THE ROLE OF EXPORTS IN ECONOMIC GROWTH WITH REFERENCE TO ETHIOPIAN COUNTRY

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Abstract

This study applies the Cobb-Douglas function model to analyze the effects of exports on economic growth in context of Ethiopian economy. To determine the relationship between export and economic growth, an attempt will be made to use econometrics techniques of analysis (co-integration system) by using the RATS software package for the time series data from 1950 to 1986. The lack of capital stock data is overcome by using the ratio of real investment to real gross domestic product (I/Y), in a place of capital stock while lack of labour force data is overcome by using the real gross domestic product per capita. The results suggest that the real export and (I/Y) are co-integrated with real GDP per capita. These results of the findings support the idea that the rate of growth of real exports has a positive effect on the rate of economic growth in context of the Ethiopian economy. Even strong positive relationship exists between real export and real growth domestic product per capita in long run rather than in short run when it is compared real exports with that of (I/Y). Thus, the contribution of real exports to economic growth in context of Ethiopian economy is greater in long run than in short run.

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Introduction

There are two extreme views, which have attempted to assess the relationship between exports and economic growth, i.e., according to the views of the first group export is regarded as it is contributing positively to the economic growth. The second group have regarded export, as it does not have a contribution to economic growth. Besides these two extreme views, even some have regarded export as it is contributing negatively to the economic growth. For example, H.V.Berg and J.R.Schmidt (1994:p:250-51), O.A.Onafwara (1996,p:346) and D.E.A.Giles, J.A.Giles and E.McCann (1992,p:196) suggest that growth of export stimulates economic growth. In other words, there is a positive association between the growth of export and economic growth. The reasons given by most of them are:

I. export growth may reflect a rise in the demand for the country's outputs, and this in turn will be realised in economic growth.

II. by raising the level of exports, additional foreign exchange will be generated, and this facilitates the purchase of productive intermediate goods.

III. a growth in exports may lead to greater productive efficiency (perhaps through economies of scale or technical improvements as a result of contract with foreign competitors and enhanced output. Productivity growth is also assumed to be the result of specific policy choices, namely policies that expand exports.

IV. there are externalises associated with export sectors; export earnings allow a country to use external capital without running into difficulties servicing foreign debt.

On the other hand, arguments have also been made (see, for example, D.E.A.Giles, J.A.Giles and E.McCann (1992,p:196) in support of the opposite view point; i.e., it has been argued that export hinders the development of country. The reason some authors give for the fallrity of the export, as the contribution to economic growth is that the strategy of the country may depend crucially on the type of good that is being traded like primary commodities exporting. Moreover, D.E.A.Giles, J.A.Giles and E.McCann (1992,p:196) also stated that there is no effect of export on economic growth. Their hypothesis rejected the existence of the effect of export on economic growth. As some of them stated, the positive relationship between real gross domestic product and real exports does not exist in developing countries like Ethiopia, which depend on exporting primary commodities.

In general the empirical evidence associated with the effect of export on economic growth is mixed. Accordingly, the objective of this paper is to test the validity of the hypothesis, i.e., the effects of exports on economic growth in context of Ethiopian economy. In other words, the aim of this study is to investigate the existence and magnitude of the link between exports and economic growth of the country in question.

Thus, this paper uses the data on Ethiopia to investigate the effects of exports on economic growth using the Co-integration System. Engle and Yoo(1987, p:143) stated that a co-integrated system can be represented in an error correction structure which incorporates both changes and levels of variables such that all the elements are stationary. This error correction structure provides the framework of estimation, forecasting and testing of co-integrated system.

The paper comprises three major parts. The first part discusses the methodology used for the analysis and the type of data used while the second part presents the result from the data. In the third part, summary and conclusion are presented.

1. Methodology and Data

To analysis this time series data, the following four stages are followed: The first stage assesses the time series properties of these (logs of these) variables, in particular examines whether each one is consistent with I(1) process (testing for unit root).

The second stage is to test for co-integration, that is, if each of these variables in the question is I(1) I assess whether their relationship is I(0)or not. A test for co-integration means looking for stable long-run equilibrium relationship among non-stationary economic variables. If co-integration exists, the specification of the error correction mechanism (ECM) is appropriate.

The third stage involves the construction of ECM with the appropriate error correction terms (residual) derived from the estimated long-term co-integration relationship. If their relation makes I(0), the evidence is supportive of the view that there is a long run tendency for real gross domestic product per capita (RGDPC) and exports to hold. Other wise, if their relation makes I(1), it exhibits a random walk behaviour and implies that they are not co-integrated. This would suggest that they do not have long-run relationship.

Finally, if the third stage does not support their long-run relation, in the fourth stage their relationship re-considered, i.e., whether there are other factors that should be taken in to account in testing their relationship hypothesis. Focusing on these stages stated above let I proceed to model building.

1.1 Model Building

1.1.1 Over view of the Model

The model is based on the Cobb-Douglas function, i.e.,

$$Y = K^b(AL)^{1-b} \qquad 1$$

Where Y represents real gross domestic product, K, L and A denote capital, labour and productivity, which includes exports and others, respectively while b is a parameter.

Equation (1) indicates that real gross domestic product (RGDP) is a function of capital, labour and productivity. Taking the logarithm of (1), it is obtained.

$$\ln Y = b\ln K + (1-b)\ln(AL) \qquad 2$$

And following more convenient way of representing let X_1, X_2, X_3 and X_4 denote the logarithm of Y, K, A and L, respectively. Thus, the above expression can be re-written as:

$$X_{1t} = bX_{2t} + (1-b)X_{3t} + (1 - b)X_{4t} \qquad 3$$

It is important to note that, lack of capital stock data is overcome by using the ratio of real investment to real gross domestic product (I/Y) in a place of capital stock while lack of labour force data is overcome by using the real gross domestic product per capita. Thus equation (3) becomes

$$X_{1t} = bX_{2t} + (1\text{-}b)X_{3t} \qquad 4$$

To examine the effects of the real export on the economic growth, equation (4) is considered since the first difference of equation (4) is an approximation to the rate of growth in the variables. This expression is considered in the model. This means that, for example, there is a 1% increase in RGDPC is as a result of b% and (1-b)% increase in real (I/Y) and real export, respectively.

1.1.2 Unit Root Tests

To examine the effect of export on economic growth, first the time series data of macro-level is assessed to test whether each of these variables are a random walk, or more generally, has a unit roots or not.

If the variables are often non-stationary, containing stochastic or deterministic trends, the mean of a non-stationary time series with drift is always changing through time; and the series has an infinite variance when the source of the non-stationary is a stochastic trend (unit root).

The standard method for detecting non-stationary behaviour in a time series is to test for the presence of a unit root. Testing can be extended to incorporate the prospect of a deterministic trend as well as the stochastic type of trend represented by a unit root.

Testing for the existence of unit root is not so simple as such. For example, testing whether a series is I(1) as opposed to I(0) is that of testing for a unit root in a time series. Banerjee, Dolando, Galbraith and Hendry (1993,p:8) stated the strategies for performing such testing have had to contend with the problem that I(0) alternatives in which the series is close to being I(1) {so that the power of the test is low} are very many economic plausible in circumstances. They further stated that the form of data generation process (for example, the orders of dynamics; the question of which exogenous variables enter; etc.) is not known, and critical values of test statistics are typically sensitive to the structure of the process.

In testing unit root, there is a problem, which restricts us from using the test statistics of the conventional t-tests of the hypothesis, since this test statistics do not have the standard asymptotic distributions for the roots greater than or equal to one. In addition to this, there is a problem that arises from the derivations of the distributions, which assumes that ε_t is a gaussian white noise. This assumption is frequently violated in economic data where the ε_t's are often found to be auto-correlated. This makes the Tables provided by Dickey and Fuller extremely unreliable. A solution to this problem was provided by Said and Dickey (1987), which proposed an alternative specification designed to "whiten" the error process. This latter approach is known as the Augmented Dickey Fuller test.

Another problem associated with unit root tests is that the relevant distributions are not robust to the inclusion of deterministic components (constant and/or time trend) in the ADF regressions. As a result it is looked at different cases (tables) when a constant and /or time trend are included.

Therefore, the testing strategy is as follows:

$$\Delta X_t = \gamma X_{t-1} + \sum_{i=1}^{P} \beta_i \Delta X_{t-i} + \varepsilon_t \qquad \text{a}$$

$$\Delta X_t = \alpha + \gamma X_{t-1} + \sum_{i=1}^{P} \beta_i \Delta X_{t-i} + \varepsilon_t \qquad \text{b}$$

$$\Delta X_t = \alpha + \beta t + \gamma X_{t-1} + \sum_{i=1}^{P} \beta_i \Delta X_{t-i} + \varepsilon_t \qquad \text{c}$$

I begin with using equation (c) of ADF regression for the time series X_t, having determined the optimal order of augmentation p. It is tested $H_0: \gamma = 0$ versus $H_1: \gamma < 1$ using the DF critical value. If

H_0 is not rejected it is concluded that X_t is I(1) with trend term and constant. If H_0 is not significant I reformulate (b) and test $H_0: \gamma = 0$ versus $H_1: \gamma < 1$ using the appropriate DF critical value. If H_0 is not rejected it is concluded that X_t is I(1) with constant. If H_0 is not significant it is reformulated (a) and test $H_0: \gamma = 0$ versus $H_1: \gamma < 1$ using the appropriate DF critical value. If H_0 is not rejected it is concluded that X_t is I(1) without constant and trend term. If H_0 is rejected it is concluded that X_t is I(0). In other words, a rejection of H_0 implies X_t is I(0) while non rejection implies that it is integrated of order 1 or higher. In the latter case I then difference X_t and repeat the whole procedure to determine whether the series is I(1) or I(2), etc.

The test is similar to a standard t -test (i.e., the test statistic used is $\frac{\hat{g}}{\hat{d}}$ except that I have to look at different tables. In addition depending on the specification I am considering i.e., (a), (b) or (c), I have to look at different critical values.

There is a problem concerning the determination of the appropriate lag length. Walter Enders (1995, p: 226) stated that including too many lags reduces the power of the test to reject the null of a unit root since the increased number of lags necessitates the estimation of additional parameters and a loss of degrees of freedom. According to him, the degrees of freedom decreases since the number of parameters estimated has increased and because the number of usable observations has decreased, i.e.; it is the lose of one observation for each additional lag included in the autoregression. He also noticed that too few lags would not appropriately capture the actual error process, so that the coefficient (γ) and its standard error will not be well estimated. To overcome these problems, let it is assessed first the procedure how to select k.

The problem with the implementation of the ADF test is the choice of an appropriate lag length. The choice of p, i.e., the number of lagged dependent variables to be included is typically made using information criteria such as the AIC though I use BIC for comparison purpose:

$$AIC(p) = T\log(RSS(p)) + 2m$$

$$BIC(p) = T\log(RSS(p)) + \log(T)m$$

Where RSS (p) denotes the residual sum of squares when p lags are fitted and m represents the number of estimated parameters. In other words, an upper limit for p is chosen, say maxp =5 and AIC is computed for p = 1... maxp. Then the p's that leads to the smallest value of AIC has been selected.

If each of the variables is I(1), it will be proceeded to the next stage. Otherwise, testing of co-integration is not necessary because the existence of I(1) is a precondition for testing co-integration.

1.1.3 Co-integration

It may seem that data which are I(d) should be differenced d times prior to being used in a regression model. There are, however, exceptions to this general rule. It is readily established that adding a series that is I(0) to one which is I(1) results in an I(1) series. Similarly, a linear combination of two series which are each I(1) will usually produce another I(1) series.

However, it may happen that the integration cancels between series to yield an I(0) outcome: This is called co-integration (Hendry (1995,p:44)). Moreover, Engle and Yoo (p: 145) also stated that even though each element in X_t is I(1) with drift so that it has a deterministic trend and a variance which goes to infinity with t, the linear combination will be stationary.

The basic idea is that if, two or more I(1) series are co-integrated then there is a tendency for them to move together in the long run. If there are shocks, which drive them apart, then they have common characteristics, which bring the series back together. It implies that equilibrium theories involving non-stationary variables require the existence of a combination of the variables that is stationary.

In general, the concept of co-integration is clearly related to the concept of long run equilibrium. Within co-integration literature, the term equilibrium, as K.Cuthbertson, S.G.Hall, M.P.Taylor (1992: 1932) stated, is that it is an observed relationship which has, on average, been maintained by a set of variables for a long period.

To check the existence of co-integration, the long run equilibrium relationship needs to be estimated. Having decided that each of our three series is I(1), it would be run the following regression:

$$X_{1t} = \alpha + \gamma X_{2t} + \beta X_{-3t} + \varepsilon_t \qquad 5$$

Since co-integration requires that each of the individual variables is I(1), i.e., X_{1t} , X_{2t} and X_{3t} are unit root process then it is estimated the long-run equilibrium relationship of equation (5). Once equation (5) is estimated, then the residual, $\hat{e}_t$ can be computed. I can view the $\hat{e}_t$ as deviations from long-run equilibrium. If these deviations are stationary, X_{1t} , X_{2t} and X_{3t} are co-integrated. It could, therefore, have the following regressions:[1]

$$\Delta\hat{e}_t = \psi\hat{e}_{t-1} + \sum_{i=1}^{P}\rho_i\Delta\hat{e}_{t-i} + u_t \qquad 6$$

For testing existence of co-integration, Engle and Yoo (1987) obtained regression, which is stated on equation (6). From equation (6), if it can not be rejected the hypothesis that $\psi = 0$, it can be concluded that the $\hat{e}_t$ contains a unit root and therefore X_{1t} , X_{2t} and X_{3t} can not be co-integrated. In testing for a unit root in the residuals like (6), I can't use the standard Dickey and Fuller critical values. This is because $\hat{e}$ is a generated repressor rather than the actual data. The correct critical values have been tabulated by Engle and Yoo(1987) which was recommended by Engle and Granger.

Though, in case of (6), there is a problem of determining maximum value of n (unknown lag structure in $\hat{e}_t$) in the ADF test, this value is chosen by using a standard model selection procedure based upon some information criterion (AIC).

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[1] Since $\hat{e}_t$ is a residual from a regression, there is no need to include an intercept term in the DF or ADF regression.

1.1.4 Error Correction Models

Once I have established the co-integration properties, I made estimates of the error correction model. In an error correction model, the changes in a variable depend on the deviation from some equilibrium relation. For instance, that X_{1t} represents the RGDPC and X_{2t} and X_{3t} are the corresponding real (I/Y) and real exports of the same country, respectively. Assume further more that the equilibrium relation among the three variables is given by $Z_t = X_{1t} - \gamma X_{2t} - \beta X_{-3t}$, then the Error correction Model (ECM) is written

$$\Delta X_{1t} = \mu_1 + \alpha_1 (X_{1t} - \gamma_1 X_{2t-1} - \beta_1 X_{-3t-1}) + \sum_{i=1}^{n} h_{1i} \Delta X_{1t-i} + \sum_{i=1}^{n} q_{1i} \Delta X_{2t-i} + \sum_{i=1}^{n} b_{1i} \Delta X_{3t-i} + u_{1t} \qquad 7$$

$$\Delta X_{2t} = \mu_2 + \alpha_2 (X_{1t} - \gamma_2 X_{2t-1} - \beta_2 X_{-3t-1}) + \sum_{i=1}^{n} h_{2i} \Delta X_{1t-i} + \sum_{i=1}^{n} q_{2i} \Delta X_{2t-i} + \sum_{i=1}^{n} b_{2i} \Delta X_{3t-i} + u_{2t} \qquad 8$$

$$\Delta X_{3t} = \mu_3 + \alpha_3 (X_{1t} - \gamma_3 X_{2t-1} - \beta_3 X_{-3t-1}) + \sum_{i=1}^{n} h_{3i} \Delta X_{1t-i} + \sum_{i=1}^{n} q_{3i} \Delta X_{2t-i} + \sum_{i=1}^{n} b_{3i} \Delta X_{3t-i} + u_{3t} \qquad 9$$

Where $u_{jt,}$ j= 1,2,3 are zero mean finite variance and α_j (j=1,2,3) are the error correction coefficient.

As already stated, the first difference of the economic time series means changing the data into the growth rate of the economy. Thus, the growth rates of RGDPC, (I/Y) and exports are analysed.

Level terms enter the error correction model. In practice, Engle and Granger (1987) suggested the use of the residuals $\hat{e}_{t-1}$ and as an instrument for $X_{1t} - \gamma X_{2t} - \beta X_{-3t}$:

$$\Delta X_{1t} = \mu_1 + \alpha_1 \hat{e}_{t-1} + \sum_{i=1}^{n} h_{1i} \Delta X_{1t-i} + \sum_{i=1}^{n} q_{1i} \Delta X_{2t-i} + \sum_{i=1}^{n} b_{1i} \Delta X_{3t-i} + u_{1t} \qquad 10$$

$$\Delta X_{2t} = \mu_2 + \alpha_2 \hat{e}_{t-1} + \sum_{i=1}^{n} h_{2i} \Delta X_{1t-i} + \sum_{i=1}^{n} q_{2i} \Delta X_{2t-i} + \sum_{i=1}^{n} b_{2i} \Delta X_{3t-i} + u_{2t} \qquad 11$$

$$\Delta X_{3t} = \mu_3 + \alpha_3 \hat{e}_{t-1} + \sum_{i=1}^{n} h_{3i} \Delta X_{1t-i} + \sum_{i=1}^{n} q_{3i} \Delta X_{2t-i} + \sum_{i=1}^{n} b_{3i} \Delta X_{3t-i} + u_{3t} \qquad 12$$

Since each equation contains the same set of repressors OLS is efficient. To see the dose relationship between error correction models and the concept of co-integration supposes that each of X_{1t}, X_{2t} and X_{-3t} is I(1) variables. In that case, equation (10), (11) and (12) involving the ΔX_{1t},

ΔX_{2t} and ΔX_{-3t} are stable. In addition, u_{it},(i=1,2,3) are white noise errors which are also stable. Since an unstable term can not equal a stable process,

$$\alpha_j \hat{e}_{t-1} = \Delta X_{jt} - \mu_j + \alpha_j \hat{e}_{t-1} - \sum_{i=1}^{n} h_{ji} \Delta X_{1t-i} - \sum_{i=1}^{n} q_{ji} \Delta X_{2t-i} - \sum_{i=1}^{n} b_{ji} \Delta X_{3t-i} + u_{jt}$$

(j= 1,2,3) must be stable too. Hence, if $\alpha_1 \neq 0$ or $\alpha_2 \neq 0$ or $\alpha_3 \neq 0$, $\hat{e}_{t-1}$ is stable and, thus represents a co-integration relation. Here, as usual, the models are chosen by using a standard model selection procedure, i.e., based upon some information criterion (AIC).

1.1.5 Data

The Data that are used in this study based on the annual times series data for the period 1950 - 1986 inclusive. Although Ethiopian's external trade statistics are currently recorded quarterly, due to the shortage of quarterly Data on other variables, I have been forced to use the data on a yearly basis. The source of data is from the Penn World Table (Mark 5.6- denoted PWT 5.6- is a revised and updated version of the preceding (mark 5) version) and International Financial Statistics (Supplement on trade statistics, IMF, 1988). All empirical results have been obtained using the Package of RATS and the over view of the time series data are also seen by using the package of PcGive though it is not presented here.

Finally, the methodology that has been described in this section is applied in this paper to time series data of Ethiopia relating to RGDPC, real (I/Y) and real exports. Thus, the remaining parts of this paper illustrate the empirical results in details.

2. Empirical result Form Finite Sample

2. 1. A Finite Sample Unit Root Test

In this section, it is assessed the existence of unit root by applying the standard Dickey-Fuller test statistics designed above. The DF regressions were considered with and without drift and trend terms included. The information criteria (AIC) are used to test for the order of integration. The results of the three variables are presented below in Table 1. For each of the variables, it has been assessed whether they have unit root: the log of each of the variables. It is followed the testing design in the model building section. Starting with an ADF regression including a deterministic time trend by giving different value of upper limit for k, say kmax but, here, it is reported only the result of lower two kmax since all of them give the same results.

From Table 1, it is examined that the t-statistics of ADF corresponding to γ, i.e., the t-test of the null hypothesis $\gamma = 0$, $\alpha = 0$ and $\beta = 0$ gives a value of -2.071, -3.477, -2.010 for log of RGDPC, (I/Y) and real exports, respectively. Referring to Table B.6 (for critical values for the Phillips-Perron Z_t test and for the OLS t-statistic, J.D.Hamilton (1994,p:763), it is found that the 2.5% and 5% critical values, for T= 50, are -3.80 and -3.59, respectively. From this, it is concluded that the null hypothesis is not rejected (the existence of unit roots are accepted).

Also note that for kmax = 3, which is used for comparison, the t-test for the null hypothesis $\gamma = 0$, $\alpha = 0$ and $\beta = 0$ gives a value of -2.071 and -2.347, for log of RGDCPC and real exports, respectively. From the same Table again indicates that it can't be rejected the null hypothesis of the unit root. But in case of log of real (I/Y), the t-test of the null hypothesis $\gamma = 0$ gives a value of -0.011. Referring to the same Table but different case, i.e., case 1, it is found that the 2.5% and 5% critical values for T=50, are -2.25 and -1.95, respectively. Now given that it is not rejected the null hypothesis that $\gamma = 0$. In both cases, in general, it is not rejected the null hypothesis that $\gamma = 0$.

Thus, the result of the sequential testing, which appear in Table 1, suggest that the logarithm of RGDPC, real (I/Y) and real exports are each I(1). Since the test statistics do not lead to rejection of the null hypothesis that $\gamma = 0$ for the logarithms of the relevant variables, it is concluded, on the basis of the standard ADF tests, that the first stage of the procedure is supported by the Data. Therefore, the next stage is to test for co-integration between RGDPC and real (I/Y) and real exports.

Table 1.[2]

[2] The result in brackets in this table is the standard deviation.

Based on upper limit kmax = 3, i.e., 3 lags:

	k	α	β	γ	t-stat.
X_1	1	0.410	0.007	-0.108	-2.071
		(0.191)	(0.003)	(0.052)	
X_2	3	-	-	-0.022	-0.413
				(0.053)	
X_3	3	-1.380	0.031	-0.409	-2.347
		(0.616)	(0.012)	(0.174)	

Based on upper limit kmax = 3, i.e., 3 lags:

	k	α	β	γ	t-stat.
X_1	1	0.410	0.007	-0.108	-2.071
		(0.191)	(0.003)	(0.052)	
X_2	1	0.262	-0.001	-0.314	-3.368
		(0.076)	(0.004)	(0.093)	
X_3	1	-0.984	-0.022	-0.315	-2.011
		(0.543)	(0.012)	(0.157)	

2.2 A Finite Sample Co-integration Test

Since it is observed that these three variables are known to be I(1), i.e., each of them containing a unit root, it is possible to assess whether there is an equilibrium relationship among the three variables or not. Two non-stationary variables, each being I(1), are said to be co-integrated if there is a linear combination of them that is stationary. To find this condition, I follow the testing strategy design noted above in model building. That is, it is started from the relationship between the three variables by giving different upper limit, say kmax values. For comparison, testing two by two of the variables, i.e., RGDPC and real export, and RGDPC and real (I/Y), are also done, by giving different upper limit values of kmax (for example, kmax = 5, 3,1).

The recursive[3] graph of the log of real (I/Y) indicates that there is a structural break in 1978. As a result of this, it is included the Dummy variables (which contains the value of 1 and 0) in the data. By doing this, their long-run relationship is not disappeared (affected) but the coefficient of log of real (I/Y) became positive, i.e.; what I expected. This structural break may be occurred as a result of the prevailing political problem at that time in the country. In other words, the country's economy might not be as such used for production purpose.

Due to the addition of the Dummy variable, the numbers of the variables, which are stated above in model building are changed. Thus, instead of equation (5), the long run equilibrium relationship is estimated by including Dummy variable, i.e.,

$$X_{1t} = \alpha + \gamma X_{2t} + \beta X_{-3t} + \varphi D_t + u_t \qquad (13)$$

In order to assess the co-integration, I estimated the residual, $\hat{u}_t$, from equation (13). At the second stage, the ADF tests are obtained as the testing strategy designed in model building. Then I proceed to test the null hypothesis of a unit root. Rejection of this null hypothesis is evidence in favour of stationary.

From Table 2, it is seen that the tests of ADF corresponding $\hat{y}$ of (6) (in model building) for the null hypothesis that these three time series, which were each I(1), have the test-statistic values of -2.952 and -2.281 for k equal to 1 and 3, respectively. These different k values are selected by minimum information criteria since it is given different kmax. Referring Table 3 of Engle and Yoo(1987 ,p:158), I find that the 5% and 10% critical values for T= 50 and n= 4, are of 3.98 and 3.67, respectively.

Therefore, I conclude that the null hypothesis is rejected in both cases, which are used for the comparison. Rejection of this null hypothesis is evidence in favour of stationary. This implies that the linear combination of these variables in question is co-integrated since the RGDPC follows a stationary, i.e., there is a stable relationship between the variables, which can be called a long-run equilibrium path. Deviations from this path in the short run are transitory. Thus, our hypothesis is

[3] It is not reported here. In addition, though the result of the three variables indicates the long run

consistent that the export has an effect on economic growth positively since the coefficient of the real exports is positive and statistically significant in determining RGDPC at 2.5% and 5% level of significance.

Table 2.

k	α	γ	β	φ	Res.{1}	t-stat. (for Res.{1})
3	6.108	0.034	0.565	-0.344	-0.531	-2.281
	(0.080)	(0.050)	(0.046)	(0.072)	(0.233)	
1	6.108	0.034	0.565	-0.344	-0.516	-2.952
	(0.080)	(0.050)	(0.046)	(0.072)	(0.175)	

2.3 Finite Sample ECM

The ECM could be entered at any lag. Here I adopt one lags since the use of Akaki information criterion for lag length selection suggested one lag even when it is assessed using different values of upper limit, i.e., 5,3 and 1 (in all case it is suggested one lag). The I(0) reduction for the individual equation generates the outcomes in Table 3. The stationary of ΔRGDPC implies that the shock to the ΔRGDPC is transitory, so the effect holds in the long run as well as in the short run.

In short- and long- term, the growth of export has a positive effect on economic growth. For example, the error correction (Z_{t-1}) induces 9% adjustment per period in the first equation of Table 3. From Table 2 above, it is seen that the coefficient of the log of export is significant relative to the coefficient of the log of (I/Y) and the coefficient value is 0.565 while the coefficient value of log (I/Y) is 0.034 in the estimation of co-integration (long run). If this is the case, for small % change of export has much stronger effect on RGDPC than (I/Y) when short-run adjustments are separated out.

However, the effect of export is insignificant in short run. In this case, there is a poor performance of the coefficient. In Table 3 the first difference of X_3 of the first equation implies that the relationship between export and economic growth is long-term rather than short term in nature since the coefficient of the real export in level at estimation stage of co-integration is higher than the coefficient of (I/Y).

relationship, the coefficient of (I/Y) is negative.

The positive relationship between input variables (exports and (I/Y)) and RGDPC suggests that RGDPC increases when the input variables are increasing. The sign of the short run effect suggests that an increase in the lag of its own (RGDPC) will temporarily balance an increase of other factor inputs. In addition, the rate of growth of RGDPC is more explained by its own lag than the other inputs since its lag coefficient is larger than the other in first equation. In other words, the high proportion of the lag coefficient of RGDPC implies that in most case it is determined by other variables rather than exports and (I/Y).

For instance, if we examine the contribution of X_{3t} to the X_{1t}, we find that it is through the disturbance, which influences the lag. For example, a shock of u_{3t} by one unit increases X_{3t} in time $(t_0) = 0$ and no other shocks, it increases X_{1t} by 0.003 at time t=1. In general, the effect of a one unit shocks in X_{3t} has responded in the system with 0.003, 0.059 and 0.198 by X_{1t}, X_{2t} and X_{3t}, respectively at time t = 1.

Table 3. Error correction models

$$\Delta X_{1t} = -0.055 + 0.09Z_{t-1} - 0.147\Delta X_{1t-1} + 0.041\Delta X_{2t-1} + 0.003\Delta X_{3t-1} + 0.016D_t + u_{1t}$$
(0.016) (0.069) (0.154) (0.030) (0.045) (0.015)

$$\Delta X_{2t} = 0.078 + 0.16Z_{t-1} - 0.696\Delta X_{1t-1} + 0.170\Delta X_{2t-1} - 0.059\Delta X_{3t-1} - 0.116D_t + u_{2t}$$
(0.098) (0.427) (0.949) (0.186) (0.275) (0.094)

$$\Delta X_{3t} = -0.005 - 0.482Z_{t-1} - 0.531\Delta X_{1t-1} + 0.2\Delta X_{2t-1} + 0.198\Delta X_{3t-1} - 0.079D_t + u_{3t}$$
(0.059) (0.259) (0.577) (0.113) (0.167) (0.057)

Summary and Conclusion

From our empirical results, it is seen that the rate of growth of real exports has a positive effect on the rate of economic growth in context of the Ethiopian economy. In other words, it is tested the validity of the hypothesis which is consistent to our objective. In long run, even it contributed greater than the real (I/Y). Thus, export has a role to play in explaining economic growth although not large in short run relative to the role to play by real (I/Y) in explaining economic growth. This is, since the occurrence of unit root and the presence of co-integrating relationships supports the use of error correction models, making it possible to distinguish between the short-run and long run effects of export up on economic growth.

From my results of the analysis, there is a positive long-run relationship between export growth and economic growth. Depending on the model selection criteria, it can be seen that the growth rate of exports has an insignificant effect on the rate of economic growth of the examined country in short run. This insignificance in short run may imply that the effect of growth in export is a long run effect rather than short run.

In general, I can conclude that the growth of the real exports has a positive effect on economic growth in short run as well as in long run. Where as, there is a significant effect of real export on economic growth in long run, its effects in short run is, however, not so strong.

References

1.Berg, H.V., Schmidt, J.R.(1994) Foreign Trade and Economic Growth: Time series evidence from Latin America, The Journal of International Trade and Economic Development, 3/3, November. University of Nebraska Lincoln, USA

2. Cuthbertson, K, Hall, S. and Taylor, M. (1992) Applied Econometric Techniques. London: Philip Allan

3. Engle, R.F., and Yoo, B.S., (1987) Forecasting and Testing in Co-integrated System. University of California, San Diego, USA, Journal of Econometrics 35, North Holland

4. Giles, D.E.A, Giles, J.A and McCann, E. (1992) Causality, Unit Roots and Export-ed Growth: The New Zealand experience. Department of Economics, University of Canterbery, the Journal of International Trade and Economic Development,1/2 November

5. Hamilton, J.D. (1994) Time Series Analysis. Princeton University Press, USA

6. Hendry, D.F. (1995) Dynamic Econometrics. Oxford:OUP

7. Onafowara, O.A. (1996) Trade Policy, Export Performance and Economic Growth: Evidence from Sub-Saharan Africa. The Journal of International Trade and Economic Development, 5/3, November, Sequehanna University, Selinsgrove, USA