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# Aid, Growth and Poverty Alleviation in Ethiopia

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# Aid, Growth and Poverty Alleviation in Ethiopia

## Abstract

Ethiopia is one of the countries receiving large proportions of aid, especially since the introduction of the policy changes (1992) there is a substantial amount of aid flows.

This lead to raise government expenditure on various productive activities, contribute either directly to the improvement of economic growth of the country (accelerator) and/or to the development of services (multiplier). In both ways I deem that the undergoing efforts made by the government using aid as an additional resource are contributing to the enhancement of the economic development of the country. But I still argue that the achievements made are not up to the expectation of the government and the donor. Therefore this study is trying to answer the question:

*What role has aid played in the economic growth and poverty reduction process in Ethiopia since the introduction of policy change (1992/93)?*

Main hypothesis of this paper falls on the idea of: for aid to be effective, change in policy or development strategy is not the only factor but there are various domestic and foreign factors (aid coordination, allocation and disbursement, and earmarking criteria) that needs more attention.

In order to answer this question I used quantitative method; traditional production function with special emphasis to the new (endogenous) growth model. But in order to examine aid effectiveness in a detail manner aid is disaggregated into loan and grant component and is estimated using time series data for the period 1981 to 2003.

Following the third generation aid studies this work tried to examine whether aid effectiveness is conditional on policy (macro and institutional) or not. My empirical model is estimated using the Error Correction cointegration approach proposed by Engle and Granger (1987). The findings provide little evidence of aid impacts on intensive economic growth in Ethiopia. According to the model economic growth of the country is influenced by human capital.

The result strongly supports the above hypothesis. In the case of intensive growth (considering all variables used in the model in per capita term), there is no significant relationship between aid given in the form of loan and economic growth, but the relationship between aid given in the form of grant and economic growth of Ethiopia is negatively related and significant whereas in the case of extensive growth foreign aid given in the form of grant does have some positive impact on growth.

## 1. Background of the Study

Ethiopia is one of the largest countries in Sub-Saharan Africa with a land size of 1.13 million km<sup>2</sup>, a population of more than 71.3 million (according to 2003 census), and the third highest population on the African continent. It has relatively high population density, ranging from 150 persons per km<sup>2</sup> in Wollo in the Northeast of the country to over 300 persons per km<sup>2</sup> in parts of south central Ethiopia. The population is estimated to be growing at 2.8 percent per year, and the demographic profile reflects preponderance of the young, with those below twenty-five years of age making up nearly two-thirds of the total population. Urbanization is very low; only 15 percent of population lives in urban centers, which makes the country one of the least urbanized in the world (Rahmato and Ayenew, 2004, p. 1).

According to Human Development index measures the country is ranked 169<sup>th</sup> out of 175, per capita income of the country is lowest when it is compared with other Sub-Saharan African countries. It is about US\$ 100-115 per annum, and average food consumption per capita per day is estimated to be less than 70 percent of internationally accepted standards. Moreover, various

domestic and international publications about the socio economic performance of the country reveal that over the last fifty years, poverty has declined, but rural poverty has been growing in severity and magnitude. Ethiopia is facing humanitarian emergencies related to the spread of HIV/AIDS pandemic as well as chronic food insecurity, owing among others to cyclical droughts, low level of agricultural productivity and expansion into marginal lands (UNDP, 2003, p. 1).

One of the main reasons for all these to occur is due to decreasing of the land to population ratio; the number of population in the rural areas is increasing at alarming rate, while the land size and the technique of production remains the same. This confirms the existence of poor agricultural productivity followed by low contribution to GDP. At present the agricultural sector overwhelmingly consists of small holders for whom cultivation is subsistence; production of food crops using the traditional practices.

Moreover, the earlier economic background has also aggravated the country's poverty; that it is sever. In the last four decades the country has gone through upheaval and radical changes. There were three different political regimes, and each system has its own economic, legal and administrative reorganization that lead to have great deal of institutional instability.

It was in 1991; the transitional government of Ethiopia came to power and initiated a broad spectrum of reform measures to address both the immediate need of economic recovery and reconstruction that addresses the long term structural problems of underdevelopment.

Since then internal conflict seized, followed by successful transition towards peace and democracy, the country begun with a clear vision of what should be done to reverse the socio-economic crisis of the 1980s. Accordingly, the first series of the economic reform programs was introduced in 1992-93 and were aimed at reorienting the economy from command to restricted market type, rationalizing the role of the state and creating a legal, institutional and policy environment that enhances private sector investment. Thus, introduction of these reform programs and adoption of Agricultural Development Led Industrialization Strategy (ADLI) were supposed to provide a long term development framework for economic transformation.

All these changes indicate the efforts made to address the economic problems of the country. However, previous economic shackles are still challenging, and to solve the economic and institutional problem of the country the government needs support from different domestic and international communities. Especially the supports that are obtained from the international institutions through provision of aid (project, program, and technical assistance) are playing a significant role and still needs strengthening in a more and better manner.

Aid is therefore thought to overcome this dilemma. This motivates the analysis in this paper, where I tried to establish econometrically the relation between aid and economic growth (intensive and extensive) in Ethiopia. While estimating aid impact on growth an attempt was made to distinguish between aid given in the form of loans and grants.

This paper starts with the brief description of aid and development in Ethiopia, followed by presenting the current aid growth relations which is conducted using cross country studies. Section three focuses on the main theoretical models that will form the basis for our empirical analysis. It begins by describing the methodology and data sources, and some concepts related to the presence of cointegrating relationships in the data. Consequently I then proceed to examine the impact of aid on economic growth and thereby evaluate indirectly the impact of aid on poverty alleviation. Finally summery and conclusion is given.

## 1.1 Aid and Development in Ethiopia

In Ethiopia, an inflow of external resources such as loans and grants has started in 1950, the year in which the relationship between the United States and Ethiopia reached a higher level. For instance pre 1975, about 75% of the required total investment during series of five year development plan period (1957-1973) was covered by external capital. Thus the magnitude of loans and grants that Ethiopia received in the years preceding the revolution was not even small. But due to the existing political economic system it has never contributed to the economic progress and was characterized by trifling development objectives. Similarly, during the post revolution period too, “37 percent of total investment expenditure of the annual campaign of 1979-1983” was financed by foreign aid (Dejene 1989; p 13).

In the subsequent years (1980-97), Ethiopia’s total ODA receipt exceeds US \$ 17 billion in nominal terms (US \$23 billion in real terms). This comes out to US \$1.0 billion (nominal) or US \$1.3 billion (real) of annual inflow. Based on the 1996 prices, the annual inflow of net ODA (loans, grants, technical assistance, and food aid) to Ethiopia averaged US\$ 1.2 billion per year in the 1980s, and then raised to US \$1.4 billion per year in the period 1991-1996 before slowing subsequently. This pattern suggests that the ODA premium for the ambitious reform program of the 1990s has been a modest increase of 17%. Correspondingly, data on effective development assistance (EDA), that is the “effective” grant equivalent (GEQ) rose from 21% in 1980s to 46% in the 1990s, which compares unfavorably with an average grant element of 70% for 1991-1997 (Abegaz, 2001).

Though, the magnitude of loans and grants that the country received in these years has increased continuously, in real term over the period 1991/92-1998/99 it increased by 13.97%, to reach nearly 2853.80 million Birr in 1998/99 (MOFED, 2000).

Recognizing the role of aid in the last decade ( since the introduction of market economy), while there have been some improvements and successes particularly in improving the social indicators, aid to Ethiopia has the least success story compared to other African countries such as Ghana and Uganda. While few poor countries manage to achieve long run-growth much in excess of 2% per capita per annum, and some do not grow at all. Hence, Ethiopia’s growth of about 0.7% per capita over the last half century is typical of the poorest fifth countries (World Bank, 2001).

So, the issue of aid effectiveness at reducing poverty of the country is debatable and questionable. In fact many advocates that (civil communities), despite the domestic policy changes made in the country, the system of aid allocation and disbursement to which it is provided; the policies and capacities of the government and organizations donating the aid; the conditionalities that are imposed by the donor; and aid volatilities are listed as some of the factors that constrains aid successes. Moreover the often limited natural resource base, harsh physical environment, the existing policies and work institutions also explains the relative effectiveness or ineffectiveness of foreign aid in the country. Therefore, this paper will try to answer the question of:

**Does the move from command to restricted free market economy lead to have effective use of aid that effects the economic growth and poverty reduction? Or in other word, what role did aid played in the economic growth and poverty reduction process in Ethiopia since 1992?**

Main objective of this paper is to evaluate the effect of aid on economic growth; to verify whether the latest policy (the policy changes introduced since 1992) enhanced efficient utilization of aid or not. I hypothesized: the increasing of aid flows to Ethiopia has brought some changes but not as such significant in a way that brings sustainable development.

## **2. Assessing Aid Effectiveness: How much do we know?**

Concept of aid dates back to the most closely identified theories of Harrod (1939) and Domar (1946). It is derived from the notion of Keynesian thoughts that linked capital investment to economic growth through the concept of the incremental capital output ratio (ICOR). Both economists contended the idea of increase in capital investment would contribute directly to economic growth. Therefore, Harrod-Domar model is the foundation for the first national development plans in the development world, and even policy-makers reciprocated the same beliefs in the power of capital.

This ICOR (increment capital output ratio) was largely demonstrated during the Marshall Plan. Since 1948 the assistance (capital and commodity) made by USA to the war-stricken economies of Western Europe has resulted in significant positive outcome in reviving the production sector of the economy. This became a base to inspired proposals for capital aid to the developing world.

Latter some more dynamic theories that supports the basic ideas of Harrod-Domar was suggested by Kuznets (1954) and Rostow (1956 and 1960).<sup>1</sup> Rostow tried to explain the importance of external capital as a major source to solve the economic problem of developing countries. This view has been widely accepted by most of the development economists; “external capital could play a major part in helping countries to meet the first condition for take-off” (Browne 1990, p. 103).

Regularly the rationale of aid lies on many points; economic, political, strategical, etc. But the basic propositions rest on economic justification: economically poor countries can be assisted on to a course of economic and social transformation through the provision of external resources supplied by the industrialized countries in the form of grants and/or loans. Principally this external resource was seen initially as a source of capital to fill the resource gap of developing countries through increasing of investment or saving that contributes to growth.

Despite this common consensus by most of the development organizations and the aid recipients, there was an argument on aid and its impact. While some convinced by the previous justification (aid and its contribution in filling the resource gap of poor countries), other groups failed to accept this and continued as the leftist on the whole aid principle. On the other hand there are other line of debates on growth theories; particularly on the issues pertaining to aid and its impact. Issue of poverty, income inequality or equal distribution which is a consequence of development process is becoming debatable, and is attracting several attentions.

Development economist and policy makers have gone through a lot of debates on the general concept of growth and its effects on poverty. Therefore, this paper is trying to examine the impact of aid on growth and through this also indirectly its effect on poverty in Ethiopia. Poverty in this sense refers to absolute poverty, which is closely linked to low economic productivity that arises

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<sup>1</sup> Rostow's book on the stages of economic growth pointed out the conditions necessary for the poor countries to attain better economic development: described as 'take-off'. This was illustrated by the three main concepts: a raise in the rate of productive investment; the development of one or more substantial manufacturing centers; and the emergence of political, social and institutional framework that facilitated on going expansion).

as a result of limited supply as well as demand factors.<sup>2</sup> Our argument relies on the following assumption: the poorest section of the country would benefit equally when there is an increasing in rate of growth of real per capita GDP. This idea has been commonly shared by most development economists that growth policies are regarded as a tool to raise the share of income of the poorest section of the society (for details see Dollar and Kraay, 2000).<sup>3</sup> In fact some agree with the advantages that can be attained from achieving growth, tried to explain when this could be desirable. Hayami et al (2005) tried to paraphrase this and stated: in addition to the level of average per capita income, the distribution of income matters in determining the prevalence and severity of poverty.<sup>4</sup> Related to these issues there is a consensus among groups of economists and they emphasized higher rates of growth usually results in more rapid poverty reduction, especially over periods of a decade or more (comparison: studies in countries of Chile, and Zambia confirms that the average incomes raise faster, the incomes of poor people tend to raise faster as well) (DFID 2004, p. 1).

Therefore, the relationship between growth and poverty is endogenous: growth is necessary to reduce poverty, and high poverty is an impediment to attaining growth. Generally, while one is dealing with the issue of poverty all these concepts raised above needs to be considered; growth impact on poverty depends on the course of growth pattern, but are the poor enable to share the fruit of growth or getting worse as a result of the process needs to be answered.

While reviewing the various theoretical justifications about physical growth, a concept used as a surrogate for development by economists', is a pre-eminent goal. Attaining economic growth is dependent on expansion of productive capacity through investment; in turn investment depends on the availability of investable resources, and saving (Browne, 1990, p.104). However, due to low earning power, weak saving habit, and limited investment opportunities the ratio of saving to gross domestic product (GDP) of developing countries, specifically Ethiopia's was/is so low. Hence, poverty is a consequence of all this which is expressed by the term called "poverty trap", expected to be filled by foreign resources. Therefore according to the earlier (first and second generation aid studies) conducted researches aid is needed to bridge the gap between the necessary increment in investment and the increment in domestic savings, which leads to have better growth.

## **2.1 What Does an Actual Aid Practice Reveal? (Lessons from the Past)**

From the above simple illustrations how aid studies have come up with mixed results must have been clear. That is, validating or invalidating of the aid growth relations; while some tried to verify the basic theoretical links others tried to invalidate these positive presumptions of pro-aid concepts. Therefore since the time aid launched there is a high debate on this topic and the argument is still continuing.

Priori to the discussions of the previous aid researches answering the question of why aid, is important and necessary. Therefore, according to the reviews referred (first, second and third) an

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<sup>2</sup> The supply factors are related to land, technology, skills, etc. On the other hand low price of commodities, limited availability of job opportunities, and poor access to urban market are the demand factors. But, access to market is one of the major reasons that could ease the entire problems. Local market provides affordable and accessible arena of exchange for goods and services produced by poor people, with out market, it is difficult to escape the poverty problem, for more information refers WDR 1990.

<sup>3</sup> Dollar and Kraay (2000) tried to explain the factors that are important in bettering the poorest section of the community in the developing countries. The four potential factors in determining the income share of the poorest are: expansion of education facilities; especially primary education, public spending on health and education, labour productivity in agriculture relative to the rest of the economy, and formal democratic institutions).

<sup>4</sup> If inequality in income distribution, as measured by Gini coefficient, remains the same, increase in average income per capita are sure to reduce the incidence of poverty. However if inequality is bound to raise along the raising phase of the inverted U-shape curve, low income economies may have to experience increase poverty incidence when they begin to experience economic growth as measured by real increases in average per capita income for total population (refer Hayami Yujiro, et al., pp 206).

answer to this question may be some what similar. That is, for all poor countries, aid is required because the total amount of revenue generated is not sufficient enough to finance the total amount of imports and the needed expenditures (both capital and recurrent). Like any other countries of Asia and Sub-Saharan Africa (SSA), even in Ethiopia despite the efforts that are applied to generate domestic resources the country is not able to finance its capital expenditures. Thus, the saving investment gap is so huge to the extent that it can not cover its simple investment programs required. This enforces to solicit foreign aid in which approximately 50% of the capital resource is covered by foreign aid (Ketsela, Mulu 2004); a main source of capital formation to the country economy.<sup>5</sup>

How far aid is important is the next question which attracted a lot of scholars and will remain as a crucial issue for the development economist to intervene.

Generally initial argument on correlations between aid inflows; on one hand, savings and investment, and growth on the other were raised at the end of 1960s. Where the optimism of the supplementalists was challenged; argued how actual practices differ from these theoretical presumptions, an indication of aid fragility. Aid far from the expected level of contributions; enhancing the capacity of aid recipients to mobilize domestic resource for development through filling the gap of financial constraints, might actually be detracting from it. So answering the question of how much is aid important may not be easy but there are a diverse views on this concept which is known as different generation ( first, second, and third) aid studies.

## **2.2 Experiences about Current Aid Perspectives**

Current aid studies (third generation aid studies) have tried to analyze the impact of aid on economic growth using cross section data and number of years of observations (applied different approach than the previous ones). Result of these studies had provided key information about aid and to whom should be given (selectivity criteria). But, issues related to macro economic impact of aid is unanswered question, and is debatable. Because, still findings of these studies are subject to several chaos, and are believed to be highly controversial.

Because, the third generation aid studies have encountered similar problem as these of the first and second generation aid studies; they are frequently criticized on the way the model is formulated, sample size and composition, data quality, and so on. “ Most of the models used so far for evaluating aid effectiveness lack proper treatment of the joint effect of the endogeneity of the aid flows, unobserved country specific factors, and conditional convergence” ( Hansen and Tarp 2000, p.7). Since each country differ in terms and degree of the problems what they really face the type and amount of aid what they need also differs remarkably. Particularly there should be a concurrence on the “supply “and “demand factors which are highly associated with the effectiveness or ineffectiveness of aid.

In this paper, in order to examine the impact of aid on growth to some extent I followed the approach of the third generation aid studies (similar to that of the selectivity criteria’s), the growth model formulated includes a variable that describes macro or institutional policy (openness, and human capital). This indicates the importance given to having good policy as one of the enhancing factor for effective utilization of internal or external resources in a new fashion. Of the various third generations aid studies some of the most important ones, which are worth of discussing are illustrated below.

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<sup>5</sup> To all developing countries aid is used as a supplementary resource when investment needs for development tends to exceed domestic saving capacities, regarded as the only way to escape from the vicious circle of slow economic growth and low savings.

Levey (1988), has tried to show the positive relationship in the aid regression model ( the variables he used are aid as a ratio of GDP, and income per capita for the period of 1968-82) using cross section data from 22 Sub-Saharan Africa (SSA) countries. He derived the positive trade off between aid and economic growth; aid attracts economic growth through improving of investment rates.

But, a study made by Boone (1996) is slightly different; he cast some doubts about the impact of aid on economic growth of the aid recipient countries. For the sample of countries he considered his estimated result reveals aid has had no impact either on improving of economic growth or rising of investments. He emphasized on the conditions where aid could lead to effective result and stated: macro economic effects of aid are generally ambiguous but support the idea of Burnside and Dollar (2000), that aid can enhance economic development beyond the direct economic effect of aid itself if the economic and institutional policy of the country is sufficiently in a good place.<sup>6</sup>

A study on aid effectiveness assessment made by World Bank (1998), and Burnside and Dollar (1997, 2000) shows similar finding. According to both of these studies, the impacts of aid on poverty reduction depends on the quality of incentive regime, particularly the effect of aid on growth process depends on the level of poverty and policy. Thus, countries that fulfill these criteria are most likely to use the aid effectively, there by achieving growth, which in turn reduces poverty (Collier and Dollar, 2002).<sup>7</sup>

Where as another Burnside and Dollar (1998), study that examined the impact of aid on infant mortality a direct poverty reduction indicator, indicates on who shares the benefit of development. Finding of this study is also similar to that of the previous one; in a poor incentive environment, there is no measurable effect of aid on the decline in infant mortality.<sup>8</sup> On the other hand in countries that follow poor policy, this is not the case that those with more aid have grown faster than those with small amount.

However, a study made by Bisogno and Chong (2001) reveals different. Because, besides to the institutional development of the aid recipient, he emphasized improving the aid delivery process as it can yield improved coverage and reduced leakage. More important, can have a large impact in terms of poverty reduction. The approaches used in this are useful in a context of reduced aid flows especially when waste and corruption issues become crucial. Thus, from a policy perspective this finding may be useful as it shows the trade-off between setting up and maintaining an administrative aid delivery system. Hence, the potential impact of aid on poverty reduction may not be as extreme as typically believed, influenced by the policy of the aid recipient but the pattern of aid flow is also another element that has direct impact on the effectiveness or non-effectiveness of aid. Perhaps some basic institutional capacity that supports a relatively simple aid delivery system can go a long way in reducing poverty.

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<sup>6</sup> Based on the cross country regression analysis conducted for a sample size of 56 countries in the period of 1973-1993, they found positive links between aid and growth of real GDP per capita, but if the highly interacted influencing factors are in a better place. Interacted set of influencing factors are: the existence of property right and their effective enforcement, efficiency of government machinery, and sound economic governance.

<sup>7</sup> Here growth is considered as a function of exogenous conditions (X), level of policy (P), the level of recipients of aid relative to GDP (A), the level of aid squared, and the interaction of policy and aid, which is given as:  $G = c + b1.x + b2.P + b3.A + b4.A^2 + b5.A.P$ . The ratio of aid to GDP does not affect the growth of economically poor countries, but the variable of aid interacted with policy; that is b5 does).

<sup>8</sup> For good policy observations, those with large amounts of aid have grown much faster (3.7% per annum per capita on average) than those with smaller amounts of aid (2.2%).



Another research piece conducted by Alesina and Dollar (2000) has come up with some what similar finding as that of Bisogno and Chong. They tried to show besides to policy the pattern of aid giving, which is dictated by political and strategic considerations is some more factor that affects aid effectiveness. Certain donors respond more to the “correct” incentives, mainly income levels, good institutions of the receiving countries and openness. Other countries give to former colonies tied by political alliance with out much regard to poverty levels or choice of politico economic regimes.

From these above discussed reviews it is clear that the idea of most of the current aid studies falls on the positive effect of having good policy in the aid recipient country. Emphasized following good policy as a major factor for aid to be effective. But these groups are classified in two strands (categories). Some (the first group) underlined on the idea of; aid could effect economic growth and then poverty if it is given to countries where there is better economic policy as it is paraphrased below:

“Impact of 1 percent of GDP in aid leads to the increase of 1.9 percent of GDP in countries with good economic management; in countries with poor economic governance, GDP decreases by 0.5 percent because of ‘crowding out’, that is more capital gets displaced out ward because of such aid process when recipients governance mechanism are defective” (The World Bank Global Development Finance, 1999 cited in P.K. Rao).

Where as the second group (like Collier and Dollar, 1999) are slightly different form the first one’s. Having good policy in the aid recipient is not regarded as a best means for aid to become more effective. Their main notion is: aid flow will raise the growth rate for one period, there by sustainably increasing the level of income, but this sustainable increase is conditional up on the initial level of income and distribution. This yields a function in which aid reduces poverty but subject to diminishing returns.

Lensink and White (2001, p. 48) tried to demonstrate the above concept. According to their study: aid impact is positive but the positive trend start to slow down after some level is reached; “aid may have not merely decreasing returns but that, after a certain level, the returns to further aid inflows are negative.” This yields aid’s impact on poverty reduction but subject to diminishing returns. A poverty efficient allocation of aid is one in which marginal cost of poverty reduction is equalized across recipient countries.

From the result of all the third generation aid studies it is clear that they tried to show the effect of aid on economic growth of developing countries. In their empirical analysis they underlined the changes that they have introduced; stated the conditions where aid could effect economic growth and then poverty subject to the policy of the aid recipients.

In Ethiopia impact of foreign aid on economic growth of the country is often evaluated by the donors (evaluation of the program or the project mainly conducted by consultants), or the civil society organizations (simple research papers that deals with the country development pace). These evaluations (mostly conducted by the World Bank), had tried to pin point the effect of aid, in filling the financial resource gap. Results of donors evaluation report is similar to the tests of aid growth relationships at the micro level, complemented by a case study investigation and shows the significant impact of aid. These evaluation reports have used general criteria as that of Cassen (1988); they used a project or program cases to verify whether aid really works or not.

On the other hand the ideas that are forwarded by the civil society organizations (from the interview and simple discussions made at regional and national level), contends the finding of the

project or program evaluation reports. The main notion of most interviewed civil societies is: foreign aid can play a significant role if the country is following better economic policy, tried to state as if aid contribution is retarded because of the policy of the country. Their view is paraphrased as follows:

“foreign resource alone can not led to have a significant impact on economic growth of the country economy”( Interview with the Ethiopian Economic Association representative, FSS, ). Most frequently blame to the country policy as the main obstruction to the country growth.

However, some of their idea seems slightly politicized, despite their logical arguments, which are more of ideological they seem to be biased on the policy aspect of the country; have dubious feeling on the whole system. However it is quite recognized that with out aid the country could not have undertake all of its development activities and on relative terms it has observed that current aid flows aimed at attaining pro-poor growth. Aid received by the country after the introduction of the policy changes (1991) are enabled to bring better changes, at least improving public services (education, health, road, etc).

Evidences (based on the econometric finding) from the recent aid studies shows the positive achievements made. For instance in the studies made by Easterly, Paul Collier and David Dollar using cross section data, where Ethiopia is included with the list of other countries, indicates the positive achievements made (better utilization of aid), as a consequence of the recent policy changes (as a result of he macro policy changes and introducing free market economy). Compared to the sample of countries considered efficient utilization of aid had observed in Ethiopia (Easterly 1999).

In the World Bank study; undertaken by Abegaz (1999) is one of the latest studies on aid and reforms in Ethiopia (Aid's Impact During Post Socialist Reforms), which is the first attempt to show aid-policy nexus with limited quantitative verifications. (Abegaz's 1999, p. 77) paper shows the changes obtained form the introduction of reforms supported by aid. Underlined, “aid flowing at an annual average of US\$ 1.3 billion (in constant dollar) followed the first phase of home grown reforms as a reward for good behavior” He further suggested the situations where aid could be effective. Assumed a country that treats its citizens fairly is also a country that is attractive to foreign aid. This is to say Ethiopia could grasp high amount of benefit from an increment in selective of international aid and private sector if the government manages to undertake the remaining reforms while building up its capacity for implementation.

Latter the linkage between aid, public capital, growth, and poverty in Ethiopia has captured by Agenor, Pierre-Richard et al. (2004). Their paper tried to confine the link between non-food aid and public investment, and the possible adverse effects of large inflows of foreign aid on fiscal accounts. A clear examination of this model focuses on the fiscal supply side effects of aid, as well as the stock and flow effects, while accounting at the same time for potential congestion effects associated with the use of public services. This study suggested the need for an increase in aid could be sizable if the elasticity of poverty with respect to economic growth is small, but they remarked to make further investigations on the issues that are directly or indirectly linked to these suggested concepts.

Having all these divergent views, this study has adopted the principle of the current aid studies (third generation aid studies). Since most of these already conducted studies at the country level (studies on aid and Ethiopia specifically) did not use any empirical approach that shows detail investigations on aid and its impact on growth, and then on poverty in Ethiopia. I believe a detail investigation on how far is aid effective to improve the economic performance of the country

need to be analyzed using both empirical and theoretical approaches. I support the advantage of having better policy and its implication on the efficient utilization of resources (aid and domestic). But while examining the impact of aid, beyond the domestic policy aspect there is a need to investigate the influence of other factors, which directly or indirectly affects aid effectiveness. Aid utilization, aid disbursement, and aid earmarking criteria are also some of the most important elements that need to be addressed.

### 3 Impact of Aid on Growth in Ethiopia

#### 3.1 Growth Model

Usually aid is distributed through different channels, and is allocated in various sectors with the aim to reduce poverty. This model focuses on assessing impact of aid on economic growth in Ethiopia, and it estimates a traditional production function, but emphasizes also aspects of the New (Endogenous) Growth Theory. Endogenous Growth Theory highlights increases in government spending to develop infrastructure but mainly personal services like education and health care as a main driving force to attain better economic growth. I follow the approach of Durberry et al. (1998) who estimate the following production relationship for a panel of several countries:

$$Y_i = \alpha_i + \beta X_i + \gamma Z_i + u_i \quad (1.1)$$

Where:

$Y_i$  is average growth rate of GDP over the period 1970-1993 for a country  $i$ .

$X_i$  is a vector of capital sources (foreign and domestic).

$Z_i$  is a vector of 'control variables' including trade, financial repression, macro economic and 'Barro' variables, and  $u_i$  is the error term.

Durberry et al.'s (1998) study tried to examine impact of aid on growth by augmenting two prominent growth models: the Fischer-Easterly model (Fischer, 1991, 1993; Easterly, 1993) and the Barro model (Barro, 1991; Barro and Sala-Martin, 1995). They have also tried to overcome the repeatedly stated criticisms regarding the extent to which previously conducted econometric aid growth studies were representative by comparing panel data and cross section econometric technique for a large sample (68 developing countries) over a large period (1970-1993).

Their main hypothesis was that the effectiveness of capital flows (aid and other investment) will be greater when there is macro economic stability and no or few trade distorting policies such as trade restrictions or financial repression are in place, because they reduce the efficiency of capital investment, and thus the rate of growth for a given level of capital investment. Therefore, they conclude, the removal of trade distorting policies would foster economic growth in developing countries.

Following the empirical approach proposed by Durberry et al. (1998), I tried to assess the impact of aid on economic growth in Ethiopia and indirectly its contribution to reduce income poverty. Much of the recent aid effectiveness literature has examined the relationship between aid and economic growth using panel data, i.e. by considering several countries over time. But in this study I used time series data as the study focus is not on number of countries. Therefore, in order

to examine the relationship between external assistance and economic growth in Ethiopia the following model is specified,

$$Y_t = \alpha_t + \beta X_t + \gamma Z_t + u_t \quad (1.2)$$

Where:

$Y_t$  is the average growth rate of GDP over the period 1981-2003 for a country Ethiopia within time interval  $t$ ,

$X_t$  is a vector of capital sources (foreign and domestic),

$Z_t$  is a vector of control variables that influence the rate of growth of the country, and/or other macro variables, and

$U_t$  is the error term.

Due to various reasons the growth equation is not exactly the same as that of Durbarry, et al.'s (1998). In this study aid refers to the official development assistance received by the government, excluding private flows and aid given by NGO's. Main hypothesis of this paper and my arguments have been already discussed in the previous chapters. While I follow the hypothesis formulated by Durbarry et al. (1998) that foreign aid has a positive impact on growth conditional on a stable macro economic environment, I also argue that for aid to be effective change in macroeconomic policy of the recipients is not the only factor to positively influence growth. The specified representation of our growth model is given by:

$$\text{Growth} = f(\text{Human capital formation, Investment, Trade})$$

In this paper gross domestic investment is replaced by the total amount of capital (domestic and foreign), expressed as the sum of domestic saving and foreign capital flows. Please note that in order to capture the poverty reducing effect of aid I estimated a per-capita growth regression (intensive) and growth regression (assessing extensive growth). Foreign capital (aid) in this case is denoted by total amount of official development assistance (Aid). Hence, the above growth function is rewritten as:

$$\text{Growth} = f(\text{Human capital formation, Saving, Aid, Trade})$$

The above growth function is refined by splitting aid up into aid given through total loans and total grants, and can be rewritten as:

$$\text{Growth} = f(\text{Human capital formation, Saving, Loan, Grant, Trade})$$

Hereafter I will represent the variables used in the growth model (equation) as follows:

$$Y_t = f(H_t, S_t, L_t, G_t, T_t, D_d, D_w) \quad (1.3)$$

Where:

$Y_t$  refers to real output growth per capita at time  $t$ .

$H_t$	captures changes in human capital formation which is represented as gross enrollment as a proportion of total population (used to measure impact of the current policy (pro-poor growth policy).
$S_t$	is the growth of real domestic saving per capita.
$L_t$	is the growth of the total aid flow (aid per capita) to the country which is supplied in the form of loan per capita. The variable is in nominal terms as no suitable deflators are available.
$G_t$	denoted the growth of aid per capita particularly the aid given in the form of grant. The variable is in nominal terms as no suitable deflators are available.
$T_t$	measures the relationship between trade openness and macro economic stability and is proxied by the ratio of real total exports (X) plus real total imports (M) to real GDP (that is $\frac{X + M}{GDP}$ ). I have used the World Bank import and export deflators to get exports and imports in real values.
$D_d$	is a dummy variable that stand for periods of drought I have compiled from the historical records.
$D_w$	is another dummy variable that stands for periods of war also compiled from the historical records.
$u_t$	is error term.

The GDP deflator from World Bank database was used to deflate all nominal variables. Therefore the rate of growth of GDP is expressed as follows:

$$Y_t = \alpha_0 + \alpha_1 H_t + \alpha_2 S_t + \alpha_3 L_t + \alpha_4 G_t + \alpha_5 T_t + D_d + D_w + u_t \quad (1.4)$$

To obtain the growth rate of all variables, except the dummies all have been transformed into logs, and differences were taken. Besides to all these I also had to check for potential cointegrating relationships, which would make it necessary to specify the model in error correction form.

## 3.2 Methodology and Data Sources

### 3.2.1 Data sources

The corresponding data for the variables given in the growth model was gathered from various national and international documentation centers. Specifically they are collected from the following sources:

1. ODA is obtained form the World Bank CD-ROM library in Addis Ababa, compiled in 2003. Similar data series are also available in Ministry of Finance and Economic development in Addis (MOFED), Ethiopia. But because of some recording problems these data lacks consistency, and since I had the doubt that the information may not be complete I preferred to use data's obtained from the WB; believed to be accurately estimated. The definition of aid in this study is based on OECD's concept, as it is defined in chapter four of this thesis.
2. Data related to saving rate of the country is gathered from MOFED (government institution), and from CD-ROM 2004 compiled by the Ethiopian Economic Association (EEA). EEA is an academic institution with large number of economist from in and out of the country as a member, who involves in various national and other economic related researches. When we compared the data that are available in both of the above

- institutions (MOFED and EEA) to major extent they are identical insofar as they were strongly positively correlated.
3. Latest and updated data related to financial aspect of the country is gathered from the National Bank of Ethiopia; from the ‘Bulletin on National Bank of Ethiopia’, which is published annually ( various publications have been referred).
  4. The cited sources (given as others) were used in order to obtain some more relevant information, which is believed to be important and necessary.
  5. Most of the macro economic indicators are fetched from the data source (<http://africa.gov.harvard.edu>) that presents a panel of data from all African nations collected from different sources but mostly from the World Bank. Particularly the series for the GDP deflator was obtained from that, which is identical to the World Bank database.

Much effort was made to include variables that directly or indirectly contribute to the level of the country productivity (growth of GDP). Overall, while collecting and aggregating data’s much effort has been put to keep the quality of the data series since this has much to do with the results to be generated.

### 3.2.2 Quantitative Method

As discussed before, This paper followed similar approach as that of the study conducted by Durbarry et al. (1998), to examine testing for cointegration we must first make sure that both series are integrated of the same order, that is  $X \sim I(d)$  and  $Y \sim I(d)$  (Bahmani et al., 1993, p. 536).

Commonly economic variables that are related to macro data are non-stationary. While one is dealing with stationarity or non stationarity data two things need to be settled. First one has to confirm what type of estimation technique should be used, identifying whether the model should be estimated using simple linear equation approach (OLS) or a system of estimators. Second, careful analysis is required, to examine whether the result generated suffers from spurious regression problem. In Granger and Newbold (1974) spurious regression is described as: given two completely unrelated but integrated time series, regression of one on the other will tend to produce an apparently significant relationship (Banerjee et al.1993).<sup>9</sup>

In order to test for stationarity of a particular series (or presence of unit root) several tests have been developed. If a time series is non-stationary it can be converted into stationarity by applying differencing. To carry out this Dickey-Fuller (here after DF) and Augmented Dickey-Fuller (here after ADF) method of testing are commonly used. Based on DF test, the time series Y is stationary if the absolute value of  $\delta$  in the Equation (1.3) is less than unity.

$$Y_t = \delta Y_{t-1} + u_t \tag{1.9}$$

Where

$Y_t$  Refers to a series of the variable to be tested for stationarity.

However, if the absolute value of  $\delta$  in the above regression is greater than or equal to unity it is non-stationary. But testing a null hypothesis that the absolute value of  $\delta$  is equal to one is statistically problematic (Harris, 1995). Therefore, the above equation is rewritten as:

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<sup>9</sup> But when your static results show high t-values, a high R2, and a low DW-value, then be aware of spurious results (Vogelvang, 2004, p. 265).

$$\Delta Y_t = \alpha Y_{t-1} + u_t \quad (1.10)$$

Where

$\alpha = (1 - \delta)$ .

Hence, the null hypothesis that  $\delta=1$  is equivalent to  $H_0: \alpha=0$

However, DF test assumes that the data generating process follows the autoregressive of order one [AR (1)] which biases the test in the presence of serial correlation. To solve the limitation of DF test, ADF test is preferred. ADF is similar to the standard DF test, constructed with regression model of the form:

$$\Delta Y_t = \alpha Y_{t-1} + \sum \gamma_j \cdot \Delta Y_{t-j} + u_t \quad (1.11)$$

Where:

$\Delta Y_t$  represents to a vector of non-stationary variable

$\sum \gamma_j$  short run adjustment

$\alpha$  long run relations

$U_t$  is the error term

The DF test explanation for tests of unit root is illustrated as follows. If the variables are found stationary at their level then application of ordinary least square (OLS) would be justifiable and there would be no fear of any spurious regression problem. However many macro economic variables are non-stationary at levels, indicating the need for removing the non-stationary trend. This can be removed by differencing the variables. But differencing of variables may also result in loss of valuable information in the long run relationship between the levels of the variables; this requires careful and systematic handling of the estimation procedure.

### 3.2.2.2 Testing for Order of Integration

Macro economic data are often integrated at their level and stationary after differencing. The number of times a time series must be differenced before it becomes stationary is referred to as its 'order of integration'.

Regularly, before making any analysis the stationarity or nonstationarity of a time series can be identified. Preliminary it can be judged by looking at the scatter plot. A time series is classified as non-stationary at levels if the variance seems to be increasing with time and there is no tendency for the series to reverse to the mean value. If a series fails to show stationarity on level it is frequently stationary on first differences (fluctuation around the mean and finite variance). Further, the relevant sample autocorrelation function (ACF) also provides additional information as the function for the levels dies off slowly while those for the first differences decline sharply before fluctuating around a fixed mean of zero (Ghatak et al. 1997, p. 216).

Besides to this, in order to identify the stationarity or non-stationary of a particular series or the presence of unit roots several tests have been developed. If the variables are non-stationary it can be converted into stationary after differencing. In applied work, however, despite its weakness Dickey-Fuller (DF) remains consistent, but loses power relative to cointegration tests that do not impose a common factor restriction, such as those based upon the estimated error correction coefficient. The weakness of DF test is that it has low power when structural breaks are present in

the serious (Kremers et al., 1992). Therefore, due to their simplicity and their more general nature ADF tests have been used.

Usually unit-root test is sensitive to the type of data. To avoid the possible problems that occurred use of annual data serious is recommended, even though such data causes the sample size to be small and leads to a slight loss in the power of the test (Banerjee et al., 1993). Thus, the model needed to test for the null hypothesis of non-stationary against the alternative of stationary using ADF as it is commonly used in most of the econometric books, and also in one of a study paper described below (<http://ncb.intnet.mu/medrc/execoana.htm>, p. 2):

$$DF: D X_t = a + bt + dX_{t-1} + u_t \quad (1.12)$$

$$ADF: D X_t = a + bt + dX_{t-1} + \sum_{i=1}^m d_j D X_{t-i} + u_t \quad (1.13)$$

ADF specification accounts for the possible autocorrelation in the error process  $u_t$  through the lag dependent variable on the right hand side. Procedurally number of lags ( $m$ ) can be established and should be relatively small. Nevertheless in order to save the degrees of freedom; one or two lags appear to be sufficient enough to remove autocorrelation in the error term. Once this is verified the next step is confirming whether the stochastic trend contains a common stochastic trend to prove if there exists a cointegration relationship between the explained and explanatory variables, regarded as the counterpart of the theoretical notion of a long run relationship.

### 3.3.2.3 Cointegration: The Engle-Granger (EG) Approach

Cointegration is a powerful relationship between variables that describes the existence of an equilibrium, or stationary relationship among two or more time-series, even if each one is individually non-stationary.

In order to test for cointegration various approaches can be used. Of these Engle-Granger approach and Johansen approach are mostly used. In most cases Johansen approach is deemed as an alternative test procedure to establish a long run relationship between variables, which is a system approach based on estimation of a vector auto-regressive model (VAR model is often regarded as superior to the Engle-Granger single equation method). But with a quite limited number of years of observations using Johansen cointegration approach is not plausible. Therefore, when the number of observation is small Engle-Granger approach is an equally useful tool to test for cointegration, which is also known as the residual-based Engle-Granger approach.

Testing for the null hypothesis that the variables are not cointegrated implies, in the Engle-Granger sense, to directly testing whether the residuals,  $e_t$  from the cointegration regression are  $I(1)$  against the alternative that  $e_t \sim I(0)$ . This is given by the following test regression equation (ibid).

$$D^{\hat{e}_t} = a + b\hat{e}_{t-1} + \sum_{i=1}^m d_j D^{\hat{e}_{t-1}} + v_t \quad (1.14)$$

The term  $D^{\hat{e}_t}$  in this case refers to the residual to be tested from the cointegration regression in each of our model described. The Error Correcting Model is valid if there is a proof that there exists stationary relationship between non-stationary variables. Therefore, the first step in any Error Correction Model estimation is to test for the existence of long-run relationship or test for co-integration. In order to perform the Engle-Granger (EG) cointegration test, at first step OLS regression at level needs to be performed. This helps to obtain the long run relationship between



the explained and explanatory variables of the model. The next step is to apply unit-root ADF test to the regression residuals, at levels (as it is described in Equation (1.7)). After confirming that the residuals derived satisfy the unit root test (stationarity at level), I proceed to the next step which is to run the OLS regression at first differences. The coefficient of the residuals determines the adjustments made in the short run in order to balance the long run disequilibrium. Usually, the value of the error correction falls between 0 and -1.

### **3.3 Econometric Estimations: The Relation between Aid, and Growth.**

#### **3.3.1 Estimating an Intensive Growth Model**

Before obtaining the final result of the analysis for the above model it is important to mention the presumptions about the relations that are expected between explained and explanatory variables. For instance, in Equation (1.3) except rate of population growth I expect all explanatory variables used in this model and also in the model of explicit growth to have a positive coefficient (relation). Because I believe rate of gross domestic product per capita of the country is directly related to the variables of gross enrollment ratio, trade, which is denoted as openness; derived from the ratio of export minus import to GDP, Aid (Official Development Assistance per capita), which is disaggregated as loan per capita and grant per capita, and to the gross domestic saving per capita. All these priori assumptions are formulated on the basis of the theoretical relations justified in various reviews (books published and studies conducted in the previous period, etc).

In addition to these above stated explanatory variables in order to control for drought and war two dummy variables have included. Since the country is known as an agrarian economy, highly dependent on rain I have included a drought dummy. I believe this would help to predict the effect of the climate changes on the over all agricultural productivity and then on growth. The second control is a dummy for war, and is assumed to be negatively related to the country's growth. Compared to pre 1991 periods at present the country has less war. But there is a suspicion that the boarder conflict with Eritrea that occurred in 1997/98 has led to have a lot of discrepancies on the country economic progress. This is presumed because Even though the war ended in 1999 the boarder conflict has not resolved yet. Thus, our assumption is this as well as all previous conflicts have had a negative impact on economic growth of the country in two ways. First, when there is war the probability of using the country capital resources in various development activities is unthinkable. Second, war (conflict), affects individual's participation in state development, keeps the country to remain unstable, increase unemployment and underemployment, and it opens room for violence and conflicts that retards economic progresses (growth).

##### **3.3.1.1 Testing for Unit Roots**

Following all this procedures, initial step of this paper focuses on verifying the stationarity or non-stationary of all the variables used in all the models, applying ADF test. We used ADF and the residual-based ADF test to determine the integration and the possible cointegration level between the variables respectively. Result of the unit root test of the variables included in each model is given in Appendix 1.1 (Table 1.1).

Most of the variables listed in the table (used in the models specified) are non-stationary in their levels and stationary at their first differences. But variables such as the dependency ratio, inflation, broad money, and budget deficit are stationary in their level and first differences.

Accordingly I rule out the application of ordinary least square (OLS) estimation, and it implies the need for removing the non-stationary trends.<sup>10</sup>

The derived result shows in the cases at level with trend and no trend the computed *t*-statistics however, exceeds the critical values. Moreover, at first difference with trend, the result reports mixed values. But the values at first difference with no trend is exceptional; the critical values are higher than the computed values (all the variables satisfy the criteria either at 5 and 10 percent level of significance). Therefore, the unit root test criterion is fulfilled at first difference with no trend, shows all variables are integrated of order one; and are I (1).

Since all macroeconomic variables are non stationary, it has become a common practice to de-trended the data priori to estimation by first differencing the I(1) variables, thereby removing the stochastic trend and rendering them stationary I(0), as it has made already. This procedure: transforming of the non-stationary variable into stationary models at first differences filter out information about ‘long run’ behavior of the variables, leaving the ‘short run’ behavior.

Once this is verified we have to check whether there exists a cointegration relationship between the explained and explanatory variables, which are regarded as the estimate of the given models. When variables share a common stochastic trend, it is possible to evaluate models which combine both short run and long run properties. This also provides information about spurious regressions that can be derived by non-stationary series (Granger and Newbold, 1974).<sup>11</sup>

### 3.3.1.2 Cointegration and the Long Run Relationship between Variables in the Intensive Growth Model

Following the above procedures in the next step we estimate the following cointegration regression using ordinary least squares (OLS) method and the results are as it is reported in Table 1.2; (Appendix 1.2).

From that table it is clear that there is evidence of cointegration relationship among the dependent and independent variables of the following equation; Equ. (1.15).

$$\widehat{Y}_t = \alpha_0 + \alpha_1 \widehat{H}_t + \alpha_2 \widehat{S}_t + \alpha_3 \widehat{L}_t + \alpha_4 \widehat{G}_t + \alpha_5 \widehat{T}_t + u_t$$

Having established the long run relationship between the variables of this model the regression results are obtained. Some of the independent variable tested for cointegration are insignificant and hence do not have long run relationship with the dependent variables.<sup>12</sup> Following this a stepwise eliminating of insignificant variables is applied and the result is as it given by Table 1.3; (Appendix 1.3).

Following Hendry’s (1995), general to specific modeling approach I gradually eliminate the insignificant variables. This helps to identify variables that are most cointegrated. This process is also vital to improve the result that would be derived in the short run relationship. That is, it maximizes the opportunity of obtaining significant value of the residuals which contributes to the

<sup>10</sup> If variables are stationary at their levels OLS estimation procedures can be used.

<sup>11</sup> When variables are cointegrated, the OLS estimate from the cointegrating regressions will be super-consistent. Super consistency implies that the estimates approach their true parameters at a faster rate than the variables were stationary and non-cointegrated.

<sup>12</sup> Variables such as loan and gross domestic saving per capita are reported insignificant at 5% and 1% level. An attempt was made to consider even at 10% believing that if our observation is more there could have been high probability of obtaining significant values. But still within that boundary these variables failed to satisfy the criteria.

result expected in the short run estimation procedure. Accordingly the following co-integrating vector is formulated.

$$EC_t = \tilde{Y}_t - 6.42 - 0.38\tilde{H}_t + 0.05\tilde{G}_t + 0.23\tilde{T}_t \quad (1.16)$$

The tilde signs ( $\sim$ ) over the variables indicate that instead of using the growth rate of the variable the only the log of was used. After step-wise eliminating procedure it has found that grant  $\tilde{G}$ , human capital formation  $\tilde{H}$ , and openness  $\tilde{T}$  have a long run relationship with the log of real GDP  $\tilde{Y}$ . When variables are cointegrated, the OLS estimate from the cointegrating regressions will be super-consistent. Super consistency implies that the estimates approach their true parameters at a faster rate than the variables were stationary and non-cointegrated.

To establish a cointegrating relationship unit-root ADF test is employed; to test the residuals for stationarity. Based on result of the residual ADF test for cointegration of the growth equation I reject the null of I(1), that is the variables are said to be cointegrated.

Conventionally in this type of analysis the short run responses of the rate of growth of GDP vis-à-vis the explanatory variables should be estimated. If the short responses of the average growth rate of the country GDP ( $Y_t$ ), with the explanatory variables stated are not estimated the whole analysis would be incomplete. Therefore, estimating of the final restricted error correction model (ECM) to rate of growth of GDP per capita in Ethiopia is the final step that needs to be considered.

After applying the procedures, the analysis result reveals that the estimated long-run relationship is integrated, but it is apparent that both grant and openness are negatively related with the left hand side of the variable at a highly significant level. On the other hand human capital formation is positively related at a very significant level. Thus, the coefficient of human capital formation (gross enrollment ratio) supports the notion that long run real GDP growth in Ethiopia is influenced by human capital formation, which is in line with New Growth Theory. That is, the labour force development has a significant impact on changing the country economic progress.

However, the coefficient for aid (grant) and openness measures are not in line with the a-priori theoretical assumptions stated in the previous discussion of this paper. Despite the goal of the donor and the expectation of the Ethiopian government aid contribution to economic growth is negative. A possible explanation for this may be that aid is not utilized appropriately. Experience indicates that aid given to Ethiopia is often more influenced by the decision of the donor rather than by the Ethiopian authorities, and/or due to the aid tying which is often made by most bilateral and some multilateral donors. The negative impact of openness of the economy or trade could be due the unbalanced relationship between export earnings and import payments. Besides the main export good of Ethiopia is coffee and as the prices for this good fluctuate strongly, the earnings from exports are not steady. This determines that while the prices for imported goods rises it detract resources from the domestic uses.

Based on the results derived it can be said that if aid is used to finance current expenses receiving aid adds more to the cost rather than to the revenue and its contribution to economic growth would remain as negative. On the other hand issues pertinent to giving of tied aid have been discussed by McGillivray and Morrissey (2000), underlined how aid tying (conditionality) affects aid effectiveness, when aid comes tied it makes hardly contribution to economic growth. Therefore if aid has to be used efficiently donors need to understand the real problems of the

country and should concentrate on monitoring how the funds are allocated, but give the local authorities the mandate of deciding where the resource should be utilized. “The exposition of fungibility requires one to project where indifference curve will be under a new budget constraint. It may be the case that governments need to attain some critical level spending on specific areas, but would allocate on greater proportion, or even all budget increases to other areas” (McGillivray and Morrissey, 2000, p. 419). Therefore, pre/post conditions imposed on aid should not be used as mechanism of controlling the government; rather it should be an enabling factor, which extends to improve contingency financing of the country. In this regard our argument falls in line to Killick (1997), stated: “the use of conditionality should not be excluded entirely but donors should be reluctant to use the hard-core variety unless there are specific grounds for believing that it will produce good results. Thus, conditionality should be the exception rather than the rule (Killik, 1997, pp. 494).

Similarly, the relationship between growth and openness is not as theory would suggest. According to the results derived it can be said that the measure taken to enhance trade and exchange by introducing free market economy did not perform well. Therefore, despite the usually stated arguments about openness in Ethiopia case, openness does not seem to enhance better use of imported resources, allowing import of goods and services at fair price and promoting of exports. Similar to the previous period’s trade pattern in Ethiopia is still influenced by importing of capital goods, and exporting of primary products.

### 3.3.1.3 The Short Run Error Correction model for Intensive Growth

Applying this general to specific estimation procedure the ECM of the rate of growth of GDP takes the form of:

$$Y_t = \alpha_0 + \alpha_1 EC_{t-1} + \alpha_2 H_t + \alpha_3 S_t + \alpha_4 L_t + \alpha_5 G_t + \alpha_6 T_t + \alpha_7 D_d + \alpha_7 D_w + u_t \quad (1.17)$$

Usually an appropriate strategy must be adopted for choosing optimum number of lags of the independent variable in an auto regressive model format. It all depends on the result of the significance level of these variables obtained. But Engel and Granger have suggested to start with fewer lags and then testing for added lags, proceeding from simple to general specification search. Nevertheless, as it is stated in most of the econometric books (Madal, 1992; Banerjee, 1993; and Vogelvang 2004), when the sample size is small using fewer lags is recommended. That is, limiting length of lags into fewer number helps to keep the degrees of freedom high.

Procedurally the above model is estimated using ECM, one way of capturing adjustments the explained variable which is usually depends not on the level of some explanatory variable, but on the extent to which an explanatory variable deviated from an equilibrium relationship with the dependent variable (Banerjee, et al., 1993). The coefficient of the error correction term is an adjustment coefficient that captures the deviation from long-run equilibrium in a previous period that is supposed to be corrected by the economic agents in the next period.

Accordingly the following results for the short-run error correction model is obtained and is given by (Appendix 1.3); Table 1.5.

$$Y_t = -0.004 - 1.149EC_{t-1} + 0.369H_t - 0.017S_t + \\ + 0.006L_t - 0.028G_t - 0.246T_t + 0.0366D_d - 0.012D_w + u_t \quad (1.18)$$

From (Appendix 1.3); Table 5.5 and Equation 5.18 it is clear that the estimated error correction model explains a large part of the observed variation.<sup>13</sup> The Durbin-Watson statistic indicates that the residuals are almost white noise, with only slight positive serial correlation. Our short run estimates from the error-correction version reflect to some extent the long run results. The gross enrollment ratio, which is denoted by H is positively related to the rate of growth of real gross domestic product per capita, and the coefficient for openness T is negative and significant, but aid is no longer statistically significant. Similarly, the sign of the grant variable maintains the same negative sign as in the long run relationship, though the loan variable enters with a positive sign, but both are not significant. This indicates that in the short run aid has no significant impact on economic growth. Combining the insights from the long-run and the short run relationship aid in the form of grant seems to have a cumulatively negative impact on growth, while nothing can be said about the effect of loans, as this variable is not significant in both the short and the long run.

The significance of the variable H provides important information. That is, the increasing of school enrollment ratio and level of schooling is contributing to the increment of total productivity not only in the long run but also in the short run case. Since the coefficient for openness is consistent to the results obtained earlier the main justification is similar. The negative impact of trade, which is effect from the unbalanced relationship between export earning and import payments in the short run is the same as in the long run case, implies the problem is not time specific.

The control variables included capturing drought and war was expected to be negatively related. But the estimated result shows drought is positively related and significant in the short run. It sounds very unusual but this could be due to food aid mainly given when the agricultural productivity is affected by the problem of the natural calamities (high rain, less rain, off season rain, etc). It determines how the food aid given is contributing to the economic growth of the country and indirectly it also provided information about the total agricultural productivity, which is diminishing even under normal circumstances.

The impact of the war dummy is negative but not significant. This is surprising, could be due to a simple reason that the simple dummy does not capture the impact of wars and border conflicts properly. First, not all situations of conflict affect the economy as a whole, but only some border regions. Second, even when a country is at state of war with a neighbor this may not imply that there are permanent exchanges of fire on a massive scale. Actions of war may be on a smaller scale and not affect the wider economy. Third, especially for Ethiopia it may be relevant that the developments in the whole region need to be taken into account.

The EC coefficient is an adjustment coefficient capturing the proportion of the disequilibrium in GDP growth in one period, which is corrected in the next period. Regularly the value of the error correction ought to lie between 0 and -1. "A value one indicates that 100 percent of the disequilibrium in GDP growth is corrected in the following year"(Feeny, S. 2005, p. 1106). Thus, the larger the error correction term, the faster the economy returns to the equilibrium rate of growth following a shock. Thus the coefficient of the lagged error correction term which is also called residual has a coefficient which is statistically significant. This shows the system corrects its previous disequilibrium by 114%. Since the adjustments made in the short run to correct the long run disequilibrium are high it shows that there is an opportunity of overshooting the country growth rate in the year following a shock.

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<sup>13</sup> ECM involves the first difference of the variables for the dependent variable as well as the disequilibrium error term

Overall, in terms of assessing the impact of aid on poverty alleviation captured by the growth of per capita real GDP was found that there is a significant effect of aid, which is given in the form of grants and is only in the long run cases. Therefore, in this paper it is argued that this may be due to the inappropriate allocation of aid and is mainly because of donor's imposition (criteria). Even in the short run this relation persists aid that is given in the form of loans seems not to have any significant impact to growth. Thus, according to the results generated from the estimated analysis, to address poverty education and overall human capital accumulation seem to be most important. Trade could be beneficial, if the prices of Ethiopia's main export goods would be higher and more stable. Finally, the food for work program during drought periods seems to have a positive short run effect on poverty alleviation.

### 3.3.1.4 Estimating an Extensive Growth Model

Parallel to this intensive growth regression approach effort was made to assess impact of aid on extensive growth, i.e. the absolute growth rate, by taking the variables in the normal way (not in per capita form). To estimate this growth (extensive) I consider all these variables what I have used in the intensive growth model and include one new explanatory variable, i.e. the rate of population growth. This variable is included in order to examine its influences on total output, and its implication on efficient use of aid, that is to identify whether rapid population growth is constraining the economic growth of the country or not. So the growth model (extensive) is specified with slight modifications and is given as follows.

$$Y_t^e = \alpha_0 + \alpha_1 H_t^e + \alpha_2 S_t^e + \alpha_3 L_t^e + \alpha_4 G_t^e + \alpha_5 T_t + \alpha_6 R_{pop} + D_d + D_w + u_t \quad (1.19)$$

Equation (1.19) is the same as Equation (1.15). The main difference is in Equation (1.19) the variables are not in the form of per capita term, and this is indicated through the superscript  $e$  for indicating the "extensive" approach.

Following similar approach as that of the above, I run OLS regression to estimate the short run and the long run relationships of the growth model. The result indicates there is cointegration among the variables used (there is long run relationship among them), but not all variables are cointegrated. So after applying stepwise eliminating procedure the variables such as aid given in the form of grant (G) and gross enrolment ratio (H) has found to be positively related at a highly significant. On the other hand variables like saving and openness are negatively related at a highly significant level

Simultaneously, result of the short run estimation of the error correction model of extensive growth reveals aid (both loan and grant) given to Ethiopia has not found as a main determinant factor for real GDP. But the gross enrollment ratio is found to consistently have a positive contribution to the short run growth. On the other hand variables such as openness and rate of population growth have found negatively related to the growth rate of GDP at a significant level. To some extent this echoes the results of the intensive model.

The coefficient of the error-correction term is also significant with an appropriate sign. This indicates that the system adjusts its previous period's disequilibrium by 49.0% a year (moderate adjustment in the long run).

From the comparison of both estimations made (assessing impact of aid on intensive and extensive growth) one interesting point has been found. In the case of intensive growth in the long run aid (given in the form of grant) is negatively related to growth. Where as in extensive case it is the reverse, aid given in the form of grant is positively related and significant. This

indicates that aid given in the form of grant has a long run positive impact on extensive growth and the previous conclusions that the negative impact of aid (grants) could be due to inappropriate allocation of funds may not be the main reason. The effect could be due to mismatch between quantity of aid and rate of population growth, and also due to the aid earmarking procedure. This also gives a clue about the quantity of aid given. That is, despite the believe of the various international organizations that the total aid flow to the country is increasing, when it is compared with other countries and with the number of population in the country the aid received is still lower (compared to other countries Ethiopia receives low aid per capita, fits to most of the reports published by various national and international reports). But the aid given in the form of loan (in both, intensive and extensive growth) still remains insignificant, and one possible reason for this insignificant might be due to giving of aid, which is tied to some pre and/or post condition, miss allocation of aid, or due to other fact that are related to aid disbursement and/or allocation criteria.

Therefore the reason for grant per capita to be negatively related in the case of intensive growth must be due to population growth, aid efficiency is countervailed by rapid population growth.

## **Conclusion**

### **3.4 Conclusion: Evidence on Aid Effectiveness in Ethiopia**

Since the time aid launched, there are ample reviews made and a number of studies conducted. Based on all these it can be said that the aid industry is a research topic which has gone through various theoretical and empirical revolutions with assorted concepts and approaches.

Generally, previous conducted researches on aid and development reveals the diverse principles about the scope of aid theories and its guiding principles. This serves as evidence about aid and its dynamical nature, which led to increase the norms and procedures in a highly flexible and fashionable mode. But, in spite of the fact that aid packages are so flexible depending on the goal of the aid and the type of the country economy (the aid recipient) its main aim centers on one common objective, that is addressing poverty of the economically poor countries, though some donors have other motive, other than poverty reduction.

Over all the aid industry has gone through different aid strategies, and policies. But its role in economic growth and poverty reduction is always highly debated. But in spite of the various modifications made on aid and its principles even today improving aid effectiveness is the focal issues. All these led to ask one important question, is aid effective? This is a crucial question to all donors, the recipient government, and to the beneficiaries.

Regularly, aid effectiveness is judged by its impact either on investment, saving, and/or by its contribution to the average growth rate of GDP. All these are the main revealing factors about aid effects on the aid recipient countries economic development.

Therefore, main analysis of this paper is to estimate impact of aid on the average growth rate of GDP per capita in Ethiopia using annual time series for the periods of 1981-2003. Mainly it focused on investigating whether foreign aid is effective in raising real growth rate of GDP per capita or not.

In this empirical analysis aid is disaggregated into loans and grants. Though both are aid types, they are given on the basis of different procedures and cannot be treated as one and the same. Based on the categorization of dependent and independent variables specified in each model (intensive and extensive growth) I tried to investigate the contribution of aid to the economic

growth of Ethiopia. Examining whether the recent policy change (pro-poor growth) led to improve aid utilization; addressing the country economic problem, raising growth and reducing of poverty.

In order to assess aid-growth relations I followed Engel-Granger and error-correction approach. The estimated result of the long run analysis of the first model (growth) indicates that the relationship between aid and intensive growth, mainly aid given in the form of grant is negative at a highly significant level. On the other hand loan is positively related but is not statistically significant. While comparing the results derived to an extensive growth model, it was found that this was most likely related to the effect of the high levels of population growth that nullify the otherwise positive effect of aid (given in the form of grants) on the long-run path of real GDP growth in absolute terms. Indirectly, it reveals despite the general statement often mentioned in various reports that the total aid flows to Ethiopia is increasing in practical term the changes are so little. Therefore, aid provision criteria should not be on the gross amount rather needs to consider by how many people is going to be consumed. For details see the text after the regressions.

Another interesting finding is the coefficient of trade (openness), which has a negative impact on both, the extensive and the intensive rate of growth of real GDP. Implies opening of the economy and the introduction of free market principles did not contribute as it is expected. Still the prices of the main export goods that are agricultural products float freely and have been experiencing a downward pressure, while import goods have become more expensive. This unbalance of proceeds and outlays from trade may be the cause for this negative association. The opening to trade has therefore had a negative impact on pro-poor relief as measured by per capita real GDP growth.

A robust and very consistent finding in all the estimated regressions - be it for the short-run as much as for the long-run relationship is that the human capital formation proxied by the gross enrolment ratio, which is strongly positively related and highly significant. This is one of the most interesting findings. It confirms how increasing of educational enrolment or school level of education is contributing to the growth rate of GDP, which is an effect of the current policy changes (spending on pro-poor growth). The finding about human capital formation is similar to one of the previously conducted research. A study made by Woldehanna (2002) on impact of role of education on the choice of activities in Ethiopia confirms the impact of education on short run developments. His finding shows the direct impact of schooling on improving the income of the poor, an effect from rising of total productivity (human capital has both direct and indirect impact on income poverty. Schooling affects income poverty indirectly through its effect upon increasing the adoption of innovations. In addition it enhances poverty reduction through enabling of farmers to enter into profitable non-farm activities (Woldehanna, 2002, p. 325).

The coefficient of one of the control variable for drought has yielded a surprising result. It was found to be positively related and significant. I interpreted this evidence that the food aid given in time of drought, where food aid is given out not for free but in the form of food for work program where farmers have to participate in soil and water conservation activities, like constructing of traces (terracing) on their fields and other key areas where major soil conservation is needed. This improves the agricultural sector; increases the productivity. The control for war was not found to be significant in any of the regressions but I argued that this may be due to the fact that the war may affect only smaller sub-areas and therefore not have any pervasive effect, or on the other extreme not to do justice to the political instability in the East-African region.



Findings related to the coefficient of the error correction term fulfills the criteria; it is significant with appropriate sign. Commonly the larger the error correction term the faster the economic return is. Value of the estimated coefficient (-114) of the error correction indicates by how much percentage the system corrects its previous periods disequilibrium; by 114 percent. This suggests an overshooting of the economy following the adjustments made in the long run.

From the whole analysis it is clear that that the aid flow to the country since the introduction of the economic reform program (1992) did not contribute directly to the rate of growth of gross domestic product per capita (intensive growth). But this does not mean that aid do not have any relationship to the country growth. Based on the extensive growth regressions made, and according to the country policy it seems that aid is contributing to the country growth but its contribution is swamped by rapid population growth. However, since the government policy is development of welfare I believe aid is assisting the government of Ethiopia to invest more on education, health, and other infrastructural facilities, and indirectly it also contributes to economic growth.

Finally, if aid is expected to be more effective in addressing poverty of the country donors should offer more aid proportional to the rate of population growth. In addition aid should be given with an intention of bringing development to the country. Otherwise, provision of aid alone may not help to obtain the desired result. Especially when aid is given on the basis of some conditions that are not willingly accepted by the government, or if the aid modalities are volatile, or if the project is having short life span its impact either on growth or poverty reduction would remain very little. Aid given in the form of grant provides better benefit if it is given considering various economic, political and other factors that could affect the project, and/or the program expected to run in return to the aid (grant) that has offered.

## References

- Abegaz, B. (1999): 'Ethiopia', In Devarajan, S., D. Dollar, and T.Holmgren (eds.): *Aid and Reform in Africa*, Washington D.C, World Bank, pp. 167-225.
- Agénor, P. R., Bayraktar, N., and Aynaoui, K.E. (2004): 'Roads out of Poverty? Assessing the Link Between Aid, Public Investment, Growth, and Poverty Reduction', Working paper, April 3 (first draft), World Bank.
- Alesina, A. and Dollar, D. (2000): 'Who Gives Foreign Aid to Whom and Why?' *Journal of Economic Growth*, Vol. 5, No. 1, pp. 36-63.
- Bahmani, O.M. and Alse, J. (1993): 'Export Growth and Economic Growth: An Application of Cointegration and Error Correcting Modeling', *The Journal of Developing Areas*, Vol. 27, pp. 535-42.
- Banerjee, A., Dolado, J.J, Galbraith, J.W. and Hendry, D.F. (1993): *Cointegration, Error-correction, and the Econometric Analysis of Non-statutory Data*, Oxford University Press, Oxford.
- Bisogno, M. and Chong, A. (2001): 'Foreign aid and poverty in Bosnia and Herzegovina: Targeting Simulations and Policy Implications', *Journal of European Economic Review*, Vol. 45, pp. 1020-1030.
- Boone, P. (1996): 'Politics and the Effectiveness of Foreign Aid', *European Economic Review*, Vol. 4, pp. 289-329.
- Browne, S. (1990): *Foreign Aid in Practice*, New York University Press, New York.
- Burnside, C. and Dollar, D. (1997): 'Aid, Policies and Growth', *Policy Research Paper No 1777*. Washington D.C., World Bank.
- Burnside, C. and Dollar, D. (1997): 'Aid, the Incentive Regime, and Poverty Reduction', Macro Economic and Growth Group, The World Bank (Draft, unpublished), pp. 1-18.
- Burnside, C. and Dollar, D. (2000): 'Aid, Policy, and Growth', *The American Economic Review*, Vol. 90, No. 4, pp. 847-868.
- Cassen, R. (1988): *Does Aid Work?* Oxford, Clarendon Press.
- Collier, P. and Dollar, D. (2002): 'Aid Allocation and Poverty Reduction', *European Economic Review*, Vol. 46, No. 8, pp. 1475-1500.
- Dejene, A. (1989): 'Famine Causation, Food aid and Foreign Financial Assistance to Agriculture in Ethiopia', Paper Presented in a National Work Shop on Food Strategy in Ethiopia. Alamaya University.
- Department for International Development (DFID). (2004): 'What is Pro-poor growth and why do we need to Know?' (Briefing, unpublished report).
- Development Cooperation of Ireland. (2004): 'Aid Modalities in Ethiopia', Department of Foreign Affairs (Report).
- Djajic, S., Lahiri, S. and Moller, P.R. (1999): 'Foreign Aid, Domestic Investment and Welfare', *The Economic Journal*, Vol. 109, No. 458, pp. 698-707.
- Dollar, D. and Kraay, A. (2002): 'Growth is Good for the Poor', *Journal of Economic Growth*, Vol. 7, No. 3, pp. 195-225.
- Durbarry, R., Gemmell, N. and Greenaway, D. (1998): 'New Evidences on the Impact of Foreign Aid on Economic Growth', Credit Research Paper N 98/8. Center for Research and Economic Development. University of Nottingham, pp. 1-33.
- Easterly, W. (1999): 'The Ghost of Financing Gap', *Journal of Development Economics*, No. 60, pp. 423-438.

- Engle, R.F. and Granger, C.W.J. (1987): 'Cointegration and Error-correction Representation, Estimation and Testing', *Econometrica*, Vol. 55, pp. 251-76.
- Feeny, S. (2005): 'The Impact of Foreign Aid on Economic Growth in Papua Guinea', *The Journal of Development Studies*, Vol. 41, No. 6, pp. 1092-1113.
- Ghatak, S., Milner, C. and Utkulu, U. (1997): 'Exports, Export Composition and Growth: Cointegration and Causality Evidence for Malaysia', *Applied Economics*, Vol. 29, pp. 213-223.
- Granger, C. and Newbold, P. (1974): 'Spurious Regression in Econometrics', *Journal of Econometrics*, Vol. 2, pp. 111-120.
- Hansen, H. and Tarp, F. (2000): 'Policy Arena Aid Effectiveness Disputed', *Journal of International Development*, Vol. 12, pp. 375-398.
- Hansen, H. and Tarp, F. (2000): 'Aid Effectiveness Disputed', in 'Foreign Aid and Development', Lessons Learnt and Directions for the Future, London: Routledge Publishers, pp. 103-108.
- Harris, R. (1995): 'Using Cointegration Analysis in Econometric Modeling', London, Prentice Hall.
- Hayami, Y. and Godo, Y. (2005): 'Development Economics: From Poverty to the Wealth of Nations', 3<sup>rd</sup> Edition, New York, Oxford University Press.
- Ketsela, M. (Minister D'etat, Finance of Ethiopia). (2004): 'An Interview on Aid to Ethiopia', *The Ethiopian Reporter Bi-Weekly*, pp. 1-7.
- Killick, T. (1997): 'Principals, Agents and the Failings of Conditionality', *Journal of International Development*, Vol. 9, No. 4, pp. 483-495.
- Lensink, R. and White, H. (2001): 'Are there Negative Returns to Aid?' *Journal of Development Studies*, Vol. 37, No.6, pp. 42-65
- Levy, V. (1988): 'Aid and Growth in Sub-Saharan Africa: the Recent Experience', *European Economic Review*, 32, pp. 1777-1795.
- Maddala, G.S. (1992): 'Introduction to Econometrics', 2<sup>nd</sup> Edition, New York, Macmillan Publishing Company.
- McGillivray, M. and Morrissey, O. (2000): 'Aid Fungibility in Assessing Aid Red Herring or True Concern?' *Journal of International Development*, Vol. 12, pp. 413-428.
- Ministry of Finance and Economic Development. (2000): 'Interim of Poverty Reduction Strategy Paper 2000/01-2002/03', Addis Ababa, Ethiopia.
- Mbaku, J.M. (1993): 'Foreign Aid and Economic Growth in Cameroon', *Applied Economics*, Vol. 25, pp. 1309-1314.
- Murthy, V.N.R., Ukpolo, V. and Mbaku, J.M. (1994): 'Foreign Aid and Economic Growth in Cameroon: Evidences from Cointegration Tests', *Applied Economic Letters*, 1, pp. 161-63.
- Rahmato, D. and Ayenew, M. (2004): 'Democratic Assistance to Post-Conflict Ethiopia Impact and Limitations', *Forum of Social Studies*, Monograph Series 3, Addis Ababa, Forum For Social Studies.
- Rao, P.K. (2003): 'Development Finance', Springer Berlin, Heidelberg, Germany.
- United Nations Development Program. (2003): 'Development Partnership in Ethiopia', Addis Ababa: Ethiopia.
- UNDP Evaluation Office. (2003): 'Partnership for Results', In *Development Effectiveness Report 2003*. New York.
- Vogelvang, B. (2004): 'Econometrics Theory and Application with Reviews', Pearson.

Woldehanna, T. and Zerfu, D. (2002): 'Poverty and Macro Economic Policy in Ethiopia', In Ayenew, M. (eds.): Poverty and Poverty Policy in Ethiopia, Proceedings of the Workshop Organized by Forum of Social Studies, March 8, Addis Ababa.

World Bank. (1998): 'Assessing aid: What works, what doesn't, and why?' New York, Oxford University Press.

World Bank. (2001): 'Aid Effectiveness Research: Aid and Reform in Africa: Lessons Form 10 Case Studies', Washington D.C, Washington.

## Appendix

### Appendix 1.1

Variables	Level		1 <sup>st</sup> Difference		Process
	With trend & Intercept	Without trend	With trend & Intercept	Without trend	
$\tilde{Y}$	-2.026	-0.056	-4.629 (***)	-4.368 (***)	I(1)
$\hat{H}$	-1.430	-0.756	-2.987	-2.564 (**)	I(1)
$\hat{G}$	-2.532	1.809	-5.535 (***)	-4.403 (***)	I(1)
$\hat{L}$	-3.245	0.575	-5.588 (***)	-5.386 (***)	I(1)
$\hat{A}$	-2.499	2.182	-5.690 (***)	-4.286 (***)	I(1)
$\hat{T}$	-1.173	-1.185	-4.789 (***)	-4.529 (***)	I(1)
$\hat{I}$	-2.498	0.115	-6.024 (***)	-6.250 (***)	I(1)
$Li$	-5.136 (***)	1.355	-3.036	-2.695 (***)	I(0)
$\hat{R}_{pop}$	-4.619	-0.234	-8.556 (***)	-8.883	I(1)
$\hat{S}$	-2.871	-0.727	-5.275 (***)	-5.543 (***)	I(1)
$Inf$	-3.942 (**)	-3.115 (***)	-5.372 (***)	-5.734 (***)	I(0)
$D\hat{r}$	-4.682 (***)	-1.262	-7.261 (***)	-7.615 (***)	I(0)
$M\hat{S}$	-2.192	-2.590 (**)	-5.977 (***)	-1.744 (**)	I(0)
$B\hat{d}$	-3.411 (**)	0.450	-7.324 (***)	-7.543 ***	I(0)

Table 1.1: ADF Unit Root test for the variables used in the models

Note: \*\* and \*\*\* refer to significance at 5 and 1 percent level.

### Appendix 1.2

Dependent Variable:  $\tilde{Y}$  = Log Gross Domestic Product (in per capita term)

Number of observations: 23

R<sup>2</sup>: 0.904

Residual Sum of Squares: 0.0116  
 Parameters: 6  
 "F": 32.19 (\*\*\*)

Adj. R<sup>2</sup>: 0.876  
 Degrees of Freedom: 17  
 D.W.: 2.34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\tilde{L}$	0.01975	0.01416	1.39418	0.1812
$\tilde{G}$	-0.07123	0.01886	3.77502 (***)	0.0015
$\tilde{S}$	0.00559	0.01245	0.44938	0.6588
$\tilde{T}$	-0.17746	0.08780	-2.02107 (**)	0.0593
$\tilde{H}$	0.34456	0.04293	8.02441 (***)	0.0000
$C$	6.41532	0.09760	65.7260 (***)	0.0000

Table 1.2: Estimated long run coefficient from the error correction of growth model  
 Note: the sign (\*) indicates the level of significance: '\*' significant at 10% level, '\*\*' significant at 5% level, and '\*\*\*' significant at 1% level.

### Appendix 1.3

Dependent Variable:  $\tilde{Y}$  = Log Gross Domestic Product ( in per capita term)  
 Number of observations: 23  
 Residual Sum of Squares: 0.018  
 Parameters: 4  
 "F": 52.29 (\*\*\*)

R<sup>2</sup>: 0.89  
 Adj. R<sup>2</sup>: 0.876  
 Degrees of Freedom: 19  
 D.W.: 2.33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\tilde{G}$	-0.04907	0.00964	-5.08985 (***)	0.0001
$\tilde{H}$	0.38083	0.03376	11.2778 (***)	0.0000
$\tilde{T}$	-0.23448	0.07690	-3.04922 (***)	0.0066
$C$	6.42047	0.09746	65.8733 (***)	0.0000

Table 1.3: Estimated Long Run coefficient from the error correction model  
 (after eliminating of all insignificant variables)  
 Note: the sign (\*) indicates the level of significance: '\*' significant at 10% level, '\*\*' significant at 5% level, and '\*\*\*' significant at 1% level. The sign '~' on top of variable indicates that log levels were used.

### Appendix 1.4

Null Hypothesis: RES Y has a unit root  
 Exogenous: Constant, Linear Trend  
 Lag Length: 0 (Automatic based on SIC, MAXLAG=2)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.164316	0.0022
Test critical values:		
1% level	-4.440739	
5% level	-3.632896	
10% level	-3.254671	

\*MacKinnon (1996) one-sided p-values.

Table 1.4: Residual test

## Appendix 1.5

Dependent Variable: Y = Log of rate of growth of GDP ( in per capita term in the short run)  
 Number of observations: 23 R<sup>2</sup>: 0.885  
 Residual Sum of Squares: 0.012 Adj. R<sup>2</sup>: 0.814  
 Parameters: 9 Degrees of Freedom: 14  
 "F": 12.5 (\*\*\*) D.W.: 1.9

Variable	Coefficient	Std. Error	t-Statistic	Prob.
<i>L</i>	0.00550	0.01309	0.42075	0.6808
<i>G</i>	-0.02777	0.03280	0.84676	0.4124
<i>T</i>	-0.24590	0.09779	2.51450	0.0259
			(**)	
<i>H</i>	0.36955	0.09588	3.85402	0.0020
			(***)	
<i>S</i>	-0.01689	0.01523	-1.10946	0.2873
<i>D<sub>d</sub></i>	0.03659	0.01919	1.90632	0.0790
			(*)	
<i>D<sub>w</sub></i>	-0.01260	0.01823	-0.69146	0.5014
<i>C</i>	-0.00376	0.01497	-0.25144	0.8054
<i>EC<sub>t-1</sub></i>	-1.14903	0.30178	3.80743	0.0022
			(***)	

Table 1.5: Estimated short run coefficient from the error correction model

Note: the sign (\*) indicates the level of significance. '\*' significant at 10% level, '\*\*' significant at 5% level, and '\*\*\*' significant at 1% level.