that all the variables except that of LRGDP will adjust to their respective long run path. Looking at their speed of adjustment, LODA<sup>2</sup> found to have a higher tendency of adjustment. This can be observed from the value of the  $\alpha_3$  coefficient on LODA<sup>2</sup> which implies that LODA<sup>2</sup> adjusts towards long run equilibrium path by 57 % in one year.

To identify the variables that are endogenously determined by the other explanatory variables in the VAR model, weak exogeneity test is conducted by imposing zero restrictions on the relevant  $\alpha$  coefficient in the three models i.e. by using  $\alpha$  coefficients reported in Table 5.4. Based on the likelihood ratio test the null hypothesis of weak exogeneity is rejected at 1 % for LIMR and at 5% for LPODA in the first model indicating that LIMR and LPODA are endogenous variables in the system. This implies the expected dependent variable in model one, LIMR, can be explained by the other variables and at the same time it explains the other endogenous variable LPODA. This enables to analyze a single long run equation for LIMR conditional on the other variables in the system. Similarly, after imposing zero restrictions on the  $\alpha$  coefficients of model two ( $\alpha_2$ ) the results of LR tests indicated that gross primary enrollment ratio is the only endogenous variable in the system. The null hypothesis of weak exogeneity is rejected at 1 % level of significance for LGPI while the test failed to reject the null hypothesis for the other variables. Following similar procedures LRPFCE and LODA<sup>2</sup> found to be endogenous variables in the third model as the null hypothesis of ‘weakly exogenous to the system’ is rejected at 1 % and 5 % level of significance for LRPFCE and LODA<sup>2</sup>, respectively. Thus, based on the results of weak exogeneity test the three indicators of poverty can be used as endogenous variables in the specified models. The LR test results for each model are reported in the following table.

**Table 5.5: Results of Weak Exogeneity Tests**

Model 1							
variables	LIMR	LRGDP	LODA	LPODA	LGEOH	LGOV	LODA <sup>2</sup>
$\alpha_1$ s	-0.32709	-0.36161	-0.4054	0.7303	0.54001	0.69122	-0.4524
Chi <sup>2</sup> (1)	12.184	0.95008	1.3141	4.0809	0.25669	2.6170	0.27313
P-value	[0.0005]***	[0.3297]	[0.2517]	[0.0434]**	[0.6124]	[0.1057]	[0.6012]
Model 2							
variables	LGPI	LRGDP	LODA	LPODA	LGEOE	LGOV	LGEOH
$\alpha_2$ s	-0.27181	-0.070730	0.29878	0.40857	-0.047760	-0.052175	0.0074818
Chi <sup>2</sup> (1)	10.591	2.0542	2.1812	2.5076	0.18942	0.69215	0.0015154
P-value	[0.0011]***	[0.1518]	[0.1397]	[0.1133]	[0.6634]	[0.4054]	[0.9689]
Model 3							
variables	LRPFCE	LRGDP	LODA	LPODA	LGOV	LODA <sup>2</sup>	
$\alpha_3$ s	-0.12253	0.018571	-0.094067	-0.16835	-0.035188	-0.57560	
Chi <sup>2</sup> (1)	11.241	0.98761	2.1852	3.7926	3.3892	5.4279	
P-value	[0.0008]***	[0.3203]	[0.1393]	[0.0515]	[0.0656]	[0.0198]**	

Having confirmed that the poverty indicators are endogenous variables in each model, it is possible to estimate the long run equations. Accordingly, the long run models with their respective interpretations are presented in the following subsections.

**5.2.1. Model 1: Poverty Measured by Infant Mortality Rate**

<p>LIMR = -0.2394LRGDP -0.20394LODA + 0.057932LPODA - 0.012457LGEOH+0.54116LGOV+0.02406 LODA<sup>2</sup></p> <p>P-values - [0.0000]*** [0.0000]*** [0.0014]*** [0.6668] [0.0000]*** [0.0039]***</p> <p>..... 11</p> <p>Vector diagnostic tests</p> <p>Vector AR test: <math>\chi^2 = 58.7073</math> [0.16139]</p> <p>Vector Normality test: <math>\chi^2 (14) = 10.066</math> [0.7573]</p> <p>Vector hetero test: <math>\chi^2 (728) = 744.53</math> [0.3273]</p>
---

The above box presents the long run equation for infant mortality rate. The LR test is conducted by imposing zero restrictions on the long run ( $\beta$ ) coefficients to identify the statistically significant explanatory variables among those included in the model. And the result<sup>17</sup> indicated that except the government expenditure on health, all the included explanatory variables have significant effect on poverty reduction, poverty measured by infant mortality rate. Furthermore they have the expected signs except that of aid policy interaction term.

Model diagnostic tests for serial correlation and normality of the residuals indicated that the estimated equation has no problem of serial correlation as well as non-normality as the null hypothesis for both tests failed to be rejected at the conventional significance levels. Similarly, the heteroscedasticity test confirmed that the errors have constant variance. The stability of the model and the consistency of estimated long run parameters are tested by using roots of companion matrix and plot of the recursive estimates, respectively. As a result, the two tests<sup>18</sup> indicated the stability of the model and also the consistency of estimated parameters.

The results of the estimated model indicated that economic growth, proxied by the logarithm of Real GDP, significantly contributes for the reduction of infant mortality rate and thereby poverty reduction. Using the estimated coefficient of LRGDP the result implies that for 1 % increase in real GDP, IMR declines by 0.24 %. Similar results had also been obtained from cross country studies by Issa and Auattara (2005); Nakamura and McPherson (2005); Gani (2009), which supports the finding of this paper.

In line with the theoretical expectations the result indicated that foreign aid, measured by percentage of official development assistance in real GDP, is another significant factor that can reduce infant mortality rate with an elasticity of 0.2. However, this result found to no longer hold when aid is interacted with macroeconomic policy index. This can be seen from the coefficient on the aid policy interaction term which is 0.057. The coefficient implies that when the value of aid policy interaction term increases by 1 % infant mortality rate increases by 0.06 %. Although it cannot be concluded that good macroeconomic performance exacerbates infant mortality this finding creates a question on the effectiveness of macroeconomic policies undertaken in the

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<sup>17</sup> Test results for the statistical significance of  $\beta$  coefficients are reported in appendix D.

<sup>18</sup> Plots of 1-step residuals  $\pm 2^{\text{nd}}$  SE and roots of companion matrix found in appendix D and E.

country in affecting infant mortality rate. In line with theoretical expectations, the quadratic aid term (squared ODA) is also found to be statistically significant with a positive sign. According to the result, a percentage increase in squared aid leads to an increase in infant mortality rate by 0.024 %. Thus, indicating the existence of diminishing returns to aid on poverty reduction. The study by Asra *et al* (2005) also indicated similar findings with regard to aid and aid squared variables.

Government expenditure on health as percentage of total government expenditure (excluding grant) is also found with the expected sign though it is statistically insignificant. The tiny share of government expenditure, relative to other sectors, to the health sector might be one reason for this statistical insignificance. Furthermore there may be specific intervention areas (than the gross figure) through which government expenditure on health can reduce infant mortality that this study does not come across. For instance government spending in social sectors like provision of improved water and sanitation, construction and expansion of health centers in rural areas, provision of trainings and educations to mothers on child care and nutrition may be one channel.

The other explanatory variable, quality of governance, has also found with the theoretically expected sign implying that poor quality of governance is one factor that exacerbates poverty.

### **The Short Run Dynamic Model (model 1)**

The Error Correcting Model (ECM), which captures both the long run and short run relationships, is estimated for model one following the necessary steps.

In the ECM specified in equation 10, the change in the variables represent variation in the short run, while the coefficients obtained for the error correction term represents the speed of adjustment towards the equilibrium path after a certain deviation. The ECM was estimated starting with the general over parameterized model. Then subjected to a systematic reduction and testing process until a robust parsimonious model is obtained. In each round, one statistically insignificant regressor is dropped until further model reduction is rejected by the likelihood ratio test. Following the above procedure the dynamic equation for model 1\_is reported in Table 5.6 below.

**Table 5.6: Results of Short Run Dynamic Model (Dependent Variable  $\Delta$ LIMR)**

Variables	Coefficient	Std.Error	t-value	P –value	Part.R <sup>2</sup>
Constant	-0.0317328	0.005884	-5.39	0.000	0.5807
DLIMR_1	-0.801142	0.1388	-5.77	0.000***	0.6135
DLRGDP	-0.0815802	0.05262	-1.55	0.136	0.1027
DLRGDP_1	0.0353229	0.05539	0.638	0.531	0.0190
DLODA	0.111449	0.06160	1.81	0.085	0.1349
DLODA_1	0.0595850	0.02502	2.38	0.027**	0.2126
DLPODA	-0.0407131	0.01818	-2.24	0.036**	0.1928
DLPODA_1	0.0376540	0.02037	-1.85	0.079	0.1400
DLGEOH_1	-0.0103704	0.01507	-0.688	0.499	0.0221
DLGOV_1	0.0298007	0.04470	0.667	0.512	0.0207
DLODA2	-0.0197829	0.01512	-1.31	0.205	0.0753
ECT_1	-0.763079	0.3423	-2.23	0.037**	0.1913
R <sup>2</sup> = 0.802892, F(11,21) = 7.776 [0.000]***, DW = 1.78					

The overall fit of the model is acceptable as indicated by the Goodness of fit of the model (R<sup>2</sup>) which implies 80 percent of the variation in the dependent variable ( $\Delta$ LIMR) is explained by the variation in the explanatory variables included in the model. The F statistics also rejected the null hypothesis that all the coefficients in the model are jointly insignificant at 1 % level of significance. The Durban Watson (DW) test result confirmed that there is no autocorrelation problem. Similarly the various diagnostic tests<sup>19</sup> performed indicated that the errors in the estimated model are not correlated, are normally distributed and have constant variance. The Ramsey test for functional form misspecification also did not reject the regression specification of the dynamic model. The test for short run parameter consistency has also confirmed that the estimated short run parameters are consistent<sup>20</sup>.

<sup>19</sup> Reported in appendix C.

<sup>20</sup> The results are reported in appendix G.

Among the estimated short run coefficients in the parsimonious model, the coefficients on DLPODA and one period lagged values of DLIMR and DLODA found to be statistically significant. The result indicated that previous year's infant mortality and macroeconomic policy interacted with aid contribute for the reduction of infant mortality in the short run. In contrast to the long run model results, the coefficient on aid found to be positive in the short run, implying higher infant mortality with higher aid. Thus, indicating the divergent impact of aid on poverty reduction in the short run and long run.

The error correcting term (ECT\_1) is also statistically significant at 5 % level of significance. The coefficient indicates that 76 percent of the disequilibrium in the previous period is corrected in one year.

**5.2.2. Model 2: Poverty Measured by Gross Primary Enrollment Ratio**

The Johansen cointegration test and weak exogeneity test results, reported in tables 5.2 and 5.5 respectively, indicated that among the variables included in model two there is one cointegrating equation and gross primary enrollment ratio is the only endogenous variable in the system. Based on these results the long run equation for gross primary enrollment ratio is estimated, and found to be the following:

LGPI=	1.9347	LRGDP -	0.53692	LODA +	1.2048	LPODA -	0.4925	LGEE -	0.23888	LGOV +	0.13755	LGEH
P-value	[0.0021]***		[0.0460]**		[0.0011]***		[0.0964]		[0.7877]		[0.7444]	
..... 12												
Vector diagnostic tests												
Vector AR 1-2 test: F (98,27) = 1.4617 [0.1301]												
Vector Normality test: $\chi^2$ (14) = 23.441 [0.0535]												
Vector hetero test: $\chi^2$ (448) = 464.20 [0.2887]												

Test for statistical significance of the estimated long run coefficients is conducted by imposing zero restrictions on the estimated long run coefficients ( $\gamma_s$ ). Consequently, the LR test results



indicated that logarithm of real GDP, ODA and PODA have a statistically significant effect on gross primary enrollment ratio.

Model diagnostic tests for serial correlation, variances and distributions of the errors in the estimated long run model indicated that the estimated VAR model has no problem of serial correlation and the errors are normally distributed with a constant variance.

The results of the estimated model indicated that, economic growth is a significant determinant for poverty reduction, when poverty is measured by gross primary enrollment ratio, with an elasticity of 1.93. This result is consistent with the results obtained by Anyanwu and Erhijakpor (2007) for SANE countries (South Africa, Algeria, Nigeria and Egypt).

Similar to the previous model both aid variables found to be statistically significant in this model too. However aid appeared with a negative sign in this model implying that increasing aid flows led to reduced enrollment in the study period. Nonetheless, in line with expectations, aids impact found to be positive when interacted with policy index, which implies that aid is effective when augmented by macroeconomic conditions to contribute for the gross primary enrollment ratio.

The estimated coefficients on government expenditure on education, government expenditure on health and governance indicator found to be statistically zero which implies that these variables have no role in the variation of the gross primary enrollment ratio, in the study period.

### **The Short Run Dynamic Model (model 2)**

The Error Correction Model (ECM), which captures both the long run and short run relationships, is estimated using the specification given in equation 10. The results are reported in the following table, Table 5.7.

**Table 5.7: Results of Short Run Dynamic Model (Dependent Variable  $\Delta LGPI$ )**

Variables	Coefficient	Std.Error	t-value	t-prob	Part.R <sup>2</sup>
Constant	-0.0400422	0.01243	-3.22	0.005	0.3658
DLGPI_1	0.742076	0.1211	6.13	0.000***	0.6759
DLRGDP	0.163348	0.1273	1.28	0.216	0.0838
DLRGDP_1	0.424778	0.1616	2.63	0.017**	0.2775
DLODA_2	-0.0946663	0.06673	-1.42	0.173	0.1006
DLPODA_1	0.101759	0.03355	3.03	0.007***	0.3382
DLPODA_2	0.178125	0.05818	3.06	0.007***	0.3425
DLGEOE	-0.269887	0.08378	-3.22	0.005***	0.3657
DLGOV_1	-0.150025	0.1160	-1.29	0.212	0.0850
DLGOV_2	-0.186564	0.1290	-1.45	0.165	0.1041
DLGEOH	0.166529	0.05805	2.87	0.010**	0.3137
ECT_1	-0.693352	0.2320	2.99	0.008***	0.3316
R <sup>2</sup> = 0.89534, F (11, 18) = 14 [0.000] **, DW = 2.42					

The model adequacy tests confirmed that the overall fit of the model is acceptable. As the value of R<sup>2</sup> indicates 89 percent of the variation in the dependent variable ( $\Delta LGPI$ ) is explained by the variation in the explanatory variables included in the model. The F statistics also rejected the null hypothesis that all the coefficients in the model are jointly insignificant at 1 % level of significance. Similarly, the various diagnostic tests<sup>21</sup> performed confirmed that the errors in the estimated model are, not correlated, normally distributed and have constant variance. The Ramsey test for functional form misspecification do not rejected the regression specification of the dynamic model.

Among the estimated short run coefficients, DLGEOH, the one period lagged values of DLGPI, DLRGDP and DLPODA as well as two period lagged value of DLPODA found to be statistically significant with expected signs. Unlike theoretical expectations, the first difference of government expenditure on education appeared with a significant negative coefficient. This may be due to tradeoffs between the distributions of government spending on education, in the

<sup>21</sup> Given in Appendix C.

different education sub-sector. That is, being much of spending allocated for higher (secondary and tertiary) education sector there might appear such a negative correlation.

The error correcting term (ECT\_1) is also found to be statistically significant. The coefficient indicates that 69 percent of the disequilibrium in the previous period is corrected in one year.

### 5.2.3. Model 3: Poverty Measured by Real Household Final Consumption Expenditure

Similar to the above two models, the Johansen cointegration test indicated the presence of one cointegrating equation in this model too. Furthermore the weak exogeneity tests confirmed that house hold consumption expenditure can be treated as a dependent variable. Accordingly, the long run equation for real house hold consumption expenditure is estimated as:

$$\text{LRHFCE} = 2.8727 \text{LRGDP} + 5.0343 \text{LODA} - 1.7554 \text{LPODA} - 7.9608 \text{LGOV} - 0.91887 \text{LODA}^2$$

P-value    [0.0281]\*\*    [0.0040]\*\*\*    [0.0737]            [0.0000]\*\*\*    [0.0396]\*\*    .....13

Vector Diagnostic Tests

Vector AR 1-2 test:  $F(72,60) = 1.4018 [0.0896]$

Vector Normality test:  $\chi^2(12) = 14.851 [0.2497]$

Vector hetero test:  $\chi^2(273) = 300.37 [0.1225]$

The LR restrictions imposed on the  $\delta$  coefficients, to test their statistical significance, indicated that LRGDP, LODA, LGOV and  $\text{LODA}^2$  have a significant effect on poverty reduction, poverty measured by real household consumption expenditure.

In this model too, the null hypothesis for vector diagnostic tests failed to be rejected at the conventional levels of significance. Thus, it can be stated that the estimated long run model is free from the problems of autocorrelations, hetroscedasticity and non normality.

Regarding the estimated long run coefficients, all the significant variables found with their theoretically expected signs. The result indicated that, a percentage change in RGDP led to an increase in real household consumption expenditure by 2.9 % in the study period. Akekere and Yousuo have obtained similar results using gross domestic product and private consumption expenditure data from Nigeria. Amin(2011), had also found similar results in a causality study for Bangladesh.

The coefficient on aid, which is statistically significant at 1 % level of significance, indicates that ODA has a strong effect on poverty reduction, when poverty is measured by household consumption expenditure. However, the effect disappears when aid is augmented by the macroeconomic policy variable. This can be seen from the statistically insignificant coefficient on the aid policy interaction variable. The result thus indicates aid's effectiveness is not conditional on macroeconomic conditions when poverty is measured by household consumption expenditure.

The result also confirmed that there is diminishing return to the flows of foreign aid. This can be observed from the estimated coefficient on the quadratic aid term,  $ODA^2$ , which is - 0.92. Thus it can be stated that aid is effective when it is relatively modest but becomes ineffective when the size of aid exceeds a certain level. This might be through creating dependency and discouraging participation in productive activities. Similar conclusion has made by Asra *etal* (2005).

The coefficient on the governance indicator is found to carry the theoretically expected negative sign which is also consistent with the theoretical claim that good governance is a base for poverty reduction.

### The Short Run Dynamic Model (model 3)

The Error Correction Model (ECM), which incorporates both the long run and short run relationships, is estimated using the specification given in equation 10. The results are reported in Table 5.8 below.

**Table 5.8: Results of Short Run Dynamic Model (Dependent Variable  $\Delta$ LRHFCE)**

Variables	Coefficient	Std.Error	t-value	t-prob	Part.R <sup>2</sup>
Constant	-0.0474543	0.03128	-1.52	0.142	0.0875
DLRHFCE_1	0.345688	0.2177	1.59	0.125	0.0951
DLRGDP	0.698721	0.3470	2.01	0.055	0.1445
DLRGDP_1	0.996817	0.3291	3.03	0.006**	0.2766
DLODA_1	0.0421543	0.09240	0.456	0.652	0.0086
DLPODA	0.206664	0.1099	1.88	0.072	0.1285
DLGOV	0.330047	0.2763	1.19	0.244	0.0561
DLGOV_1	-0.770589	0.3002	-2.57	0.017*	0.2154
DLODA2	-0.0419884	0.03422	-1.23	0.232	0.0590
ECT_1	-0.653796	0.2861	-2.29	0.031*	0.1787
R <sup>2</sup> = 0.630344, F(9,24) = 4.547 [0.001]**, DW = 1.59					

Having the first difference of real household consumption expenditure as dependent variable, the model adequacy tests confirmed that the overall fit of the estimated model is good. The value of R<sup>2</sup> is found to be 0.63 implying that 63 percent of the variation in the dependent variable is explained by the variation in the explanatory variables included in the model. The F test statistic given by 4.547 is also significant at 1 % level of significance which confirms the rejection of the null hypothesis that all the coefficients in the model are jointly zero. Similarly, the various diagnostic tests performed also confirmed that the errors in the estimated model are not correlated, normally distributed and have constant variance. The model specification test also indicated that there is no functional misspecification.

The result of the estimated short run model produced coefficients which resembled the long run coefficients in terms of signs. However, unlike the long run results, only the one period lagged

values of DLRGDP and DLGOV found to be statistically significant. According to the estimated short run coefficients, previous year's real GDP led to rise in current year's household consumption expenditure while a similar increase in governance measure causes reduction in consumption expenditure.

The error correcting term (ECT\_1) is also found to be statistically significant with a negative sign. And the estimated coefficient indicates that 65 percent of the disequilibrium in the previous period is corrected in one year.

### **5.3. Comparing the Impact of ODA with Regard to Different Poverty Measures**

In general, foreign aid, measured by official development assistance, found to be a significant factor in affecting poverty in the long run. This can be observed from Table 5.9 below. However, its role is not identical when poverty is measured by different indicators. That is, when infant mortality rate and real household consumption expenditure are used as measures of poverty, ODA is found to contribute for the improvement of these variables, which in turn implies ODA's contribution for poverty reduction. On the contrary, when gross primary enrollment ratio is used as measure of poverty its impact found to be negative. These results thus indicate that over the long run, aid (ODA) has divergent role in reducing poverty depending up on the measures of poverty. In addition to this, the impact found to be insignificant in the short run. And this insignificance of the estimated short run parameters implies that a time gap is needed for aid to have impact on poverty reduction.

The result also indicated that the impact of macroeconomic performance on the effectiveness of aid over the long run is divergent. In the model where gross primary enrollment ratio is used as measure of poverty, macroeconomic policy found to be influential i.e. the effect of aid which were negative has changed when aid is interacted with the macroeconomic policy index. Contrary to this the role of macroeconomic policy became insignificant and adverse when household consumption and infant mortality rate are used as a measure of poverty, respectively. With respect to the quadratic aid term, the results confirmed that there is diminishing return to the inflow of aid (ODA).

**Table 5.9: Summary of the Estimated Long run Coefficients on Aid Variables**

Measure of poverty	Variable	Long run coefficient	Significant
Infant mortality rate	LODA	-0.2	Yes
	LPODA	0.06	Yes
	LODA <sup>2</sup>	0.024	Yes
Gross primary enrollment	LODA	-0.54	Yes
	LPODA	1.2	Yes
	LODA <sup>2</sup>	-	-
Real household consumption expenditure	LODA	5.03	Yes
	LPODA	1.76	No
	LODA <sup>2</sup>	-0.92	Yes

Comparing the values of the estimated coefficients of ODA in the three models, ODA's effect found to be high on household consumption expenditure as seen from the elasticity of consumption expenditure to ODA, i.e., 5.03. This result also supports previous theoretical and empirical arguments which stated that foreign aid increases consumption expenditure in recipient countries.

Although previous empirical studies produced divergent conclusions on the effectiveness of foreign aid in reducing poverty, the findings of this study revealed that aid has significantly contributed for the poverty reduction efforts in Ethiopia, in the study period. Therefore the results of this study found to be in line with Goal 8 of the MDGs which states the requirement of increased global partnership, via foreign aid, for the timely achievement of the poverty reduction goals, specifically, the goals to 'Eradicate Extreme Poverty and Hunger', 'Achieve Universal Primary Education' and 'Reduce Infant Mortality Rate'. However, the significant negative coefficient on the quadratic aid term implies that, there have to be a limit to the aid inflows so as to avoid the adverse impacts on the overall economy.

## CHAPTER SIX

### CONCLUSIONS, POLICY IMPLICATIONS AND DIRECTIONS FOR FURTHER STUDIES

This section presents conclusions, policy implications as well as directions for further studies. The conclusion part provides a brief summary of the study and the policy recommendations are developed based on the findings of the study. Directions for further studies are also suggested at the end.

#### 6.1. Conclusions

Driven by recent shifts in financial flows towards poverty reduction programmes and contradictory findings of previous literature on aid – poverty relations, this study examined the effectiveness of foreign aid in reducing poverty using a time series data (1974/75-2009/10) from Ethiopia.

Investigating the role of foreign aid in reducing poverty in Ethiopia, being the main objective of the study, econometric model have been constructed based on theoretical and empirical literatures. Since data on conventional measures of poverty (head count index, poverty gap index and poverty severity index) is available only for four years (1996, 2000, 2005 and 2011) other three indicators of poverty used to conduct the empirical analysis. These measures are infant mortality rate, gross primary enrollment ratio and real house hold consumption expenditure. Corresponding to the three indicators of poverty, three different models have been formulated by including relevant variables. The first model considered infant mortality rate as measure of poverty with variables economic growth, aid, aid policy interaction term, aid squared, government expenditure on health and governance indicator. The second model differs slightly from the first one as it have gross primary enrollment ratio as a measure of poverty and government expenditure on education substituting the aid squared term. The third model included variables economic growth, aid, aid policy interaction, governance indicator and aid squared with poverty measure real household consumption expenditure.

Given that the data used for analysis is a time series, prior to estimations of the models, unit root tests have been conducted. The results from the ADF and PP unit root tests indicated that all the variables are integrated of order one. After identifying the order of integration, the Johansen



maximum likelihood estimation technique has employed to test for the presence and rank of cointegrating relations, for each model. Consequently, the test indicated the presence of one cointegrating equation in the three models. Since the Johansen maximum likelihood estimation technique treats all the variables as they are endogenous, the true endogenous variables have to be identified in order to formulate the long run relationships using one equation. Thus, the weak exogeneity test has been conducted by imposing zero restrictions on the corresponding relevant parameters. And the likelihood ratios confirmed that infant mortality rate, gross primary enrollment ratio and household consumption expenditure are endogenous to the system in model 1, model 2 and model 3 respectively.

Having the three indicators of poverty as dependent variables the results of long run estimations produced coefficients that are (almost) consistent with theoretical expectations. In the models with dependent variable of infant mortality rate and household consumption expenditure aid found to be a significant poverty reducing factor even without augmented by macroeconomic policy as in the model with dependent variable, gross primary enrollment ratio. Furthermore, the results showed that aid is effective only up to a certain level, which is determined by the absorptive capacity of the economy.

Among the other variables, while economic growth found to be a significant factor that contributes for poverty reduction in all the three models, governance indicators and government expenditure on social sectors appear to have negative and insignificant roles, respectively.

## **6.2. Policy Implications**

Based on the findings of the study the following policy interventions, which are expected to accelerate the poverty reduction efforts in the country, are forwarded.

As the results of the study indicated, though foreign aid helped for the reductions of poverty by reducing infant mortality rate and increasing household consumption expenditure, its effect found to be adverse on gross primary enrollment ratio. And the macroeconomic policies which have improved aid's effectiveness in improving enrollment ratio found to exacerbate infant mortality rate. Thus, sector specific macroeconomic policies have to be formulated and

implemented to achieve the targeted goals of development and poverty reduction through foreign aid.

Revisiting the allocation of foreign aid for different sectors is required to arrive at the desired low level of poverty. That is more aid needs to be allocated for the sectors which can eradicate poverty permanently rather than for consumption.

Policies that can accelerate the economic growth of the country and reduce the governance conditions can also be major intervention areas. The empirical analysis justified that Economic growth is a significant factor in reducing poverty. Thus, by developing policies that can secure the expansion of economic activities and persistent economic growth, poverty can be reduced largely. Similarly, the government has to take firm actions in a way to improve the quality of governance.

### **6.3. Directions for Further Studies**

Although this study came up with new methodology and findings on aid-poverty relations in Ethiopia, there are some issues that are not captured by the current paper. For instance, it would be more interesting if the impact of governance on effectiveness of foreign aid, and, its implication on poverty reduction has been investigated. In addition to this, it is also important to identify the maximum (critical) level of aid receipts in order to avoid the adverse impacts of large aid inflows.

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## Appendices

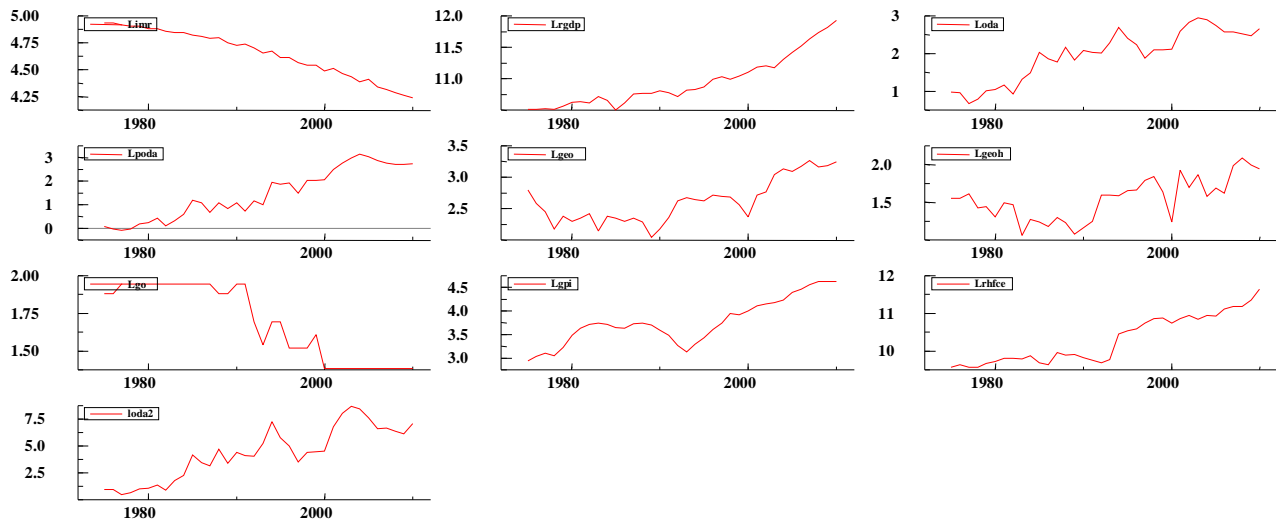
### Appendix A: Phillips-Perron Unit Root Test Results

Variable	Specification	PP Unit Root Test				Order of Integration
		PP test statistic	1% Critical Value	5% Critical Value	P-value	
LIMR	With C	3.031	-3.682	-2.972	1.0000	I(1)
	With C and T	-2.014	-4.288	-3.560	0.5938	
	With no C and T	-6.675	-2.644	-1.950		
DLIMR	With C	-10.477	-3.689	-2.975	0.0000	I(1)
	With C and T	-18.280	-4.297	-3.564	0.0000	
	With no C and T	-5.568	-2.646	-1.950		
LGPI	With C	-0.874	-3.682	-2.972	0.7964	I(1)
	With C and T	-1.709	-4.288	-3.560	0.7468	
	With no C and T	1.788	-2.644	-1.950		
DLGPI	With C	-3.089	-3.689	-2.975	0.0274	I(1)
	With C and T	-3.044	-4.297	-3.564	0.1203	
	With no C and T	-2.853	-2.646	-1.950		
LRHFCE	With C	0.576	-3.682	-2.972	0.9870	I(1)
	With C and T	-1.957	-4.288	-3.560	0.6247	
	With no C and T	2.428	-2.644	-1.950		
DLRHFCE	With C	-5.250	-3.689	-2.975	0.0000	I(1)
	With C and T	-5.422	-4.297	-3.564	0.0000	
	With no C and T	-4.726	-2.646	-1.950		
LRGDP	With C	3.771	-3.682	-2.972	1.0000	I(1)
	With C and T	0.374	-4.288	-3.560	0.9965	
	With no C and T	3.544	-2.644	-1.950		
DLRGDP	With C	-4.615	-3.689	-2.975	0.0001	I(1)
	With C and T	-5.582	-4.297	-3.564	0.0000	
	With no C and T	-3.569	-2.646	-1.950		
LODA	With C	-1.271	-3.682	-2.972	0.6425	I(1)
	With C and T	-2.522	-4.288	-3.560	0.3170	
	With no C and T	0.824	-2.644	-1.950		
DLODA	With C	-6.287	-3.689	-2.975	0.0000	I(1)
	With C and T	-6.252	-4.297	-3.564	0.0000	
	With no C and T	-6.066	-2.646	-1.950		
LPODA	With C	-0.709	-3.682	-2.972	0.8445	I(1)
	With C and T	-3.406	-4.288	-3.560	0.0506	
	With no C and T	1.056	-2.644	-1.950		
DLPODA	With C	-8.290	-3.689	-2.975	0.0000	I(1)
	With C and T	-8.189	-4.297	-3.564	0.0000	
	With no C and T	-7.326	-2.646	-1.950		
LGEOE	With C	-0.788	-3.682	-2.972	0.8226	I(1)
	With C and T	-3.312	-4.288	-3.560	0.0644	
	With no C and T	0.415	-2.644	-1.950		

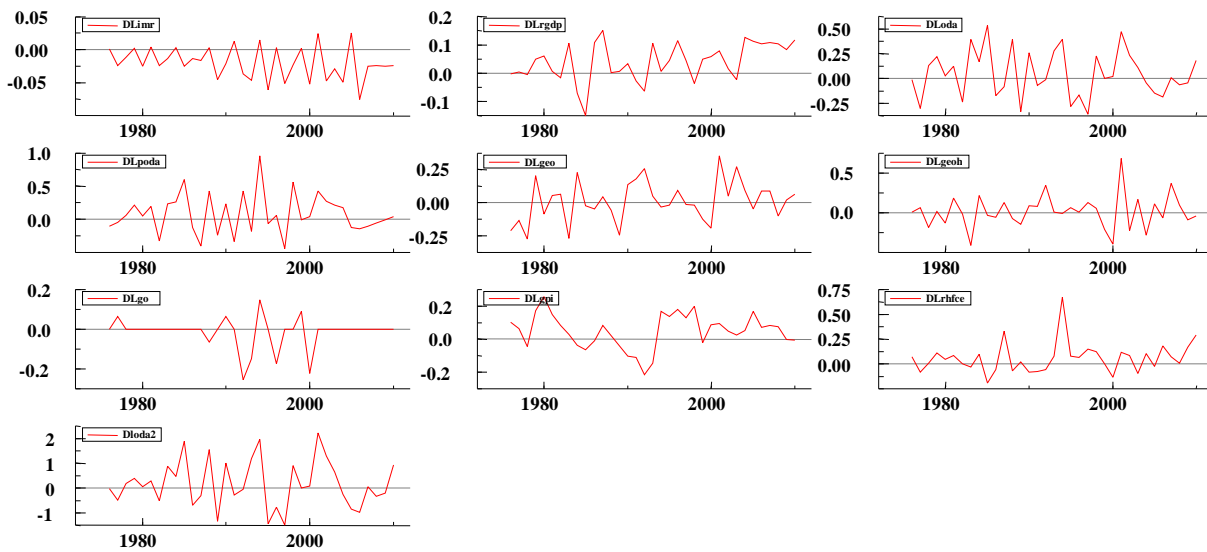
DLGEOE	With C	-6.174	-3.689	-2.975	0.0000	I(1)
	With C and T	-6.433	-4.297	-3.564	0.0000	
	With no C and T	-6.149	-2.646	-1.950		
LGEOH	With C	-1.921	-3.682	-2.972	0.3221	I(1)
	With C and T	-3.338	-4.288	-3.560	0.0602	
	With no C and T	0.343	-2.644	-1.950		
DLGEOH	With C	-9.516	-3.689	-2.975	0.0000	I(1)
	With C and T	-10.053	-4.297	-3.564	0.0000	
	With no C and T	-9.514	-2.646	-1.950		
LGOV	With C	-0.278	-3.682	-2.972	0.9285	I(1)
	With C and T	-2.658	-4.288	-3.560	0.2540	
	With no C and T	-1.647	-2.644	-1.950		
DLGOV	With C	-6.508	-3.689	-2.975	0.0000	I(1)
	With C and T	-6.431	-4.297	-3.564	0.0000	
	With no C and T	-6.085	-2.646	-1.950		
LODA2	With C	-1.269	-3.682	-2.972	0.6433	I(1)
	With C and T	-2.877	-4.288	-3.560	0.1701	
	With no C and T	0.328	-2.644	-1.950		
DLODA2	With C	-5.696	-3.689	-2.975	0.0000	I(1)
	With C and T	-5.611	-4.297	-3.564	0.0000	
	With no C and T	-5.585	-2.646	-1.950		

## Appendix B: Plot of Variables Used in the Study

### I. Graph of All Variables at Level



### II. Graph of All Variables at Their First Difference



## Appendix C: $\alpha$ and $\beta$ matrices

### I. $\alpha$ - coefficients

$(\alpha_1 \text{ s})$ for Model 1							
LIMR	-0.32709	0.039844	0.011136	-0.0093774	-0.0008077	-8.8136e005	-0.0005451
LRGDP	-0.36161	-0.25218	-0.020129	0.025224	0.0044060	-0.018017	-0.0011470
LODA	-0.4054	0.70170	0.020817	-0.33520	0.020820	-0.019826	0.0077490
LPODA	0.7303	0.45186	0.077472	-0.63867	0.010937	-0.0089711	0.0061751
LGEOH	0.54001	0.51703	-0.11990	-0.22093	-0.0069884	0.026104	-0.0078182
LGOV	0.69122	0.20954	0.020871	0.094615	-0.0025456	-0.027780	-0.0008655
LODA <sup>2</sup>	-0.4524	2.9466	0.10301	-1.0121	0.10692	-0.028927	0.019790
$(\alpha_2 \text{ s})$ for Model 2							
LGPI	-0.27181	0.065413	0.022342	0.0063732	0.16828	0.0081658	-0.022507
LRGDP	-0.070730	-0.04147	-0.086799	0.0012953	0.12058	-0.017959	0.024339
LODA	0.29878	0.36880	0.22375	0.049313	-0.0055923	0.015578	0.070438
LPODA	0.40857	0.44001	0.36564	0.018324	0.27434	0.10200	0.026641
LGEOE	-0.047760	0.16450	-0.12068	-0.019117	-0.21431	0.034704	0.059164
LGOV	-0.052175	0.092474	0.12367	-0.012468	0.038190	-0.025782	5.7688e005
LGEOH	0.0074818	0.38938	-0.36559	-0.024241	-0.18916	0.014493	-0.014167
$(\alpha_3 \text{ s})$ for Model 3							
LRPFCE	-0.12253	0.077549	-0.10769	-0.018596	-0.037755	0.016326	
LRGDP	0.018571	0.092962	-0.047711	-0.015886	-0.0031530	0.016326	
LODA	-0.094067	-0.06041	-0.93837	0.019644	-0.038521	0.0010015	
LPODA	-0.16835	-0.40803	-0.80941	-0.0079763	-0.026051	-0.026588	
LGOV	-0.035188	0.016951	0.20194	-0.0015514	-0.039158	-0.023069	
LODA2	-0.57560	-0.13031	-3.1965	0.073834	-0.044795	-0.12019	

### II. Long Run Coefficients under Alternative Normalizations

$(\beta \text{ s})$ for Model 1						
DIMR	LRGDP	LODA	LPODA	LGEOH	LODA <sup>2</sup>	LGOV
1.0000	0.23940	0.20394	-0.057932	0.012457	-0.024060	-0.54116
1.8380	1.0000	0.26203	-0.24793	-0.94012	-0.094739	-1.9311
-2.7119	-2.6692	1.0000	-0.34443	2.0839	-0.34792	-0.72018
8.3477	2.0746	1.0374	1.0000	0.74013	-0.35336	0.30323
-27.932	-8.7129	8.3533	2.6764	1.0000	-4.2018	-0.31757
-0.084335	-0.46001	6.3546	-0.59589	0.71237	1.0000	10.863
-19.471	6.8869	0.50370	-6.8929	5.4458	-1.3983	1.0000
$(\gamma \text{ s})$ for Model 2						
LGPI	LRGDP	LODA	LPODA	LGEOE	LGOV	LGEOH
1.0000	-1.9347	0.53692	-1.2048	0.49250	0.23888	-0.13755
-0.13715	1.0000	0.080007	-0.55871	0.25672	-3.5903	-1.5523
0.95689	0.11641	1.0000	-0.68924	-0.73434	-2.0922	1.3608

-0.26234	-10.818	-7.7578	1.0000	2.9614	6.5325	0.29926
0.10634	-1.0078	0.089359	-0.33416	1.0000	-0.66616	-0.060132
-2.5626	1.9457	0.16849	-0.087211	-2.0985	1.0000	1.2879
-0.53230	-0.76254	-0.46286	0.19862	-1.9785	-0.60448	1.0000
( $\delta_s$ ) for Model 3						
LRHFCE	LRGDP	LODA	LPODA	LGOV	LODA2	
1.0000	-2.8727	-5.0343	1.7554	7.9608	0.91887	
-1.9126	1.0000	0.65541	1.9254	-0.60757	-0.62192	
0.25138	0.77637	1.0000	0.14135	-0.44275	-0.15061	
-0.55518	4.5830	6.6425	1.0000	3.3966	-2.2444	
1.0056	-1.1038	4.3501	0.12529	1.0000	-1.0738	
4.4416	4.9460	-1.0559	-0.24569	4.6054	1.0000	

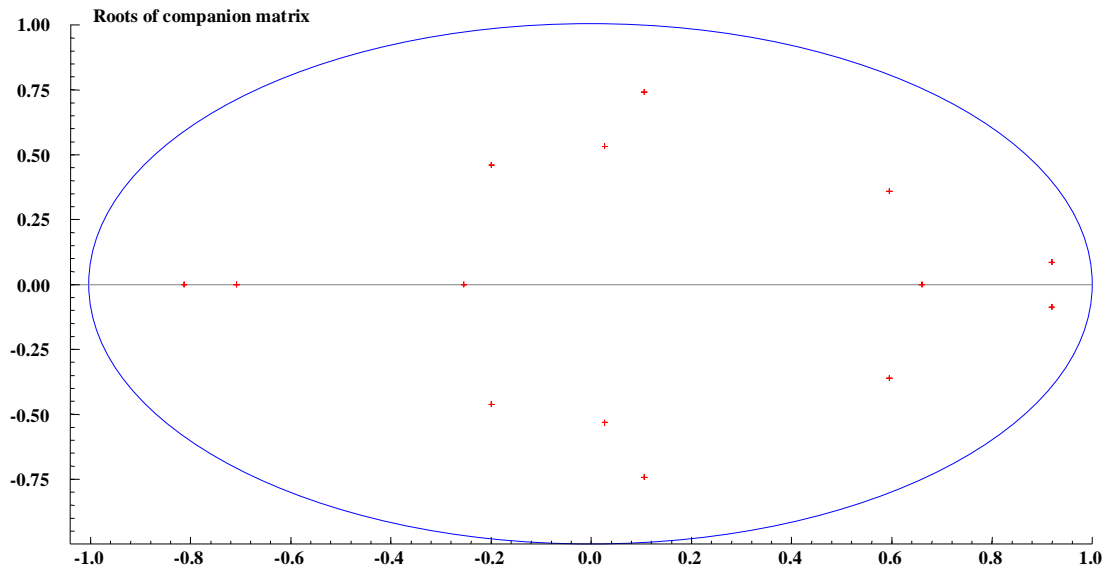
#### Appendix D: Results of Long Run Coefficients Significance Test

Variables	$\beta$ -coefficients	Chi <sup>2</sup> (1)	p-value
$\beta$ coefficients			
Variables	$\beta$ -coefficients	Chi <sup>2</sup> (1)	p-value
LRGDP	0.23940	19.188	[0.0000]***
LODA	0.20394	30.558	[0.0000]***
LPODA	-0.057932	10.177	[0.0014]***
LGEOH	0.012457	0.18536	[0.6668]
LGOV	-0.54116	27.818	[0.0000]***
LODA <sup>2</sup>	-0.024060	8.3129	[0.0039]***
$\gamma$ – coefficients			
LRGDP	-1.9347	9.4516	[0.0021]***
LODA	0.53692	3.9824	[0.0460]**
LPODA	-1.2048	10.721	[0.0011]***
LGEOE	0.49250	0.23888	-0.13755
LGOV	0.23888	0.072494	[0.7877]
LGEOH	-0.13755	0.10630	[0.7444]
$\delta$ – Coefficients			
LRGDP	-2.8727	4.8196	[0.0281]**
LODA	-5.0343	8.2670	[0.0040]***
LPODA	1.7554	3.1983	[0.0737]
LGOV	7.9608	16.965	[0.0000]***
LODA <sup>2</sup>	0.91887	4.2359	[0.0396]**

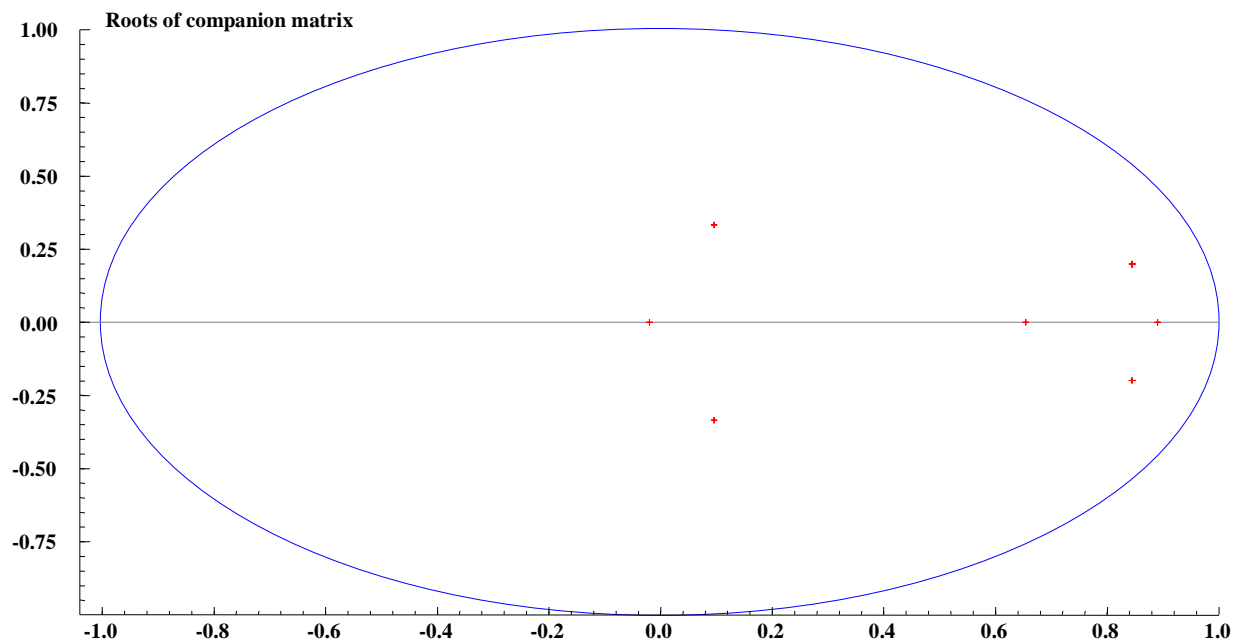
## Appendix E: VAR Stability Tests

### I. VAR stability tests using the roots of companion matrix

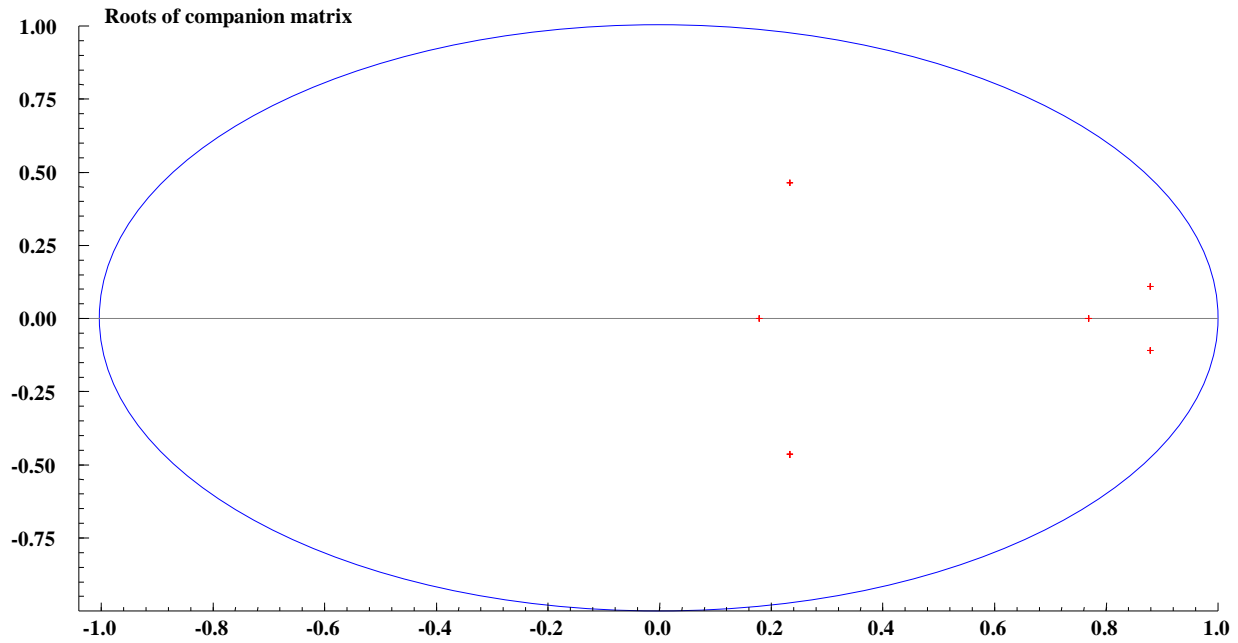
#### A. Roots of companion matrix for Model 1



#### B. Roots of companion matrix for Model 2

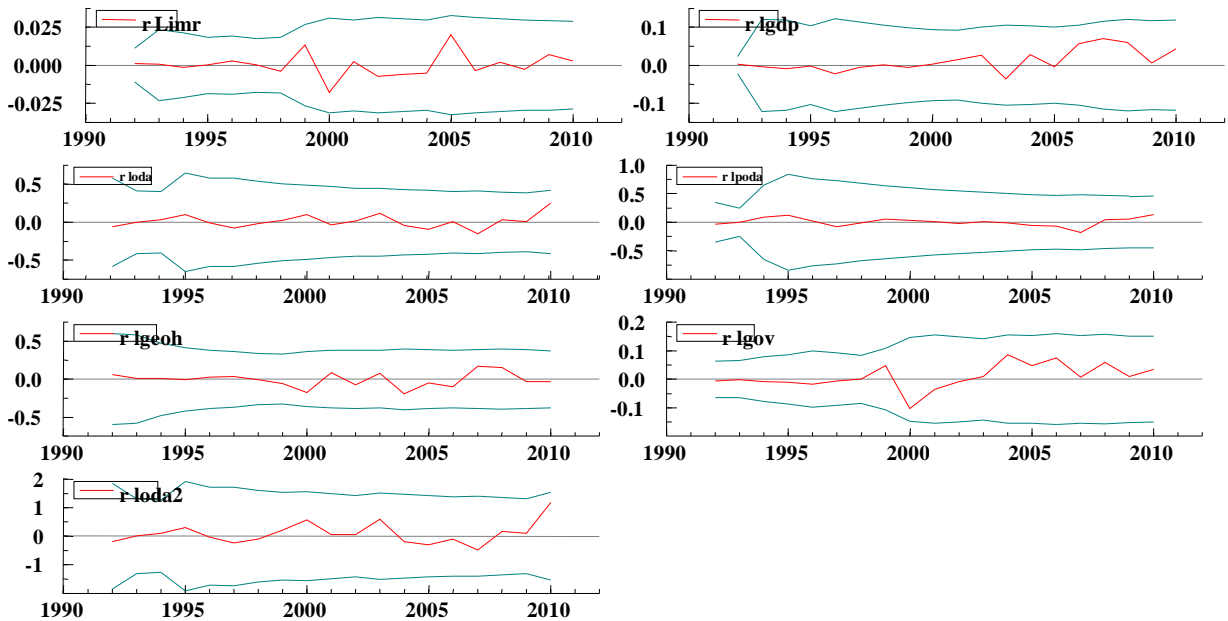


### C. Roots of companion matrix for Model 3

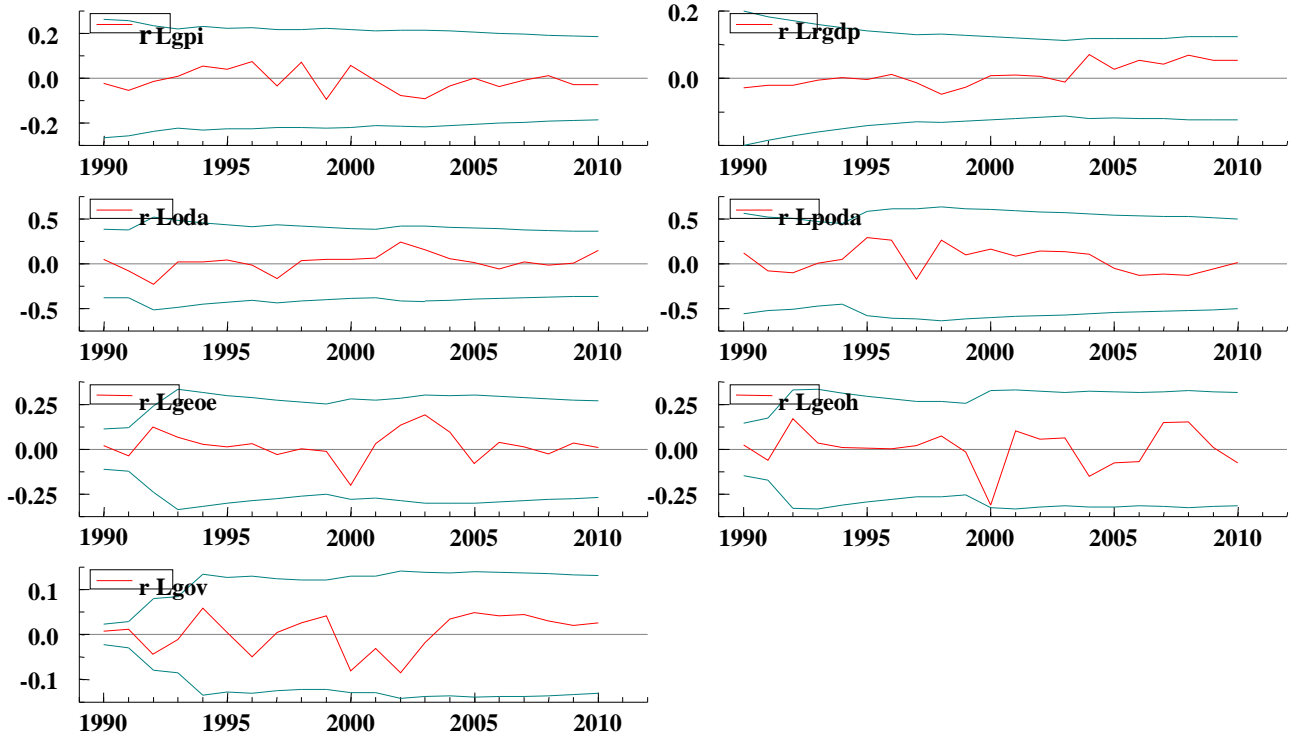


## II. VAR Stability Test Using Plot of Recursive Graphs (1-step residuals +/-2nd SE).

### A. For Model 1

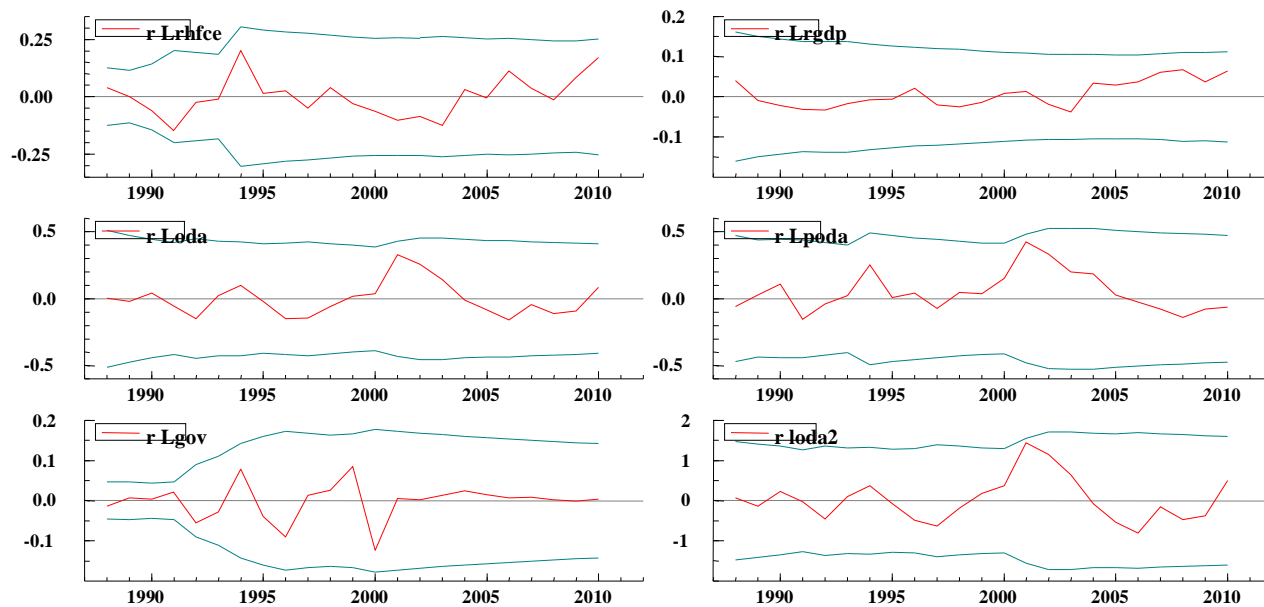


B. For Model 2



C. For Model 3





## Appendix F: Short Run Model Diagnostic Test Results

### A. For Model 1

AR 1-2 test:  $F(2,19) = 0.68962 [0.5139]$

ARCH 1-1 test:  $F(1,19) = 2.5346 [0.1279]$

Normality test:  $\text{Chi}^2(2) = 1.8691 [0.3928]$

Hetero test:  $\text{Chi}^2(22) = 19.035 [0.6432]$

RESET test:  $F(1,20) = 0.12304 [0.7294]$

### B. For Model 2

AR 1-2 test:  $F(2,16) = 1.6533 [0.2225]$

ARCH 1-1 test:  $F(1,16) = 0.19120 [0.6678]$

Normality test:  $\text{Chi}^2(2) = 1.2763 [0.5283]$

Hetero test:  $\text{Chi}^2(22) = 20.309 [0.5637]$

RESET test:  $F(1,17) = 2.0978 [0.1657]$

C. For Model 3

AR 1-2 test:  $F(2,22) = 1.8997 [0.1734]$

ARCH 1-1 test:  $F(1,22) = 1.1681 [0.2915]$

Normality test:  $\text{Chi}^2(2) = 2.6384 [0.2673]$

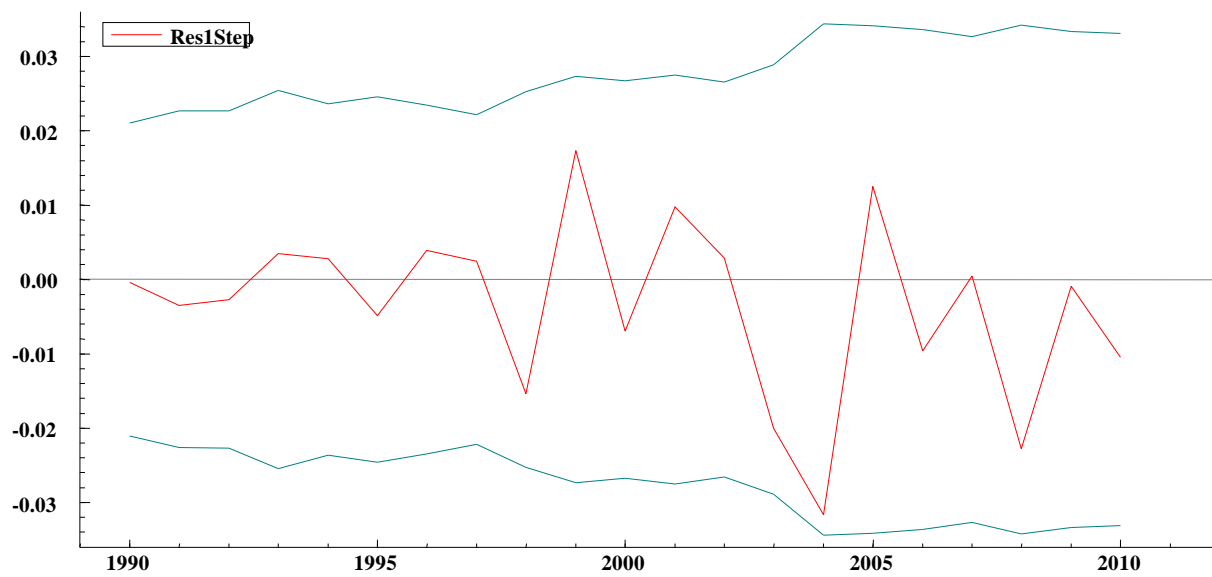
Hetero test:  $F(18,5) = 0.37282 [0.9444]$

RESET test:  $F(1,23) = 3.6839 [0.0674]$

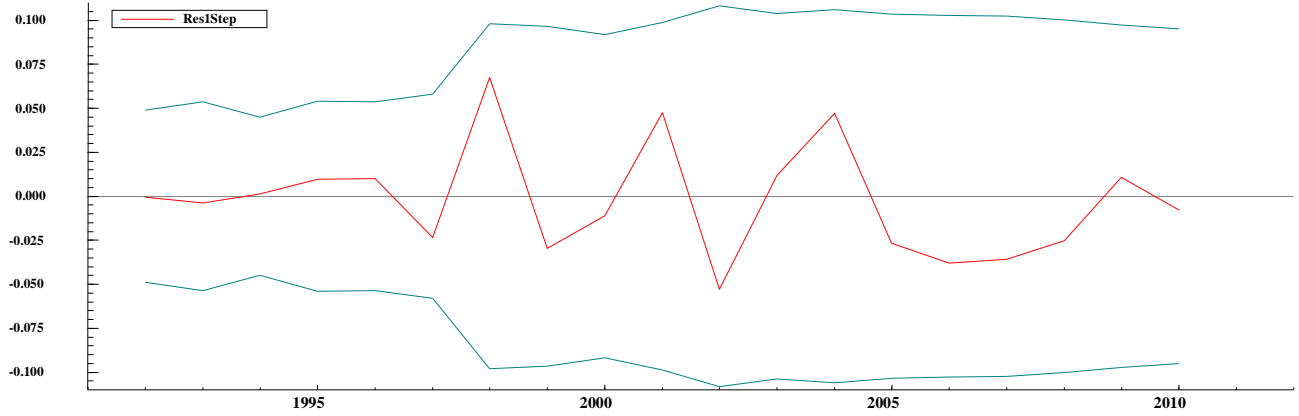
**Appendix G: Short run Model Stability Test Results**

(1-step residuals +/-2nd SE)

A. For Model 1



### B. For Model 2



### C. For Model 3

