ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

Foreign Aid and Human Development in Sub-Saharan Africa: Panel Data Evidence

By

Yidnekachew Wondimu

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Masters of Science in Economics (Economic Policy Analysis)

June 2009

Addis Ababa

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

"Foreign Aid and Human Development in Sub-Saharan Africa: Panel Data Evidence."

By

Yidnekachew Wondimu Zewde

Approved by the Board of Examiners:

Hussien Hamda
Advisor

Signature

Teshome Mulat
Examiner

Signature

Getachew Yoseph
Examiner

Signature

Acknowledgments

First and for most I would like to thank my research advisor, Dr. Hussien Hamda for his invaluable advise, comments and encouragement from the start of the work to the final submission. For me, words are limited to express his commitment, dedication, kindness, politeness and friendly approach. Without his understanding and assistance the completion of this paper would have not been real. However, all errors and inconsistencies if any are of mine. Secondly, I would like to thank the United Nations Economic Commission for Africa's (UNECA) library staffs for providing me the necessary materials and unlimited internet access. My heartfelt gratitude also goes to Berektie Kinfe for her unlimited patience, encouragement, financial assistance, moral, love and understanding. Finally, all family members, relatives, friends, classmates, the African Economic Research Consortium (AERC) staffs and the Economics Department secretaries deserve appreciation for providing me moral, financial assistance, training and information. For all, I would like to say thank you very much.

Table of Contents

Contents **Page**

List of Tables

List of Figures

Abbreviations and Acronyms

AEL	Aid Effectiveness Literature
CRS	Credit Reporting System
DAC	Development Assistance Committee
DPD	Dynamic Panel Data
GMM	Generalized Methods of Moments
GDF	Global Development Finance
GDP	Gross Domestic Product
GODA	Gross Official Development Assistance
HIPCs	Highly Indebted Poor Countries
HDI	Human Development Indicators
IDA	International Development Association
IMF	International Monetary Fund
LDCs	Least Developed Countries
MTBF	Medium-Term Budget Framework
MTFF	Medium-Term Fiscal Framework
MDGs	Millennium Development Goals
NAT	Net Aid Transfer
NOA	Net Official Aid
NODA	Net Official Development Assistance
NGOs	Non-Governmental Organizations
OECD	Organization for Economic Cooperation and Development
SSA	Sub-Saharan Africa
UNDP	United Nations Development Programme
WDI	World Development Indicators

Abstract

This paper re-examines the question of aid effectiveness in Sub-Saharan Africa (SSA) by analyzing the effect of foreign aid on selected components of HDI including economic growth, adult literacy and under-five mortality rates. The estimation technique of Dynamic Panel Data (DPD) System-GMM has been applied to a panel data from 44 SSA countries for the period 1973-2007. The data shows that during the period considered, SSA's share of aid inflows to the developing world is significant. However, following the global financial crisis, total foreign aid and SSA's share is expected to decline. This requires better use of the limited aid resource. Thus, searching for ways to use the aid in an efficient manner and spending the money in those activities and/or sectors which yield better economic outcomes is seems to be imperative. The estimated results indicate that the impact of aggregate aid on economic growth is statistically insignificant, but the aid enhances economic growth when matched with good domestic macro-policies. However, the effectiveness of aid to the education and health sectors is justified irrespective of the quality of domestic institutions. This implies that aid to the region can bring improvement in human development if coupled with good macro policies and institutional setup. The Robustness of these results is also checked with respect to the use of different definitions of foreign aid (aid per capita and aid-to-GDP ratio) and results remained unchanged. Thus, the policy implication is that aggregate aid to the region can bring economic growth if efforts are made to improve the policy environment. Moreover, for the overall improvement in human development, foreign aid to the region should better target education and health sectors, which UN Millennium Development Goals (MDGs) target. In general, the result suggests that macro-policies would help countries of the region not only to grow but also to make aid more effective to spur economic growth. Thus, in the medium and long-term, to realize the benefits of good policy in a better way, revising and working towards appropriate institutional setup and macro polices in the region is advisable.

I. Introduction

1.1 Background of the Study

Foreign aid can be defined in different ways and take different forms. According to the standard set by Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD), *Net Official Development Assistance* (NODA) consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of DAC, multilateral institutions, international institutions (such as the World Bank and IMF) and by non-DAC countries to promote economic development and welfare in countries and territories in part I (developing countries) of the DAC list of aid recipients (OECD, 2003). However, to take a certain transfer of resource as foreign aid, the concessionality of such transfer should be reflected in way that it should include loans with a grant element[1] of at least 25 percent (which is calculated at a discount rate of 10%).

According to the various aid-related reports of the OECD and the World Bank, a huge amount of aid as a percentage of GDP and total expenditure has been given to different countries in SSA for the purpose of reducing poverty, ensuring stability, curbing short-term problems such as famine and disasters, and for humanitarian emergency purposes. For example, for SSA, Net ODA from all donors as a percentage of recipient's GDP has increased from 4.1 in 1980 to 5.6 in 2003 (World Bank, 2005). The lion's share of this aid (around 75% in 1980s) has been received from DAC donors.

[1] *The grant element of aid reflects the financial terms of a transaction: interest rate, maturity and grace period. It is a measure of the concessionality (softness) of a loan. It is calculated as the difference between the face value of a loan and the discounted present value of the service payments the borrower will make over the lifetime of the loan, expressed as a percentage of the face value (OECD, 2006).*

Indeed, sector-level aid (especially aid to education sector) has increased substantially over the past decades. For example, over the period 1993-96 to 2002-2004, aid in education as a share of total aid increased from about 1.1% to about 9.3% (Elizabeth and Nandwa, 2006).

A critical review on the findings of previous studies concerning the reliability of foreign aid to development in LDCs results in three broad lines of arguments. These are aid *pessimistic view* (e.g., Easterly, 2003; Rajan and Subramanian, 2005); aid *optimistic view* (e.g., Bermopong and Elizabeth, 2008; Radelet et al., 2004 and Collier, 2006) and aid *conditionality view* (aid supporters with some conditions and prerequisites), i.e., aid can be effective to reduce the different indicators of poverty and underdevelopment if it is "managed efficiently" and coupled with good macro-policies and strategies (e.g., Burnside and Dollar, 2000).

For instance, in the second category of argument, Gupta et al. (1999) found that aid-financed public expenditures on health and education resulted in reduction of infant mortality and increased school enrollment rates in LDCs. Contrary to this, Filmer and Pritchitt (1999) and Roberts (2003) found that aid-financed expenditure on education had no significant effect on enrollment rates.

Although various studies have been done in the area of foreign aid, poverty and growth, most of the works conducted so far are either on the effectiveness of aggregate aid on growth or on other indicators of human development (such as infant mortality and adult literacy rates). The efforts made to analyze the issue with disaggregation of aid and the resulting development indicator was very limited. Most aid effectiveness studies, such as by Burnside and Dollar (2000), Hassen (2008), Easterly (2003), Easterly et al. (2004) and Gomanee et al. (2005) narrowly defined human development and considered economic growth (as proxied by GDP per capita growth rate) as adequate indicator.

The debate on the effectiveness of foreign aid is still hot and on-going. Thus, the area invites attention to be a part of it and needs effort to try to bridge some of the existing gaps in the current period of sizable aid inflows to SSA with the objective of attaining different domestic macroeconomic goals and internationally agreed targets such as Millennium Development Goals (MDGs). Thus, SSA deserves to be a focus for studies on aid-related issues.

In this thesis, effort is made to widen and disaggregate the aid-generated outcomes into economic growth, adult literacy and mortality rates. In short, the study attempts to show the effect of different forms of foreign aid (aggregate, education and health aid) on three elements of human development indicators (economic growth, mortality and literacy rates). Thus, it is intended to explain the macroeconomic effects of aid and thus its effectiveness to influence HDI, which is the main issue in SSA, by estimating econometric models using panel data analysis for the period 1973-2007.

The estimated results indicate that aggregate net aid transfer is conditionally effective, i.e. its effectiveness is conditioned on the goodness of domestic macro-policies. However, aid to the education and health sectors is unconditionally effective to improve adult literacy and reduce under-five mortality rates respectively. Thus, it implies that aid effectiveness studies should be extended with disaggregation of aid instead of using aggregate aid. This approach has got strong support from previous studies such as Bermopong and Elizabeth (2008), Thiele and Dreher (2006) and Masud and Yontcheva (2005).

1.2 Statements of the Problem

It is obvious that a number of studies have been conducted on foreign aid, economic growth and poverty at individual country, regional and international levels by applying different methodologies and using different data sets. However, the theoretical predictions and empirical evidence on the impact of foreign aid on selected components of human development indicators (HDI) is still mixed. For example, Mishra and Newhouse (2007) and Gomanee et al. (2005) found that aggregate aid improve HDI and reduces infant mortality in LDCs. Similar conclusion has been reached by Roberts (2003) and Verschoor and Kalwij (2006). However, Boone (1996) found that aggregate aid has no significant impact on infant mortality or income growth in LDCs.

The pool of empirical studies in SSA also brings the mixed and inconclusive results into the front. For instance, Easterly (2003) pointed out that aid has been most ineffective in SSA. Others, such as Burnside and Dollar (2000), who advocate the unconditional or conditional effectiveness of foreign aid, do accept that it has been less effective in the region. Thus, due to the existence of such long debates on the effectiveness of aid, Collier (2006) and Fundagna (2008) came up with the suggestion that SSA is the region where the issues of aid and aid effectiveness remain unsettled yet and it is the future playfield of aid.

In a nutshell, the non-robustness of the results of the previous studies is because of factors such as the quality of the data used, the methodology applied, the definition of the variables, the proxy considered, aggregations and targets to be attained. The problem of excessive aggregation of the aid and its outcome variables however attracted more attention in the current research arena.

Masud and Yontcheva (2005) studied the effectiveness of foreign aid in reducing poverty through its impact on HDI for different poor countries of Asia, Latin America and Africa. Thus, using a dataset of both bilateral aid and NGO aid inflows, their results showed that NGO aid reduces infant mortality and does so more effectively than official bilateral aid. The impact on illiteracy is less significant. From the other side of disaggregation, Hassen (2008) argues that both bilateral and multilateral aids are ineffective at influencing economic growth in SSA. In addition, he suggested that research on aid effectiveness remains to be extended along with high level of disaggregation.

Similarly, Harms and Lutz (2004) emphasized the need for new approach, an approach which disaggregates aid both with regard to the different components of aid and to the various aspects of policies or institutions. Clemens et al. (2004) also came up with a similar proposal to disaggregate aid into different components and tested a relationship between the correct component of aid and growth, rather than arguing that aid is effective or ineffective with analysis based on a wrong variable.

Some researchers also criticize previous studies which evaluating the effectiveness of foreign aid using growth in per capita GDP. For instance, Masud and Yontcheva (2005) argue that the very objective of foreign aid is poverty reduction, which could be measured by other development indicators (e.g., improvements in health care and educational achievements) than by the growth in per capita GDP. Although aggregate aid may not have a significant positive effect on income growth, it is possible that it may lead to poverty reduction and improvement in the living standards of many people through improved health, education and reductions in hunger (Bermopong and Elizabeth, 2008).

Even if methodological issues have been refined and advanced, the literature presents rather inconclusive and mixed results. However, in studies conducted hitherto, the use of panel data estimation technique in answering the research questions was limited (at least not numerate). In this study, panel data estimation technique is applied with the advantage of dealing with cross-sections repeatedly observed over time (i.e. it combines cross-sections with time series). Furthermore, panel data adds more variability, renders better efficiency and enables one to better analyze the dynamics of adjustment than its time series counterpart (Baltagi, 2005).

Thus, motivated by the above lines of evaluations, criticisms and suggestions on earlier works, such as measurement issues and the need for aid disaggregation, this thesis is conducted to shed some light on the issue and to bridge the gaps existing in the aid literature. Thus, it tries to extend the horizon a little bit further by disaggregating aid into net aid transfer, education and health sector aid and links each with the associated components of HDI (growth, literacy and mortality rates). Following such lines of arguments, econometric results indicated that aggregate aid transfer is effective if coupled with good macro-policies, but aid to the health and education sector is effective to reduce under-five mortality and improve adult literacy rates, respectively. However, aggregate aid is not statistically significant to affect those sectoral outcomes, which poses doubt on the findings of most previous aid effectiveness studies and favors aid disaggregation.

1.3 Objectives of the Study

The general objective of this study is to examine the effectiveness of aggregate and sectoral aid on selected components of human development indicators (economic growth, adult literacy and under-five mortality rates) in SSA. The specific objectives of the study are:

i. to examine the effectiveness of aggregate aid on economic growth in SSA; and
ii. to study the effect of health and education aid on under-five mortality and adult literacy rates, respectively.

1.4 Significance of the Study

This study is significant to SSA in general and to Ethiopia in particular since in these economies the long-run targets, among others, is reducing poverty, plummeting excess dependency on external finance, ensuring growth and stability, attaining the MDGs and improving the human development. Thus, the outcomes of the study are helpful in this line.

1.5 Scope and Limitations of the Study

The scope of this study is delimited to the analysis of the effects of net aggregate aid transfer, health and education aid on economic growth, mortality and literacy rates. In fact, these are not the only components or indicators of human development. HDI also includes other indicators such as longevity (life expectancy), access to pure water and maternal mortality. However, due to data limitation, this study limits its scope to the analysis and examination of the macroeconomic effects of different types of aid on only these three components of HDI.

In the analysis of the effectiveness of education aid, the dependent variable (literacy rate) in the estimated equations is a quantitative indicator. However, to see the effect of aid on quality aspects, education outcome should have been measured in terms of completion rates and some measures of educational quality. In the WDI (2008) database, the data on quality indicators such as completion rates are lacking.

Furthermore, the data used for the regression of mortality and literacy equations do not capture all the health and education aid inflows to the various recipient countries -- the Credit Reporting System (CRS) database does not have data on aid from some non-DAC countries and multilateral agencies. However, DAC's aid constitutes more than 75% of the ODA to the region, which is significantly representative. As to sampling, the sample selection is purely guided by the availability of data. For this reason, some countries such as Somalia, Eritrea and Sao Tome & Principle are excluded from the regression analysis.

1.6 Organization of the Study

The rest of the thesis is organized as follows: the next section discusses the theoretical and empirical literature. The third section describes the research methods followed including the nature and sources of data utilized in the study to achieve the set objectives. Descriptive and econometric results are presented and discussed in section four. The last section provides conclusions and policy implications drawn from the findings of the study.

II. Review of Related Literature

2.1 Theoretical Literature

2.1.1 Types and Measurement of Aid

Before proceeding any further, it is worthwhile to explain and discuss some of the variables and technical terms which are used in this work. Firstly, foreign aid is a transfer of resources on concessional terms undertaken by official agencies in order to support the economic, social and political development of LDCs (Radelet, 2006). However, according to DAC's definition, a transfer is considered as foreign aid if it has a grant element of 25% or more.

The Gross Official Development Assistance (GODA), which treats all grants and ODA loans extended as aid, includes such items as the debt forgiveness grants (cancellations of non-ODA loans called Other Official Assistance loans). These items, as Roodman (2006a) argues, either lack enough concessionality (the minimum requirement of 25% grant element) or are originally provided to assist a non-developmental purpose. In addition, as the capitalization of interest arrears accompanying debt rescheduling does not imply any actual transfer of money, its treatment as a new aid flow overstates the true value of developmental aid (see e.g., Hassen, 2008).

However, netting the repayments on ODA (principal and net interests) in addition to rescheduled debts and debt forgiveness grants out of GODA gives the Net Aid Transfers (NAT). Net ODA (NODA), which nets out principal repayments out of GODA, is criticized for neglecting the netting out of interest repayment. In this thesis, therefore, the use of Net Aid Transfers (NAT), where there are different measurements of aid such as GODA and NODA draws from the extensive criticisms of these alternatives by Roodman (2006a) and later by Hassen (2008).

One of the basic issues in the study of aid is about the indicator of aid dependency. Ratios of aid to Gross National Income (GNI), gross capital formation, imports, and government spending can provide a measure of the recipient country's dependency on aid. Such ratios are generally much higher in SSA than in other regions, and they increased in the 1980s. For instance, Moss and Subramanian (2005) identified 22 low-income countries, 16 of which were in Sub-Saharan Africa where ODA inflows were equivalent to at least half of total government expenditure. And in 12 poor countries, of which ten are in SSA, the ratio of ODA to government expenditure was 75% or more. The increase in aid dependency ratios reflects events affecting both the numerator and the denominator. Thus, aid dependency ratios may reveal as much about a donor's interest as they do about a recipient's needs (OECD, 2004).

2.1.2 Aid in Macroeconomic Perspective

Here, it is very important to review some literature on how aid affects economic performance. Thus, the following section is devoted to the discussion on how aid is incorporated into macro-analysis and shows the transmission mechanism through which foreign aid affects economic growth and welfare. According to the classical economist's concept of National Income Accounting Identity, the expenditure on domestically produced output is given by:

$$Y = C_d + I_d + G_d + EX \quad ----- (1)$$

where, C_d shows expenditure on consumption of domestically produced goods and services; I_d represents net domestic investment; G_d stands for government spending on domestically produced goods and services; and EX represents export of goods and services to abroad for sale.

However, the total consumption, investment and government spending can be disaggregated into domestic (d) and foreign (f). Therefore, the above identity, (1), can be represented as,

$$Y = [C - Cf] + [G - Gf] + [I - If] + EX \quad ----(2)$$

where, C_f, G_f and I_f are together implying expenditures made on foreign produced goods and services. It is also known that Gross Domestic Product (GDP) is the total expenditure on domestically produced goods. Therefore, equation (2) can be rewritten as;

$$Y = C + I + G + EX - [C_f + I_f + G_f] \quad ----(3)$$

In equation (3), the term inside the square bracket is the total spending on imported goods. Thus,

$$Y - C - G = I + [EX - IM] \quad ----(4)$$

If taxation (T) is added and subtracted from the left hand side of equation (4) and if investment is disaggregated into private (p) and government (g),

$$[Y - C - T] + [T - G] = [I_p + I_g] + [EX - IM] \quad ----(5)$$

where, the expressions $[Y - C - T], [T - G]$ *and* $[EX - IM]$ show private savings, public savings and net export (foreign sector savings), respectively. However, with minor mathematical manipulations, the above identity (5) can be re-formulated as,

$$(Y - [C + G]) - [Ip + Ig] = [EX - IM] \quad ----(6)$$

$$[S - I] + [IM - EX] = 0 \quad ---(7)$$

The identity in (7) points out that the fund remained after investment is intended to be used for import demand. Therefore, it implies the fact that the economy balances the domestic net sources of fund to the uses of fund. However, countries in SSA have been importing capital goods, exporting more of primary goods and saving little as compared to their investment need. Thus, the basic question to be asked here is how the financial gap gets filled. The gap between overall savings net of investment (S-I) and trade balance (EX-IM) invites foreign assistance into the picture (for more on gap models, see Chenery and Strout, 1966 and Bacha, 1990).

2.1.3 The Functioning of Aid in the Supply Side

The above analysis is devoted to the demand side of the economy. However, according to Collier and Dollar (2002) and Rajan et al. (2005), the effect of aid is not only limited to the demand side but it also affects the supply side of the economy by increasing the productivity of inputs, such as capital and labour. Theoretically, perhaps the main impact of aid is to increase capital stock (K). This may increase output and hence living standards. Therefore, by providing aid, increasing K and GDP it is hoped that this will change living standard of a country and will enable to fund public and private investment from their own savings and taxation –self-sustaining growth, in Rostow's words (Symposium on Aid, 2004).

However, unrequited aid inflows can generate so-called "the transfer paradox." Thus, aid flows can make a country worse off than before. Foreign aid generally accrues to the public sector and the economic impact of aid flows highly depends on what the government does with aid. If either the public or the private sector spends the gift on imported goods, there will not be any macroeconomic

effects (Rajan et al. 2005). The government can possibly transfer the aid receipts to the private sector, directly or through tax cuts, or in the form of increased expenditure. Regardless of the form, it is very likely that in response to the aid flows domestic demand will rise. Unless there is considerable excess supply in the economy, real exchange rate or the prices of domestically produced goods and services must increase in the short run.

As Rajan et al. (2005) argue, the medium-run effects, however, depend on the supply side response. The response of the supply side is determined by how aid inflows are utilized to build on the productive capacity of the economy and how the supply side responds to those changes. One of the possible scenarios is that excess demand in the non-tradable sector is met by attracting some labor and capital from the export sector.

The inter-sectoral reallocation of resources away from the export into non-tradable sector results in a shrinking export sector. This hurts the growth prospects as the traditional export sector is, by and large, characterized by relatively high productivity gains. Also, if the resulting expansion in the sector is strong relative to the growth in domestic demand, the prices of non-tradable will fall. This generates the possibility that the real income may go down for a small open economy, if the prices fall down enough. This phenomenon is termed as "the transfer paradox", which is closely related to the "The Dutch disease effect" of aid inflows.

However, this channel can be broken down into two mediating channels: from aid to exchange rates and from exchange rates to the growth of the tradable sector. Thus, this implies that the supply responses to aid matters a lot for the overall effectiveness of aid.

2.1.4 Aid and Economic Growth: A Theoretical Review

The standard theoretical model in the literature to investigate the relationship between aid and growth has been the *two-gap model* of Chenery and Strout (1966). The gaps referred to in the model are the differences between: (i) domestic savings and the necessary level of investment to achieve a certain rate of growth; (ii) foreign exchange receipts and the level of imports required to reach a certain level of production. However, Chenery and Strout (1996) built on earlier works by other development economists, such as Lewis (1954) and Rostow (1960). According to Easterly (2003), "Rostow (1960) left an indelible mark on development thinking by promising that an aid-financed increase in investment would launch a take-off into self-sustained growth."

The two-gap model has been extended into *three gap model* by Bacha (1990) to include government's fiscal position as another possible gap. It is based on the premise that foreign aid actually finances investment rather than consumption, and investment is productive. In fact, in order for foreign aid to be channeled into investment, the incentives to invest, as opposed to consume, must be there (Mehmet, 2008). As Easterly (2003) puts it, to have a positive link between aid and economic growth, foreign aid must go into investment and that investment must be productive.

In the two-gap model, economic growth depends on investment as a share of GDP, adjusted by a factor that reveals whether investment is of high or poor quality. In this case, the amount of investment would be the sum of domestic savings and foreign aid. The model can be spelled out in this way as, $g_y = \frac{\left(\frac{I}{Y}\right)}{\alpha} = \frac{\left(\frac{S}{Y} + \frac{A}{Y}\right)}{\alpha}$ i.e. $\frac{I}{Y} = \frac{S}{Y} + \frac{A}{Y}$

where, I is required investment, Y is output, g_y is target GDP growth, A is aid, and S is domestic saving. The parameter α is known as the incremental capital-output ratio (ICOR), usually thought to range between 2 and 5. Basically, the two gap model was based on the Harrod-Domar (H-D) (1957) growth model. Economists working on developing countries have applied the H-D model to calculate short-run investment requirements for a target growth rate. They then calculate a "financing gap" between the required investment and available resources, and often fill such a gap with foreign aid. Easterly (1997) tried to trace the intellectual history of how a long-dead model came to influence today's aid allocation to developing countries. Finally, the H-D model was found to be inconsistent both theoretically and empirically.

As Easterly (1997) argues, even though the two-gap model has been the target of severe criticism almost since its inception, it has provided the underlying principles both for early aid policies (e.g., the World Bank aid allocation rule and the Revised Minimum Standard Model, RMSM[2]) and for regression specifications of most empirical papers (e.g., Boone, 1996 and Gomanee et al., 2005).

One of the problems with the two-gap model is the Leontief-style production function. As a result, most recent models of aid consider Solow-type growth models with Cobb- Douglas production function. The Solow model, however, does not offer a stable, linear relationship between aid and growth (Mehmet, 2008 and Hassen, 2008). In addition, in Solow- type of growth models, technology is considered as the basic determinant of long-run growth but it is assumed exogenous.

---

[2] *The financial programming model of IMF and the Revised Minimum Standard Model (RMSM) of World Bank are at the core of macroeconomic policy exercises conducted by the institutions. The main objective of RMSM of the World Bank is to make explicit the link between medium-term growth and its financing. The relationship relates the desired level of investment, I, to the change in real output, Δy (for more see Agenor, 2004).*

In some of the recent studies, as an alternative to the neoclassical growth models, endogenous growth models draw attention, which take into account human capital, social and institutional factors as well as more traditional inputs. Thus, some social, institutional and environmental factors are controlled for in the empirical studies that were based on such theoretical basis, since they potentially shift the production function (Hassen, 2008). As Mehmet (2008) argues, foreign aid might have effects on growth similar to the effects of natural resources.

2.1.4.1 Quantitative Impact of Aid in the Standard Growth Model

Rajan et al. (2007) suggested that the theoretical estimate of the impact of aid on growth is based on the standard Solow-Swan growth model. The model assumed that a fraction of aid goes toward financing public investment, which has an impact on long-run growth via capital accumulation.

$$Y = AK^{\alpha}L^{1-\alpha} \quad \text{---------- (8)}$$

Equation (8) is a simple Cobb-Douglas production function, with α representing the share of capital in income (Y), and A is the technology parameter. In per worker terms, equation (8) can be re-written as: $y = k^{\alpha}$ where, $y = Y/L$ and $k = K/L$.

The equation for capital accumulation is:

$$\dot{K} = I - \delta(K) = Ig + Ip - \delta(Kp + Kg) \quad \text{---------- (9)}$$

where, $\boldsymbol{Kp+Kg = K}$ and the subscripts (p and g) refer to the private and government sector, and δ is the depreciation rate. Assuming that a fraction 'β' of aid is invested by the government, with the rest (1-β) representing consumption or waste, equation (9) can be re-written as:

$$\dot{K} = \beta \text{ Aid} + \text{Ip} - \delta \text{ K} \quad \text{Or}$$

$$\dot{k} = \frac{\beta \text{ Aid}}{L} + \frac{\text{Ip}}{L} - (n+\delta)\, k \quad \text{---------- (10)}$$

where, n represents the population growth rate. Thus, the rate of growth of output per worker, γ_y, can be expressed in terms of the rate of growth of capital stock per worker as:

$$\gamma_y = \frac{\dot{y}}{y} = \alpha\left(\frac{\dot{k}}{k} + \frac{\dot{A}}{A}\right) \quad \text{---------- (11)}^{3}$$

Substituting equation (10) into (11) yields,

$$\gamma_y = \alpha\left(\frac{\beta \text{ Aid}}{kL} + \frac{\text{Ip}}{kL}\right) - \alpha(n+\delta) + \alpha\frac{\dot{A}}{A} \quad \text{--------- (12)}$$

According to equation (12), the coefficient of aid in cross-country aid-growth regression measures the change in growth with respect to the change in aid. Therefore, to express variables in the form of per output terms, equation (12) needs to be converted into one that expresses aid in terms of GDP on the right hand-side. Thus (12) can be re-written as:

$$\gamma_y = \alpha\beta\frac{Y}{K}\left(\frac{Aid}{Y}\right) + \alpha\frac{\text{Ip}}{kL} - \alpha(n+\delta) + \alpha\frac{\dot{A}}{A} \quad \text{---------- (13)}$$

Differentiating equation (13) with respect to aid-to-GDP ratio (Aid/Y) yields:

$$\frac{d\,\gamma_y}{d\left(\frac{Aid}{Y}\right)} = \alpha\,\beta\,\frac{Y}{K} \quad \text{---------- (14)}$$

[3] *For detailed proof and discussion, please see the appendix part of Rajan et al. (2007).*

Equation (14) implies that the coefficient of per output aid in a cross-country growth regression should be related to the capital share in income (α), the fraction of aid invested (β), and the output capital ratio (Y/K). According to Rajan et al. (2007), it is possible that equation (14) underestimates the value of aid because it ignores the fact that the public investment financed by aid has spillovers and hence economy-wide productivity impacts. Incorporating this would yield the following variant of equation (14), given by (14a):

$$\frac{d\gamma_y}{d\left(\frac{Aid}{Y}\right)} = \alpha\beta\frac{Y}{K} + \frac{d\left[\dot{A}/A\right]}{d\left(Aid/Y\right)} \text{------(14a)}$$

The last term in the right-hand side of (14a) captures the effect of aid on productivity growth. It is difficult to know whether and to what extent public investment has had such productivity impacts in aid-receiving countries. However, in cross-country growth regressions, in addition to aid there are different types of control variables to be accounted for which vary from one school of thought to the other (More on this in the theoretical framework of the methodology part).

2.1.4.2 Approaches to the Determinants of Growth

Gwarteny et al. (2004) have summarized the three approaches that the economics literature has offered for income and growth disparities among countries. These are: (a) the production function-based approach, (b) the institution approach, and (c) the geography and location approach. The first approach focuses on the amount and quality of inputs (where aid is one) into the production process as a means to generate higher income and growth. It is based on the work of Harrod-Domar and Solow (1956).

The second approach is built on the idea that policy and institutional environments affect the availability and productivity of resources. According to Hansen and Trap (2000), this approach of growth explanation is corresponding to the 'third generation studies' of aid effectiveness.

Furthermore, according to Hibbs (2001), politicized neoclassical growth theory emphasizes that the stocks of labor and capital available for production, as well as the efficiency with which factor inputs are transformed into output, depend decisively on how politics, policy and institutional arrangements affect the security of property and private returns to entrepreneurship, innovation, investment and hard work. Thus, the prime movers in neoclassical models such as technology and saving behavior, however, are viewed as intermediate variables driving growth and development which themselves are determined by the political and institutional environment.

The third approach focuses on the importance of geographic and location factors as main determinants of variations in income and growth across economies. The basic variables which can be included in this approach are tropical climate, access to an ocean port and distance from the world's major trading centers. As Hassen (2008) argues, location in the tropics, landlockedness and distance from the major trading centers impede the attractiveness of a nation as a base for production and subsequently retard the inflow of foreign direct investment (FDI) and then growth.

2.1.4.3 Review of Aid and Growth Modeling

A critical review of modeling of aid and growth has been made by Doucouliagos and Paldam (2006). According to their meta study, the Aid Effectiveness Literature (AEL) is a body of about 100 empirical studies of the effect of development aid on savings, investment and growth and it tries to catch the effects by a small set of formally homogeneous models. A third of AEL analyzes

conditional models where aid effectiveness depends upon z, so that aid only works for a certain range of the variable. The key term in this family of AEL models is thus an interaction term of z times aid (z * aid). The leading candidates for z are a good policy index and aid.

A thorough search by Doucouliagos and Paldam (2006a) has produced around 97 aid effectiveness papers. Those papers brought many models, which can be divided by their causal structure, into three families as shown in Figure 1. Around 43 papers which are categorized under group A (Accumulation) studied the impact of aid on savings or investment. It has been indicated that about three-fourth of aid is crowded out by a fall in savings, mainly due to increases in public consumption. The remaining one-fourth causes increasing investments.

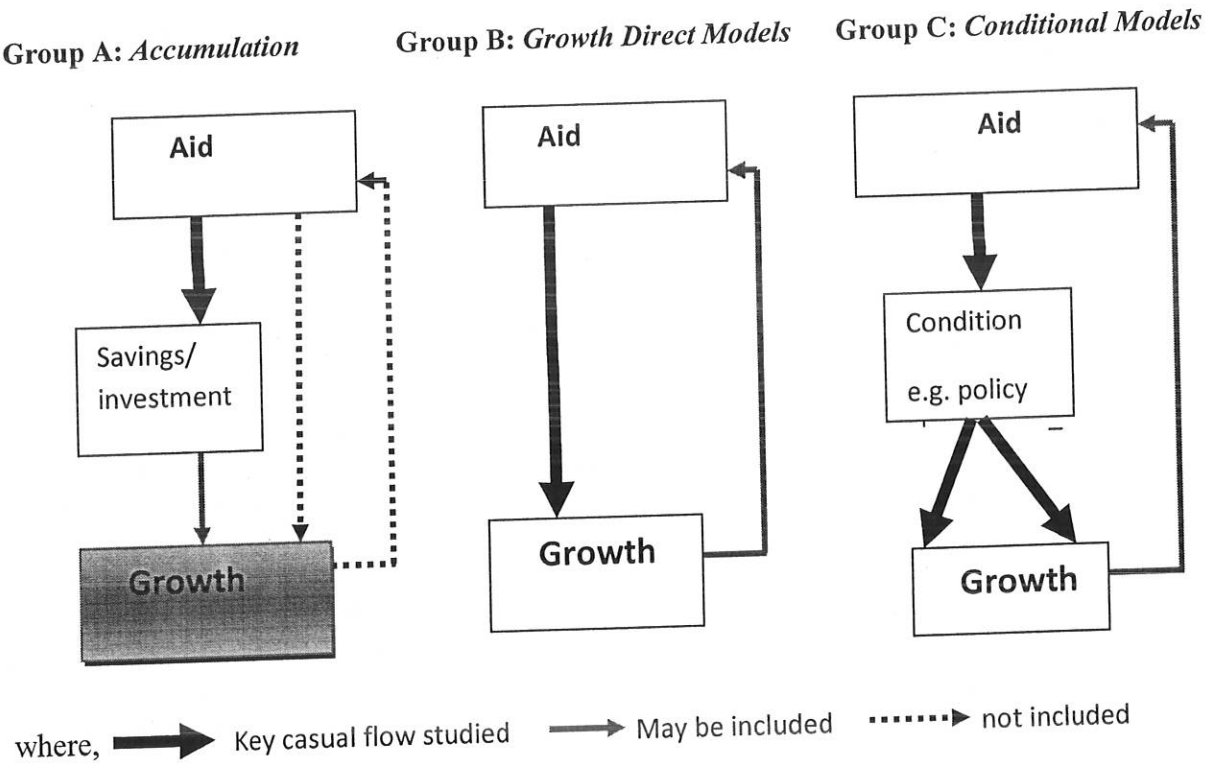


Figure 1: The causal structure in the three families of AEL models

In the second type of casual structure, 68 papers have used the reduced form models of the direct effects of aid on growth (Doucouliagos and Paldam, 2006b) and indicated that the estimates of the direct effect of aid on growth reported scatter considerably, and add up to a small positive, but insignificant effect on growth.

However, most of the recent aid effectiveness studies are categorized under family C (conditional models)[4]. Under this family, the papers contain conditional estimates, where the effect of aid on growth depends on a conditional variable z, which is scaled so that if z is positive, the result is positive growth, and vice versa if z is negative. Actually, this is the family and channel of aid on which this thesis is based.

So far as chronology is concerned, the AEL was started in the early 1970s by papers in the A-group. Those early studies found no effect of aid on capital accumulation, and the AEL then moved on to the B-group papers, where most of the research in the 1980s and 1990s was done. The C-group started in 1995. This wave of papers is still strong (Doucouliagos and Paldam, 2006a). Some of the studies which can be included into the C-group are Burnside and Dollar (1995, 2000), World Bank (1998), Easterly et al. (2004) and Hassen (2008).

2.1.4.4 Conditional Aid Effectiveness Models

According to a detailed review by Doucouliagos and Paldam (2006a), the C-family of studies are based on the idea that aid effectiveness may be due to aid having a positive effect on growth in some countries and a negative effect in others, so that aid is conditionally effective. Up till now, three

[4] *The papers in each category or family (A, B and C) are presented in the main body and listed in appendix part of Doucouliagos and Paldam (2006a and 2006b).*

conditions have been proposed, leading to three models. Thus, these models are shortly summarized and interlinked with some previous studies as follows:

i. *The Good Policy Model*: Aid works if the recipient country pursues good polices, and it is damaging in countries pursuing bad policies. The model was proposed by Burnside and Dollar (2000), and has been developed by a group in the World Bank.

ii. *The Medicine Model*: "Aid works if given in moderation, and harms if taken in excess, just like most medicine". This model was first proposed by Hadjimichael et al. (1995), but it has mainly been developed and publicized by Dalgaard et al. (2004). Most members of this group are associated with the Danida (the Danish Aid Agency). As Doucouliagos and Paldam (2006a) enumerate, this model has been further analyzed in 15 more papers.

iii. *Institution Models*: according to Doucouliagos and Paldam (2006a), around 10 papers contains models that condition for various institutions: the papers for example condition for democracy, quality of institutions (e.g. Collier and Dollar, 2002) and for trade openness.

In a nutshell, though the earlier generation of papers (for example, Boone, 1996) had a different focus, assessing whether aid-induced savings fosters growth or if aid partly substitutes investment, the current generation of papers addresses the role of macro policies, influence of new growth theory, potential endogeneity in aid and policy, and non-linearity in the aid-growth relationship. For instance, Burnside and Dollar (2000; BD to shorten) investigated whether macro policy matters for aid effectiveness and found that aid has a positive impact on growth only in the presence of good economic policy.

They observed that it is not aid but the interaction term (aid with policy) that is consistently significant, where the policy index is constructed by taking a linear combination of three well-documented policy variables in the growth literature (budget deficit, openness and inflation). The BD's result refuels the debate on conditional and unconditional aid effectiveness and encourages so many studies to emerge. For example, using different specification and data, Collier and Dollar (2002) and Collier and Dehn (2001) have supported BD's conclusion.

However, Easterly et al. (2003) using the same specification and methodology as in BD (2000) fail to support BD's conclusion when they expand the dataset to include more countries and more years. Hansen and Tarp (2001) addressed the issue of non-linearity in aid by including *square aid* (aid^2) term where they found that squared aid drives out the significance of the aid*policy interaction term and concluded that aid, on average, works although with diminishing returns. Such results are in line with the conclusion reached by Hadjimichael et al. (1995). Furthermore, Roodman (2003, 2007) performed a series of robustness checks and concluded that most of his findings support Hansen and Tarp (2001), as opposed to BD (2000).

The academic debate, attack and counter-attack on aid effectiveness are still ongoing. Previous papers (e.g., Burnside and Dollar, 2000; Easterly et al., 2003), however, tried to take care of non-linearity in the aid variable by imposing a certain functional form restriction, adding a square term, in the usual parametric aid regressions. Instead, Eskander et al. (2006) have pursued a nonparametric estimation framework and they were able to derive specification free, data-driven, point estimates, which capture the varying effects on growth at different levels of aid and policy. In fact, this is particularly helpful because it enables one to focus on specific value ranges of aid and policy in assessing when they are growth-enhancing and when they are neutral or even growth-detracting.

If they happen to accommodate all three possibilities, though in different data segments, linear estimation would simply tend to average out and could possibly 'tilt' the results in either direction.

In general, the debate on the existing empirical literature is concentrated more on two major hypotheses: (1) Policy Hypothesis (PH): aid works only in the presence of good policy, i.e., the interaction term (aid*policy) has a positive and significant effect on growth and (2) Diminishing Returns Hypothesis (DRH): aid works but with diminishing returns, irrespective of good policy. As a third variant, some models condition aid effectiveness on the existence and well functioning of institutions.

2.1.5 Arguments on Aid Inflows to LDCs

So far what is reviewed was about how theoretically aid is incorporated into macroeconomic framework and models. However, based on lessons from experience and from the ongoing debate on aid effectiveness, there are studies and theories of growth which deal with aid appropriateness to LDCs, which are worth reviewing.

Two opposing views dominated the debate over foreign aid and its potential contribution to growth and poverty reduction. In one side, there are aid skeptics from what Collier (1999) referred to as the "aid dependency school." It has offered sophisticated arguments: just as recent analysis of poor households in developed countries has established reasonable evidence for a dependency syndrome whereby welfare payments create very high implicit marginal tax rates and so discourage work, trapping recipients into continued need for welfare, some aid dependency proponents argue that poor countries are subject to the same trap (Bourguignon and Leipziger, 2006). However, Easterly (2006) and Rajan (2005) reached non-robust effect of aid on growth after intensive data work.

On the other side of the spectrum is the more optimistic view expressed by those who believe that aid can be effective, and suggests that economic development cannot take place in the poorest regions of the world without massive injections of official development assistance. For example, one prominent advocate for massively scaling up of aid is Sachs (2005). Despite variations in methodology, approach and model used, supporters of aid has a common inference in that they all justify the necessity of foreign aid inflows to third world countries. In general, these views have been discussed by Dollar and Easterly (1999), Harms and Lutz (2004), and Easterly (2005) and summarized by Hassen (2008).

According to the Big Push Models, poor nations remain poor because they are stuck in a 'poverty trap", a situation where subsistence consumption and low savings result in low income, which, in turn, perpetuates low income … and so on. Therefore, to get out of the poverty trap, the poor need a large aid-financed increase in investment, which leads to a "Big Push" (Hassen, 2008). However, the endogenous growth model assumes poverty has resulted from low human capital and infrastructure; and therefore, foreign aid is required to improve human capital and infrastructure. As Burnside and Dollar (2000), Easterly (2003, 2005), Dalgaard et al. (2003) and Hassen (2008) argue, poor nations are poor because their governments have chosen bad policies and poor institutions; and thus, foreign aid is required to induce better policies and to promote good institutions.

Although there is continuous debate on whether the aid inflows to a particular region or country has helped or detracted HDI, what is generally observed in the literature is that foreign aid has pros and cons. A positive impact of foreign aid on economic growth is argued to come through enhancing investment, increasing the capacity to import goods or technology, increasing productivity of capital, improving welfare, supporting budget and promoting endogenous technical change (e.g., Radelet et al., 2004; Hassen, 2008; Rajan et al., 2007 and Bermopong and Elizabeth, 2008).

On the other hand, the negative impacts of foreign aid include undercutting incentives for revenue collection, undermining government accountability to their citizens and lessening the pressure on governments to maintain popular legitimacy (Moss et al., 2006). Other negative effects of aid include encouraging rent-seeking and corruption, dampening bureaucratic quality and the rule of law, reducing long-run labor supply and capital accumulation incentives (Harms and Lutz, 2004).

According to Rajan et al. (2005) and Hassen (2008), aid may seriously affect export performance all the way through appreciating real exchange rates of LDCs resulting in loss of competitiveness and undermined production of tradable goods (a scenario commonly known as "The Dutch Disease" effect). As Easterly (2005) pointed out, aid has been most ineffective to bring better outcomes in SSA. Instead of aid he has suggested democracy and markets as the true source of long-run development. In his own words;

> *Since markets and democracy are such a successful system, they can be a great model to try to make aid more like a successful system, to try to inspire aid efforts to do less planning and more searching... [...Thus, without building democratic states and well functioning market system, the West's efforts to assist the rest may do much ill and so little good...](p.6).*

Thus, Easterly's argument sheds some light on the fact that aid can be effective if it is used in a country where strong democratic system and well-functioning markets are in place. Others, such as Burnside and Dollar (2000), using regional dummy, verify that aid has been less effective in SSA.

In sum, there is no conclusive argument regarding the issue of aid appropriateness. At least to come up with a summarizing idea, aid can be useful and has contributed to economic development and improvements in quality of life variables in many countries. Evidence for successful aid is particularly strong in targeted programs with defined objectives.

But, at the same time, and especially at very high levels over a sustained period, aid could also have distorting effects on some of the very outcomes donors hope to encourage through aid, such as policy ownership, fiscal sustainability, institutional development, and long-term economic growth (Moss et al., 2005).

2.1.6 Aid and Aggregate Welfare

Most of the previous literatures on the economic effectiveness of aid have concentrated on the impact of economic growth. Evidence suggests that aid does contribute to growth (e.g. Hansen and Tarp, 2001; Morrissey, 2001 and Gomanee et al., 2005), although some would qualify this statement by arguing that aid is only effective conditional on good policies being in place (World Bank, 1998; and Burnside and Dollar, 2000). This is one way in which aid can increase welfare, as higher growth is likely to lead to increases in aggregate welfare, but there are also other ways. Aid used to deliver health and education services, for example, would only affect growth in the long-term, if at all, but could potentially impact immediately on aggregate welfare. Accordingly, considering only the indirect channel via growth would underestimate the impact of aid on aggregate welfare, and even in cases where aid had no significant impact on growth it could still increase welfare of the poor (Gomanee et al., 2004a).

In fact, it is difficult to examine the impact of aid on poverty across countries directly, as comparative cross-country data on measures of poverty over time is extremely scarce and census based. For example, in the WDI (2008) database, the data for most of the monetary measures of poverty are not available in a continuous basis. So this invites the adoption of other non-monetary measures such as HDI, mortality and literacy rates.

Gomanee et al. (2004a) using cross-country data and by formulating pro-public expenditure indices (weighted and un-weighted), have tried to show the effectiveness of aid in improving human welfare - as measured by the HDI and infant mortality rate. As they argued, these are not measures of poverty or deprivation, but since they are likely to be correlated with such measures it is possible to consider the implications of those findings for using aid to increase the welfare of the poor.

The existing studies of a direct relationship between aid inflows and welfare indicators have adopted a standard cross-country growth regression approach, replaced growth with an indicator of welfare or poverty as the dependent variable (Gomanee et al., 2004a and Mosley et al., 2004). Those studies which incorporate government expenditure on social sectors found that this is the transmission mechanism for the effect of aid on aggregate welfare. However, to link aid with poverty through social sector spending, it is important to know the government expenditures most likely to increase aggregate welfare. Gomanee et al. (2004a) described these as pro-public expenditures and considered that they may also capture the extent to which expenditures are pro-poor.

According to UNDP (2002) as cited in Gomanee et al. (2004a), an alternative measure of welfare is given by the HDI, an index between 0 and 1 of measures of different dimensions of quality of life, especially longevity, education and access to resources. Longevity, as measured by life expectancy at birth, is intended to capture the capability of leading a long and healthy life, and an indicator of educational attainment (e.g., adult literacy rate, mean years of schooling and enrolment ratios) is a proxy for capability of acquiring knowledge, communicating and participating in community life. Furthermore, real GDP per capita in purchasing power parity dollars represents access to resources needed for a decent standard of living. Income is unquestionably an important component of welfare, but the HDI allows for other components such as longevity, literacy and mortality rates.

2.1.7 Aid and Roles of Institution

Throughout the 1970s and 1980s the two-gap model of Chenery and Strout (1966) provided the main framework to conceptualize the links between aid and growth, which was subsequently extended by Bacha (1990) to incorporate government's fiscal behavior. And aid was perceived to fill gaps that were the most pressing. But currently the popular view is that developing countries suffer more from an "institutions gap" and a "policy gap" than a "financing gap" (Dalgaard et al., 2004 and Romer, 1993). To take this into account, the usual empirical framework for testing the aid-HDI relationship has started to augment aid with some measure of institution, policy, governance and political stability. Burnside and Dollar (2000), Dalgaard et al. (2004), Hansen et al. (2004), Easterly et al. (2003) and Hassen (2008) are some of the works done in this line.

In theory, social capital and institutions may complement each other as well as complement aid. But they may also act as substitutes to aid. If social capital and quality of institution enhance growth and higher growth leads to less need for aid, then the relationship between social capital (and institutions) and aid will be negative (Baliamoune and Lutz, 2004). Nevertheless, the realization of the importance of sound public institutions to the development process is a recent phenomenon (e.g., Acemoglu et al., 2004).

Most aid effectiveness studies (e.g. Burnside and Dollar, 2000; Easterly, 2003) focused on the effect of aid on some macroeconomic outcomes (such as economic growth, HDI and poverty). However, relatively less critical attention has been paid to the potential effects of large increases in aid on public institutions in low-income countries. To my knowledge, this issue has been discussed critically by Moss et al. (2006), where they have theoretically explained the fact that institutions affect aid effectiveness and in turn affected by aid.

In the conditional aid effectiveness models, there is a contention that aid is thought to work best in environments with high-quality public institutions and increasingly, measures of institutions have been an explicit factor for aid disbursement and allocation. Thus, institutional development is frequently an independent variable thought to affect the efficiency of aid, and thus a legitimate factor in selecting aid recipients and determining allocation strategies. This suggests that aid should be selectively focused on countries that are thought to most effectively use resources to engage in poverty reduction (Moss et al., 2005).

As Radelet (2003) argues, such logic underlies the International Development Association (IDA's) performance-based allocation process and the Millennium Challenge Account, a new U.S aid program that explicitly targets assistance to countries that are thought best able to use additional resources (such as reducing poverty). In line with IDA's allocation rule, Bigsten (2006) has suggested that donors should delegate more responsibility to the recipients, while at the same time creating an incentive structure for good performance.

In addition to macroeconomic and institutional effects, there are costs of aid related to the structures, practices, and procedures of the current international aid system. These include a long-standing and well-known list of common complaints about aid: *volatility*, *uncertainty* (Moss et al., 2005) and *conditionality* of ODA flows, fragmentation of donor efforts, project proliferation and duplication, conflicting or dominant donor agendas, competition for staff, and high administrative and oversight costs (Brautigam and Knack, 2004 and Moss et al., 2005).

Moreover, in the tax effort literature, foreign aid is generally expected to reduce tax shares since aid provides an alternative, non-earned source of revenue for governments in addition to tax revenue (Remmer, 2004; Brautigam and Knack, 2004). Consequently, a government that receives significant

amounts of aid is thought to have less incentive to tax and improve its tax administration. That is, foreign aid may be used as a substitute for domestic revenue mobilization whilst allowing the same level of expenditure. Not only may aid inflows lead to lower tax effort, but it may also slow down the development of domestic institutions such as the tax administration in recipient countries (Brautigam and Knack, 2004).

However, the econometric evidence on behalf of this relationship is somehow inclined to the negative relationship between tax effort and aid. Using data from Stotsky and WoldeMariam (1997), Brautigam (2000) found that 71% of African countries with aid-to-GDP ratio above 10% in 1995 had lower than expected tax effort.

One of the most usual types of question in most aid studies and debates is "how much is too much aid?" i.e. from what point on aid harms institutions, tax effort and different macroeconomic outcomes (which is a question of determination of saturation level). In fact, this question is partly similar to the *medicine model* discussed earlier. To answer this, Berg (1997, 2000) suggested that aid starts to have negative effects on local institutions when aid flows reach 5% of GDP, which would mean that the overwhelming majority of states in SSA region are negatively affected. However, Clemens and Radelet (2003) found that the 'saturation point' is highly dependent on local conditions, but ranging from 15-45% of GDP. Thus, there is a huge gap between the two results, implying that the issue is still open to research intervention.

2.2 Empirical Literature

2.2.1 Aggregated Aid Effectiveness Studies

Empirical studies on the subject of aid effectiveness have come up with a range of answers for the relationship between aid and growth. Boone (1996) found a negative relationship between aid and growth and finally concluded that foreign aid seems to finance consumption rather than boosting growth in the recipient countries. Boone's finding however refueled the discussions on aid effectiveness. In recent periods, Burnside and Dollar (2000) and Collier and Dollar (2002) suggested that aid effectiveness is closely related to the macroeconomic policies followed by the country in question. Hansen and Tarp (2001), Dalgaard and Hansen (2005), Roodman (2007) and Mehmet (2008), to name a few, however, oppose these results on statistical grounds and provide evidence in favor of the hypothesis that aid raises growth regardless of the quality of the policy environment. Thus, the issue is still debatable and empirical results are inconclusive.

Eskander et al. (2008) have tried to investigate whether reforms increase aid effectiveness in a typical developing country. They have estimated a typical aid-growth regression that includes a reform dummy as one of the explanatory variables and constructed a new policy measure by broadening the Burnside and Dollar (2000) policy index to incorporate more variables. They have tried to assess aid effectiveness in a reforming country scenario and their finding indicated that reform itself is highly significant in fostering growth, though aid is not despite good policy or reform, which is contrary to Burnside and Dollar's finding.

The findings of Burnside and Dollar (2000), however, have been further criticized by a number of studies on numerous statistical grounds concluding that their result is too fragile. For example,

Mehmet (2008)[5] has revisited the aid-growth relationship using Bayesian Model Averaging techniques to account for uncertainty issues regarding model specification. The finding indicated that the data evidence does not support the claim that aid works only in good policy environments: aid inflows are not very effective in boosting growth regardless of the quality of the policy environment.

In line with Mehmet (2008), Rajan et al. (2005) examined one of the most important and intriguing puzzles: "why is it so hard to find a robust effect of aid on the long-term growth of poor countries, even those with good policies?" They look for a possible offset to the beneficial effects of aid, using a methodology that exploits both cross-country and within-country variation and found out that aid inflows have systematic adverse effects on a country's competitiveness, as reflected in a decline in the share of labor intensive and tradable industries in the manufacturing sector.

In another attempt to test the robustness of the Burnside Dollar's result, Baliamoune and Mavrotas (2008) have examined the impact of institutional quality and social capital on aid effectiveness and found strong evidence that social capital and institutions enhance aid effectiveness. Once they accounted for the role of social capital and institutions, the impact of policies tend to disappear. Their findings have important policy implications as they indicate conditioning aid allocation on good policies may not lead to an optimal (or fair) allocation of aid[6]. This casts doubt on the conclusion reached by Burnside and Dollar (2000, BD to shorten) and the policy lessons derived from their findings.

---

[5] *It can be accessed using the link http://economicsbulletin.vanderbilt.edu/2008/volume15/EB-08O10017A.pdf*

[6] *However, to come to this conclusion, Baliamoune and Mavrotas (2008) have tried to widen the BD's policy index by introducing macroeconomic variables such as interest rate and credit policy.*

After correcting for the possible problem of endogenity, Rajan et al. (2007) examined the effects of aid on growth using cross-section and panel data. Thus, they found little robust evidence of a positive (or negative) relationship between aid inflows into a country and its economic growth. In their result, there was no evidence that aid works better in better policy (no support for BD's result) or geographical environments, or that certain forms of aid work better than others.

To sum up, the BD's (2000) conclusion that aid can do better when policies are good has elicited comments from researchers. Furthermore, their results have been challenged as being "extremely data dependent" (see, Dalgaard and Hansen, 2001; Clemens et al., 2004 and Easterly et al., 2004). Eskander et al. (2006) have tried to check the BD's result and reached a conclusion which partly supports the BD's conclusion: "... the BD conclusion that aid is effective only in the presence of good policy holds in an economically narrow but meaningful range, although aid often works only with diminishing returns...".

Three main arguments have been advanced by Masud and Yontcheva (2005) to explain the disappointing results of most empirical aid effectiveness studies. The first argument is that aid is misallocated – that is, donors give aid for strategic reasons to the wrong recipients.. Secondly, aid is misused – that is, recipient governments pursue non-developmental agenda with the aid. The third argument is that GDP growth is not the right measure of aid effectiveness (e.g., see Boone, 1996; Masud and Yontcheva, 2005; Bermopong and Elizabeth, 2008).

Specifically, Boone (1996) tested the last argument by examining the impact of aid on changes in Basic Human Development Indicators such as infant mortality, primary school enrollment and life expectancy, instead of using GDP growth rate. Similarly, Alesina and Dollar (1998) studied the pattern of allocation of foreign aid from various donors to receiving countries.

2.2.2 Disaggregated Aid Effectiveness Studies

Most recent researchers who have studied the effectiveness of aid are dissatisfied with the use of aggregate aid. The disaggregation of aid may take different forms such as sectoral disaggregation (e.g., health and education etc.), donor type disaggregation (e.g., bilateral and multilateral), purpose disaggregation (e.g., emergency, social and developmental etc), duration (short, medium and long-term) and form disaggregation (e.g., loan and grant) etc. Therefore, the following section is particularly devoted to a review of disaggregated aid effectiveness literature.

Ouattara and Strobl (2000) proposed that the ambiguity on aid effectiveness literature may be a result of ignoring different types of aid, such as project or programme aid. By disaggregating total aid into these two categories, they found evidence that project aid inflows affect growth positively whilst the impact exerted by programme aid is negative. However, there was no evidence that good policy enhances the growth effect of either of these two types. Except the aid measures, they have used the same variables and the exact data set as in Easterly et al. (2003), which is an expanded data set of the original one used by BD (2000). But they came up with entirely different result.

Recently, Asiedu and Nandwa (2007) examined the effectiveness of education sector aid on growth. They have disaggregated the aid data into primary, secondary and higher education, and run separate regressions for low income and middle income countries. Their analysis covered 90 developing countries over the period 1990-2004 and they have used a dynamic panel data estimator proposed by Arellano and Bond (1991) and Blundell and Bond (1998) for their estimations. They found that the effect of aid varies by income as well as by the type of aid; in low-income countries, aid for primary education enhances growth, while growth in middle income countries is promoted by aid for higher levels of education.

In addition, the question of aid effectiveness has been tackled by disaggregating aid into "productive" and "unproductive". Economidesa et al. (2004) have constructed a model of a small growing open economy that distinguishes two effects from foreign transfers: (i) a direct positive effect, as higher transfers allow the financing of infrastructure; (ii) an indirect negative effect, as higher transfers induce rent-seeking competition on the part of self-interested individuals. There was evidence that aid has a direct positive effect on growth, which is however significantly mitigated by the adverse indirect effects of associated rent-seeking activities.

The BD (2000) finding, i.e., aid works in a good policy environment, has still been challenged by scholars. Reddy and Minoiu (2006) disentangled the effects of two components of aid as a developmental, growth-enhancing component, and a geopolitical, possibly growth depressing component. The effect of developmental aid was significant, large, and withstands a battery of robustness checks including alternative proxies for developmental aid, specifications and treatments of outliers. Nonetheless, they found no evidence of diminishing returns to aid nor that aid is only effective in good policy environments -- they rejected both the policy and medicine hypothesis.

On the other side of disaggregation, Feeny and Ouattara (2000) analyzed the impact of aid on agricultural GDP growth and household consumption by disaggregating GDP into its various components. For this, they have utilized the dataset which has been used by Easterly et al. (2003) by augmenting it with sectoral GDP data from the World Bank (2005). Their findings suggested that foreign aid exerts a positive and statistically significant impact on the growth of per capita agricultural GDP and household consumption. With this result, they went on to conclude: "scaling up of aid will therefore contribute to the achievement of the MDGs". However, the MDGs constitute much broader goals and details than growth of agricultural GDP and household consumption.

An empirical study by Masud and Yontcheva (2005) on the effects of aid on two human development indicators shows that aid reduces infant mortality and improves school enrollment. In addition, Dreher et al. (2006), using a dynamic panel estimator to investigate the effects of education aid on educational attainments in LDCs, found that aid has a robust and statistically significant positive effect on primary school enrollment rates. Using similar methodology and policy variables as Dreher et al. (2006), Michaelova and Weber (2006) investigated the effects of education aid, measuring education outcome as both primary school enrollment and graduation rates, found small statistically significant positive effect of aid on primary school enrollment and completion rates.

The above relationship between aid and components of HDI also got support from Gomanee et al. (2004a), who found that a 10% increase in lagged aid appears to be associated with a 2% increase in HDI. The results for infant mortality were generally weaker; a 10% increase in aid appears to be associated with a 4% reduction in infant mortality.

Recently, Bermopong and Elizabeth (2008) investigated whether external aid has a significant effect on human capital formation in LDCs using panel data from a large number of developing countries over the period 1990-2004. Specifically, they studied whether external aid targeted to education and health sectors increase primary school enrollment and completion rates and whether aid to the health sector decreases child mortality rates. They found that aid has a significant positive effect on primary school enrollment and completion rates, but aid to the heath sector significantly decreased child mortality rates in countries considered in their study.

III. Methodology

In this section, the methods and approaches used (applied) in this study are described, and organized into four sub-sections. The first sub-section briefly presents the theoretical base for how foreign aid is incorporated into economic growth by focusing on different growth models (both classical and new ones), which actually points to the empirical specifications of the models upon which this study is crucially based. The second sub-section is devoted to the formulation and development of the estimable empirical models. The third part, however, shortly summarizes the issues of estimation techniques and test of hypotheses. The last sub-section, winds up the entire section by providing reasons for sample selection, describing the variables and data sources.

3.1 Specification of the Model

3.1.1 Theoretical Framework

3.1.1.1 Foreign Aid in the Context of Growth Models

The macroeconomic link between foreign aid and economic performance (especially growth) has been the major area of controversy in different studies and textbooks. In fact, most of the scholars in the field base their discussions and arguments on different growth models. Earlier studies, such as Boone (1996), have considered the neoclassical growth model. However, the recently emerging aid-growth studies (e.g., Hansen and Trap, 2001; Easterly, 2003; Easterly et al., 2004; Alemayehu, 2004; Alemayehu and Befekadu, 2005 and Hassen, 2008) not only take up the neoclassical growth model but also take into account other determinants of growth such as location and geography, institutional quality, governance issues, colonial history and human capital.

The production function considered in the neoclassical (especially Solow-Swan) framework is of Cobb-Douglas type, where, the function exhibits constant returns to scale and inputs have positive but diminishing marginal productivity. In short, with labor-augmenting technical progress, the production function in its generic form is given by:

$$Y\left[K(t), A(t)L(t)\right] = \left[K(t)\right]^{\alpha}\left[A(t)L(t)\right]^{1-\alpha} \quad ---(15)$$

The marginal (i) and the Inada (ii) conditions are: *(i)* $Y_L, Y_K > 0$ and $Y_{LL}, Y_{KK} < 0$, and

(ii), $\lim_{K\to\infty}(F_k) = \lim_{L\to\infty}(F_L) = 0$ and $\lim_{K\to 0}(F_k) = \lim_{L\to 0}(F_L) = \infty$

As shown in (16), dividing both sides of the function in (15) by efficiency term (AL) yields the relationship between output per effective labor and effective -capital (i.e. the intensive form)[7].

$$\tilde{y} = \left(\tilde{k}\right)^{\alpha} \quad ---(16)$$

The above equality implies that output per effective labor is an exponential function of effective capital (capital per effective labor). The change in effective-capital over time is[8],

$$\dot{\tilde{k}} = \frac{\left[\dot{K}\right]}{\left[AL\right]} - K\left(\frac{\dot{L}}{L}\right)\left[\frac{1}{AL}\right] - K\left(\frac{\dot{A}}{A}\right)\left[\frac{1}{AL}\right] \quad ---(17)$$

Thus, the rate of growth of effective-capital can be derived as,

---

[7] *I drop the time variable here and elsewhere when the meaning is plain.*

[8] *A dot on a variable indicates the first order derivative of the variable with respect to time (t). For example,* $\dot{Y}$ *always denotes (dY/ dt)*

$$\left[\frac{\dot{k}}{k}\right] = \frac{\left[\dot{K}\right]}{K} - \left(\frac{\dot{L}}{L}\right) - \left(\frac{\dot{A}}{A}\right) - - - (18)$$

The equation of motion for the aggregate stock of physical capital (K), which indicates the investment-requirement function, is given by:

$$\frac{\dot{K}}{K} = \frac{I - \sigma K}{K} = \frac{I}{K} - \sigma - - - (19)$$

where, δ is the rate of depreciation of physical capital which is assumed to be constant. Thus, substituting the above equation (19) into the rate of growth of effective capital (18) yields the following simplified relation (20):

$$\left[\frac{\dot{k}}{k}\right] = g_k = \frac{I}{K} - \left(\delta + g_L + g_T\right) - - - (20)$$

where, the variables g_L and g_T in the function (20) indicate the growth rate of labor and rate of improvement of technology, respectively. However, in the neoclassical framework of growth, saving is equal to investment (S=I) and it is some linear function of national income (Y), i.e. saving (S) = sY, where, 's' is the rate of saving. Therefore, equation (20) can be written as,

$$g_{\hat{k}} = s\left[\frac{Y}{K}\right] - (\delta + g_L + g_T) - - - (21)$$

Equation (21) is the *fundamental dynamic growth equation*, which indicates that the growth rate of effective capital over time is determined by saving rate (s), output-to-capital ratio, rate of depreciation (δ), rate of growth of labor (g_L) and technology (g_T). The curvature of the production function along with the Inada conditions ensures that there is a unique steady-state level of capital per worker, k*: satisfying $sy = (\delta + g_T + g_L)\, k^*$. At steady state per capita capital, (k*), output, capital and consumption per unit labor should grow at the rate of exogenous technological progress (g_T) and are therefore independent of parameters of production (α) and rates of saving, depreciation and labor force growth (anything else, including politics, policies and institutional arrangements).[9]

In macroeconomics literature, the variable which attracts more attention is the output per capita (Y/L= y): it is a variable used frequently by researchers to measure aid effectiveness (e.g., Easterly et al., 2004; Hassen, 2008 and Daniel et al., 2005) and economic performance (e.g. World Bank, 2005). Following Hibbs (2004), the growth rate of output per capita (g_y) can be obtained as:

$$\frac{\dot{\hat{y}}}{\hat{y}} = \frac{1}{\hat{y}}\left(\frac{d\hat{y}}{dt}\right) = \left[\left(\frac{1}{\hat{y}}\right)\frac{\partial f(\hat{k})}{\partial \hat{k}}\right]\frac{d\hat{k}}{dt} = - - -(22)$$

, which upon multiplication of the right hand-side by $\left(\frac{\hat{k}}{\hat{k}}\right)$ yields,

[9] *For further comparative statics and discussion, please refer Hibbs (2004).*

$$\frac{\dot{y}}{y} = \frac{f'(k)}{y}\frac{\dot{k}}{k}.k = \frac{f'(k).k}{y}\left[\frac{\dot{k}}{k}\right] = \alpha\left[\frac{\dot{k}}{k}\right] \quad ---(23)$$

If capital commands its marginal product at every instant, α denotes the capital's share of output.

Given $\frac{\dot{y}}{y} = \alpha\left[\frac{\dot{k}}{k}\right]$, it is also possible that $\left[\frac{\dot{y}}{y} - g_T\right] = \alpha\left[\frac{\dot{k}}{k} - g_T\right]$.

$$g_y = \alpha g_k + (1 - g_T) \quad ---(24)$$

As shown in (24), the rate of growth of per-capita output (g_y) is determined by the rate of growth of per-capita capital (g_k), where, the latter can be obtained by;

$$g_k = \frac{I}{K} - \delta - g_L \quad ---(25)$$

Therefore, substituting g_k from equation (25) into g_y in (24) gives,

$$g_y = \alpha\left[\frac{I}{K} - \delta - g_L\right] + (1-\alpha)g_T \quad ---(26)$$

Thus, to express the investment variable (I) in the form of per output terms, equation (26) needs to be converted into one that expresses investment per GDP on the right hand-side (see; equation 27).

$$g_y = \alpha\left\{\left[\frac{I}{Y}\frac{Y}{K}\right] - \left[\delta + g_L + g_T\right]\right\} + g_T \quad ---(27)$$

In equation (27), investment can be disaggregated into investment by private (Ip) and government (Ig). Furthermore, assuming that a fraction 'm' of aid is invested by the government, with the rest (1-m) representing consumption or waste, equation (27) can be re-written as:

$$g_y = \alpha\left\{\left[\frac{mAid + I_p}{Y}\left(\frac{Y}{K}\right)\right] - \left[\delta + g_L + g_T\right]\right\} + g_T \quad ---(28)$$

Indeed, private investment (I_p) can be decomposed into investment from domestic sources (I_d = domestic savings, S_d) and investment from foreign sources (I_f). The latter component (I_f), mainly reflects the net FDI inflows, therefore, equation (28) can be refined further as;

$$g_y = \alpha\left\{\left[\frac{Y}{K}\left(\frac{mAid}{Y} + \frac{S_d}{Y} + \frac{FDI}{Y}\right)\right] - \left[\delta + g_L + g_T\right]\right\} + g_T \quad ---(29)$$

where, 'm' shows the fraction of foreign aid actually turned into investment by the recipient government (= dI/d(Aid)), but (1-m) captures the possibility of aid fungiblity. According to Hassen (2008), 'm' is termed as "*marginal propensity to invest out of foreign aid*".

Thus, using panel data regression framework, equation (29) can be reformulated as,

$$\left[g_y\right]_{it} = \alpha\left\{\left[\left(\frac{Y}{K}\right)_{it}\left(\left(\frac{mAID}{Y}\right)_{it} + \left[\frac{FDI}{Y}\right]_{it} + \left[\frac{Sd}{Y}\right]_{it}\right)\right] - \left[\delta + g_L + g_T\right]\right\}_{it} + g_T + \theta_i + \theta_t + V_{it} \quad ---(30)$$

In equation (30), representing all the right-hand-side variables (the variable of interest and control variables) by a vector X, then the model can be written compactly as,

$$\left[g_y \right]_{it} = B_0 + BX_{it} + \theta_i + \theta_t + V_{it} \text{---(31)}$$

where, θ_i, θ_t and V_{it} denote country-specific effect (measure of individual heterogeneity), time-specific effect and idiosyncratic error term, respectively. Furthermore, i and t indexes country and time, respectively.

The neoclassical framework discussed above takes account of some of the determinants of growth. However, the model overlooked some other important determinants such as the effect of institutional quality, good governance, human capital, policies, geographic factors and other qualitative determinants of growth. This gap, however, motivated researchers in the past to study the issue of aid effectiveness in different angel and estimated varieties of Aid-Growth regressions (e.g., Easterly, 2003; Dollar and Burnside, 2000; Easterly et al., 2004 and Hassen, 2008). In fact, their research outcomes were in support of the inclusion of the above sets of variables – the regression coefficients of those variables are significantly positive.

In this thesis, some basic determinants of growth which are missing in the neoclassical growth model, such as the proportion of land in the tropics and malaria prevalence to proxy geographic factor, Freedom House's civil liberty and political right indicators to proxy the quality of institution, percentage of education expenditure to proxy human capital, are included. However, the consideration of such proxies is not ad hoc, rather it is in line with previous studies such as Easterly (2003) , Roodman (2007), Brempong and Elizabeth (2008) and Hassen (2008).

Before proceeding to the formulation of empirically estimable models, I think it is worthwhile to make a bird's eye view on some of the related studies that extend the neoclassical growth model. In their effort to include the growth effect of human capital, Mankiw et al. (1992) show that an

augmented neoclassical model that includes a broad measure of capital is able to explain statistically around three quarters of the cross-national variation in levels of prosperity.

In addition, Baro (1991), Baro and Martin (1995), Mankiw et al. (1992) and Agenor (2004) confirmed that if the concept of capital is broadened, however, to include human as well as physical capital stocks, the conditional convergence prediction of neoclassical growth theory receives much better empirical support. As Hibbs (2004) puts it, "with a traditional conception of capital, the bare bones Cobb-Douglas neoclassical model cannot possibly account for the wealth and poverty of nations".

Hibbs (2001, 2004) has reviewed the main features of neoclassical growth theory, with an eye to seeing what it has to say about the causes of wealth and poverty among nations. He argued that outside the OECD and a comparatively small circle of other countries (e.g., 'Asian tigers'), neoclassical models contribute little to identifying the deeper sources of cross-national patterns in growth and productivity. He then goes on to discuss the recent advances in the empirical analysis of economic performance that feature the influence of politics, policy and institutional arrangements on entrepreneurship, innovation, investment and the efficiency with which factor inputs are transformed into output.

Another approach taken by Olson et al. (2000) applies growth accounting to the traditional neoclassical model in order to identify country-specific determinants of the 'Solow residual' (total factor productivity). Thus, differentiating the neoclassical generic production function with respect to time for the j^{th} economy, and then dividing through by Y (output) to find the growth rate of output, yields a national income accounting equation:

$$\left[\frac{\dot{Y}}{Y}\right]_{jt} = (\alpha_K)_{jt}\left[\frac{\dot{K}}{K}\right]_{jt} + (\alpha_L)_{jt}\left[\frac{\dot{L}}{L}\right]_{jt} + R_{jt} \quad ---(32)$$

The total factor productivity -- residual (R_{jt}) -- can be partitioned into country-specific productivity effects, R(j), and random shocks, (r_{jt}), where the former supplies the main channel by which politics, policy and institutions affect economic growth. Their regression experiments using the above model produced strong statistical evidence that the measures of institutional quality exert large effects on international differences in country-specific total factor productivity.

In addition, Hall and Jones (1999) and Acemoglu et al. (2000) hypothesized reduced form equations representing the straightforward idea that politics, policy and institutions are what determine the scale of factor inputs and their efficiency in producing value added. The general regression equation considered in their study is:

$$\ln(y)_j = \alpha + \beta PI_j + \gamma Z_j + \varepsilon_j \quad ---(33)$$

where, y denotes output per worker, *PI* represents politics, policies and institutions; and *Z* is a vector of additional control variables. Their findings implied that the PI variables affect growth through increasing the availability and productivity of factor inputs. Thus, in sum, those studies reviewed above suggest the need and possibilities to extend the neoclassical growth model into different dimensions.

3.2 Estimable Econometric Models

In addition to the above extensions and modifications on the neoclassical model, it is a well documented fact in the literature that the expected benefit obtained from aid in the neoclassical model is confined to the growth rate of output per capita. However, so far as the concept of development is concerned, it is substantial to broaden the expected outcomes of aid to poverty reduction and improvement of HDI. To this end, in this thesis, attempt is made to widen the benefits obtained from aid and test whether aid is effective enough to affect those outcomes. Thus, based on the theoretical framework developed earlier, the following general regression model is specified.

$$(y_{it})_j = \alpha + BX_{it} + B'X'_{it} + \theta_i + \theta_t + V_{it} \quad ---(34)$$

where, y represents the vector of benefits realized from receiving aid such as *GDP growth rate* (g_y), *reduction of infant mortality rate* (M), and *improvement in literacy rate* (L). And X' is a vector of control variables which are absent in the neoclassical growth framework, such as institutional quality indicators, policy variables, geographical variables and other interaction terms. The subscript 'j' refers to the regression equation for the j^{th} expected benefit of foreign aid.

Accordingly, the number of equations to be estimated (j) is determined by the number of benefits realized from aid. Therefore, methodologically, this study tries to extend the horizon of the neoclassical aid-growth nexus by broadening the outcomes of aid and incorporating other important variables from the newly emerging literature on aid and poverty (such as the literature on institution, governance, policy and geography).

The model in (34) is too general that the jobs of further simplification, localization and reshaping are undeniable; it is important to come up with the estimable version of the model. Thus, based on the theoretical arguments and the research objectives, the following sets of estimable models are formulated. From equation (34),

$$\left(y_{it}\right)_j = \alpha + BX_{it} + B'X_{it}' + \varepsilon_{it} \text{ -----(35)} \quad \text{where, j} = g_y, L \text{ or M}$$

Therefore, there are three empirically estimable models namely, *Growth equation* (g_y), *Mortality equation (M)* and *Literacy equation* (L). As to what X and X' constitute in the three models (G, L and M), there are some common variables which affect all the dependent variables (for example, aid, population growth rate and policy variables) but the remaining variables are equation-specific such as technological improvement, sectoral expenditure and aid. In each equation, interaction terms (e.g., aid*policy) and square of some variables (e.g., aid^2 and $policy^2$) are included to check for diminishing returns and non-linearity. To be specific, the three models are specified below from (36)-to-(38).

$$\left[g_y\right]_{it} = \alpha + B_1 Aid_{it} + B_2 Aidsqu_{it} + B_3 policy_{it} + B_4\left(aid * policy\right)_{it} + BX_{it} + \varepsilon_{it} \text{ ---(36)}$$

where, *Aid* is net aid transfer (NAT), *Aidsqu* is foreign aid squared and *policy*[10] is a variable indicating the 'goodness' of macro-policies. The variable *Aid*policy* is an interaction term between aid and policy, and it essentially shows whether the effectiveness of aid in boosting economic growth is conditioned on the existence of good macro-policies. The *policy* variable comprises of

[10] *In the original Burnside and Dollar (2000) and later in Easterly et al. (2003), policy is constructed by regressing GDP growth rate on all variables in X and measures of the budget surplus, inflation and openness, and using the latter three to construct a policy induced predicted growth rate.*

three macroeconomic policy indicators- inflation rate, budget surplus as a percentage of recipient's GDP and openness to foreign trade. The data for such variables are obtained from WDI (2008) and DAC-OECD (2003) databases.

Following the approach used by Burnside and Dollar (2000), Easterly et al. (2003), Hansen and Trap (2001) and Hassen (2008), the policy variable is generated from the regression of GDP growth rate on all control variables (X) including indicators of macro policy (inflation rate, budget surplus and openness). The openness variable considered for this study, which is retrieved from WDI (2008), is the ratio of the sum of export and import to GDP (i.e., (X+M)/GDP). This openness variable is preferred to the close-open dummy, because it enables one to show the extent of openness to trade. Furthermore, ε_{it} ($= V_{it} + \theta_i + \theta_t$) is a composite error term comprised of an idiosyncratic error term (V_{it}), country heterogeneity (θ_i) and time-specific effect (θ_t).

In the estimable model specified above (36), the vector X constitutes other control variables, which can possibly affect economic growth (which is proxied by GDP growth). Those variables are variables that have been used in the literature to explain growth. This includes level of savings, the net flow of capital (proxied by FDI), initial condition, quality of institutions, proportion of land in the tropics (to proxy geographic factor), number of people assassinated (to proxy political instability), ethnic fractionalization index (to proxy social conflicts), education expenditure, labor force growth rate and life expectancy.

In this study, the proxy considered for institutional quality is Freedom House's political right and civil liberty index. The choice of such proxy is guided by data availability. However, a somewhat better proxy, the International Country Risk Guide (ICRG) variables, which consist of subjective scores on five aspects of politics, policy and institution relevant to the security of property rights in

various countries and periods, is failed to be accessible. Thus, the effort made to get the data on those variables was not successful.

Some studies such as Burnside and Dollar (2000) and Gomanee, et al. (2005) predict that with good policies aid works to improve living conditions in receiving country. However, others (e.g., Easterly, 2003) argue empirically that aid does not have any effect on growth on account of the fungibility and misuse of aid. Therefore, signing the coefficient of aid (β_1) in (36) a priori is not easy, and thus remains an empirical issue. However, aid square is expected to have a negative sign, because of the fact that aid is expected to exhibit diminishing returns, i.e., receiving excessive aid in a continuous manner may tend to reduce its role of promoting growth or improving HDI as argued by Easterly(2003), Hassen (2008) and Bremopong and Elizabeth (2008), among others.

The other two regression equations (37 and 38), which try to show the effects of sectoral aid and other control variables on adult literacy and infant mortality rates, are specified below. Most of the control variables which are included in these models are consistent with studies conducted by Gomanee et al. (2004a, 2004b), Bremopong and Elizabeth (2008) and Masud and Yontcheva (2005).

$$[L]_{it} = \theta_0 + \theta_1 Aid_{it} + \theta_2 AidSqu_{it} + \theta_3 INQ_{it} + \theta_4 INQSq_{it} + \theta_5 (Aid*INQ)_{it} + \theta_6 GRGDPPC_{it} + \theta_7 GEeduc_{it} + \theta_8 (tech/stud)_{it} + \varepsilon_{it} \quad \text{.....(37)}$$

where, '*L*' indicates adult literacy rate[11], '*Aid*' is aid allocated to education sector, *INQ* is an index for good institutional setup, '*GEeduc*' is domestic expenditure on education and (tech/ stud) is a variable representing the teacher-to- student ratio.

[11] *According to UNESCO's definition, adult literacy rate is the percentage of people age 15 and above who can understand, read and write a short, simple statement on their everyday life.*

As to the expected sign of the parameter estimates of model (37), which is actually based on the findings of the studies conducted thus far, for the coefficient of aid variable, the results from previous studies are mixed. For example, Dreheret al. (2006) and Michaelova and Weber (2006) come up with a result that aid works to improve the rate of literacy ($\theta_1>0$) while other studies concluded that aid is ineffective to improve the rate of literacy, *ceteris paribus*. Thus, a priori its sign is indeterminate. For the variable, square of aid (AidSqu), almost all of the related literature (especially, the *Medicine model* studies) report a negative sign implying diminishing returns to aid ($\theta_2<0$). As this study substantially depends on the *Policy* and *Medicine* model studies, a negative coefficient of aid squared is expected.

The coefficient of real GDP growth is expected to be positive ($\theta_6>0$). However, such expectation is in line with the findings of previous studies such as Brempong and Elizabeth (2008) and Masud and Yontcheva (2005)-economic growth improves literacy rate. Moreover, these studies contended that good institutions and policies are expected to improve rate of literacy i.e. ($\theta_3>0$). Thus, the coefficient of the interaction term (Aid*INQ) is expected to be positive, hoping that aid works if the recipient government is governing well.

Gupta et al. (1999) find that public expenditures on education lead to increased school enrollment rate in LDCs, i.e., ($\theta_7>0$). Furthermore, Baldacci et al. (2004) show that expenditure on education is the only significant determinant of primary school enrollment. In fact, the amount of expenditure allocated for a sector in reality implies the government's commitment to improve the outcome generated from that sector (however, effectiveness is another question!). Thus, sharing this idea, and presuming that a government spending more on a sector improves that sector's outcome, a positive effect is hypothesized.

The coefficient of the teacher-to-student ratio (θ_8) variable (taken as a proxy to the quality of instruction), however, may lead us to the concept of production function. When we take teachers as one of the inputs to the teaching process and the students as output, more teachers enable one to have more students, i.e., helping to increase literacy rate. Annual reports of UNESCO on education strengthen this argument and disclose the need for teachers' development to increase literacy. Based on these arguments, a positive coefficient of the variable ($\theta_8 > 0$) is expected.

The third regression equation, (38), models the effect of aid given to health sector and other control variables on under-five mortality rate. The model in its level form is,

$$[M]_{it} = \alpha_0 + \alpha_1 \text{Aid}_{it} + \alpha_2 \text{AidSqu}_{it} + \alpha_3 \text{INQ}_{it} + \alpha_4 (Aid * \text{INQ}_{it}) + \alpha_5 \text{GRGDPPC}_{it} + \alpha_6 \text{Social}_{it} + \alpha_7 (\text{doc/pat})_{it} + \varepsilon_{it} \ldots\ldots (38)$$

where, M[12], *Aid*, (*doc/pat*) and *social* are variables indicating infant mortality rate, health sector aid, doctor-to-patient ratio and social spending (proxied by expenditure on education), respectively. The other variables are defined in the literacy equation, (37). The results of previous studies indicate that the sign of the coefficient of aid can be either positive or negative. For example, Gomanee et al. (2004a) find that aid improves human welfare and decreases infant mortality. However, the other strand of literature believes that it does not reduce mortality. Thus, no a prior sign is given to it. The same holds for the coefficients of aid squared and the economic growth rate.

Furthermore, education is considered to be one of the tools which help to reduce mortality--educated people care more about their health and the health of others (Gupta et al., 1999 and Masud and Yontcheva, 2005). Thus, α_6 is expected to be negative.

[12] *According to World Bank (2008) definition, average under-5 mortality rate is the probability that a newborn baby will die before reaching age five and such probability is expressed as a rate per 1000.*

3.3 Estimation Techniques, Hypothesis and Specification Tests

This section explains the estimation techniques applied and the tests carried out to detect and correct different specification problems. One of the challenges in the process of estimation, which is common to most macroeconomic variables, is endogeneity. To correct for this problem, this study chooses to adopt the Generalized Methods of Moments (GMM) methods of estimation. It is chosen because the GMM estimator consistently estimates dynamic panel data model, produces substantial efficiency gains and performs better in small samples. It has been applied in recent dynamic panel data studies such as Bermopong and Elizabeth (2008), Hassen (2008) and Roodman (2007).

Burnside and Dollar (2000) and Easterly et al. (2004) estimate a number of variants of equation (36) using simple OLS and 2SLS, where for the latter all variables in X are assumed to be exogenous. However, there are a number of potential econometric problems in doing so. First of all, as pointed out by Hansen and Tarp (2001), many of the variables in X are likely to be endogenous. Thus, to shed more light on the choice of this estimation technique (GMM), the following general Dynamic Panel Data (DPD) model is considered:

$$y_{it} = \alpha + \rho y_{it-1} + BX_{it} + \theta_i + \theta_t + V_{it} \quad ---(39)$$

Lagging the above model, (39), one period we will have:

$$y_{it-1} = \alpha + \rho y_{it-2} + BX_{it-1} + \theta_i + \theta_t + V_{it-1} \quad ---(40)$$

As shown in (39) and (40), both (y_{it}) and (y_{it-1}) are a function of θ_i and θ_t (which are part of the error term, ε_{it}). This makes an OLS estimator biased and inconsistent even if V_{it} is not serially correlated. On the other hand, the within-estimator runs an equation of the form

$$y_{it}-\bar{y}_{i.}=\left(\theta_i-\bar{\theta}_i\right)+\left(\theta_t-\bar{\theta}_t\right)+\rho\left(y_{it-1}-\bar{y}_{i.-1}\right)+B\left(X_{it}-\bar{X}_{i.}\right)+\left(V_{it}-\bar{V}_{i.}\right).....(41)$$

Again, y_{it-1} is correlated with $\bar{V}_{i.}$ by construction. Thus the within estimator is biased (e.g., Nickell, 1981 computed this bias) and its consistency depends on 'T' being large. The model in equation (39), however, includes as one of the regressors a lagged dependent variable (y_{it-1}). In such a case, the usual approach to estimating a fixed-effects model -- the Least Squares Dummy Variable (LSDV) estimator -- generates a biased estimate of the coefficients and also leads to *incidental parameter problem*. Furthermore, the random effects Generalized Least Square (GLS) estimator is also biased in a Dynamic Panel Data (PDP) model. The problem arises because the GLS method entails quasi-demeaning of variables using some' λ', i.e.,

$$y_{it}-\lambda\bar{y}_{i.}=\rho\left(y_{it-1}-\lambda\bar{y}_{i.-1}\right)+B\left(X_{it}-\lambda\bar{X}_{i.}\right)+\left(V_{it}-\lambda\bar{V}_{i.}\right)---(42)$$

In the right-hand-side, the first and third terms are correlated, which leads to biased and inconsistent parameter estimates.

Anderson and Hsiao (AH for short) (1981), suggested differencing equation (39) to get rid of the time and country-specific effects and tried to find instruments which are uncorrelated with the error term. However, this method leads to consistent but inefficient estimates of the parameters because it does not make use of all the available moment conditions. Latter, Arellano and Bond (1991) proposed a GMM procedure that is more efficient than AH (1981) method. They argue that additional valid instruments can be obtained in a dynamic model if one utilizes the orthogonality condition that exists between lagged values of y_{it} and the disturbance term (V_{it}). Furthermore, to

check for validity of those instruments, Arellano and Bond (1991) introduced Sargan's test of over identifying restrictions.

Later, Arellano and Bover (1995) and Blundell and Bond (1998) unified the GMM framework for looking at Instrumental Variable (IV) estimator for dynamic panel data models. This method eliminates individual and time effects by computing orthogonal forward deviation. Orthogonal deviations as proposed by Arellano (1988) and Arellano and Bond (1995) express each observation as the deviation from the average of the future observations in the sample for the same individual and weight each deviation to standardize the variance (see Baltagi, 2005). The orthogonal forward deviations use the same instruments as in Arellano and Bond (1991) but add some other lagged values as instrument.

Thus, Arellano and Bover (also called system-GMM) estimation technique, which actually considers all the right-hand-side variables as endogenous, is more appropriate to handle the problem of endogenity by providing a wider choice of instruments than the Arellano and Bond (1991) technique.

3.3.1 Tests of Hypotheses and Misspecification

The main types of hypothesis tests conducted in this study are parameter tests, specification tests and misspecification tests. As usual, to carry out parameter tests, the t-test (for one parameter) or F-test for several parameters is used. It is known that estimating heteroscedastic and serially correlated errors with the assumption of homoscedasticity and no autocorrelation will yield consistent but inefficient estimates (Sichei, 2008). Thus, to detect the presence of autocorrelation the

Durbin-Watson statistic in panel data framework and the Arellano and Bond's AR test are considered. To correct for such problems, if detected, the approach considered is to accept the usual estimates, but to calculate their robust standard errors (Baltagi, 2005).

For the growth regression model specified earlier, to test for stationarity (unit roots), Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) tests are applied. In both tests, the null hypothesis to be tested is 'there is unit root'. Both tests begin with the following;

$$y_{it} = \rho_i y_{it-1} + BX_{it} + \varepsilon_{it} \quad ---(43)$$

If $|\rho_i|<1$, y_{it} is weakly (trend) stationary. On the other hand, if $|\rho_i|=1$, then y_{it} contains unit root. Thus, the general Augmented Dickey-Fuller (ADF) model is,

$$\Delta y_{it} = (1-\rho_i) y_{it-1} + BX_{it} + \sum_{j=1}^{p_i} \rho_{ij} \Delta y_{it-j} + \varepsilon_{it} \quad ---(44)$$

Therefore, according to these tests, the null hypothesis (H_0) to be tested is $(1-\rho_i)=0$ against the alternative (H_1) that $(1-\rho_i) \neq 0$. The LLC test differ from IPS test where the former assume common unit root ($\rho_i = \rho$) and the latter assumes individual unit root ($\rho_i \neq \rho$). To check for the presence of cointegration with the null hypothesis "there is no cointegration", the Engel-Granger (EG) based Pedroni (2004) test is utilized. The general approach is to obtain residuals from the regression (43) and then test whether the residual is integrated of order 1, I (1), just like in EG-2 step procedure (i.e. testing of $\eta_i = 0$ in 45). Thus, the auxiliary regression is;

$$\Delta e_{it} = \eta_i e_{it-1} + \sum_{j=1}^{p_i} \eta_{it} \Delta e_{it-j} + V_{it} \quad -----(45)$$

Thus, Pedroni's panel cointegration statistic is constructed from the residuals of the auxiliary regression and shows that the standardized statistic is asymptotically normally distributed.

3.4 Data Sources, Description and Sample Selection

The input data used in this study is obtained from different sources including the IFS CD-Rom, World Development Indicators (WDI) and Global Development Finance (GDF) databases of the World Bank, Organization for Economic Co-operation and Development (OECD) CD-Rom, Freedom House's online databases, Roodman (2007) aid data file and regional reports. However, to examine the data and to make it ready for regression analysis, graphical presentation and summary descriptive statistics are also presented in the first part of the next section.

The aid variable (NAT), which is considered for the growth equation (36), is obtained from of Roodman's (2007) data file. The data covers a period from 1960-2007 and nets out all the repayments and cancelations of loans. The sectoral (education and health) aid data, which is used in the mortality and literacy equations, is obtained from the Aid Activity (AA) database. The aid in AA (also known as the Creditor Reporting System-CRS) comes from donors, including the 22 member countries of the OECD's Development Assistance Committee (DAC), the European Commission and other international organizations. The database covers DAC donors' bilateral aid (including projects executed by non-governmental organizations and multilateral institutions on behalf of the donor), and projects by the World Bank, the regional development banks and some UN agencies.

The CRS's sectoral classification contains the following broad categories: *social infrastructure and services* (covering the sectors of education, health, population, water, government and civil society), *economic infrastructure and services*, *production*, *multi-sector* and *non-sector allocable*. In the CRS database, each sector is also defined through a number of purposes and detailed activities. For example, the education sector encompasses: (i) Education Policy and Administrative Management; (ii) Basic education; (iii) Secondary education and (iv) Post-secondary education. The health sector activities are also broadly classified into (i) general health and (ii) basic health.

The health and education sector aid data for the period 1973 to 2007 is used for empirical analysis. The choice of this period is dictated by the availability of data. Given that sectoral aid data are only available from 1973, the econometric analysis is based on seven four-year periods, one three-year and one two-year periods. The data for each variable is averaged for four years to (1) reduce the shake (noise) observed in the annual data and (2) be able to analyze those macro variables in terms of average than individual year basis.

The countries which are included in the regression analysis are listed in appendix I. However, the criterion considered to include a country in the econometric analysis is the presence of crucial variables (e.g., aid, literacy rate, mortality rate and GDP growth rate) for that country (those countries which have missing data for crucial variables for more than 5 periods are dropped from the regression analysis).

IV. Results and Discussion

This section presents both descriptive and econometric results and discussion of especially the key variables of interest (foreign aid and Human Development Indicators, HDI). It is organized into two broad sub-sections. The first sub-section presents and discusses descriptive results of foreign aid and HDI. Here attempt is made to show how foreign aid and components of HDI are trending and co-trending, which in fact points to the statistical relationship. In general, the data is explored to visualize the behavior and trend of the variables over time and across countries. To substantiate the discussion made in the descriptive part and to be able to test some workable hypotheses of the study, the second sub-section (4.2) gives due attention to the econometric analysis and statistical inference.

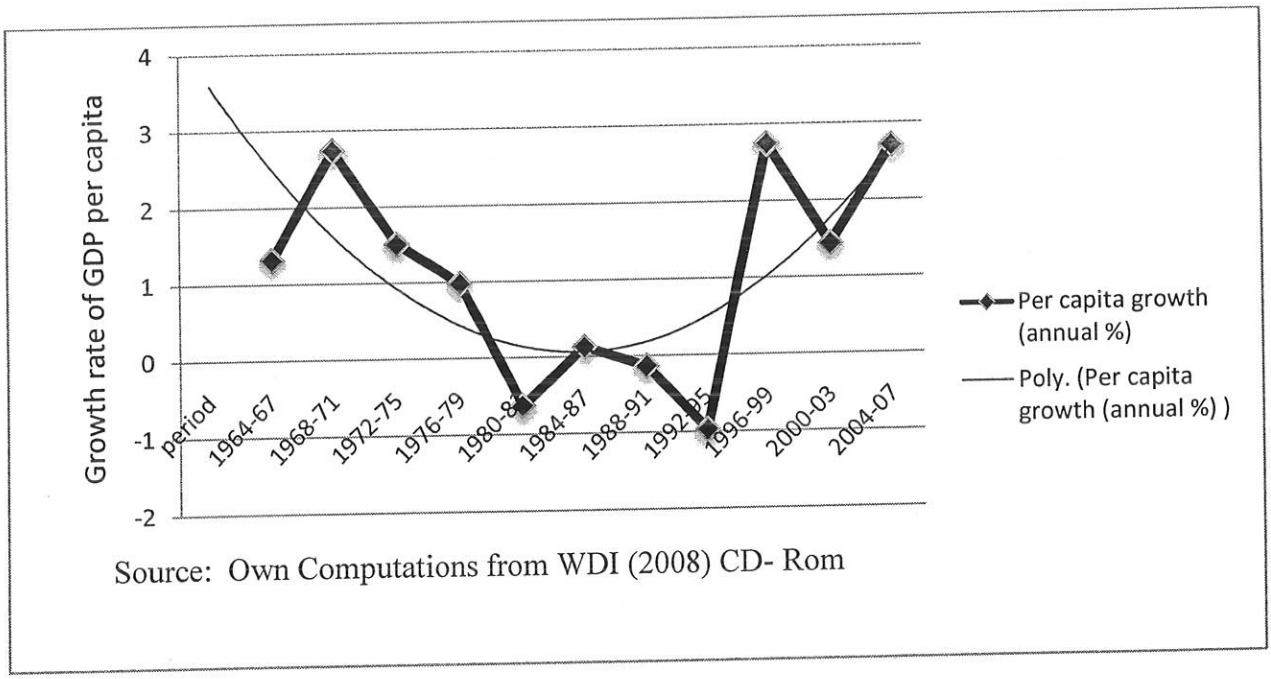
4.1 Descriptive Results

4.1.1 Human Development Indicators Trend in SSA

As the objective of this study is to show the macroeconomic link between different forms of foreign aid and HDI, in this sub-section a short summary is presented about the basic indicators of human development in SSA in particular and Africa in general. These include growth rate of GDP per capita, adult literacy and under-five mortality rates. As shown in Figure 2, the growth rate of GDP per capita, which is one component of HDI, is exhibiting a highly fluctuating trend over the period under consideration.

The periods 1980-83 and 1992-95 are shown to be the period of recession. Furthermore, the growth trend exhibited in the period 2004-2007 is just the opposite of what it has been during 1964-67 and a polynomial trend line yields a 'U' shape. In sum, the region's growth, as proxied by per capita GDP

growth rate, has shown improvements over the period 1992-2007. This implies that the recent GDP growth record of the region is somehow promising and encouraging one.

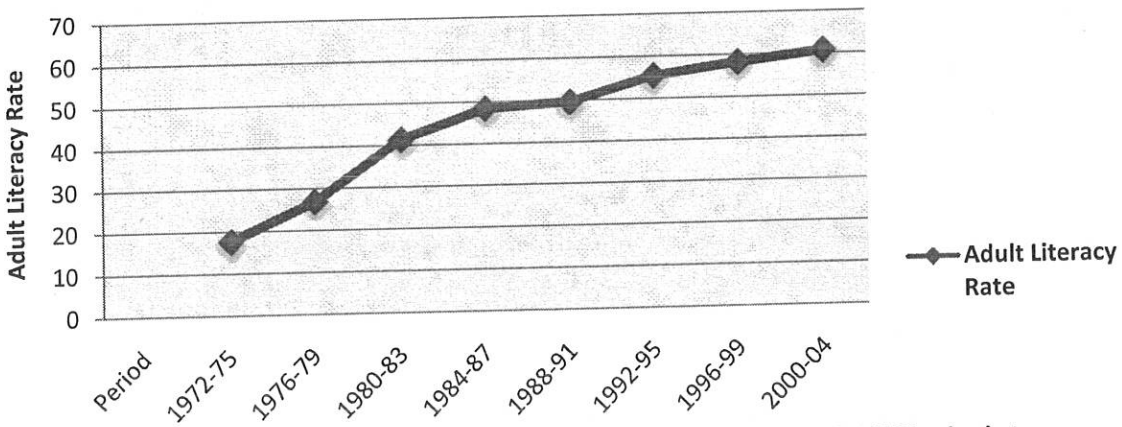


Source: Own Computations from WDI (2008) CD- Rom

Figure 2: Per Capita GDP Growth Rate (%) in SSA (4-year average from 1964-2007)

The Human Development Index of the region in 2008, which is calculated based on data on life expectancy from UN (2007), on adult literacy rates from UNESCO Institute for Statistics (2003, 2008a), on combined gross enrolment ratios from UNESCO (1999, 2008b), and on GDP per capita (2006 PPP US$) from World Bank (2008c) indicate that out of those countries which have been identified as low HDI, 24 of them are in SSA. In recent periods, even though the region is showing some remarkable performance in terms GDP growth, the human development index rank of the region is still lower than other regions of the world (i.e. other components of HDI such as life expectancy, adult literacy rate, and infant immortality rate are still low).

A more recent data from the OECD-DAC database and WDI (2008) on literacy rate strengthen the argument that adult literacy rate is improving over time. The average literacy rate for SSA region over the period 1972-2007 is found to be 46, which is less than the average literacy rate of 62 over the period 1999-2006. In fact, this literacy rate of 62 is quite higher and better than what it has been in earlier periods but it signals the need for further efforts to realize one of the Millennium Development Goals of attaining universal education targeted by member states of the United Nations.



Source: OECD (2003)-Statstics on Economic Indicators of Aid Recipeints- and WDI (2008) CD-Rom

Figure 3: Adult Literacy Rate in SSA Four Year Average (1972-2004)

Another component of HDI considered is mortality rate. According to the harmonized estimates of the World Health Organization (WHO), UNICEF, and the World Bank (which is based mainly on household surveys, censuses, and vital registration), on average, the mortality rate in the region of SSA has declined over time. A four year average data on infant mortality rate from the WDI (2008) pointed out that, for the region, under-five mortality rate has declined from 239 in period 1964-67 to 141 in 2004-2007. In fact, the average over the period 1964-2007 is 179, which is still high in absolute terms.

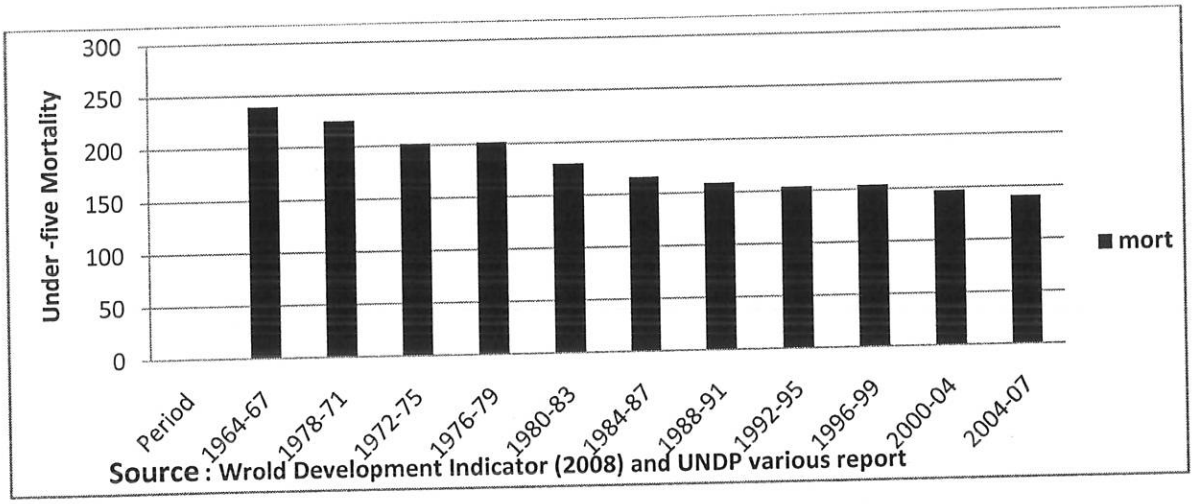


Figure 4: Under-Five Mortality Rate (per 1000)

Over the period 1999-2006, SSA has recorded lower level of adult literacy compared to other regions of the world. In addition to literacy rate, the other components of HDI are also relatively lower which actually points to lower HDI index. It is visible in column (5) of Table 1 that the HDI index of SSA, 0.495, is much lower than the world average of 0.747. Overall, the region is characterized by low HDI as indicated by low level of literacy, gross enrollment and life expectancy.

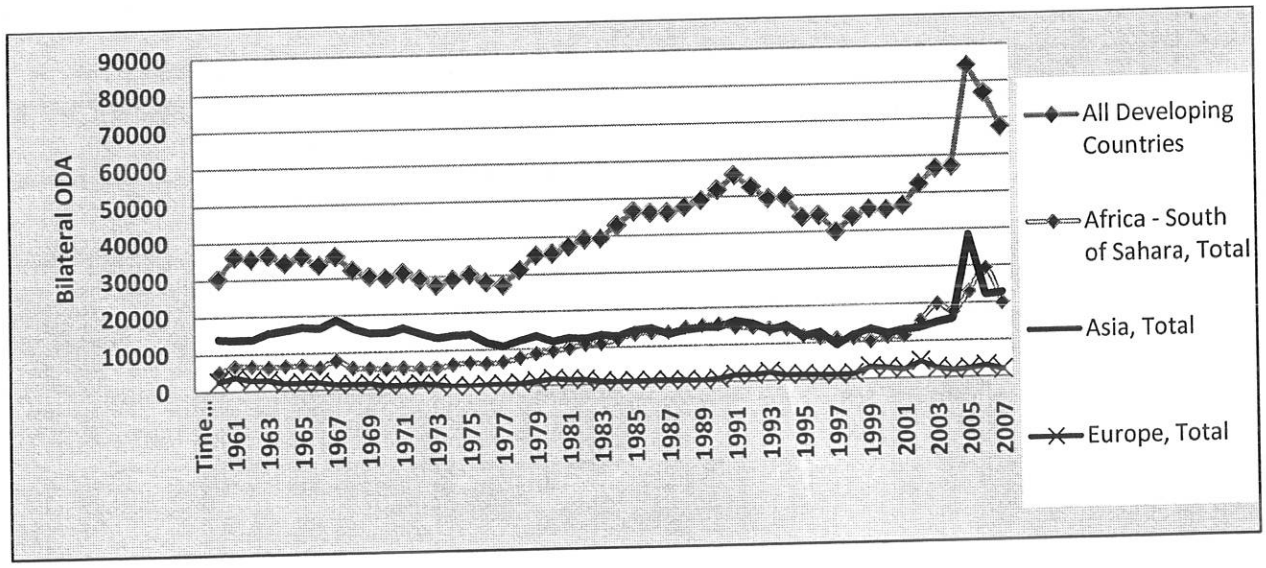
Table 1: HDI and Its Components in Different Regions of the World

	Components of Human Development Indicator (HDI)			
Region/ Income Group	Combined gross enrollment ratio in % (2006)	Life expectancy at birth	Adult literacy 1999-2006	HDI index (2006)
Developing countries	63.5	66.3	78.8	0.688
Least developed countries	48.8	54.9	56.3	0.480
East Asia and the Pacific	69.2	72.0	92.3	0.762
Latin America and the Caribbean	82.0	73.1	90.6	0.810
South Asia	58.1	64.1	63.6	0.606
Sub-Saharan Africa	***50.3***	***49.9***	***62.1***	***0.495***
Medium human development	64.1	67.8	80.3	0.690
Middle income	73.2	71.1	91.4	0.774
Low income	54.9	60.3	63.8	0.564
World	***67.0***	***68.3***	***81.0***	***0.747***

Source: UNDP, HDI Index Trend (2008), Table (1)

4.1.2 Foreign Aid in SSA: Size, Trends and Composition

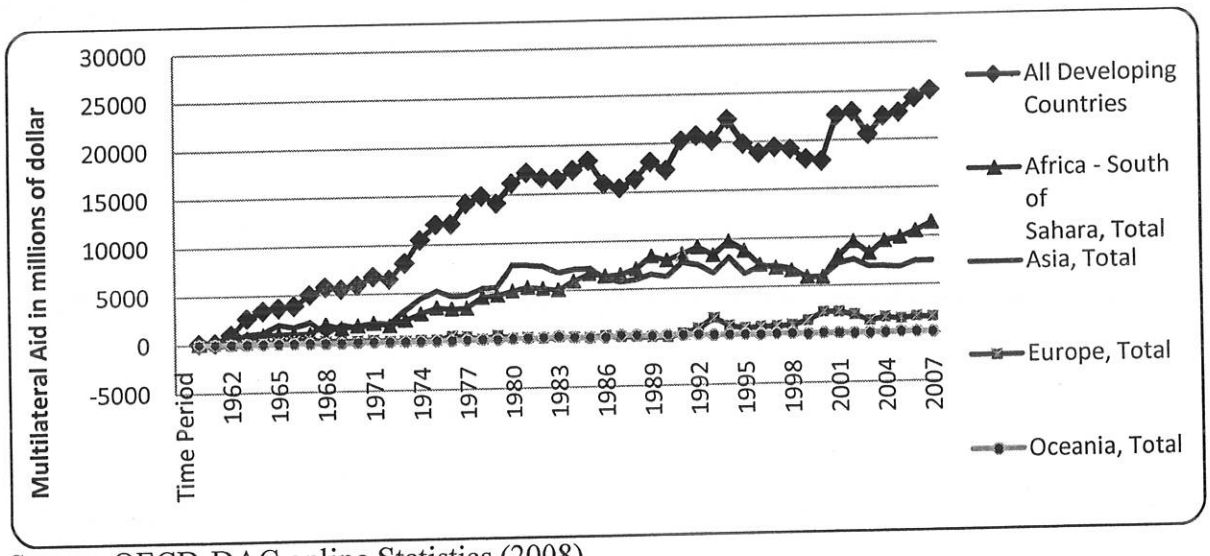
Foreign aid has exhibited different trends in SSA over the period 1960-2007. In this part, the focus is on the trends and overall behavior of different types of aids (such as NAT, health and education sector aid). So as to assign ranks for the different groups, the patterns of aid are analyzed from donors' and recipients' side. Furthermore, in order to account for the economy's size, aid as percentage of GDP and per-capita aid are also scrutinized.



Source: OECD-DAC Online Statistics on ODA

Figure 5: Regional Share of Total Bilateral ODA from DAC donors (in 2006 millions of dollar)

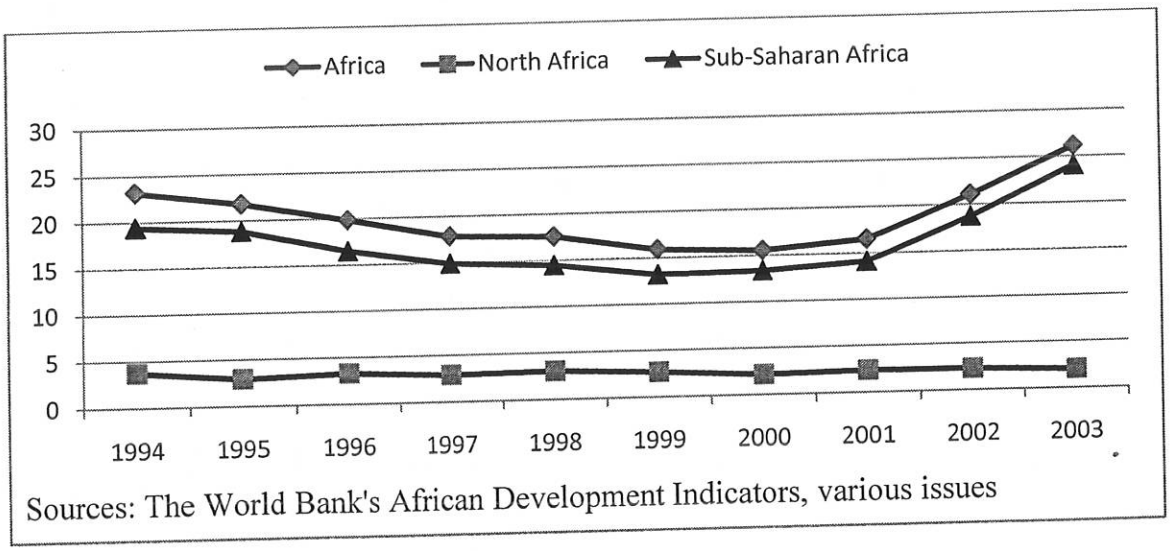
As shown in Figure 5, the SSA's share of bilateral aid has been increasing overtime. Furthermore, a comparison on the total bilateral aid inflow to SSA and Asia indicate that before 1983 the share of bilateral aid given to SSA was less than the Asian counterpart. However, after 1983, the latter's share tends to decline except in year 2004. Thus, on regional basis, SSA is the home of excessive bilateral aid inflows especially in recent periods. Even though there are some slightly different trends, the total multilateral aid to the region also exhibit nearly similar pattern as the total bilateral aid does (see Figure 6).



Source: OECD-DAC online Statistics (2008)

Figure 6: Regional Share of Multilateral Aid (amount in 2006 Constant Prices)

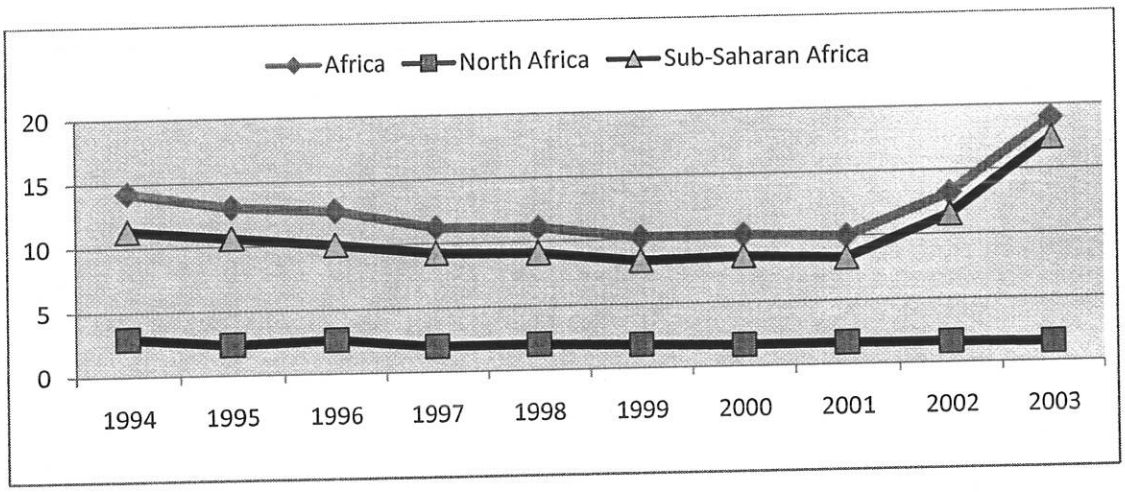
As shown in Figure 7, the net ODA given to SSA is just tracking the aid pattern of Africa and showing an upward trend since 2000. On the contrary, the aid dependency exhibited by the North African countries has shown lesser fluctuation and it is in a declining trend. Thus, SSA takes the first rank even within the African continent.



Sources: The World Bank's African Development Indicators, various issues

Figure 7: Net ODA from All Donors (in billions of US Dollars) in 1994-2003

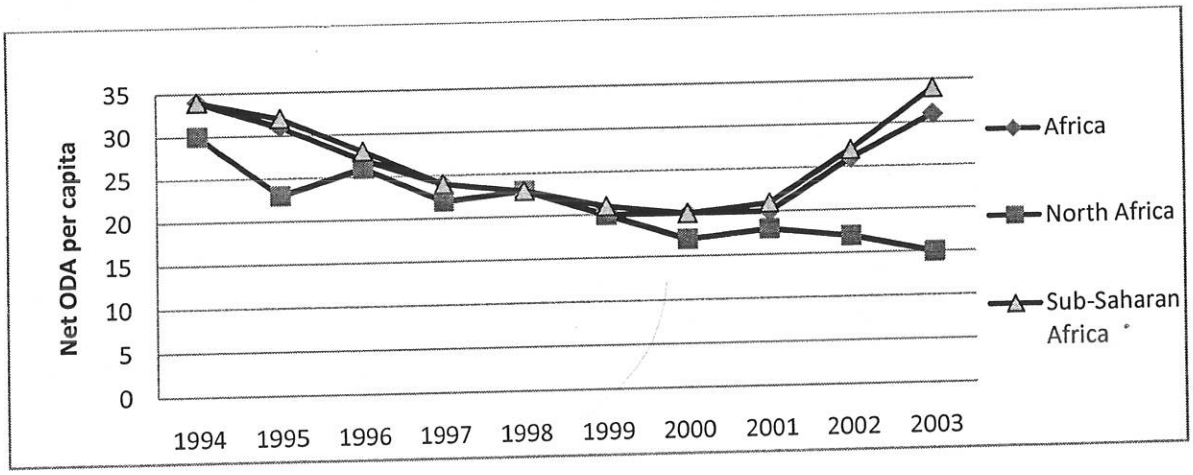
The same pattern as in Figure 7 is put on view by considering the net ODA coming from DAC donors. Figure 8 displays this fact. However, Figures 7 and 8 strengthen the argument that most of the bilateral aid received by Africa in general and SSA in particular is coming from DAC donors.



Source: The World Bank's African Development Indicators, various years

Figure 8: Net ODA from DAC Donors (amount in Billions of US Dollars)

When the size of the economy is taken into account (such as population and GDP), the trends and behavior of net ODA provided to the two Africa regions (SSA and North Africa) shows a trend somewhat different from the one shown above (in mi US$).



Source: Own computations from the World Bank's African Development Indicators

Figure 9: Net ODA Per Capita from All Donors (US dollars), 1994-2003

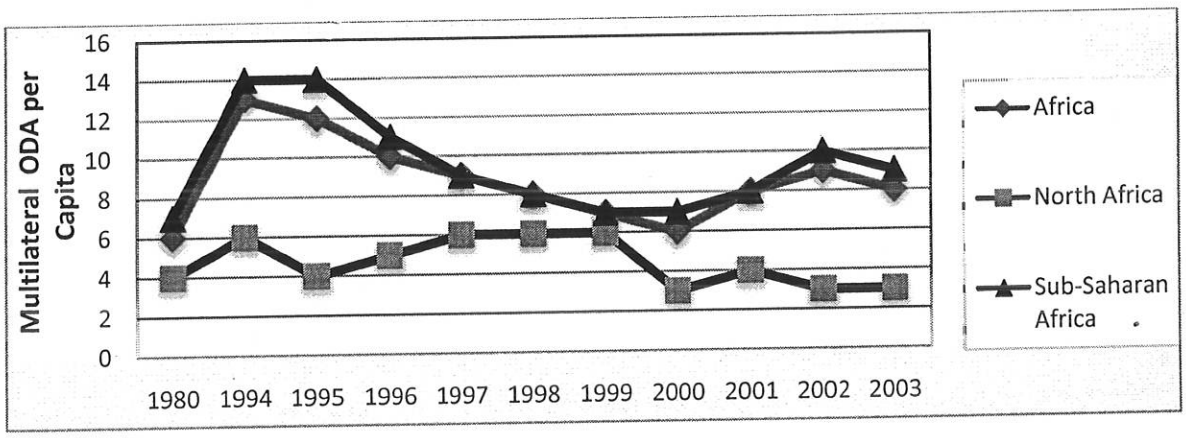
Figure 9 implies that the net ODA per capita from all donors of SSA and North Africa has shown a converging trend in the period 1996 to 2001. However, from 2001 onwards, there has been some degree of divergence. The other variable which enables one to account for the size of the economy is its GDP. Thus, when the net ODA of the region is adjusted to its GDP, it can partly show the aid-dependency of the economy. This can be seen from Table 2 and Figure 10.

Table 2: Net ODA from all donors as a percentage of the region's GDP

Year / Region	1980	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Africa	3.2	5.4	4.6	3.9	3.4	3.4	3.1	2.9	3.1	3.8	4
North .A	2.1	2.7	1.9	2	1.7	1.7	1.4	1.1	1.1	1.1	0.9
SSA	4.1	6.8	5.9	5	4.3	4.5	4.1	4	4.3	5.5	5.6

Source: The World Bank's African Development Indicators and DAC (2006).

Table 2 shows that the reliance on aid in North Africa has been declining over the period 1980-2003. However, aid as a percentage of region's GDP in SSA has shown substantial fluctuation over the period under consideration. The period's average of aid to GDP ratio in SSA of 4.9 is higher than both the continental average (3.7) and North Africa region (1.6). The pattern of ODA per capita from multilateral agencies look likes,



Source: World Bank's African Development Indicators and DAC's online statistics.

Figure 10: Net ODA Per Capita from Multilateral donors, 1980-2003

Figure 10 portrays the fact that multilateral aid per capita to SSA and North Africa has been on the way to converge and trending together before the year 1999. However, this converging trend and the possibility of showing similar pattern of change have disappeared after 1999. Similar to the case when multilateral aid is measured in millions of dollar, multilateral aid-to-GDP ratio to SSA and Africa are going together, implying considerable share of SSA in multilateral aid transfer to the continent (see Figure 11).

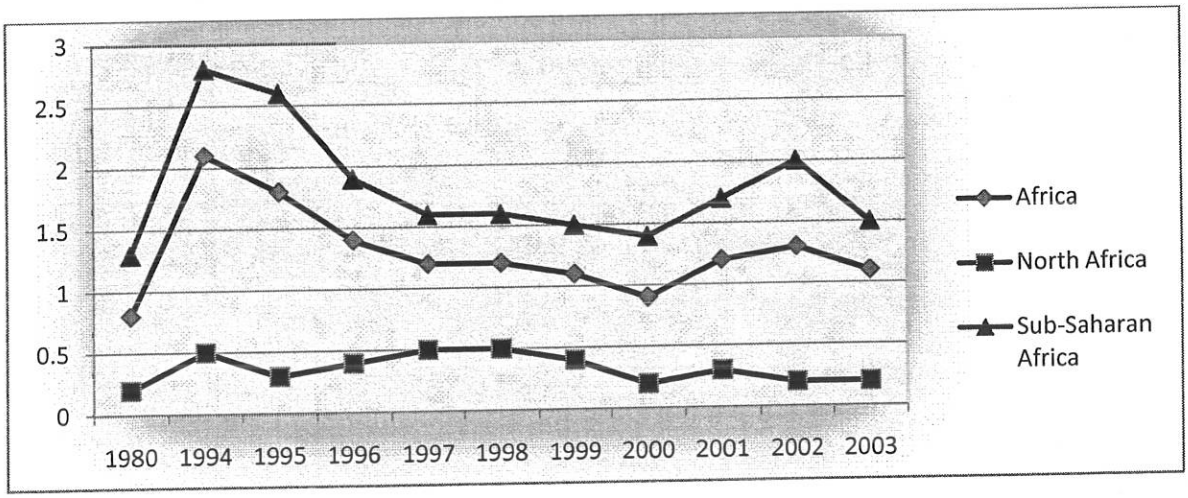
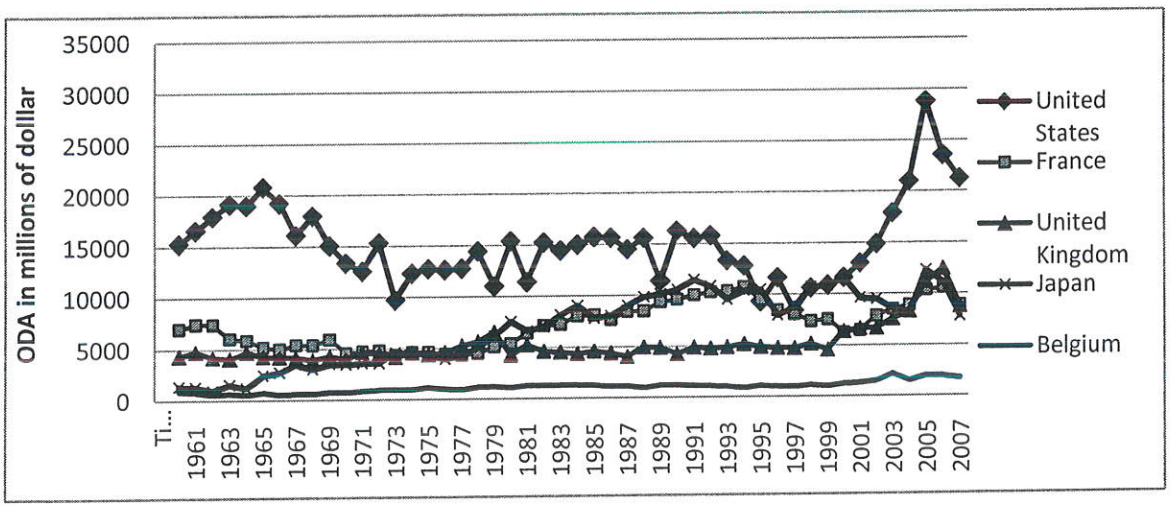


Figure 11: Net ODA from Multilateral Donors as a Percent of Recipient GDP, 1980-2003

On average, multilateral aid as percent of recipient's GDP exhibits a declining trend over time for both SSA and North Africa. It reached a maximum of 2.8 and 0.5 for SSA and North Africa in 1994, and the period average of such aid for SSA, North Africa and Africa was 1.8, 0.33 and 1.3, respectively. Thus, all the above measures and indicators of indebtedness imply that SSA is more addicted to aid than North Africa does. Perhaps, the declining share of North Africa's aid may imply the overall self-sufficiency of the region.

In sum, the top five bilateral donors to the world in millions of dollars on net disbursement basis since 1970 are the United States, Japan, France, United Kingdom and Germany, each constituting 29%, 13%, 10%, 9% and 8% of DAC aid, respectively. However, the top five multilateral donors since 1970 are the European Commission (EC), International Development Association (IDA), Asian Development Fund (ADF), World Food Programme (WFP) and United Nations Development Programme (UNDP).According to OECD-DAC's statistics on bilateral ODA flow to SSA, United States, Japan, France and United Kingdom are the major donors to the region. As Figure 12 shows, the aid from Belgium is relatively small but following a stable path with minor fluctuations.



Source: OECD-DAC statistics on regional Bilateral aid flow

Figure 12: Trends of ODA from major donors of SSA (Millions of dollar)

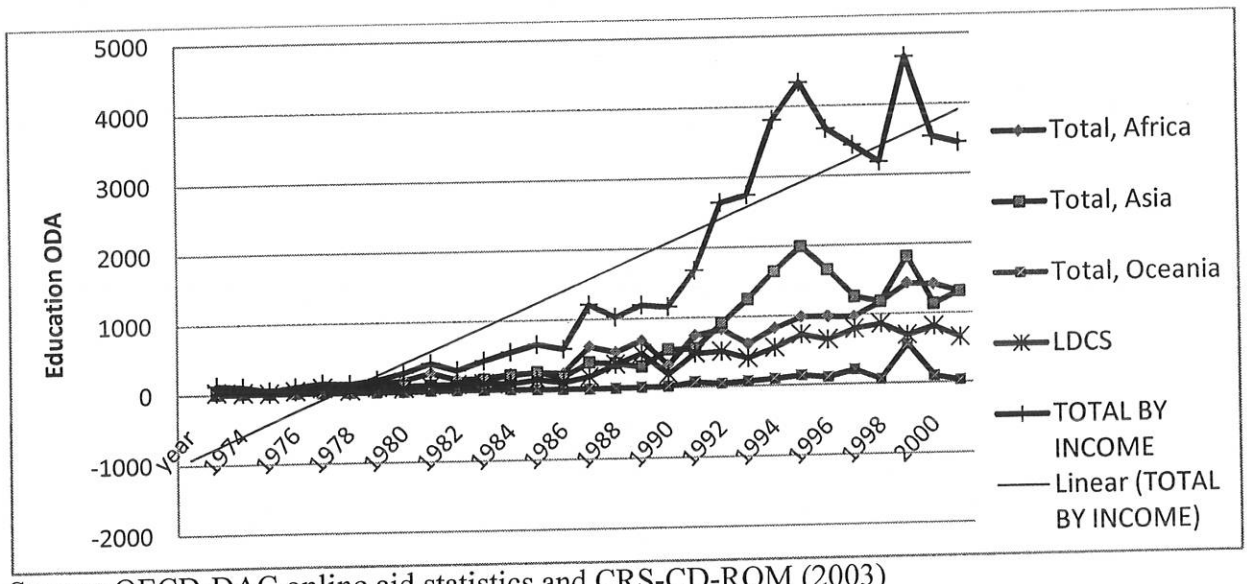
Furthermore, over the period 2000-04, Iceland (85%), Portugal (84%), Italy (82%), Belgium (83%), and France (76%) allocated more than 75% of their bilateral aid to Africa. However, their contributions as a percentage of DAC counties total was 1%, 2%, 6%, 3%, and 19%, respectively. Thus, it is clear that, over the period under consideration, Iceland, Portugal and Belgium directed more share of their total assistance to Africa.

Looking at the indebtedness history of African counties in the period 1970-79, Egypt, Tanzania, Sudan, Morocco, Congo Democratic Republic and Algeria were in the list of 'top 6 aid recipients in Africa'. However, this sign of indebtedness has changed a bit in the latter periods. For example, in the ten years period of 1980-89, Egypt, Tanzania, Sudan, Morocco and Kenya were taking the lead in their respective order. In the period 1990-99, Mozambique, Zambia, Ethiopia and Côte d'Ivoire had joined the top six in that order. However, in 2000-04 Congo Democratic Republic[13], Tanzania, Ethiopia, Mozambique and Egypt were taking a rank of first-to-fifth aid recipients of the continent.

The analysis made so far concentrates exclusively on the questions of "from where more portion of the aid (bilateral and multilateral) is coming from" and "which countries are receiving more of it" under the period in consideration. In fact, asking questions such as "to which sector the aid is disbursed" and "funding which activities within the sector" are also quite natural. Thus, in order to answer these and similar questions, the following section tries to view the sectoral aid (health and education) from the recipients' and donors' side. So as to make logical comparisons, the variables are analyzed within and between regions.

As can be seen from Figure 13, the total education aid disbursed to different regions has shown an increasing trend over the period under study (see the linear trend line). In general, Asia and Africa are the two major recipients of education aid over the study period, and the former's share has been highly correlated with the total aid commitment to the sector.

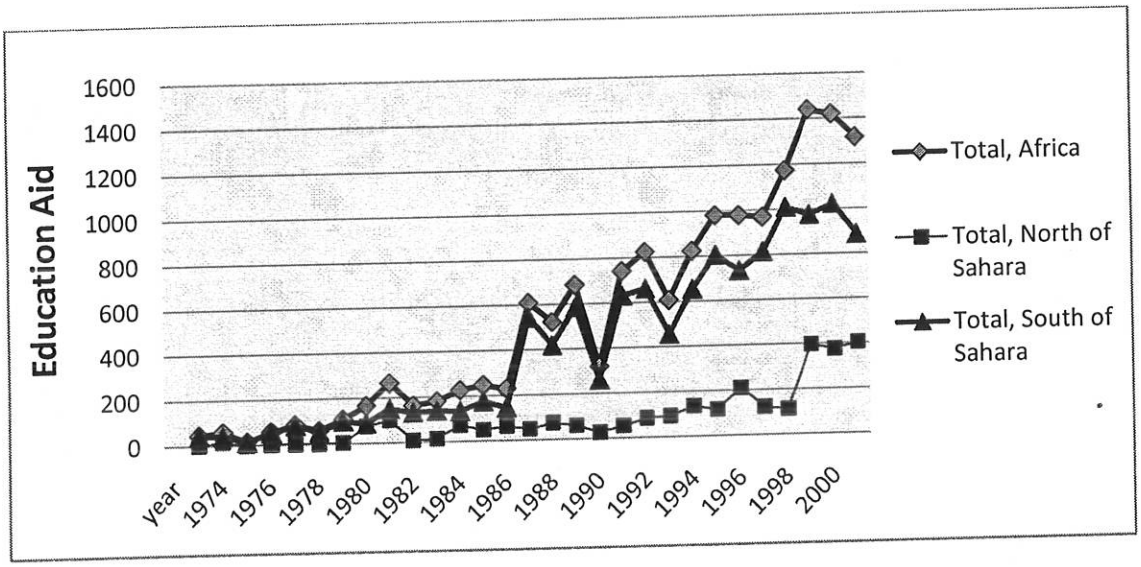
[13] *However, over the period 2000-04, the indebtedness structure for Congo Democratic Republic indicated that more share of aid is comprised of debt forgiveness grant (OECD, 2005).*



Source: OECD-DAC online aid statistics and CRS-CD-ROM (2003)

Figure 13: Education Aid Allocation by Region

Comparison between the African regions, SSA takes the lion's share of education aid committed and disbursed to the continent, with this share highly pronounced in the period 1982-1995. As indicated in Figure 14, North Africa's share of aid to the education sector is relatively small but showing a weak upward trend after 1990.



Source: OECD-DAC-CRS online aid statistics and CD-ROM (2003)

Figure 14: DAC Donors' Aid to Education Sector in Africa by Region

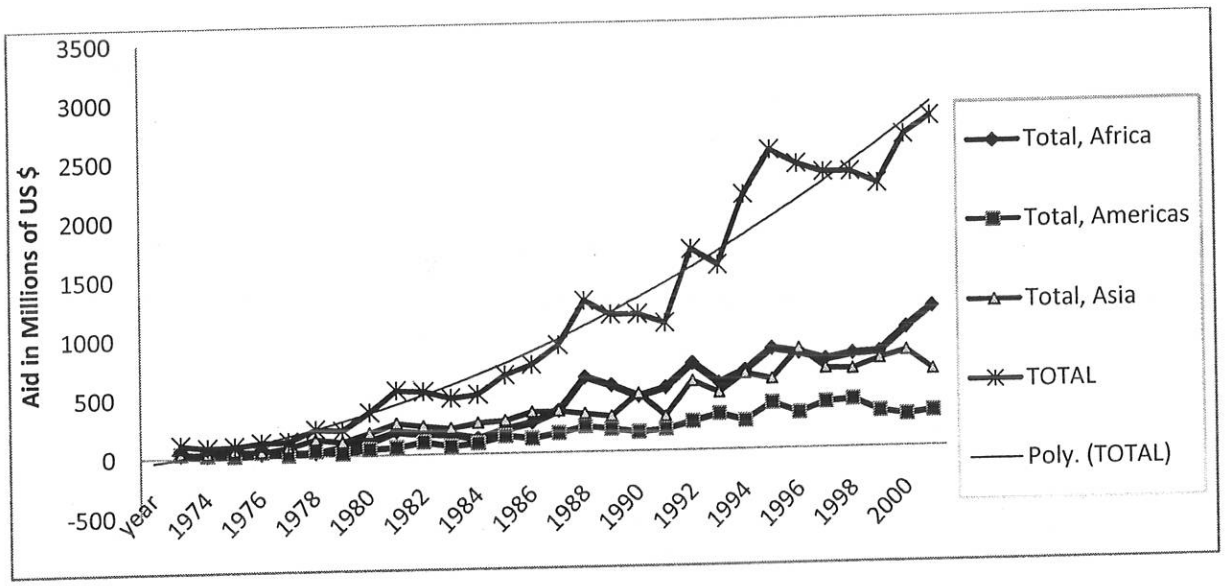
A long time series data on education aid, obtained from the OECD (2003) and averaged over ten year periods, indicate that most of the countries in Eastern Africa (such as Tanzania, Ethiopia, Kenya and Uganda) have been receiving a dozen of it (see Table 3).

Table 3: Top Ten Recipients of Education Aid in SSA: ten years average, 1973-2002

Period	1973-82		1983-92		1993-2002	
Rank	Country	Amount (in mil US$)	Country	Amount (in mil US$)	Country	Amount (in mil US$)
1	**Tanzania**	16.8	Zimbabwe	49.8	South Africa	73.0
2	Zimbabwe	11.3	**Tanzania**	49.2	Uganda	46.7
3	Botswana	8	Namibia	34.7	Ghana	36.8
4	**Kenya**	7.1	**Ethiopia**	32.5	Cameroon	35.7
5	Somalia	5.7	Zambia	27.7	Mozambique	35,0
6	Nigeria	4.9	**Kenya**	19.5	**Ethiopia**	34.4
7	Côte d'Ivor	4.6	South Africa	18.2	**Tanzania**	33.7
8	Senegal	4.6	Mozambique	17.8	Senegal	33.2
9	Zambia	4.3	Cameroon	15.0	Malawi	31.4
10	**Ethiopia**	3.9	Botswana	12.1	**Kenya**	28.8

However, one of the components of aid which is disbursed to the social sector is related to health and population. In Figure 15, the trend implied by total aid to the health sector is in one way or another consistent with the behavior of education sector aid. Generally speaking, it can somehow indicate fair distribution of aid to different social sectors (education and health). In other words, it can fairly be acceptable to say that both sectors get comparable attention.

Thus, so far as the regional distribution of health and population related aid is concerned, the Africa's share gets momentum and takes away the lead from Asia after 1987 onwards. As displayed in Figure 16, after 1999, heath aid to Africa has shown a sharp increase following the increase in total health aid flow to the world recipients. However, after the year 1984, the share of aid to the health sector of SSA has been dominating the North Africa region of the continent.

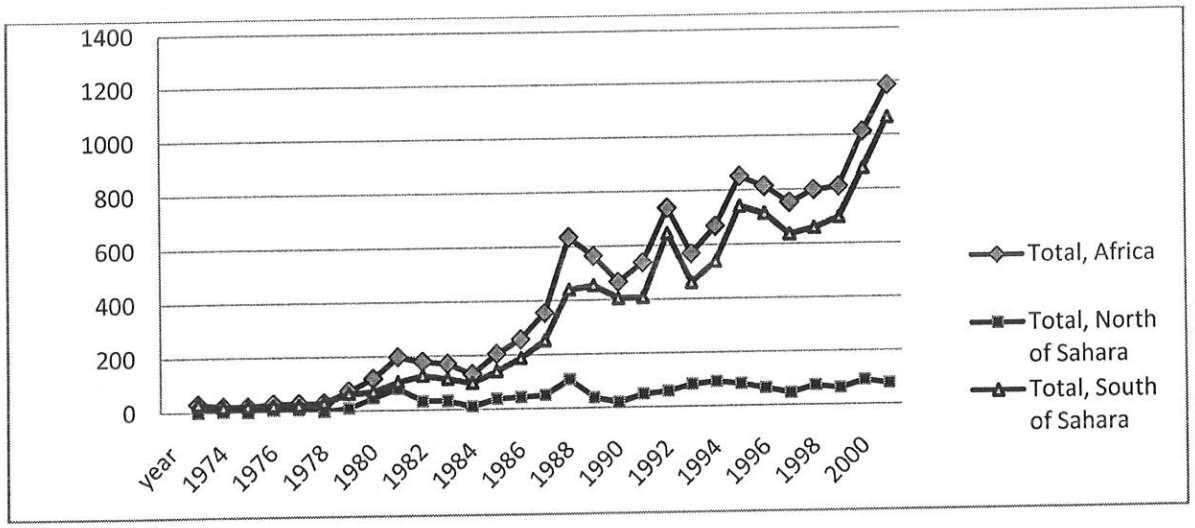


Source: DAC-Credit Reporting System (2003)

Figure 15: Health and Population Related Aid by region (1974-2000)

Looking into the donor side, in 2004, from DAC donors, Australia, United Kingdom, Portugal, Iceland and Finland have extended more share of their overall sectoral aid to Africa. Furthermore, Australia, France, Portugal, Greece and Italy were the top-five donors for the development of the education sector in Africa. The health sector, however, has been more assisted by Iceland, Italy, Luxembourg, Netherlands, Spain and Denmark. On the other hand, in the same year (2004) United States, United Kingdom and New Zeeland were intensively funding population programme.

Over the period under study, the percentage increase of ODA to the health and education sectors is substantial, which actually ensures the attention given to the outcomes of the two sectors in the recent era of achieving the MDGs, among others, reducing infant mortality and increasing literacy rates. The sources of such aids imply that more shares are from bilateral donors (especially from DAC donors) with a rising share.



Source: DAC-Aid Activities (CRS) Database (2003)

Figure 16: Health and Population Related Aid to Different Regions of Africa

4.1.3 Descriptive Results of Aid-HDI Nexus in SSA

Before proceeding directly to the statistical inference and econometric analysis, it is vital to see the relationship between different forms of aid (aggregate, health and education aid) and those aid-generated outcomes (such as growth, literacy and infant mortality rates). As indicated in Figure 17, the scatter plot revealed that there seems to be some positive relationship between aid disbursed to the education sector and the resulting literacy rate[14]. Not surprisingly, as the percentage of education aid per capita increases, it results in a more improvement in adult literacy rate. Thus, it implies that the size of aid matters for its effectiveness, i.e. it reinforces the *Medicine Model* and justifies the inclusion of *Aid Square* term in the specification of the model. Similar positive relationship has been observed between expenditure on education and literacy rate (see Figure 19 in the Appendix II).

[14] *It is important to note that the analysis made in this sub-section is a complement to the econometric part, but it should not be considered as a substitute to the latter. The issue of hypothesis testing is entirely based on the econometric part, which is to be addressed in a little while. Thus, the arguments used in this part are not strong rather they are introduced at best to explore and examine the data.*

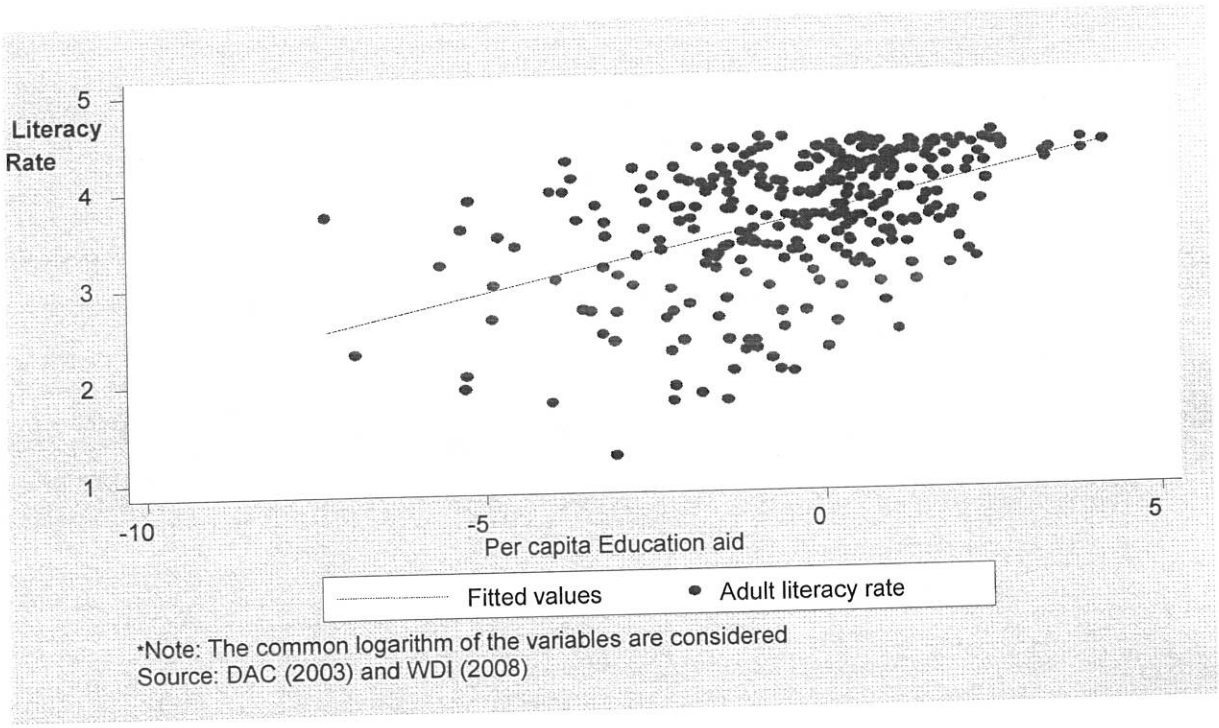


Figure 17: Scatter Plot of Literacy Rate and Per capita Education aid

A descriptive result on aid inflows to the health sector suggests that aid to the sector works to reduce under-five mortality rate (see Figure 18). The negative pair-wise correlation between aid to this sector and mortality rate (-0.23) also reinforces this fact.

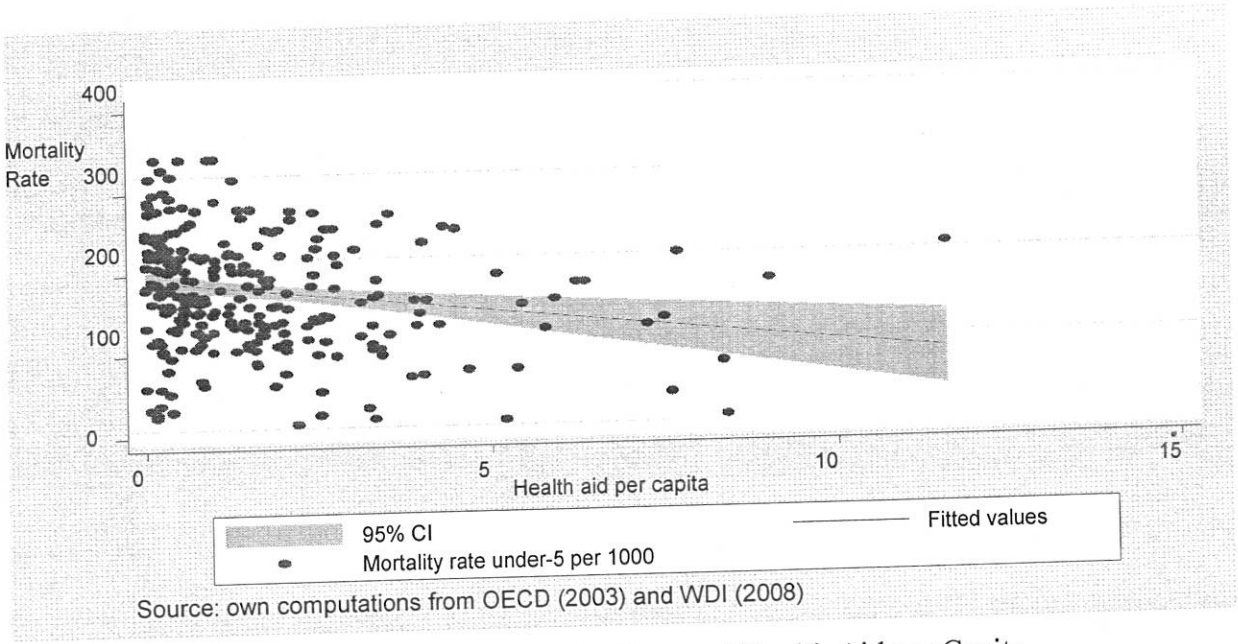


Figure 18: Scatter Plot of Under-five Mortality Rate and Health Aid per Capita

Table 4 shows some average relationship between different forms of aid (aggregate net aid transfer, education and health aid) and outcomes (such as growth, literacy and mortality rates). It displays the number of observations corresponding to a specific combination of the *aid type and its outcome.* Out of the total observations of 428, 194 (45%) of the observations correspond to countries which are receiving below-average aid and recording below-average economic growth, but there are 164 observations (39%) corresponding to below-average aid and above average growth. However, the numbers of observations corresponding to high[15] growth and high aid (high, high) and low growth and high aid (low, high) are very small (i.e., 7% and 9% of the total observations, respectively).

Table 4: Selected HDI and Foreign Aid nexus: Analysis Matrix

	High aggregate aid Per capita	Low aggregate aid Per capita
High Growth	**(30, 7%)**[16]	(164, 39%)
Low Growth	(38, 9%)	**(194, 45%)**
Total observations = 428		
	High Education Aid per capita	Low Education Aid per capita
High Literacy Rate	(48, 15.2%)	(105, 33.2%)
Low Literacy rate	(20, 6.3%)	**(138, 44%)**
Total observations = 316		
	High Health Aid per capita	Low Health Aid per capita
High Mortality Rate	**(55, 18.4%)**	(93, 31.1%)
Low Mortality Rate	(83, 28%)	**(68, 23%)**
Total observations = 299		

[15] *Note that the terms 'high' and 'low' used here are to represent 'above average' and 'below average'.*

[16] *In each cell the first and the second numbers indicate the number of observations which correspond to a given combination and the percentage share out of the total observations, respectively.*

From table 4, it seems that there is no clearly determined relationship between aggregate net aid transfer and GDP per capita growth rate. However, regarding sectoral aid (education and health aid) and their associated outcomes, the analysis matrix uncovers better discernible relationship.

To have a bird's eye view of the data used and to further examine the sample data, summary statistics are presented in Table 5.

Table 5: Sample Descriptive Statistics

Variable*	Mean	Std. Dev.	Min	Max
GDP per capita growth rate	1.0341	4.6959	-24.082	37.585
Net Aid transfer/GDP	0.3205	2.6967	-0.0045	55.858
Assassinations/GDP	0.0308	0.1517	0	2.25
Fiscal Balance/GDP	-4.460	5.0972	-25.775	14.4
FDI/GDP	2.629	5.8260	-6.5197	62.196
Annual Inflation Rate	44.56	410.83	-2.6595	8242.32
Labor Force Growth Rate	0.026	0.020	-0.2297	0.09465
Life Expectancy at Birth	49.910	7.6909	27.361	73.0935
Net National Saving	4.498	10.816	-58.956	41.8108
Institutional Quality Index	4.837	1.4430	1	7
Openness to Foreign Trade	68.95	37.070	11.391	245.805
Under-5 Mortality Rate	163.89	68.403	13.18	345
Adult Literacy Rate	46.67	23.70	3.5	91.836
Population Growth Rate	2.595	1.1733	-5.932	9.8731
Education Aid Per Capita	3.257	6.6917	0.00063	64.388
Health Aid Per Capita	1.8180	3.0235	0.00015	30.598

*Note that all the time varying variables are averaged over four years period.

In Table 5, the average growth rate of GDP per capita in the region during the sample period is 1.03, but highly variable with standard deviation of 4.7. The average aid per capita inflows to the education and health sectors in the sample are 3.26 and 1.8, respectively, but both with large standard errors of 6.69 and 3.02 in that order. One important thing observed in the table is that in the sample data the mean value of institutional quality index is relatively poor (which is approximately equal to 5, with the index ranges from 1-to-7, where 1 represents best quality of institution while 7 shows the worst). Thus, this signifies that the region on average has weak institutional quality.

In general, the summary statistics show that some of the variables such as net aid transfer in percentage of GDP, education aid per capita, GDP per capita growth rate, institutional quality index and extent of openness have more overall variation. However, such the variations are more pronounced among groups (countries) than within group[17].

4.2 Econometric Results and Discussion

In this section, the empirical models developed earlier are confronted with data and the parameter estimates are estimated and interpreted. Therefore, to examine the macroeconomic effects of foreign aid on the components of HDI, three models are estimated. To recapitulate, the models are *growth*, *literacy* and *mortality* equation. Firstly, the extended and augmented neoclassical growth equation is estimated using GMM estimation technique.

In what follows, estimated econometric models specified earlier (36, 37 and 38) are presented and discussed. The first estimated model is the empirical growth model specified in equation (36).

[17] *Note that the table summarizes only the overall sample data statistics. Though not reported, the within and between summary statistics are also carried out and shows slightly different statistics.*

Thus, following the method used by Easterly (2003), Easterly et al. (2004), Roodman (2007) and Hassen (2008), the policy variable is generated by regressing GDP per capita growth rate on all X variables including the rate of inflation, budget surplus and extent of openness to foreign trade[18]. Finally, the index for policy is obtained by considering the significant regressors from the variables in X and policy. So as to determine the threshold policy level, the variables chosen from X are valued at their arithmetic mean.

Table 6 reports the parameter estimates of the coefficients of the policy variables. However, before running the actual regression, the variables of interest are examined for stationarity.[19] Furthermore, hetroskedasticity is also checked and corrected using robust standard errors. The Arellano and Bond's (1991) AR test of zero second degree autocorrelation in first-differenced errors shows that the null hypothesis of no autocorrelation is failed to be rejected (with p-value of 0.9075). The Sargan's test of over-identifying restrictions statistic (with chi-square probability of 0.7309), which is also a test for the validity of the instrument vector, implies that the null of valid instruments is failed to be rejected.

As shown in Table 6, the basic variables which are essential to the formulation of the policy variable are significant and with the expected sign. The magnitude of the coefficient for each policy variable can be interpreted as the weight attached to that particular policy to affect economic growth. For instance, from the magnitude of the coefficients, fiscal policy is more important than the other two policies (monetary and foreign trade policies), ceteris paribus[20].

---

[18] In short, the chosen regression equation is given by:
$(g_y)_{it}$ = constant + α_1 $(\text{inflation})_{it}$ + $\alpha_2(\text{openness})_{it}$ + α_3 $(\text{fiscal balance})_{it}$ + βX_{it}

[19] In this supplementary regression, GDP per capita growth rate and policy variables are stationary at level, I (0).

[20] However, answering the question why this happens is beyond the scope of this study.

Table 6: Estimation Results for Generating the Policy Variable

Explanatory Variable	Coefficient	t-value
Inflation rate	-0.0006465**	(-2.01)
Openness to trade	0.0237163**	(2.11)
Fiscal Balance/GDP	0.0988863*	(2.62)
Arellano-Bond AR(1)-P-value	(0.0138)	
Arellano-Bond AR(2)-P-value	(0.9075)	
Sargan's test –chi square probability	(0.7309)	

Note:*, ** and *** show significance of the corresponding variable at 10%, 5% and 1% levels, respectively.

Though the coefficient of inflation rate is statistically significant, the economic significance seems to be very low. For the moment, let us give more emphasis to the statistical significance. The attention on statistical significance is due to my presumption that the magnitude of the effect of inflation rate on economic growth could be changed if foreign aid comes into picture. The other variables which are significant in this supplementary regression (actually not reported in Table 6) include net national saving, assassinations (a proxy considered to account for political instability), landlockedness and foreign direct investment[21].

It is known that good policy is not an end by itself, rather it is a means to attain better economic outcomes (such as improvement in HDI). Thus, the policy variable generated in this way is used in the basic growth regression (36) as:

$$\left[g_y\right]_{it} = \alpha + B_1 Aid_{it} + B_2 Aidsqu_{it} + B_3 policy_{it} + B_4 \left(aid * policy\right)_{it} + BX_{it} + \varepsilon_{it}$$

[21] *The policy variable is retrieved using the mean values of the non-policy significant regressors and the policy variables. Thus, it is given by* **Policy** *= 0.09888* (fiscal balance)-0.0006465* (inflation) + 0.023716* (Openness)-(7.046752*0.0307604) +(0.2737525* 2.62926) +(0.0751611*4.498238)-(3.453365* 0.360262)*

Table 7 reports the results of growth regression using varieties of estimation techniques. It is important to note that the dummy variables such as landlockedness and variables which are not exhibiting within variation (time invariant variables) are dropped in the within (fixed-effect) and difference-GMM estimation techniques. The reason is that, in the first case, the demeaning process (the within transformation) removes these variables, whereas in the second case, the differencing process wipes them out.

It is also clear that the growth equation (36) has endogenous regressors (such as policy and aid variables) as well as country heterogeneity. In such cases, pooled OLS, the fixed effect (FE) and the random effect (RE) estimators are not consistent. Thus, under these circumstances, researchers have either used an instrumental variable (IV) or GMM estimators to consistently estimate the growth equation. The recent studies by Brempong and Elizabeth (2008), Hassen (2008) and Roodman (2007) are some of the studies which have been using this type of estimation.

A consistent estimator to estimate cross-country growth regressions in a panel set-up is Arellano and Bond's (1991) Dynamic Panel Data (DPD) estimator. This estimator is a GMM estimator that uses lagged levels of endogenous and predetermined regressors as instruments in a first difference equation. However, as explained before, the Arellano and Bond's estimation technique (sometimes called Difference-GMM) wipes out those time invariant variables. Furthermore, it does not utilize all the moment conditions. Thus, to better tackle these problems in this study the System-GMM (Blundell and Bond, 1998) estimation technique is preferred. However, as is common in the literature, the results obtained from using alternative estimation techniques are presented for comparison, not for interpretation.

Table 7: Regression Results of the Growth Equation Using Different Estimation Techniques

Explanatory Variables	Coefficient Estimates in Estimation Technique			
	System GMM	Difference GMM	Fixed Effect (Within)	Random effect
Lagged Growth	-0.185163*	-0.07901	-0.20617	0.04922
Aid/GDP	-1.287652	-1.08675	-1.97427	3.90584
Aid squared	-0.792033	-1.18381	2.00690	-0.64630
Policy	0.334243	0.7373**	1.04758	-0.10657
Aid*policy	3.85865**	4.4748**	0.85999	0.149345
Initial Condition	0.00018**	0.0002*	0.00009	0.000020
Assassinations	-3.79652**	-4.1340*	-1.1864	-1.62958
Ethnic Fractionalization	-8.09822			1.59838
FDI	0.40289**	0.3513**	0.31733**	0.27639*
Landlocked	-0.04301			-1.37411
Labor force growth	3.912578**	3.9959**	0.84987	4.46016
Education expenditure/GDP	0.059653	-0.1316	-0.1271	-0.4699**
Life expectancy	0.07813	0.1175	0.14199*	-0.01876
Net national Saving/GDP	0.05874*	0.0588*	0.09356*	0.06408**
M2/GDP	-0.0753**	-0.0829*	-0.1296**	-0.02971
Institution Quality	-0.35419	-0.1139	-0.53647**	-0.62308**
Manufactured export as % of merchandize export	-0.0560**	-0.0876**	-0.03899	-0.00988
Malaria prevalence	-0.0110	-0.0438		-0.04309**
Constant	5.13815		-2.8707	8.97812**
AR(1) p-value	0.2459	0.1051	$R^2 = 0.4231$	$R^2 = 0.3449$
AR(2) p-value	0.7670	0.7770		
Sargan test	0.1635	0.3982		

One of the most important results observed in Table 7 is the statistical insignificance of foreign aid and its polynomial term (aid-squared). Despite some variation in the sign of the coefficient, in none of the estimation techniques used above the aid variable is significant. However, in the case of GMM estimation technique (in both system and difference GMM), the *aid*policy* interaction term is significant with expected positive sign. This result suggests that aid helps economies to grow when it is coupled with good macro policies. This is in line with Burnside and Dollar's (2000) findings, but contrary to the findings of Easterly (2003), Easterly et al. (2004) and Hassen (2008).

As to the control variables, initial condition, assassinations, FDI, national saving (taken to proxy physical capital), labor force growth and financial depth variables are all statistically significant in the System-GMM estimation technique. In general, FDI, national saving and financial deepening variables were robust to the variation in estimation method, the choice of instruments and other robustness checks. To further justify and interpret the *aid*policy* interaction term, it is vital to link this econometric result with the descriptive statistics. An inspection of the data indicates that out of 290 pair of observations on GDP per capita growth and *aid*policy* interaction term, in 136 (47%) of the cases the values of both variables are below average. The positive pair-wise correlation between them can partly supplement this outcome.

It is also important that the reliability of the GMM estimation technique is justified on the ground that the coefficient of the lagged endogenous variable (lagged growth) in the GMM estimation (Arellano and Bond, -0.0790126 or Blundell and Bond, -0.1851633) is in between the coefficient of the same variable in Pooled OLS (0.081666) and within effect estimation (-0.2061726). Therefore, the use of which reduces the bias.

To better emphasize on the conditionality of aid on good policy, the model is estimated with and without the policy variable as reported in Table 7.1 in appendix II. Without policy, both aid and its squared term are statistically insignificant. The introduction of the policy variable makes aid effective to spur growth, but the coefficients of aid and its square are still statistically insignificant. In the absence of the policy variable, the negative effect of landlockedness becomes significant to affect growth. Thus, bad policy would hurt the growth of landlocked countries more than countries which are not.

However, the Solow variables including labor force growth rate (g_L), national saving and FDI are statistically significant and with the expected sign, irrespective of the inclusion or exclusion of the policy variable. Furthermore, the positive coefficient of the initial condition variable implies that the economy of the region is operating below its steady state level of output, i.e., addition to the capital stock is productive. It also indicates the scope for convergence to the steady state growth path.

The result which needs further attention is the change in the significance of the institution variable. As indicated in column 3 of Table 7.1, when the policy variable is included in the growth equation, the institutional quality variable loses its significance. Thus, it could be possible to argue that good policy may substitute the growth effect of good institutional setup. It is also evident from the result that the introduction of the policy variable has changed the sign of the human capital (proxied by education spending as a share of GDP) from negative to positive. Thus, in countries where there is better macro-policy stance, the expenditure allocated to the education sector supplements growth. It means that policy matters to make education expenditure effective to augment growth.

In sum, the above regression results suggest that the question of aid effectiveness in the region is also the issue of re-visiting the macro-policy stance. Thus, at least to better utilize the short-run blessings of foreign aid, working on the improvement of macro-policies is imperative. To check for cointegration, a residual-based test has been conducted. Thus, the null hypothesis of unit root[22] process in the residual is rejected at 1% level of significance (the coefficient estimate of the lagged residual is statistically different from 1). The t-ratio of 4.16 is compared with the tabular value of the Pedroni's test statistic. Thus, the comparison leads to the rejection of the null hypothesis, implying that there is no unit root process in the error term.

[22] *Where, a process with a unit root has an infinite memory and can be considered the sum of all past random shocks.*

The analysis made so far is about the effectiveness of aggregate aid on economic growth, which is one part of the story. However, to come up with an answer to the effectiveness of aid on the other two components of HDI, literacy and mortality rate regression equations are estimated.

The first column of Table 8, reports the GMM estimation results of the literacy rate equation when aid is expressed in aid-to-GDP ratio. The coefficient of education aid implies that aid to the sector affects literacy rate positively. Furthermore, it is clear from the result that aid to the sector works well when it is augmented with good institutional setup (where, this is implied by the positive coefficient of the aid-institution interaction term).

The control variables such as indicator of quality of instruction (proxied by teacher-to-student ratio), net domestic expenditure to the education sector, lagged institutions and economic growth are all statistically significant and with the postulated sign. The negative coefficients of the non-linear variables (such as aid squared and institution squared) imply that aid to the sector and institutional quality improves literacy rate with diminishing returns, but their magnitudes are abnormally very high. The other diagnostic test statistic, i.e., the Sargan test of over-identifying restrictions and the Arellano and Bond test of autocorrelation, signify that the null hypothesis of valid instruments and no autocorrelation are failed to be rejected.

Moreover, when aid is interacted with the index for institutional setup, the magnitude of the effect of aid on literacy rate becomes more than the case when the institution variable is absent. Though the quality of institution in the region appears to be somewhat poor, but it has helped the sector to bring better outcome. This result provides some indication concerning the enhancement of the relatively poor institutions of the region.

Table 8: Regression Results of Literacy Equation using Aid-to-GDP Ratio

	DPD Coefficient Estimates			
Explanatory Variable	With institution variable		Without institution variable	
Lagged adult literacy rate	0.6215	(0.000)*	0.6166	(0.000)
Population growth rate	-0.0171	(0.062)	0.0118	(0.169)
Teacher-to-student ratio	6.3751	(0.000)	4.6029	(0.003)
Education aid/GDP	0.0128	(0.032)	0.0097	(0.223)
Education expenditure net of aid/GDP	1.2153	(0.013)	0.8965	(0.001)
Lagged institutional quality	0.2711	(0.005)		
(Education aid/GDP*institution)	30.704	(0.062)		
Lagged growth	0.0039	(0.032)	0.0045	(0.000)
(Education aid/GDP) squared	-338.93	(0.040)	-55.583	(0.277)
Institutional Quality squared	-0.5525	(0.182)		
Constant	1.4127	(0.000)	1.448	(0.000)
AR(1) p-value		(0.0702)		(0.026)
AR(2) p-value		(0.2945)		(0.326)
Sargan test statistic		0.1419		0.1304

*Note that the numbers in parenthesis are p-values

However, to check for the robustness of the model and to show the sensitiveness of the result to the change in the way aid is measured, the other alternative measure of aid (aid per capita) is also tried and presented in Table 9. Thus, the estimation results of the literacy rate equation implies that all variables are significant and with the expected sign. The diagnostic tests of valid instrument and no autocorrelation are also failed to be rejected.

The Burnside and Dollar's (2000) argument of aid conditionality on policy also sheds some light on this issue in the sense that aid works to increase literacy rate when it is augmented with good institutional setup.

Table 9: Estimation Results of the Literacy Equation using Aid per Capita

	DPD Coefficient Estimates	
Explanatory Variable	With institution variable	Without institution variable
Lagged adult literacy rate	0.5723 (0.000)	0.57186 (0.000)
Population growth rate	-0.0200 (0.006)	0.0190 (0.013)
Teacher-to-student ratio	7.6318 (0.000)	3.4457 (0.006)
Education aid per capita	0.0114 (0.006)	0.01465 (0.001)
Per capita Education expenditure net of aid	0.00098 (0.008)	0.00096 (0.003)
Lagged institution	0.20580 (0.004)	
Education aid per capita * institution	0.04533 (0.010)	
Lagged growth	0.00406 (0.000)	0.00294 (0.000)
Institutional quality squared	-0.65241 (0.009)	
Per capita education aid squared	-0.00051 (0.019)	0.000009 (0.400)
Constant	1.5269 (0.000)	1.5468 (0.000)
AR(1) p-value	(0.0823)	(0.0223)
AR(2) p-value	(0.2825)	(0.3370)
Sargan test statistic	0.2319	0.1810

Note that the numbers in parenthesis are p-values

Thus, regardless of the use of any of the two aid measurements (aid per capita or aid-to-GDP ratio) education aid significantly improves literacy rate. The result also suggests that aid to the sector could be effective regardless of the quality of institutions but at a cost of continuous dependency: the positive coefficient of the aid squared term in column (3) of Table 9 can strengthen this argument. In a nutshell, the result suggests that education aid should be provided to the region in moderation, coupled with an effort to strengthen institutional setup.

The third regression equation (38) models the effect of health sector aid and other control variables on under-five mortality rate. The GMM estimation results using two definitions of aid are shown in Table 10. The regression result shows that aid to the health sector affects under-five mortality rate negatively. In this sector, aid could be unconditionally effective to reduce mortality rate. The other control variables, previous period mortality rate, number of physicians per 1000 people, economic growth rate, and public expenditure, are found to help reduce mortality rate.

A counterintuitive result is the positive coefficient of lagged institutional quality variable, which implies that institutions of the region would hurt the outcome of the health sector, i.e. increasing mortality rate. However, the coefficient of its square is negative, which implies that improving the institutional setup could be effective to reduce mortality rate when the change is considerable. Economic growth is found to reduce mortality rate significantly. One can also figure out supportive and intuitive evidence in the descriptive statistics that for most countries which have recorded above-average economic growth, the infant mortality rate is found to be below average.

Similar to what was done for the literacy rate equation, the robustness of the result is also checked by taking health aid-to-GDP ratio as alternative measure of aid, which is shown in column 3 of Table 10. However, the use of such measure of aid as alternative does not bring significant change on the regression results, implying that the result is not sensitive to how aid is expressed or defined. When aid is measured in terms of aid-to-GDP ratio, the interaction term (aid* institution) becomes insignificant implying that the effect of aid-policy combination on mortality rate is more sensitive to population size than economy size. However, in the use of two definitions of aid, the instruments are found to be valid and the AR (2) autocorrelation is absent.

Table 10: DPD Estimation Results for Mortality Equation

	Coefficients using Two Measures of Aid	
Explanatory Variables	Health Aid per Capita	Health Aid-to-GDP Ratio
Lagged Mortality Rate	0.34084 (0.000)	0.3389 (0.000)
Health Aid	-0.04204 (0.003)	-0.0482 (0.027)
Physician per 1000 People	-0.04569 (0.000)	-0.0489 (0.000)
Economic Growth	-0.01584 (0.000)	-0.0155 (0.000)
Population Growth	0.00021 (0.988)	0.0080 (0.604)
Health Aid *Institution	-0.17641 (0.007)	-0.0117 (0.307)
Public Expenditure	-0.00803 (0.000)	-0.0077 (0.000)
Lagged Institutions	2.2612 (0.000)	2.1520 (0.000)
Health Aid Squared	0.0079 (0.002)	21.477 (0.508)
Institutional Quality Squared	-0.4301 (0.007)	-1.1013 0.000
Constant	3.0950 (0.000)	2.9420 0.000
AR(1) p-value	(0.0378)	(0.0550)
AR(2) p-value	(0.2349)	(0.2457)
Sargan's Test Statistic	0.1351	0.1104

Note: Values in parenthesis are p-values

This result is in line with the findings of Gomanee et al. (2004a), Brempong and Elizabeth (2008) and Masud and Yontcheva (2005) that aid improves human welfare and decreases infant mortality in LDCs. The positive coefficient of the institutional variable in the mortality regression, however, leaves some assignment to the policy makers of the region[23]. To better utilize the advantages of aid in the health sector, working hard to bring considerable change in institutional setup is essential.

[23] *For positive coefficient of the institutional variable, the nature of data may be responsible. Thus, to give a strong conclusion, further works are required using different measures, indicators and proxies of institutional quality. Given the data at hand, what I say is what has to be said but I strongly urge further work in this area.*

As another robustness check, the effect of aggregate net aid transfer to the economy on literacy and mortality rates has been tried. For this, aid to the education and health sector has been replaced by aggregate aid to the economy (measured as net aid transfer-to-GDP ratio and aid per capita).

However, such aggregation leads to a surprising result, where no statistically significant relationship between aggregate aid to the economy and either adult literacy rates or under-five mortality rates were found (see Table 11 in Appendix II). Thus, this result suggests the importance of disaggregation in conducting aid effectiveness studies.

V. Conclusions and Policy Implications

Most early studies on aid effectiveness have been criticized on the ground that all types (forms) of aid are alike in their effects to influence a certain Human Development Indicator, HDI (such as growth). However, one of the recent advancements in the aid effectiveness literature is the consideration of the issue with disaggregation. Thus, most of the works which have been conducted in this way have come to the conclusion that (i) some types of aid are effective and others are not, (ii) aid in any form (type) is effective and (iii) all types of aid are ineffective. This paper revisits the question of aid effectiveness in SSA by examining the effects of different types of aid (aggregate net aid transfer, education and health aid) on three components of HDI (economic growth, literacy and under-five mortality rates).

The paper uses a panel data of 44 SSA countries over the period 1973 - 2007[24] and a dynamic panel data estimation technique to show the effects of aid on the three elements HDI. The estimated results indicate that aggregate net aid transfer enhances economic growth when coupled with good macro policy. Therefore, the result suggests that aggregate aid requires good macro policy stance to affect economic performance, i.e., aggregate aid is conditionally effective.

However, using under-five mortality and adult literacy rates as measures of outcomes in health and education sectors, it was found that aid to the health sector significantly reduces mortality and aid to the education sector improves literacy rate. These results are robust to the alternative measurements of aid to the education and health sectors (i.e., aid-to-GDP ratio and per capita aid). Furthermore, sectoral aid affects the sector's outcome even without any conditionality upon the quality of institutional setup, but such unconditional effectiveness of aid is weak in the health sector.

[24] *However, for the estimation of the growth equation (36), the sample period has been extended further back to the period 1964-2007. Such extension however does not bring any significant change in the regression result.*

A result which favors the approach of disaggregation is that, aggregate net aid transfer to the economy is not statistically significant to affect literacy and mortality rates. Thus, aggregation can be cited as one justification for the conclusion of no significant effects of aid. From this result, implication for future research is that aid effectiveness studies should be extended with disaggregation of aid instead of using aggregate aid. This has got strong support from Bermopong and Elizabeth (2008), Thiele and Dreher (2006) and Masud and Yontcheva. (2005), since all argue for disaggregation when investigating aid effectiveness in LDCs.

In general, the estimation result suggests that the impact of aggregate aid on growth is statistically insignificant, but aid works to improve economic growth when augmented with good policy environment. However, the effectiveness of aid to the education and health sectors is justified regardless of the quality of institutions. Thus, the policy implication of these results is that aggregate aid to the region should be supported with efforts to improve the policy environment, and especial attention should be given to channeling of the aid to more-responsive sectors of the economy. Furthermore, the donors to the region should better target the education and health sectors, especially if the recipient country's macro policy is found to be consistently poor.

However, given the different macroeconomic complications of sustainable and excessive reliance on foreign aid (such as loss of policy ownership, volatility, rent seeking behavior, aid dependency and budget softening etc), this study is not in a position to advocate for increased aid inflows to the region, but it simply suggests that the region should make wise use of any aid it receives.

References

Acemoglu, D., S. Johnson, and J. Robinson. (2004). "Institutions as the Fundamental Cause of Long-Run Growth." *NBER Working Paper* 10481.Cambridge, MA: National Bureau of Economic Research.

Agenor, R. (2004). "Knowledge, Human Capital and Endogenous Growth". The World Bank pp. 363-64.

Agenor, R. (2004). *The macroeconomics of Adjustment and Growth*.3rd ed.

Alemayehu, G. (2004). "Fundamentals of International Economics for Developing Countries: A Focus on Africa: Trade Theory, Policy and Practice". Vol. 1, chapter 9.

Alemayehu, G. and D. Befekadu. (2005). "Explaining African Economic Growth Performance: The Case of Ethiopia". Prepared as a component of the AERC Collaborative Research Project, Explaining Africa's Growth Performance, Nairobi, Kenya.

Alesina, A. and D. Dollar. (1998). "Who Gives Aid to Whom and Why?" Cambridge. *NBER Working paper*, No.6612.

Bacha, E. (1990). "A Three-gap Model of Foreign Transfers and the GDP Growth Rate in Developing Countries" *Journal of Development Economics:* Vol.**32**, pp. 279-296.

Baldacci, E., B. Clements and S. Gupta. (2004). "Social Spending, Human Capital, and Growth in Developing Countries: Implications for Achieving the MDGs". IMF *Working Paper* No. WP/04/217.

Baliamoune, M. and G. Mavrotas. (2008). "Aid Effectiveness Looking at the Aid-Social Capital-Growth Nexus". *UNU-WIDER Research Paper*. United Nations University No. 75.

Baltagi, H. (2005). "*Econometric analysis of panel Data*". 3rd ed. John Wiley & Sons Ltd, Chichester, West Sussex, England.

Barro, R. and X. Sala-i-Martin. (1995). "*Economic Growth*". New York: McGraw-Hill.

Barry, E. (1991). "The Marshall Plan: History's Most Successful Structural Adjustment Program". *NBER and University of California* at Berkeley, *NBER, and CEPR.*

Bazoumana, O and E. Strobl. (2006). "Disaggregating the Aid and Growth Relationship project Vs programme". *The University of Manchester* publication.

Bermopong, K. and A. Elizabeth. (2008). "Aid and Capital Formation: Some Evidence". Discussion Paper, Tunis, Tunisia: African Development Bank, pp1-21.

Bigsten, A. (2006). "Can Aid Generate Growth in Africa?" Working papers in economics Department of Economics Göteborg University, No. 3.

Blundell, R. and S. Bond. (1998). "Initial Conditions and Moment Restrictions in Dynamic Panel Models", *Journal of Econometrics*, Vol. 87, pp. 115-43.

Boone, P. (1994). "The Impact of Foreign Aid on Savings and Growth", Centre for Economic Performance Working Paper 1265.

_____. (1995). "Politics and the Effectiveness of Foreign Aid". *NBER Working Paper series*, No. 5308. Cambridge.

Bourguignon, F. and D. Leipziger. (2006). "Aid, Growth, and Poverty Reduction: Toward a New Partnership Model" pp.1-21.

Burnside, C. and D. Dollar. (1998). "Aid, Policies and Growth". *Policy research working paper*. No. 1777. Washington, D.C.: The World Bank, Development Research Group.

_____. (2000). "Aid, policies, and growth", *American Economic Review*: Vol. 90, No. 4, pp. 847-68.

Chenery, H. and M. Strout (1966) "Foreign Assistance and Economic Development": *American Economic Review.* Vol.56, pp. 679–733.

Clemens, M., S. Radelet, and R. Bhavnani. (2004). "Counting Chickens when They Hatch: the Short term Effects of Aid on Growth". Center for Global Development. Working Paper No.44.

Collier, P. and D. Dollar (2002) "Aid Allocation and Poverty Reduction" *European Economic Review* Vol. 46, pp.1475–1500.

Collier, P. (2006). "Assisting Africa to Achieve Decisive Change". *Swedish Economic Policy Review*: Vol. 13.

Daglaard, C and H. Hansen. (2000). "On Aid, Growth, and Good Policies. *CREDIT research paper*, No.00/17.

_____ . (2001). "On Aid, Growth and Good Policies", *Journal of Development Studies*: Vol. 37. No. 6. pp. 17-41.

Dalgaard, C., H. Hansen and F. Tarp. (2003). "On the Empirics of Foreign Aid and Growth". University of Copenhagen, Economic Policy Research Unit. Working paper ISSN- 0908.

_____ . (2004). "On the Empirics of Foreign Aid and Growth", *Economic Journal*: Vol. 114. No. 496. pp. 191-216.

Daniel, T., M. Amanaja and O. Morrissy. (2005). "Fiscal Aggregate, Aid and Growth in Kenya": A Vector Autoregressive (VAR) Analysis. Nottingham University. CREDIT paper 0/7.

Doucouliagos, H. and M. Paldam. (2006). "Conditional aid effectiveness: A Meta study". Department of Economics, Deakin University, Melbourne, Australia.

Easterly, W. (1997). "The Ghost of Financing Gap: How the Harrod-Domar Growth Model Still Haunts Development Economics". Draft paper.

_____ . (2003). "Can foreign Aid Buy Growth?" *Journal of Economic Perspectives*, Vol. 17, No. 3, pp. 26-48.

Easterly, W., R. Levine and D. Roodman. (2003). New Data, New Doubts: Revisiting "Aid, Policies, and Growth". Working paper, No. 26.

_____. (2004). "Aid, Policies and Growth: A Comment", *American Economic Review*: Vol. 94, pp. 774-780.

Economidesa, G., S. Kalyvitisa and A. Philippopoulosa. (2004). "Do Foreign Aid Transfers Distort Incentives and Hurt Growth? Theory and Evidence from 75 Aid-Recipient Countries".

Elizabeth, A. and B, Nandwa. (2006). "On the Impact of Foreign Aid in Education on Growth: How Relevant is the Heterogeneity of Aid Flows and the Heterogeneity of Aid Recipients?" Department of Economics, University of Kansas.

Eskander, A., D. Mukherjee, and E. Shukralla. (2008). "Foreign Aid, Growth, Policy and Reform." Economics Bulletin: Vol. 15. No. 6, pp. 1-9.

_____. (2007). "Aid, Policies, and Growth in Developing Countries: A New Look at the Empirics". Preliminary Draft. Department of Economics Western Michigan University.

Feeny, S. and B. Ouattara. (2000). "What Type of Economic Growth Does Foreign Aid Support?" School of Economics, Finance and Marketing, RMIT University, Melbourne, Australia.

Filmer, D. and L. Pritchitt. (1999). "The Effects of Household Wealth on Educational Attainment: Evidence from 35 Countries". *Population and Development Review*: Vol. 25. No.1, pp. 85-120.

Gomanee, K., O. Morrissey, P. Mosley and A. Verschoor. (2004). "Aid, Government Expenditure and Aggregate Welfare" .CREDIT (mimeo).

_____. (2005). "Aid, Government Expenditure and Aggregate Welfare", World Development, Vol. 33, No.3.

Gomanee, K., S. Girma and O.Morrissey. (2005). "Aid and Growth in Sub-Saharan Africa Accounting for Transmission". World Institute for Development Economics Research, No. 60.

Gupta, S., M. Verhoeven and E. Tiongson. (1999). "Does Higher Government Spending Buy Better Results in Education and Health Care?" *IMF Working Paper* WP/99/21.

Gwartney, J., R. Holcombe and R.Lawson. (2004). "Economic Freedom, Institutional Quality, and Cross-Country Difference in Income and Growth". Cato institute: *Cato Journal*. Vol.24, No.3.

Hansen, H. and F. Tarp. (2000). "Aid Effectiveness Disputed". *Journal of international Development*: Vol. 12. pp.375-98.

_____. (2001). "Aid and Growth Regressions", *Journal of Development Economics*: Vol.64, pp. 547-70.

Hasan, R. and M. Quibria. (2002). "Poverty and Patterns of Growth". *ERD* Working Paper Series; Asian Development Bank. No. 18.

Hassen, A. (2008). "Effectiveness of Foreign Aid in Sub-Saharan Africa: A Less Disaggregated Analysis". Addis Ababa University; Unpublished Masters (MSc) Thesis.

Harms and Lutz. (2004). "The Macroeconomic Effects of Foreign Aid: A survey". University of St.Gallen, Department of Economics. *Discussion paper* No. 11.

Hibbs, D. (2001). "Macroeconomics Lecture". Goteborg University Department of Economics published in Kyklos, Vol.54, pp.265-286.

_____. (2004). "Macro Theory: Neoclassical Growth Theory with Exogenous Saving" Google search result pp.1-18.

International Monetary Fund. (2007). "Fiscal Policy Response to Scaled-Up Aid: Macro-Fiscal and Expenditure Policy Challenges" the Fiscal Affairs Department.

Kaufmann, D., A. Kraay and M. Mastruzzi. (2007). "Governance Matters VI: Aggregate and Individual Governance Indicators 1996-2006". Washington D.C.: The World Bank. *World Policy Research* Working Paper. WPS4280.

Mankiw, N., D. Romer and D.Weil. (1992). "A Contribution to the Empirics of Economic Growth", *Quarterly Journal of Economics*: Vol.107: pp.407-437.

Masud, N. and B. Yontcheva. (2005). "Does Foreign Aid Reduce Poverty? Empirical Evidence from Non-governmental and Bilateral Aid". IMF Institute. *IMF Working Paper* No.100.

Mehmet, E. (2008). "Foreign Aid and Growth." Economics Bulletin: Vol. 15. No. 14. pp. 1-14

Mishra, P. and D. Newhouse .(2007). "Health Aid and Infant Mortality". *IMF Working Paper.* No. WP/07/100, Washington DC, IMF.

Moss, T., G. Pettersson, and N. Walle. (2006). "An Aid-Institutions Paradox: A Review Essay on Aid Dependency and State Building in Sub-Saharan Africa".

Organization for Economic Cooperation and Development (2006). "Development Aid at a Glance": Statistics by Region and Various reports.

Radelet, S., M. Clemens and R. Bhavnani. (2004). "Aid and Growth: The Current Debate and Some New Evidence". Center for Global Development.

_____. (2005). "Aid and Growth". Finance and Development: Volume. 42. No.3. pp. 1-10.

Rajan, R. and A. Subramanian. (2005). "What Undermines Aid's Impact on Growth?" *National Bureau of Economic Research* Working Paper. No. 11657.

_____. (2007). "Aid and Growth: What Does the Cross-Country Evidence Really Show? " *Review of Economics and Statistics.*

Reddy, S. and C. Minoiu. (2006). "Development Aid and Economic Growth: A Positive Long-Run Relation". Google search result.

Roberts, J. (2003). "Poverty Reduction Outcomes in Education and Health: Public Expenditure and Aid". *ODI Working Paper.* Overseas Development Institute, London. No. 210.

Roodman, D. (2005). "An Index of Donor Performance". Working Paper, Center for Global Development, No. 67.

_____. (2007). "The Anarchy of Numbers: Aid, Development, and Cross-country Empirics". Working Paper, Center for Global Development, No. 32.

Ruth, J. and Ann. (1996). "Estimating Dynamic Panel Data Models: A Practical Guide for Macroeconomists".

Sichei, M. (2008). Econometrics Lecture (Unpublished). African Economic Research Consortium. Arusha, Tanzania.

Symposium on Aid. (2004). "A Critic on Recent Aid Effectiveness Studies".

Tasiran, A. (2005). "Econometric Analysis of Panel Data". Lecture Series. Department of Economics, Gothenburg University Lecture series.

Thiele, R., P. Nunnenkamp and A. Dreher (2006). "Sectoral Aid Priorities: Are Donors Really Doing their Best to Achieve the Millennium Development Goals?" Kiel Institute for World Economy.

Verschoor, A. and A. Kalwij. (2006). "Aid, Social Policies and Pro-Poor Growth", *Journal of International Development*: Vol.18. No.4. pp. 519-531.

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

Appendices

Appendix I

Countries included in the study Sample

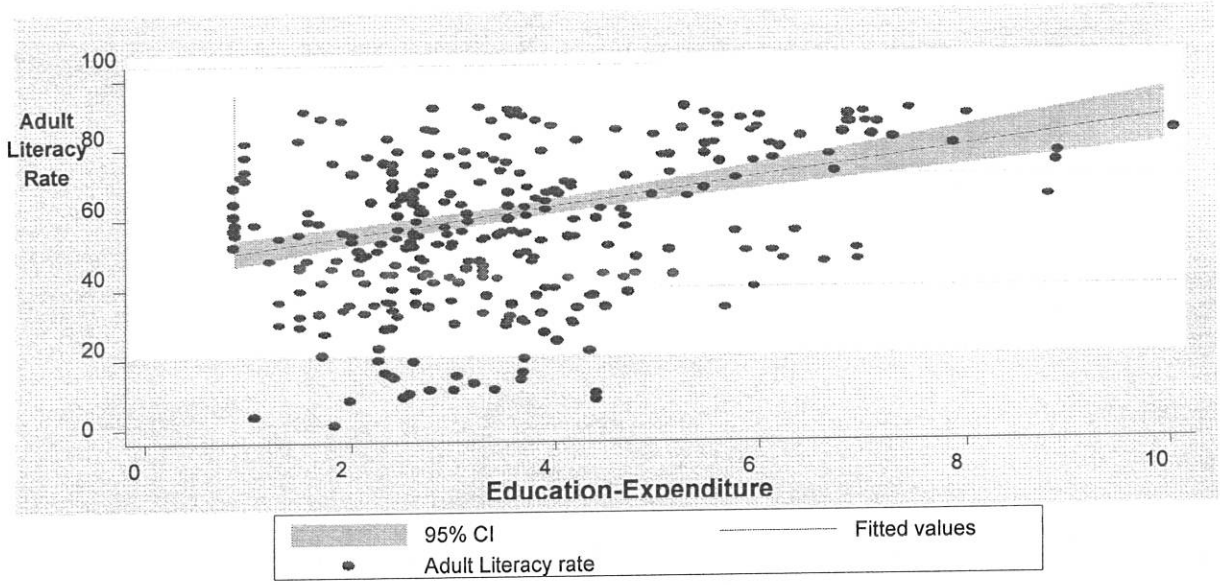
Angola	Gabon	Namibia
Benin	The Gambia	Niger
Burundi	Ghana	Nigeria
Burkina Faso	Guinea	Rwanda
Botswana	Guinea-Bissau	Senegal
Cameroon	Kenya	Seychelles
Cape Verde	Lesotho	Sierra Leone
Central African Rep.	Liberia	South Africa
Chad	Madagascar	Sudan
Comoros	Malawi	Swaziland
Congo, Dem. Rep. (Zaire)	Mali	Tanzania
Congo, Rep.	Mauritania	Togo
Cote d'Ivoire	Mauritius	Uganda
Equatorial Guinea	Mozambique	Zambia
Ethiopia		Zimbabwe

Appendix II

Table 7.1: Growth Regression With and Without Policy Variable

Explanatory Variables	System GMM Coefficient	
	Without Policy Variable	With Policy Variable
Lagged growth	-0.0754	-0.1852*
Aid/GDP	0.4375	-1.2877
Aid squared	1.1065	-0.7920
Policy		0.3342
Aid*policy		3.8587**
Initial Condition	0.0001***	0.0002**
Assassinations	-4.0350	-3.7965**
Ethnic Fractionalization	0.3891	-8.0982
FDI/GDP	0.5729**	0.4029**
Landlocked	-2.7213**	-0.0430
Labor force growth	4.1677***	3.9126**
Education expenditure/GDP	-0.3916*	0.0597
Life expectancy	0.0319	0.0781
Net national Saving/GDP	0.1140***	0.0587*
M2/GDP	-0.0665*	-0.0753**
Institution Quality	-0.3595*	-0.3542
Manufactured Export as % of merchandized export	- 0.0334	-0.0560**
Malaria Prevalence	-0.0471	-0.011001
Constant	6.5952	5.138147

Note:*, ** and *** show significance of the corresponding variable at 10%, 5% and 1% levels, respectively.



Source: a four year average from CRS-OECD (2003) and WDI

Figure 19: Scatter Plot of Adult Literacy Rate and Education Expenditure

Table 11: Coefficient Estimates of the Education Equation Using aggregate Aid

Explanatory Variables	**DPD Coefficient Estimates**	
	Using aid-to-GDP ratio measure of aid	Using Education aid per capita measure of aid
Lagged Adult Literacy Rate	0.6406 (0.000)	0.6182 (0.000)
Population Growth Rate	-0.0149 (0.146)	-0.0112 (0.274)
Teacher-to-Student Ratio	7.5713 (0.000)	7.6097 (0.000)
Aggregate Aid	0.0050 (0.318)	0.0067 (0.202)
Education Expenditure Net of Aid	0.0000 (0.000)	0.0000 (0.006)
Lagged Institutional Quality	1.2923 (0.000)	1.4523 (0.000)
Aggregate Aid*Institution	3.5943 (0.730)	0.0054 (0.659)
Aggregate Aid Squared	-79.338 (0.425)	-0.0001 (0.647)
Institutional Quality Squared	-1.2948 (0.000)	-1.6338 (0.000)
Lagged Growth	0.0031 (0.094)	0.0021 (0.193)
Constant	1.0844 (0.000)	1.1365 (0.000)
AR(1) P-Value	(0.0902)	(0.0885)
AR(2) P-Value	(0.2832)	(0.2840)
Sargan Test Statistic	0.2361	0.2154

Note:*, ** and *** show significance of the corresponding variable at 10%, 5% and 1% levels, respectively.

Declaration

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

The examiners' comments have been duly incorporated.

Declared by:

Name Yidnekachew Wondimu

Signature _____

Date 30/06/2009

Confirmed by:

Name Dr. Hussien Hamda

Signature _____

Date 30/06/2009

Place and date of submission, Addis Ababa, June 30, 2009