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By Fentaye Setargie Ejigu

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FOREIGNAIDVISAVIS FOREIGNEXCHANGEGAPUNDERTHEETHIOPIANECONOMY

Strictly as per the compliance and regulations of:

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I.   Introduction

The beginning of foreign aid traces back to the 1940s marshal plan in which its purpose was to reconstruct the war- torn economy of Western Europe (Todaro, 1994).

Ethiopia has experienced strong economic growth in recent years. With real GDP growth at or near double digit levels since 2003/04, the country has consistently outperformed most other countries in Africa and expanded much faster than the continent-wide average. At the same time, the country still faces some structural weaknesses that present significant challenges in the medium term. Its economy is highly vulnerable to exogenous shocks by virtue of its dependence on primary commodities and rain fed agriculture. It has experienced major exogenous shocks during the past five to seven years. These are notably droughts and adverse terms of trade (e.g., prices of coffee and fuel). (Peter and Lamin, 2010). Similarly, the external trade performance of Ethiopia remained weak. The export sector, dominated by few agricultural commodities, suffered from weather fluctuation and price instabilities in the international market. On the other hand, the dependency on imported goods continued to be substantial. Thus the external trade sector recorded an increase in the trade gap; it is increased from 10.1 percent in1992-2000 to 19.7 percent of the country's GDP in 2005- 2009. Between 2009/10 and 2010/11, both trade balance and current

account balance as a percentage of GDP is declined. (MoFED, 2010).

In general, the high import intensity of the economy, limited capacity to produce capital goods, low levels of domestic savings and limited capacity to generate foreign exchange make the development effort in Ethiopian beyond domestic capacity. All these factors have provided an apparently objective justification for the huge inflow of foreign aid.

The amount of foreign financial assistance that is given to the developing countries in general and for African countries in particular has been increasing from time to time. In Africa, the share of Official Development Assistance (ODA) to GDP has significantly increased over the years. It drastically increased from 1.9 percent in 1960-61 periods to 2.9 percent in 1970-71 and to 5 percent in 1983-84 and reached 9.6 percent in 1990-91 periods (WB 1992). And also, the share of foreign aid to GDP has also increased to 18 percent during 2000-2010 fiscal years.

Despite such increase flow of external finance to the African countries a number of empirical studies argue that the role of aid in promoting the development potential of Africa remained unsuccessful. For instance, between 1970 and 1997, the real per capital GDP of Sub Sahara Africa has been 0.6%, despite huge flow of aid to the region (Gomanee et al, 2002). World Bank (1998), Burnside and Dollar (1997) have raised does aid work? The question raised has been answered. It can work, depending on policies. If they are   good, aid will be efficient, if they are not, aid will be useless, at best. Aid has to be allocated to those countries pursuing good policies, to a larger extent, it is argued, than is already the case. Aid effectiveness and aid selectivity issues are thus simultaneously solved.

The literature on the impact of aid on economic growth are mainly in the cross sectional analysis of developing countries. Most of these cross sectional analysis suggest that the growth impacts of foreign assistance vary among countries that pointed out the need for empirical study for individual countries.

Despite a number of empirical works that has been done on the impact of aid on economic growth in Ethiopia little has been done in analyzing its impact through financing foreign exchange gaps (import requirements) in which further study is still required. Thus, this paper will attempt to examine the growth impacts of official development assistance through

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financing import requirement by using a multivariate co integration analysis.

In broad spectrum, the objective of this paper is to assess the effectiveness of foreign aid in enhancing economic growth through financing import requirement. Specifically this paper tries to:

- Examine the impact of foreign aid on import requirements
- Determine whether foreign aid effectiveness is policy dependent or not.
- Determine whether there is absorptive capacity constraint of the economy as to the flow of foreign aid or not.

II. Data and Methodology

a) Data Type and Source

For the purpose of analyzing the impact of foreign aid on the economic growth through its transmission channels, time serious data, from 1974/75 to 2013/14, would be used. For this achievement secondary data is collected from different government ministers and authorities' data base as well as international financial organizations. These include Minister of Finance and Economic Development, publications of National Bank of Ethiopia (NBE), Ethiopian Investment Authority, Central Statistical Authority (CSA), Ethiopian Economic Association (EEA), International Monetary Fund and World Bank data base.

b) Model Specification

This paper would try to assess the impact of aid on growth by considering transmission channel by using multivariate co integrated VAR approach and it will be examined by specifying the following two equations based on the equations that are derived by Gomanee et al (2002).

i. *Growth Equation*

The growth model, which is used in this study, is based on Harrod –Domar (1946) growth model in which the growth of a given country depends on the amount of investment.

$$g = \kappa/Q.I = \delta I \qquad (1)$$

Where δ = incremental capital output ratio,

I = investment level,

Q = output level, and

g = growth rate of output.

However, recently different scholars come to include various variables that are believed to affect the growth of a country. Rana and dowling (1988) extended the Harrod Domar growth work by including variables like labor force and policy variables.

Since the objective of this paper is to assess the impact of aid on growth, attempts are made to include variables to further improve the above model and to be in line with the objective.

Thus, the growth function is given by:

$$RGDP = f(INVo, AID, PA, HC, LAB, (A)^2) \qquad (2)$$

Where, RGDP = Real Gross domestic product

INVo = investment level that is not financed by aid

AID = aid as a ratio of GDP

PA = aid policy interaction term

HC = human capital proxied by education expenditure

LAB = labor force as a ratio of total population

Accordingly, the model to be estimated can be specified as follows:

$$ln\text{RGDP} = \beta_0 + \beta_1\text{INVo} + \beta_2 ln\text{AID} + \beta_3\text{PA} + \beta_4\text{HC} + \beta_5 ln\text{LAB} + \beta_6\text{A2} + \varepsilon_i \qquad (3)$$

a. *Dependent Variable*

Real GDP: The dependent variable of the model is Real GDP

b. *Explanatory Variables*

Beside foreign aid a number of factors are expected to influence the economic growth. These variables are briefly described with their respective expected relation to the economic growth.

c. *Non-aid Financed Investment (INVO)*

This is the ratio of non-aid financed investment to GDP. The variable INVO would be developed by using the technique of generated regressor of Gomannee, Girma, and Morrissey (2005). Using residuals from an aid-investment bi-variate regression i.e. aid is used as the only explanatory variable; a variable is constructed representing that part of investment which is not financed by foreign aid (INVO). Then INVO is used in place of investment in the growth regression. It is worth noting that this transformation affects only the estimated coefficient on the aid variables. Empirical aid-growth regressions usually omit investment from their equation. Aid is intended to affect growth via its effect on investment. However, not all aid is intended for investment, and not all investment is financed by aid. If investment is omitted from the growth equation, there will be potential omitted variable bias- any effect of investment on growth is attributed to the other variables (especially aid) as argued by Girma, Gomannee and Morrissey (2005). If both aid and investment are included, there will be a problem of double counting (as part of aid is used for investment), and the coefficients are biased. Therefore, to address such problems Gomannee, Girma, and Morrissey (2005) propose the technique of generated regressors (the mechanism of residual generated regressor). Using the technique, non-aid financed investment (INVO) is generated as:

$$INVO = I - 0.04AID \qquad (4)$$

Where, INVO = investment which is not financed by aid.

I = Total investment as ratio of GDP

AID = Official Development Assistance as ratio of GDP

Official Development Assistance (ODA): It is the ratio of Official Development Assistance (ODA) to GDP as defined by the DAC (Development Assistant Committee).

ODA is defined as pure grants and concessional flows from bilateral governments and their agencies as well as multilateral financing agencies to the developing countries at low rates of interest with maturity periods of a long-term nature, all of them containing a grant element of at least 25 %.

A^2: the square of ODA to GDP: This takes into account whether there is diminishing return to aid. The diminishing returns to aid hypothesis assume that an inflow of aid, above a certain threshold level, starts to have negative effects. This happens because of the limited absorptive capacity of recipient countries.

Aid Policy Interaction Term (PA): an interaction between policy indicator (P) and aid (A) which capture the conditional effectiveness of aid on policy. The policy indicator will be developed based on Burnside and Dollar (1997), with minor modifications, out of a regression result obtained from a growth equation. The growth model is comprised of budget surplus/deficit, openness to trade, inflation, and telephone lines per 1000 people (covering aspects of fiscal, trade, monetary, and infrastructure policy) as an explanatory variable, and the coefficients of these variables are taken from the growth regression to construct the policy indicator. To account for openness to trade in the construction of the policy indicator (OPEN), a standard openness index, $(X + M)$/GDP this is the ratio of total trade to GDP which is exports plus imports divided by GDP (Yanika, 2003) will be used.

The result of the policy indicator obtained is:

$$P_t = -2.9635(BD)_t + 0.1498(OPEN)_t + 0.1288(INF)_t + 2.423(TELE)_t \qquad (5)$$

Where, BS/BD: overall budget surplus/deficit excluding grants; like Burnside-Dollar (1997) approach this paper will also use inflation as a proxy for monetary policy), OPEN; a standard openness index, $(X + M)$/GDP (i.e the ratio of total trade to GDP) where X: total value of goods and services exported; M: total value of goods and services imported; TELE: major telephone lines per 1000 people.

Labor Force (LAB): This represents labor force as a ratio of total population. That is age from 15-64 years as a percentage of total population;

Human Capital (HC): A wide range of growth models has treated human capital as a critical factor in determining growth rate of output (Lucas, 1988). It is an important source of long-term growth, either because it is a direct input to research (Romer, 1990) or because of its positive externalities (Lucas, 1988). Policies that enhance public and private investment in human capital, therefore, promote long-run economic growth. The inclusion of human capital variables in growth models are intended to capture quality differences in the labor force, as non-physical capital investment increases the productivity of the existing labor force. They commonly relate to education and are measured by an index of educational attainment, by mean years of schooling, or by school enrolment (Barro and Lee, 1993). However, none of this data are found in the required level so we will use expenditure on education as a proxy to human capital.

ii. *Import Equation*

Bacha (1990) and Taylor (1993, 1994) argues, a major benefit of export is that they generate the foreign exchange required to purchase the import required for growth. According to Gomanee et al (2005) also, the most obvious is imported investment goods.

Based on the theoretical explanation of the 1950s two gap models and the recent three gap models will formulate the import equation.

According to Bacha (1990) it is by financing import and increasing investment goods that foreign aid affect a growth of a country. That is, by financing the gap between import and export.

Therefore earnings of export and foreign aid are a main source of foreign exchange required to pay for import. However, the purchasing power of this financing revenue (export and foreign aid) depends on the exchange rate and terms of trade. Therefore we include Terms of trade and real exchange rate to capture their effect.

The import function is given by:

$$M = f\ (X,\ AID,\ TOT,\ RER,) \qquad (6)$$

Where, M = Import as a ratio of GDP
X = Export as a ratio of GDP
AID = Aid as ratio of GDP
TOT = terms of trade
RER = Real exchange rate

Accordingly, the model to be estimated can be specified as:

$$lnM = \varphi_0 + \varphi_1 ln\ X + \varphi_2 lnAID + \varphi_3 lnRER + \varphi_4 TOT + \varepsilon i \qquad (7)$$

c) *The Unit Root Test*

The standard classical methods of estimation which are used in the applied econometric work are based on a set of assumption one of these is that all variables are stationary. However, most economic variables are not stationary (Gujarati, 1995). A data

series is said to be stationary if its error term has zero mean, constant variance and the covariance between any two – time periods depends only on the distance or lag between the two periods and not on the actual time which it is computed (Harris, 1995). On the other hand a time series is stationary if its mean, variance and auto covariance (at various lags) remain the same on matter at what point we measure them, i.e they are time invariant (Gujrati, 2004).

The unit root test is one of the mechanisms that enable us to check whether the time series data is stationary or not. There are several ways of testing the presence of unit root. In this paper unit root test will be conducted using Dickey-Fuller (DF) and Augmented Dickey- Fuller (ADF) tests.

d) Co-integration Test

Most macroeconomic variables are found to be non stationary and showing trending overtime (Johansen, 1991). However, one can difference or de trend the variables in order to make the variables stationary. If variables become stationary through differencing, they are in the class of difference stationary process. On the other hand, if they are de trended, they are trend stationary.

Cointegration among the non stationary variables reflects the presence of long run relationship in the system, (Gujarati, 1995). There are two approaches used in testing for Cointegration. They are: (i) the Engle-Granger (two step algorism) and: (ii) the Johansen Approach.

The Engle-Granger (E-G) method requires that for co-integration to exist, all the variables must be integrated of the same order. Hence, once the variables are found to have the same order of integration, the next step is testing for level of integration. This needs to generate the residual from the estimated static equation and test its stationarity.

Although, the Engle-Granger (EG) procedure is easily implemented, it is subject to several limitations.

The Johansen (1988) procedure enables estimating and testing for the presence of multiple co integration relationships, in a single step procedure. Moreover, it permits to estimate the model without priory restricting the variables as endogenous and exogenous. Under this procedure, the variables of the model are represented by a vector of potentially endogenous variables. Therefore, this paper will use the Johansen maximum Likelihood Procedure since it addresses the weakness of the E-G method.

e) Vector Error Correction Model (VECM)

Economic variables have short run behavior that can be captured through dynamic modeling. If there is long run relationship among the variables, an error correction model can be formulated that portray both the dynamic and long run interaction between the variables. In the previous discussion, it was shown that if

two variables that are non-stationary in levels have a stationary linear combination then the two variables are co integrated. Co integration means the presence of error correcting representation. That is, any deviation from the equilibrium point will revert back to its long run path. Therefore, an ECM depicts both the short run and long run behavior of a system.

f) VAR Diagnostic Tests

Once the VAR models are estimated we should make some diagnostic tests which are important in order to make sure that the results obtained from VAR estimation can be used for forecasting or policy purposes. These post-estimation tests are mostly performed on the residual of the VAR and they include: the LM test for residual autocorrelation, Jarque-Bera test for residual multivariate normality, test for VAR stability and White test for the presence of heteroscedasticity in the VAR's residuals.

i. *Residual Vector Normality Test*

The Jarque-Bera normality test is used to determine whether the regression errors are normally distributed. It is a joint asymptotic test whose statistic is calculated from the skewness and kurtosis of the residuals.

ii. *Error Vector Autocorrelation Test*

Testing for autocorrelation helps to identify any relationships that may exist between the current values of the regression residuals and any of its lagged values (Brooks, 2002). The null hypothesis of the LM test for autocorrelation is that the residuals are not serially correlated, while the alternative is that the residuals are serially correlated. If the P-value is less than 0.05 then we reject the null hypothesis (Harris, 1995). The test statistic is given by:

$$LM = (T\text{-} q)R\ e^2 \qquad (8)$$

Where, q is the degree of freedom and $R\ e^2$ is the coefficient of determination obtained from the auxiliary regression; and the LM test statistic is chi-square distributed.

iii. *Stability Test*

The test for stability checks whether the roots of the characteristic polynomial lies inside the unit circle. If all roots lie inside the unit circle then the VAR is considered as stable and can be used for policy analysis. We can also make use of variance decomposition and impulse response functions in our analysis if the VAR is stable.

iv. *Heteroscedasticity Test*

The test for heteroscedasticity investigates whether the variance of the errors in the model are constant or not. Breusch-Pagan-Godfrey test is used to check whether the residuals are homoskedastic. It tests the null hypothesis that the residuals are both homoskedastic and that there is no problem of

misspecification. The test regression is run by regressing each cross product of the residuals on the cross products of the regressors and testing the joint significance of the regression. If the test statistic is significant, that is, P value is less than 0.05; the null hypothesis of homoscedasticity and no misspecification will be rejected (Brooks, 2002: 445).

III. Results and Discussion

a) Unit Root Test Results

Since unit root tests are sensitive to the presence of deterministic regressors, three models are estimated. The most general model restrictive models i.e. with a constant is estimated first and with a drift and time trend and without either constant and trend, respectively, are estimated. A unit root test for each variable is performed on both levels and first differences. The result of the unit root test for the variables at level was presented in table below.

Table 3.1 : Unit root test results for variables at level

Variables	With drift only	With drift and trend	Only stochastic
LnRGDP	-2.724	-0.902	-2.425
LnAID	-0.607	-1.309	0.956
PA	1.846	1.338	2.037
HC	2.254	3.474	1.625
LnLAB	-0.855	3.382	-0.669
A^2	-0.878	-1.347	-0.725
LnX	-1.267	-1.888	0.088
LnRER	-1.077	-1.819	-0.346
TOT	-2.126	-2.526	-1.246
LnM	-0.719	-1.874	0.783
$lnINV_o$	-2.197	-2.832	-1.201
Critical values 1%	-3.615588	-4.219126	-2.627238
Critical values 5%	-2.941145	-3.533083	-1.949248

Source: Eveiws 6 stastical output of ADF test at level.

The ADF test results show that all the variables (at levels) are non stationary with the three different specifications. That is, the test conducted fails to reject the null hypothesis of unit root in the three different specifications.

Therefore, to avoid spurious regression all these variables have to be differenced to transform them to stationarity. In the second stage, the order of integration

of the non-stationary variables were performed proceeding in the same way by means of ADF tests applied to all series in first differenced form.

First difference of the each variable was generated by deducting one period lag from the variable of itself of successive period. After making the first difference of each series the usual unit root test of ADF were applied to determine their order of integration. The result of the test was presented below.

Table 3.2 : Unit root test results for variables (at 1st difference)

Variables	With drift only	With drift and trend	Only stochastic
DlnRGDP	-5.348***	-6.273***	-4.819***
DLnAID	-6.431***	-6.754***	-6.265***
DPA	-4.111***	-4.544***	-4.001***
DHC	-3.860***	-3.832**	-2.505**
DlnLAB	5.794***	4.243***	4.245***
DA^2	-6.788***	-7.185***	-6.715***
DlnX	-5.365***	-5.373***	-5.437***
DlnRER	-4.884***	-4.806***	-4.936***
DTOT	-6.009***	6.110***	-6.033***
DLnM	-7.303***	-7.243***	-7.163***
$DINV_o$	-10.309***	-10.245***	-10.416***
Critical values 1%	-3.621023	-4.226815	-2.628961
Critical values 5%	-2.943427	-3.536601	-1.950117

Source: Eveiws 6 stastical output of ADF test at 1st difference.

*Note ***, ** denotes significant at 1%, 5% significance level respectively.*

The first differences of the variables are investigated for a unit root test and the test result proved that all of them are stationary in the three different specifications. Therefore, it can be conclude that all variables are integrated of order one.

b) Multivariate Co integration Test Results and VECM

i. Growth Equation

a. Long run Equation for Growth Equation

Once the ADF unit root test result revealed that the series is I (1), a co integration test is performed to determine the rank of the co integrating vector. The rank of the co integrating vector is determined using the Johansen's maximum likelihood method.

Table 3.3 : Johansen's Co integration test results

Ho (null hyp.)	Ha(alternative hyp.)	Eingen Value	λ trace Stat	5% critical value	Prob.	λ max.	5% critical value	P.value
r = 0	r =1	0.822051	158.0928	125.6154	0.0001	63.87150	46.23142	0.0003
r ≤ 1	r =2	0.622206	94.22126	95.75366	0.0635	36.01601	40.07757	0.1337
r ≤ 2	r=3	0.576493	58.20525	69.81889	0.2946	31.78986	33.877687	0.0869
r ≤ 3	r=4	0.263501	26.41540	47.85613	0.8754	11.31634	27.58434	0.9567
r≤ 4	r=5	0.190987	15.09905	29.79707	0.7736	7.841785	21.13162	0.9131
r ≤ 5	r=6	0.141001	7.257268	15.49471	0.5479	5.623531	14.26460	0.6619
r ≤ 6	r=7	0.043194	1.633737	3.841466	0.2012	1.633737	3.841466	0.2012

Source: Eveiws 6 stastical output of johansen Co integration test.

The optimal lag length used to test for co integration is determined at lag length of one using Akakie Information Criteria (AIC).

The test result (both λ trace and λ max statistics) rejects the null hypothesis of no co integration both at the 5 % and 1 % significance level. In other words, the null of at most one co integrating vector is not rejected. Hence, there exists single co integrating vectors which make up the long run relationship among the variables in the system.

The presence of a single co integrating vector points to estimate the long run equation along with its associated coefficients (β) and adjustment parameters (α) which are important for further analysis. The corresponding β and α coefficient vector are reported below.

Table 3.4 : Normalized Long run β Coefficients

Variables	LnRGDP	LnAID	PA	A^2	INVo	HC	LnLAB
Estimated coefficients	1.00000	-0.027	-2.24e-06	0.00295	-0.014	-1.10e-10	-5.733

Source: Eveiws 6 stastical output of johansen Co integration test.

Table 3.5 : Adjustment (α) coefficients

Variables	LnRGDP	LnAID	PA	A^2	INVo	HC	LnLAB
Adjustment coefficients	-0.725075	-5.135677	-3.61e+08	-45451257	3.522394	-2.48e+09	-8.19e-05

Source: Eveiws 6 stastical output of johansen Co integration test.

Once after conducting co integration tests the next task would be identification of a given equation with specified endogenous and exogenous variables which is the main problem in most econometrics analysis. Therefore to identify variables that are endogenously determined and conditional up on the other variables in the VAR, the test for weak exogeneity is conducted. This requires imposition of zero restriction on the first column of α coefficient. The results of weak exogeneity test are given in the following table.

Table 3.6 : Result of weak exogeneity test (Zero restriction on α co-efficients)

Variables	LnRGDP	LnAID	PA	A^2	INVo	HC	LnLAB
α- coefficients	-0.725075	-5.135677	-3.61e+08	-45451257	3.522394	-2.48e+09	-8.19e-05
$\chi 2$	20.51183	0.418486	0.903671	0.900039	1.031968	0.3766521	0.030889
P-value	0.0006***	0.517693	0.341799	0.341968	0.09697	0.539471	0.860489

Source: Eveiws 6 stastical output of imposing Zero restriction on α co-efficient.

*Note *** denotes rejection of the null hypothesis at 1% significance level.*

The likelihood ratio test of exogenity indicates that except the dependent variable (real GDP) all variables are exogenously determined in the model. The null of weak exogeneity for the dependent variable is rejected at 1% level of significance while for other variables it is not rejected at any conventional level of significance.

Similarly a zero restriction is imposed on long run β coefficients to identify which explanatory variables constituting the growth equation are statistically different from zero.

Table 3.7 : Result of Zero restriction test on β coefficients

Variables	LnAID	PA	A^2	INVo	HC	LnLAB
β-coefficients	-0.027	-2.24e-06	0.00295	-0.014	-1.10e-10	-5.733
$\chi 2$	4.088618	13.24954	4.175495	40.011	11.776	5. 07356
P-value	0.04636**	0.0002***	0.041013**	0.00000***	0.0006***	0.034728**

Source: Eveiws 6 stastical output of imposing Zero restriction on beta co-efficient.

*Note ***, **, represents rejection of the null hypothesis at 1%, 5% level of significance respectively.*

The result of the likelihood ratio test (the zero restriction tests) performed on the long run coefficients of the explanatory variables shows the statistically significant coefficient different from zero, which allows the estimation of the long run growth equation. The estimated long run growth equation is:

$$LRGDP = 0.027LAID + 5.733LLAB - 0.00295A^2 + 0.014INVo + 1.10e\text{-}10HC + 2.24e\text{-}06PA$$

[4.088618]   [5.07356]   [4.175495]   [40.011]   [11.776]   [13.24954]

(0.04636)** (0.034728) ** (0.041013) ** (0.00000) *** (0.0006) ***(0.0002) *****

Vector Hetero test: Chi^2(6) =11.37399(0.0775)

Vector AR (1, 2): Chi^2(30) =38.99056(0.1259)

Vector Normality: Chi^2(2) = 0.328147(0.848680)

The long run result depicts that all explanatory variables are significant in affecting growth at five percent level of significance.

The result of the diagnostic test[1] confirms the adequacy of the model. That is, the null of homoscedacity is not rejected at any level of significant; therefore the model is free of hetroscedacity problem. In addition, the null of no serial correlation is not rejected and the test for normality confirmed that the errors are normally distributed and the null is not rejected at any conventional significance level.

Generally, aid has a significant and positive impact on the growth of a country. According to the result a one percent increase in aid will increase RGDP by 0.027 percent. This result is also consistent with the result reached by Tolessa (2001) and Tsegay (2008) in Ethiopia. Also Malik (2008) found that foreign aid has a long run positive impact on growth in Togo. The result also confirms that the impact of aid on growth is significant at 5% level of significant.

Similarly, foreign aid interacted with policy (PA) has a significant positive influence on growth. The positive result is associated with the policy environment (macroeconomic and infrastructure) in the country which makes aid more effective. A comparison of the coefficients of aid and the aid interacted with policy indicator in absolute terms indicate that aid would be more effective had there been a favorable macroeconomic policy environment.

Though the importance of a sound policy environment for growth is unquestionable, but the argument of Burnside and Dollar (1997, 2000) that aid is effective only in a good policy environment is not valid in Ethiopia since aid entered alone has a positive and significant contribution to growth as indicated above. Rather it can be argued that aid is effective in promoting growth in Ethiopia in the period considered; but its effectiveness would have been higher if it was supported by a sound macroeconomic policy environment.

Like the theoretical expectation the Aid squared term, shows that negative and significant impact, suggests that the presence of capacity constraint in absorbing foreign aid beyond some level. In other words, the argument that foreign aid tends to have diminishing returns beyond some threshold level is operate in the Ethiopian situation in the study period considered since countries with low level of human capital and poor institutions are expected to have a capacity constraint in absorbing excessive capital from abroad and The existing situation in Ethiopia is a living example of the scenario. Similar result is obtained by Wondwossen (2003) for Ethiopia Lensink and White (2000) and Burnside and Dollar (1997, 2000) for Developing countries.

Investment, which is not financed by aid, has a positive impact on growth. A unit change in investment which is not financed by aid to GDP ratio, leads to a 0.014 percent change in the real GDP of a country. The above result also confirms that its impact is significant at one percent level of significant.

Human capital has positive impact on the growth of a country. Referring to the result, a change in educational expenditure (a proxy to human capital) by one unit leads to a 1.1 percent change in the real GDP of a country and this result is significant at one percent level of significant.

The other variable which is entered on the long run growth equation is labor force in line with the theoretical expectation has entered with a positive sign and moreover it is significant. It shows that economically active labor force has played a role in promoting growth in the long run.

b. Vector Error Correction Model for Growth Equation

Since the variables in the growth equation are found to be co integrated, we proceed to estimate the vector error correction model which represents both the long run and short run adjustments among the variables. The lag changes in the relevant variables represent short run elasticity's (alternatively, short run variation), while the error correction term (ECT) represents the speed of adjustment back to the long run relationship among the variables. A VECM is estimated beginning with the general over parameterized model. Then the VECM is subjected to a systematic reduction and diagnostic testing process until an acceptable parsimonious model is obtained. In the process, all insignificant explanatory regressors with their corresponding lags are dropped until further reduction is rejected (Hendry, 1997).

In the short run dynamic equation, all weakly exogenous variables identified in the long run growth equation are entered in the right hand side of the model in their appropriate lagged difference form. In addition the error correction term with one period lag is also incorporated in the VECM. Using the VECM specification, a short run dynamic equation is estimated for growth function. Dropping insignificant regressors from the specification (i.e. step-by-step elimination of insignificant regressors from the general VECM model) following the general to specific modeling strategy, a parsimonious result for growth is reported below.

Table 3.8 : results of Short run equation for growth equation

Variables	Coefficient	t-value	p-value
D(INVO)	0.002031	0.544025	0.5912
ECT-1	-0.170086	-2.101302	0.0459**
D(ODA2)	9.82E-07	1.001502	0.3262
D(PA)	-1.22E-07	-0.987705	0.3328
D(LNRGDP (-2))	0.361288	2.342078	0.0274**
D(LNODA (-2))	0.050126	1.249248	0.2231
D(HC(-2))	2.93E-12	0.207300	0.8375
D(ODA2(-1))	3.04E-06	2.184942	0.0385**
D(LNLAB)	23.12110	5.762515	0.0000***
D(PA(-1))	-3.28E-07	-2.307906	0.0296**
C	0.063514	5.638379	0.0000***

Note ***,** denotes that rejection of the null hypothesis at 1%,5% level of significance.

$R^2 = 0.76$ DW= 2. 03 F (10,36)= 74.83738(0.0000)
AR(1-2) =F(2,23)= 0.866839 (0.4336)
ARCH =F(1,33)= 0.317814 (0.5768)
Hetro=F(10,25)= 0.558932 (0.8350)
Normality =Ch^2(2)= 1.238561(0.427652)
Ramsey reset =F(1,24)= 1.290507 (0.2672)

Source: Eveiws 6 stastical output of vector error correction model.

The Goodness of fit of the model (R^2) shows, 76 percent of a variation in the dependent variable (RGDP) is explained by the variation in the explanatory variables included in the model.

ii. *Import Equation*

a. *A Long run Equation*

The diagnostic test of the short run model for growth shows that there is no problem at all. The tests show that the null of the various tests are not rejected except for the joint insignificance of the explanatory variables i.e. the coefficients of the explanatory variables

are jointly significant. The result shows that there is no serial correlation and the errors are normally distributed with constant variance. A test for ARCH is performed but the result failed to reject the null of no autoregressive conditional heteroscedasticity. The Ramsey test for model misspecification confirms that the model is well specified and there is no problem in the specification of the model.

The estimated dynamic equation for growth result indicates that foreign Aid (ODA) has a positive impact on growth as it is expected, however its impact is insignificant in the short run. It point that foreign aid was used to finance investment which has a longer gestation period and its impact may not be reflected in the short run. The aid-policy interaction term has got a negative and significant influence on growth. Moreover, the result indicates that the unfavorable role of poor policies for growth in the short run.

Aid square has appositive and significant impact on growth. The finding reveals that unlike the theoretical expectation there is no capacity constraint in absorbing foreign aid at any level in the short run. In other words, the argument that foreign aid tends to have diminishing returns beyond some threshold level do not operate in the Ethiopian situation in the study period considered only in the short run.

Labor force in line with the theoretical expectation has entered with a positive sign and moreover it is significant. It shows that economically active labor force has played a role in promoting growth both in the short run and long run. Human capital proxed by education expenditure has appositive impact but it is insignificant in the short run.

The error correcting term is statistically significant and between zero and one. The coefficient indicates that RGDP adjusts itself to the equilibrium by 17 percent in one year.

Table 3.9 : Johansen co integration test results

Ho (nullhyp.)	Ha (alternativehyp.)	Eingen value	λ trace Stat	5% critical value	Prob.	λ max.	5% critical value	P-value
r = 0	r =1	0.630527	72.11157	69.81889	0.0324	36.84011	33.87687	0.0215
r ≤ 1	r =2	0.316971	35.27146	47.85613	0.4337	14.10507	27.58434	0.8153
r ≤ 2	r=3	0.2966310	21.16638	29.79707	0.3474	13.00246	21.13162	0.4520
r ≤ 3	r=4	0.184425	8.163920	15.49471	0.4480	7.542882	14.26460	0.4271
r≤ 4	r=5	0.016645	0.621038	3.841466	0.4307	0.621038	3.841466	0.4307

Source: Eveiws 6 stastical output of johansen Co integration test.

The optimal lag length used to test for co integration is determined at lag length of one using Akakie Information Criteria (AIC).

Like to that of investment, government consumption expenditure and growth equations the co integration test result reveals that there is one co integrating vector in the import equation. In other words, both the λ trace and λ max test results from the above

table shows that the null of no Co integrating vector is rejected at 5% level of significance in favor of at most one Co integrating vector in the equation.

The existence of one co integrating vector suggests that the first row of β coefficient and the first column of α coefficient are important for further analysis.

Table 3.10 : Normalized Long run β Coefficients

Variables	LnM	LnAID	LnX	LnRER	TOT
Estimated coefficients	1.00000	-0.505193	-1.622157	-1.136896	1.1222

Source: Eveiws 6 stastical output of johansen Co integration test.

Table 3.11 : Adjustment (α) coefficents

Variables	LnM	LnAID	LnX	LnRER	TOT
Adjustment coefficients	-0.0622	0.0504	-0.0721	-0.0144	0.0368

Source: Eveiws 6 stastical output of johansen Co integration test.

Weak exogeneity test for the import equation results in the logarithm of import to GDP ratio (dependent variable) as endogenous. For the import variable, the null hypothesis of weak exoginity is rejected at 1% level of significance. However, for all variables other than the dependent variable (explanatory variables) the null of weak exogeneity is not rejected at any level of significant that means these variables are exogeneous to the model under consideration.

Table 3.12 : Result of weak exogeneity test (Zero restriction on α coefficients)

Variables	LnM	LnAID	LnX	LnRER	TOT
α- coefficients	0.212723	-0.172327	0.246698	0.49181	-0.125637
χ^2	9.091803	0.072426	0.171355	0.342354	1.938597
P-value	0.0026***	0.7878	0.6789	0.55847	0.163821

Source: Eveiws 6 stastical output of imposing Zero restriction on α co-efficient.
Note *** represents the rejection of the null hypothesis at 1% significant level.

Once the variables are identified as endogenous and exogenous, check for the significance of the explanatory variables is the next task and this requires zero restriction tests on the beta coefficients. The results are presented in the following table.

Table 3.13 : Result of Zero restriction test on coefficients

Variables	LnAID	LnX	LnRER	TOT
β – coefficients	-0.505193	-1.622157	-1.136896	1.1222
χ^2	9.932139	6.024717	9.818287	16.74174
P-value	0.001624***	0.014107**	0.001728***	0.00043***

Source: Eveiws 6 stastical output of imposing Zero restriction on beta co-efficient.
Note ***, ** denotes rejection of the null hypothesis at 1%, 5% significant level respectively.

The long run equation and its significance are depicted as follows:

$$LM = 0.505LAID + 1.622LX + 1.137 LRER - 1.12 TOT$$

$$[9.932139] \quad [6.024717] \quad [9.818287] \quad [16.74174]$$

$$(0.001624)*** \quad (0.014107)** \quad (0.001728)*** \quad (0.00043)***$$

Vector Hetero test: $Chi^2(4) = 8.383013(0.0785)$

Vector AR (1-2): $Chi^2(30) = 37.42392(0.1651)$

Vector Normality: $Chi^2(2) = 1.086559(0.5808)$

The long run estimation of import equation reveals that all the explanatory variables are significant in affecting import in the long run. The diagnostic test for the model also reveals that the model fails to reject the null of no hetroscedacity, no serial correlation and the error terms are normally distribute at 5 percent significance level.

From the equation, export is found to be the main determinant of import in the country and its impact is significant at 5 percent level of significance in the long run. According to the long run result of the model, a one percent increase in the export to GDP ratio leads to 1.6 percent increase in the import to GDP ratio. This result confirms that export earning is a primary source of finance for the import of a country goods and services.

Foreign aid is also found to have a positive and significant impact on import of a country at 1% level of significance. And a one percent increase in aid to GDP ratio will increase import to GDP ratio by 0.50 percent. From the long run equation one can conclude that in Ethiopia, aid has been used to finance the gap between import and export which is consistent with the theory

posed by the gap models. This is consistent with a result of yohannes (2011) in Ethiopia and Gomanee et al (2005) in Sub-Saharan Africa.

Terms of trade have a negative significant impact on the import of a country at one percent level significance. The result with TOT can be explained in the way that the export of Ethiopia is not price sensitive due to capacity constraint and the lag in agricultural output. From the result a unit changes in terms of trade results a 1.12 percent decrease in import to GDP ratio. Whereas The RER result indicates that the import of our

investment goods is exchange rate sensitive in the long run. And a one percent increment in real exchange rate results a 1.14 percent increment in import to GDP ratio.

b.Vector Error Correction Model for Import Equation

Since the variables in the import equation are found to be co integrated, we proceed to estimate the vector error correction model which represents both the long run and short run adjustments among the variables. Based on the residual saved for the long run estimation the following short run model is obtained for import of Ethiopia.

Table 3.14 : Results of short run equation for import

Variables	Coefficients	t-value	p-value
D(LNRER(-2)	0.267822	2.408604	0.0226**
D(LNEXPORT)	0.6826369	6.835582	0.0000***
ECT-1	-0.388931	-3.287626	0.0027***
D(LNODA(-1))	0.021935	1.453323	0.1569
D(TOT(-1))	0.103566	0.837793	0.4090
D(LNIMPORT(-2))	0.015741	0.142599	0.8876
C	0.020009	1.213631	0.2374
Note ***,** represents rejection of the null hypothesis at 1% and 5%level of significant respectively.			

$R^2 = 0.70$ DW = 2.05 F(6,36)=11.53328(0.0001)
AR(1,2) =F(2,27)= 0.196014 (0.8232)
Hetro=F(6,29)= 0.530795 (0.7805)
Normality = $Ch^2(2)$= 0.898894(0.637981)
ARCH= F(1,33)= 1.199304 (0.2814)
Ramsey Reset =F(1,28) =3.453695 (0.0737)

Source: Eveiws 6 stastical output of vector error correction model.

The diagnostic test for the import equation in the short run shows no problem related with serial autocorrelation, hetroscedasity, autocorrelation conditional hetroscedasity, functional misspecification and normality.

The goodness measure R^2 says that, 70% of the variation in the import in the short run is explained by the variation in the variables included in the model. The all over test of significant F-test also shows that all variables in the model except the constant are jointly significant in affecting import of the country in the short run.

The short run estimation of import equation reveals that like that of the long run impact, export is a significant determinant of import in the short run. In other words export has positive and significant impact on import in the short run. Aid does not have a significant impact in the short run even if it has positive impact. Real exchange rate has positive significant impact on import in its lag in the short run. Terms of trade has a positive impact on the import of a country in the short run in its lag however it is insignificant.

The error correcting term for import is negative and significant. The co efficient of the error correcting term implies that in one year import adjusts itself to equilibrium by 38.9 percent.

IV. Conclusion

The result from the growth equation revealed that aid contributed positively to economic growth in the long run, but its short run effect appeared insignificant indicating that most of the aid has been used to finance investment which has a long gestation period. Similarly, foreign aid interacted with policy (PA) has a significant positive influence on growth only in the long run. The positive result is associated with the policy environment (macroeconomic and infrastructure) in the country which makes aid more effective. A comparison of the coefficients of aid and the aid interacted with policy indicator in absolute terms indicate that aid would be more effective had there been a favorable macroeconomic policy environment.

Therefore, aid is effective in promoting growth in Ethiopia in the period considered; but its effectiveness would have been higher if it was supported by a sound macroeconomic policy environment. Like the theoretical expectation the Aid squared term, shows that negative and significant impact, suggests that the presence of capacity constraint in absorbing foreign aid beyond some level only in the long run while in the short run the result indicates that no capacity constraint in absorbing foreign aid.

The empirical result on import equation confirms that export is a main determinant of import both in the long run and short run. In addition Aid has a positive contribution on import both in the long run and short run but it is insignificant in the short run, this justifies the importance of aid in financing the gap between export and import.

Therefore, for the period under consideration aid played a positive role in improving economic growth of Ethiopia through financing import requirement (foreign exchange gap).

Based on the empirical investigations, the following policy implications are drawn by the researcher.

Though the view that aid is ineffective but only in a good policy environment is not supported in the period under consideration, the finding points that the importance of a good policy environment to make aid more effective. Thus setting a sound policy environment is crucial to use aid more effectively and make domestic investment efficient.

The Ethiopia economy is characterized by huge trade deficit therefore foreign aid can be used to finance this problem and enhance economic growth.

Diversification along with policies of export promotion in addition to import substitution are crucial to minimize the foreign exchange constraints which makes dependence on aid compulsory, In addition, the poor track of export in the past decades also points the need to reduce dependence on primary commodities as the dominant way of foreign exchange earnings.

References Références Referencias

1. Bacha E. (1990), "A Three Gap Model of Transfer and the GDP Growth Rate in Developing countries", Journal of development economics, 32(2): 279-296.
2. Barro R. J. and Lee W. (1993), "International comparisons of Education Attainment", Journal of monetary economics, 32, pp. 363-394.
3. Burnside C. and Dollar D. (1997), "Aid, Policies and Growth", macroeconomics and growth Division policy research department, World Bank.
4. Burnside C. and Dollar D. (2000), "Aid, Policies and Growth", American Economic Review 90(4), 847-868.
5. Brooks, C. (2002), "Introductory Econometrics for Finance", Cambridge: Cambridge University Press.
6. Dubary, R., N. Gemmel, & D., Greenway (1998) "New Evidence of the Impact of Foriegn Aid on Economic Growth", Credit Research Paper 98/18, Center for Research in Economic Development & International trade, University of Nottingham.
7. Dowling J. and Hiemenz U (1983), "Aid, Saving and Growth in the Asian Region", the Journal of Institute of developing Economics, 21(1):3-13.
8. Enders W. (1995), "Applied Econometric Time Series", John Wiley and Sons, New York Engle R.
and Granger C. (1987), "Co integration and Error Correction: Representation, Estimation and Testing", Econometrica, 55: 251-278.
9. Ethiopian Economic Association, (2000/01), Annual Report.
10. Gomanee, K., S. Girma, and O. Morrissey (2002). "Aid and Growth in Sub-Saharan Africa: Accounting for Transmission Mechanisms". CREDIT Research Paper 02/05.
11. Nottingham: School of Economics, University of Nottingham.
12. Gomanee, Karuna/Girma, Sourafel/Morrissey, Oliver (2005): "Aid and Growth in Sub-Saharan Africa: Accounting for Transmission Mechanisms". The United Nations University World Institute for Development Economics Research (UNU-WIDER) Research Paper No. 60.
13. Griffin K. (1970), "Foreign Capital, Domestic Savings and Economic Development", Bulletin of the Oxford University, Institute of Economics and Statistics, Vol. 32(2): 99-112.
14. Griffin K. and J. Enos (1970), "Foreign Assistance: Objectives and Consequences," Economic Development and Cultural Change, Vol. 18: 313-327.
15. Gujarati D. (1995), "Basic Econometrics", Mc Graw-Hill, Inc. 3rd edition.
16. Gujarati D.2004, "Basic econometrics", Mc Graw-Hill, Inc 4th edition.
17. Hansen H. and Tarp F. (2000), "Aid Effectiveness Disputed", Journal of International Development, 12, 35-398.
18. Hansen H. and Tarp F. (2001), "Aid and Growth Regressions", Journal of Development Economics, 64(2): 547-570.
19. Harris R. (1995), "Using Co integration Analysis in Econometric Modeling", Prentice Hall/Harvester Wheat Sheaf.
20. Hendry D. (1997), "Dynamic Econometrics", Oxford university press.
21. Johansen S. (1988), "Statistical Analysis of Co integration Vectors", Journal of economic dynamics and control, 12(2/3): 231-254.
22. Johansen S. (1991), "Estimation and Hypothesis Testing of Co integration Vectors in Gaussia vector Autoregressive model", Econometrica, 1551-1580
23. Lensik, R., & H., White (2001), "Are There Negative Returns to Aid"?, Journal of Development Studies Vol.37 Number 6.
24. Levy, V. (1987), "Anticipated Development Assistance, Temporary Relief Aid and Consumption Behavior of Low-Income Countries", the Economic Journal, 97, 446-458.
25. Lucas, R.E. (1988), "On the Mechanics of Economic Development", Journal of Monetary Economics, 22(1), pp. 3-42.

26. Malik G.(2008), "Foreign Aid and Economic Growth", A co integration Analysis of the six Poorest African Countries, University of Western Sydney, Economic Analysis and Policy, Vol.33 No.2.
27. Michael Todaro, (1997),"Economic Development", 5th Edition.
28. Micael Todaro, (1994), "Economic Development", Longman Publishing Ltd., London and New York.
29. MoFED, (2010), "annual report on the Ethiopian economy".
30. MoFED, (2012) "Brief Note on the 2005 (EFY) GDP Estimates series and other macroeconomic indicator."
31. National Bank of Ethiopia (2009), "Annual report on the Ethiopian Economy".
32. Peter M. and Lamin B.(2010) "Ethiopia's Economic Growth Performance", Economic Brief,Vol.1,Issue 5
33. Ramsey, J. B. (1969), "Tests for Specification Errors in Classical Linear Least-Squares Regression Analysis", Journal of the Royal Statistical Society, B, 31, 350-371.
34. Rana P. and Dowling J. (1988), "The Impact of Foreign Capital on Growth: Evidence from Asian Developing Countries", the Journal of Institute of Developing Economics.
35. Romer, P. M., (1990), "Endogenous Technological Change", the Journal of Political Economy. Vol. 98, No 5, Part 2: The Problem of Development: A Conference of the Institute for the Study of Free Enterprise Systems, pp. S71-S102.
36. Tassew Tadesse. (20011), "Foreign Aid and Economic Growth in Ethiopia.Semi-annual online Journal. Econ Res Guard 1(2):88-108".
37. Taylor L. (1994), "Gap Models", Journal of Development Economics, 45(1)17-34.
38. Taylor L. (1993), "The rocky road to reform: trade, industrial, financial and Agricultural strategies", World Bank, Volume 21.
39. World Bank (1992, 1998), "World Development Indicators, Washington DC", The World Bank.
40. Yanikkaya, H. (2002). "Trade Openness & Economic Growth: A Cross-Country Empirical Investigation", Journal of Development Economics 72(2003)57-89.