Determinants of Economic Growth in Ethiopia

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Abstract

Economic growth around the world has not been equal for a long time. Some economies grow faster while others grow slower. What accounts for the fast or slow growth is a question worth asking. This study tried to identify the sources of long run economic growth in Ethiopia. Time series data covering the period 1981-2011 were employed for the dependent (national income) as well as independent variables. Explanatory variables including investment, human capital, foreign aid, rainfall, population and terms of trade were investigated. The findings show that growth in Ethiopia is positively affected by investment (physical capital), human capital, foreign aid and rainfall. Whereas, population growth and terms of trade (the latter is insignificant) have a negative effect on the growth of real GDP in Ethiopia. Therefore, the focus regarding the Ethiopian economy should revolve around increasing saving and investment, paying attention to the enhancement of human capital, minimizing the influence of weather on the economy, and finally checking the rapidly growing population. These measures will help achieve rapid economic growth in Ethiopia.

Introduction

Human beings have always sought ways to improve their lives and living standards. To this end, development has become the primary goal of every nation. The aspiration for economic growth and development is the result of experiences seen in the form of sustained elevation in an entire society towards a better life. The basic function of all economic activities is to

provide as many people as possible with means enough to meet basic needs and a level of material prosperity that guarantees worthiness and esteem. Moreover, economic growth increases the range of human choice i.e. freedom. The average level of satisfaction increases with a country's level of income, of course, this is true up to a certain level (Todarro et al, 2009). Economic growth reduces scarcity and gives us more satisfaction (more goods and services). Thus, all societies try to achieve economic growth and development.

Throughout the human history, there was virtually no appreciable growth in per-capita income, particularly, before 1750. The average person before the eighteenth century was not better off from the average person of 100,000 B.C. The past 250 years witnessed rapid economic progress that is considered as a unique episode in human history (Gordon, 2012). Modern economic growth was born after the industrial revolution. This event changed forever the possibilities for material consumption. Income per person began to undergo sustained increase in favored group of countries-Westerners (Clark, 2007). Following this, people became capable of enjoying vastly improved living standards.

A number of parameters are employed to measure the economic progress of nations and evaluate the improvements in the living standards of citizens. One such measurement is real gross domestic product (GDP) or GDP per capita. Although there are difficulties in using real GDP per capita as a measure of the quality of life, it is reasonably correlated with other measures of well being such as health and literacy. Economic growth improves living standards through many channels. It creates more jobs, accelerates investment, boosts business confidence, and increases the revenue to the state in the form of taxes.

Environmental benefits are also to be maximized as cleaner technologies are likely to be installed (Riley, 2012). With growth, families are better able to purchase more goods and services. It also has positive impacts on physical health and political freedom. As a result, living standards in both poor and rich countries can be improved. It can be said that growth is a moral imperative for achieving lasting human flourishing (Noell et al, 2013)

However, when measuring living standards of citizens, it is necessary to go beyond real GDP per capita. Economic growth is only a necessary condition not a sufficient indicator of economic development. Economic development is by far broader than growth. It is a multidimensional process involving the transformation of social, institutional, and economic structures. In addition, it encompasses issues like that of income distribution and the reduction of poverty in order to guarantee a better life for the majority of a given society (Todaro et al, 2009).

But, this is not to over look the role played by economic growth to economic development. High and equally accessible material well being is a prerequisite for other socio-economic advancements. The universal features of economic development such as health, education and so on, naturally follow the growth in per capita income (Ray, 1998). Economic growth can occur without development. But, economic development can never be realized without growth. That is why the human development report in 1996 stated that "human development is the end-economic growth is the means". In underlying the importance of growth to development, Paul Collier said that "growth is not a cure-all, but the absence of growth is a kill-all" (Noell et al, 2013)

Statement of the problem

Economic growth is unevenly distributed across countries and over-time. Prosperity has not come to all societies, but only to few. Countries have different levels of development. As a result, living standards of citizens across countries shows large gap. In 2012, Norway ranked first in human development with human development index HDI of (0.995) while Niger scored the lower HDI (0.065). If the issue is brought to a regional level, Sub-Saharan Africa has an HDI of (0.475) while it is (0.558) and (0.771) for South East Asia and that of Europe respectively (Human Development Report: 2013). Switching the scale in to real GDP per capita also shows similar results to that of the HDI. Accordingly, Qatar topped the world with per capita income of over $105,000 while the Democratic Republic of Congo (DRC) scored the least per capita income of $ 400. Recently, wealth has continued to be highly accumulated in North America, Europe, and few Gulf States while Africa and south East Asia are under extensive poverty (Pasquali et al, 2013). GDP growth rates in developing countries are on average higher than those in developed countries. For example, Africa's growth exceeded the world average in the start of the 21st century with average growth rates of 5.6% in 2002-2008 and of course, 4.8% in 2013. Unfortunately, this did not ensure poverty reduction. The recent global dispersion of production has led to unequal benefits, benefiting East and South East Asia, especially, China (Economic Report on Africa, 2013)

The variation in growth performance is attributed to a number of factors. Among these, a given country's resource endowments, technological advancements, economic policies, population size and structure, and human capital are key variables affecting growth. In addition, history, culture, political stability, institutions, and so on are core elements. The significance

of colonialism and globalization has also been at the heart of debates concerning disparities in the pattern of development (Ashraf et al, 2010)

In developing countries, endowments in the form physical capital stock, human capital and technological advancement are very low. And much is explained by uncertainties and vagaries of nature that are difficult to manipulate to the extent needed by an economy (Seid, 2000). Besides, due to the imperfect nature of information and absence of contingent markets, dealing with such economies requires a different approach from that of developed countries (Pal et al, 2012). Likewise, Ethiopia being an agrarian country, its economy is dependent on nature. The' heart beat' of the entire economy changes with the performance of the agricultural sector i.e. there is high degree of correlation. Even though the service sector over took the lead in 2011/12 as a share of GDP by contributing 45.3% while agriculture followed by 43.7%, agriculture is still dominant in many aspects. It supports 85% of the labor force, 86% the total external earning; supplies 70% of raw material requirements for domestic industries (EEA, 2013)

However, the Ethiopian agriculture has suffered from poor cultivation, lack of appropriate technology, frequent drought, soil degradation, poor infrastructure, and weak markets. The problem posed by frequent droughts was enormously huge. As the agricultural sector mainly depends on rainfall, a shock (un-seasonality and variation in amount) is followed by a devastating impact on the entire economy. The droughts that occurred in 1973/74, 1984/85 exposed many farmers to starvation. Especially, the 1974/75 and 1984/85 were very severe in that many farmers lost their lives due to famine (Kassahun, 2009)

Given such patterns, deviating from the traditional growth models like the Neo classical growth model which failed to answer questions regarding

growth and development in low income countries including Ethiopia, sounds right (Pal, 2012). The role played to the Ethiopian economy by weather conditions is indispensable; its inclusion in to the model is critical. Moreover, foreign aid, socio-cultural and institutional variables are issues that need to be assessed to better understand the sources of growth in the Ethiopian economy. Few studies have been conducted under this topic. Two of them are Seid (2000) and Tigabu (2005). These studies have contributed by including non- traditional factors like rain fall. But, there is still a long way to go in order to identify the determinants of growth in Ethiopia.

Objectives of the Study

The grand objective of this research is to investigate the determinants of economic growth in Ethiopia.

Specific objectives: the study has the following specific objectives:

- To indicate the main sources of growth to the Ethiopian economy for the period 1981-2011
- To assess the significance of foreign aid to the Ethiopian economy
- To examine the impacts of population and terms of trade on the economy

Scope of the Study

The study assesses the sources of economic growth in Ethiopia for the period 1981-2011. The variables treated here are very few when compared to the several factors affecting growth in Ethiopia this is for the sake of manageability. Time, finance, and inaccessibility of data were the major constraints. Despite all these problems, the study tried its best to effectively utilize the available data and employed appropriate techniques in order to come up with reliable findings.

Significance of the Study

Identifying the sources of growth in Ethiopia is enormously important. But, researches in this area are limited. If the country is to improve the lives of its citizens by alleviating poverty, appropriate studies on the determinants of growth will immensely contribute by indicating more relevant variables that are critical in ensuring sustainable growth and development. Therefore, this study will serve as an input for policy makers and as a future focus area for future researches.

Methodology of the study

Data Type and Source

This study employs secondary data for the period 1981-2011. To achieve the objectives set, data from CSA, EEA, NBE, IMF, and the World Bank in both printed and electronic form were important ingredients.

Method of Data Analysis

In this research, techniques of analysis ranging from simple descriptive analysis to advanced econometrics (OLS) method are employed. The descriptive include averages, percentiles, variances and standard deviation. While the main tool of this study is the econometrics approach, attempt has been done to visualize the state of variables (both dependent and explanatory) using descriptive statistics. Here and percentages are vital devices.

The Model

The extended Solow model by the addition of human capital is given in the following aggregate production function which is in a Cobb-Douglass form (Mankiw et al, 1992)

$$Y_t = A_t L_t^{\alpha} K_t^{\beta} H_t^{\gamma} \quad \text{---------- (1.1)}$$

Where Y_t = rear GDP at a given time, t.

A_t = Technology factor

L_t = labor force (the number of hours worked in the economy) at a given time, t.

K_t = physical capital stock (equipments, production facilities and son) at a given time,t.

H_t = human capital stock at time, t.

A, β, and γ are elasticities of Y with respect to L_t, K_t , and H_t respectively.

This model can further be extended to reasonably represent the production functions of countries like Ethiopia. Non-conventional factors such as rainfall, foreign aid, remittance are a key to the performance of Ethiopia. The state of a country in the international trade as approximated by variables such as terms of trade does influence the growth process. As noted earlier, the Ethiopian economy highly depends on agriculture. This makes capital accumulation dependent on the amount of rainfall. As a result capital stock at time, t is a function of the amount of rainfall at time, t, (R_t)

$$K_t = f(R_t) \quad \text{---------- (1.2)}$$

The capital stock is also dependent on foreign currency holdings. This in turn depends on the amount of foreign aid and terms of trade. This is given as follows

$$K_t = f(T_t, F_t,) \text{ ---------- (1.3)}$$

Where T_t=terms of trade at time,t.

F_t= foreign aid at time, t.

By combining equations (3.2) and (3.3)

$$K_t = f(R_t, T_t, F_t, Ka_t) \text{ ---------- (1.4)}$$

Where Ka_t=autonomous capital stock at a given time, t.

Assuming that aggregate capital stock for the Ethiopian economy takes the familiar Cobb-Douglass form.

$$K_t = , Ka^{\beta 1}{}_t R^{\beta 2}{}_t, F_t^{\beta 3}, T_t^{\beta 4} \text{ ---------- (1.5)}$$

$$Y_t = A_t L^{\alpha}{}_t (Ka^{\beta 1}{}_t R^{\beta 2}{}_t, F_t^{\beta 3}, , T_t^{\beta 5})^{\beta} H^{\gamma}{}_t{}_t$$

This can be rewritten as

$$Y_t = A_t L^{\alpha}{}_t \, Ka^{\theta 1}{}_t R^{\theta 2}{}_t, F_t^{\theta 3}{}_, T^{\theta 4}{}_t H^{\gamma}{}_t \text{ ---------- (1.6)}$$

Where $\theta 1 = \beta 1\beta$, $\theta 2 = \beta 2\beta$, $\theta 3 = \beta 3\beta$, and $\theta 4 = \beta 4\beta$,

Equation (3.6) can rewritten in a stochastic form

$$Y_t = A_t L^{\alpha}{}_t \, Ka^{\theta 1}{}_t R^{\theta 2}{}_t, F_t^{\theta 3}, , T^{\theta 4}{}_t H^{\gamma}{}_t{}_t e^{\mu t} \text{ ---------- (1.7)}$$

Where 'e' is the base of natural logarithm and 'μ_t' is a stochastic term. From equation (3.7) it is clear that the relationship between the real GDP (Y_t) and

the explanatory variables is non-linear. However it can be transformed in to logs so that linearity is possible. Therefore,

$Y_t = \ln A_t + \alpha \ln L_t + \theta 1 \ln Ka_t + \theta 2 \ln R_t + \theta 3 \ln F_t + , + \theta 4 \ln T_t + \gamma \ln H_t + \mu_t$ ------- (1.8)

As labor is a positive fraction of the total population, the following equation can be formulated.

$L_t = a P_t$ where $0 < a < 1$ and Pt =population at time, t.

$L^{\alpha}_t = (a P_t)^{\alpha}$

$\ln L^{\alpha}_t = \ln (a P_t)^{\alpha}$

$\alpha \ln L_t = \alpha \ln a + \alpha \ln P_t$ ---------- (1.9)

By inserting equation (3.9) in to (3.8). The following formula can be written.

$Y_t = \ln A_t + \alpha \ln a + \alpha \ln P_t + \theta 1 \ln Ka_t + \theta 2 \ln R_t + \theta 3 \ln F_t + \theta 4 \ln T_t + \gamma \ln H_t + \mu_t$

$Y_t = \theta_0 + \alpha \ln P_t + \theta 1 \ln Ka_t + \theta 2 \ln R_t + \theta 3 \ln F_t + \theta 4 \ln T_t + \gamma \ln H_t + \mu_t$ ------ (1.10)

Where $\theta_0 = \ln A_t + \alpha \ln a$.

Equation (1.10) is the model specified for this study.

Results and Discussion

Descriptive analysis

The aim of this study is to determine the long run sources of economic growth in Ethiopia. To this end, variables that are believed to be more

relevant in explaining growth are modeled in econometric analysis. Before making the econometric analysis, a brief descriptive analysis is done in order to indentify the trend of both the dependent and independent variables. Tables, Percentages, and line graphs are employed to visualize the movement of variables of interest for the period 1981-2011.

As the type of policy regime is a key in affecting variables affecting growth, attempt is made to compare the changes of variables in the Socialist regime (the Derg, 1974-1991) and the current regime EPRDF (1991-2011). The following table shows the average growth rate of per capita income and population.

Table 1: Average Growth Rates of Per capita income and population the Derg and EPRDF regimes

Period	Average Growth Rate of	
	Population	Per capita Income
1974-1991	2.82%	-0.74%
1991-2011	2.62%	4.11%

As it can be seen in table 1. Population growth is very high in both regimes. Average growth rate of per capita income is negative (-0.74%) and population growth is very high (2.82%) during the socialist regime. Relatively, growth in per capita income is better in the current regime (4.11%). The net average growth in per capita income in Ethiopia (accounting for the rapid population growth) is not satisfactory for the whole period.

The following table shows the rate at which each variable grew on average in the two distinct political regimes.

Table 2: Results showing average percentage change of both the dependent and independent variables.

Year	Average GDP growth rate	Average Population growth rate	Average Human capital Growth rate	Average Physical Capital growth rate	Average terms of trade growth rate	Average growth rate of foreign aid	Average growth rate of rainfall
1974-991	2.05	2.82	3.56	0.073	1.49	26.87	0.15
1991-2011	6.76	2.62	8.31	0.22	-1.10	32.30	-2.31

Table 2 conveys important information about the state of variables in the two regimes. For instance, the real GDP growth rate is much lower in the military regime than in the current regime, 2.05% and 6.76% respectively. This is attributed to high military expenditure and low private participation during the Derg regime and the high volatility of the agricultural sector, political instability and inappropriate policies are accountable for this low performance. On the other hand, the relative better performance of growth in the current regime is a result of favorable weather (in relative terms) and active participation of the private sector (Tadesse, 2011).

Population growth is greater than two percent in both the Derg and EPRDF regimes, 2.82% and 2.62% respectively. This implies that it takes only less

than 27 years for the population of Ethiopia to double. The negative pressure of the rapid population growth is clearly accountable for the low per capita income as indicated in table 1. The channel for this effect may be through high consumption (reducing investment) and forcing expenditure on education health to be thinly distributed-reducing investment on human capital.

The Human capital growth is 3.56% during the Derg and 8.31 % in the current regime. Similarly Physical capital grew at 0.073218% for the period 1974-1991 and 0.216405% between 1991and 2011. When it comes to terms of trade, it is positive (1.49%) in the socialist regime and negative (-1.10%) in the current regime. In the first case, imports were discouraged and taxed heavily. This may be accountable for relatively higher growth rate in the terms of trade. Even though amount of rainfall is not directly controllable by political regimes, in the above table, column eight shows that average growth rate of rainfall is positive (0.15%) for the period 1974-1991 and negative (-2.31%) for the period 1991-2011. This is an alarm for an economy like that of the Ethiopian. The rain-fed agriculture which supports about 85% the labor force and the greater share of export earnings should be transformed using modern technology if the cyclical damages from weather shocks are to be minimized.

Econometric Analysis

Before estimating the growth equation (1.10), the time series properties of the variables must be checked using different relevant tests. One way to investigate the property of time series variables is to use unit root test. Here, the Augmented-Dickey Fuller (ADF) test is employed to test for the unit-root

–the null hypothesis that says variables are non-stationary against the alternative hypothesis the variable have no unit root. If the result shows that variables are non-stationary at a level, or I (0). The second option is to check for stationary test in differences- first difference, second difference etc. If the result shows the presence of non stationarity in the data, we deal with the problem by taking the first difference of the variables in the model as their first difference may be stationary. If the result is stationary, then the variables are said to be integrated of order one, or I(1). Similarly, if the original series has to be integrated twice (i.e. taking the first difference of the differenced) and if it becomes stationary, then the original series is said to be integrated of order two, or I (2). The ADF test states that if the computed t value is more negative, we reject the null hypothesis of unit root and accept the hypothesis no unit root. The test is conducted using the log levels and the first differences of the variables.

The ADF test involves testing the null hypothesis of non-stationarity of the variables against the alternative hypothesis of stationarity. The logs of the dependent variable and independent variables in this study were tested for stationarity. All of them except human capital are non stationary at a leve, I(0). Then they were tested at first difference in which the results showed stationarity in all variables. The results of the ADF test for each of the variables at first difference are given below.

Table 3: Results of Unit Root test using ADF-Test

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.715975	0.0092

Test critical values:	1% level	-3.679322
	5% level	-2.967767
	10% level	-2.622989

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

Null Hypothesis: D(LNF) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.001426	0.0051
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

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

Null Hypothesis: LNH has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		5.855717	1.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Null Hypothesis: D(LNP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.406902	0.0016
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Null Hypothesis: D(LNR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.581061	0.0011
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Null Hypothesis: D(LNT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.169442	0.0030
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Null Hypothesis: D(LNK) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.732092	0.0001
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

The above tables shows that all the variables are stationary of order one, or I(1). First, all the variables were tested at a level, but all of them except

human capital (lnh) are non-stationary. At first difference, lnGDP,ln F, lnH, lnK,lnP, LnR, and lnT are stationary using the augmented Dickey-Fuller (ADF) test. This shows that the mean value and variances are constant.

As seen from tables 3, the null hypothesis of nonstationarity (Ho: Each variable has a unit root) can be rejected looking at ADF test result. The P-values of all the variables are less than 0.05. This implies that the null hypothesis cannot be accepted for all the variables in the logs. Thus the first differences of the variables are integrated of order one, or I (1). The results from the test suggest that all the variables are I(1) indicating that the variables are stationary at first difference.

Another decision rule here is the t-statistics. As it can be seen from the above table all the variables calculated t-values in absolute value are greater than the critical values at all the three significance levels (1%, 5%, and 10%). The more negative the calculated the t-value, the more likely the null hypothesis is to be rejected. This tells us that the null hypothesis (there exist non-stationarity) is rejected and that of the alternative hypothesis (variables are stationary) is accepted.

Co- integration Test and analysis

The differencing operation to achieve stationarity involves a loss of potential information about the long run movements of variables (Madala, 2010). Time series variables may be non stationary at a level, but their linear combination might be stationary. If the residual found is stationary of the same order, it can be said that the time series variables are co –integrated implying a long run relationship. It has been noticed that the presence of non stationarity in the variables at a level. The best way is to make the variables stationary by taking the first difference; however, valuable long–run

relationships among the variables would be lost after differencing. In the presence of co integration, the valuable long-run relationship can be preserved since estimation will not be spurious, so long as the variables are integrated by the same order and are co integrated. The study tests for the existence of a long run relationship among the variables from equation (1.10).

Here, the test employed is the Johansen –Test for cointegration. This test helps to check whether there is long run relationship or not after, applying the unit root test (test for non statinarity), the task that follows is to test for long run relationship. The long run relationship exists if and only if the variables are co integrated i.e. the integration of the variables of interest indicates that there is long-run equilibrium relationship between variables. Here, Johansen test is to be applied to test for cointegration. The null hypothesis to be tested is that there is no cointegration between variable. This is conducted in two steps. First, OLS of equation (1.10) is applied. Then follows Dickey-Fuller stationary test for residuals, u_t, from the OLS regression in step one. These residuals represent deviation from the equilibrium (fitted line). If the residuals are found to be stationary, then it means that the variables are co integrated. Similarly, if the variables are cointegrated it means that even if all variables are not stationary at a level, their linear combination is stationary. The cointegration of variables shows that variables move together in the long run. After the cointergration relationship has been established among the variables, an Error-Correction Model (ECM) is estimated to determine the dynamic behavior of the growth equation.

The residual found in the first step of estimation was tested for stationarity. At a level i.e I (0), it was found non stationary. But after differencing it

became stationary i.e. it is integrated of order one, or I(1) like most of the other variables. The following table describes the ADF test of the residual at first difference.

Table 4: ADF Test for the Residual

Null Hypothesis: D(RESID) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.395935	0.0000
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

After testing for unit root, it is found that the variables are integrated of order one, or (1). Then, estimation of the long run model was performed. There, occurs the residual term. Then it was tested for stationarity both at a level and at first difference. It has a unit root at a level, I(0). But, at fist difference, the residual is stationary as table 4.4 shows. The stationarirty of the residual has an important implication i.e. it shows that the variables are co integrated. The Johansen cointegration test for the variables indicates the presence of cointegration and also the presence of one cointegration as the variables are integrated of order one. The null hypothesis that there is no co integrating vector in the system is rejected, but the null that there exists at most one cointegrating vector of order one is not rejected at 5% level of significance. These findings establish the existence of an underlying long-run equilibrium relationship between the dependent variable, log real GDP and the independent variables.

Since the residual's stationarity has indicated that the variables have long run relationship, the Johansen Cointegration is performed.

Table 5: Results of Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.956672	209.4104	125.6154	0.0000
At most 1 *	0.859195	121.5196	95.75366	0.0003
At most 2	0.678341	66.62905	69.81889	0.0875
At most 3	0.453561	34.86971	47.85613	0.4549
At most 4	0.276363	17.94840	29.79707	0.5699
At most 5	0.230731	8.891364	15.49471	0.3755
At most 6	0.053736	1.546555	3.841466	0.2136

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.956672	87.89076	46.23142	0.0000
At most 1 *	0.859195	54.89057	40.07757	0.0006
At most 2	0.678341	31.75933	33.87687	0.0876
At most 3	0.453561	16.92131	27.58434	0.5867
At most 4	0.276363	9.057037	21.13162	0.8278
At most 5	0.230731	7.344809	14.26460	0.4492
At most 6	0.053736	1.546555	3.841466	0.2136

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
1 Cointegrating Equation(s): Log likelihood 278.3897

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNH	LNF	LNK	LNP
1.000000	-0.238628	0.141708	-0.165749	-2.090674
	(0.13254)	(0.03148)	(0.05165)	(0.21519)

The Johansen's maximum eigenvalue is presented in table 5 and determine the number of cointegrating vector. The null hypothesis is that there is no cointegrating vector: H_0: r =0 is rejected, but the null that there exist at most one cointegrating vector (H_0: r =1) is not. From the maximum eigenvalue test results, for H_o: r = 0, the reported trace statistic is 209.4104 which is greater than the 5% critical value of 125.6154, thus suggesting that the null hypothesis is rejected. Similarly, for H_o: r <=1, the reported trace statistic is 121.5196 which is also greater than the critical value of 95.75366 6. Thus, the null hypothesis that H_o: r <= 1 can be rejected at 5% level of significance. But, for H_o: r<=2, <= 3…<=6, the reported trace statistics are less than the critical value at 5% significance level. The results therefore confirm the existence of cointegration. These findings establish the existence of an underlying long-run equilibrium relationship between the dependent variable and the independent variable.

Long – Run Analysis

The main objective of this paper is to identify the long run sources of economic growth in Ethiopia for the period 1981-2011. To this end, data on variables that are believed to be more relevant in explaining economic growth in Ethiopia have been employed. These include rainfall, population, and human capital, physical capital, foreign aid, and terms of trade. Log of real GDP is regressed on the log of the above mentioned six explanatory variables. The regression result for the long run model is given below.

Estimation Equation:

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LNGDP = C(1) + C(2)*LNF + C(3)*LNH + C(4)*LNK + C(5)*LNP + C(6)*LNR + C(7)*LNT

Substituted Coefficients:

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LNGDP = 7.69358472787 + 0.00282366264003*LNF + 0.58122471171*LNH + 0.200230612782*LNK - 0.698294962005*LNP + 0.00526270176502*LNR - 0.0322289081708*LNT

Table 6: Results showing Long –Run estimation of log real GDP

Dependent Variable: LNGDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.693585	0.703974	10.92879	0.0000
LNF	0.002824	0.026489	0.106597	0.9160
LNH	0.581225	0.105249	5.522380	0.0000
LNK	0.200231	0.050434	3.970122	0.0006
LNP	-0.698295	0.210641	-3.315102	0.0030
LNR	0.005263	0.056359	0.093378	0.9264
LNT	-0.032229	0.099766	-0.323045	0.7496

R-squared	0.982480	Mean dependent var	10.94472
Adjusted R-squared	0.977910	S.D. dependent var	0.404997
S.E. of regression	0.060193	Akaike info criterion	-2.581542
Sum squared resid	0.083335	Schwarz criterion	-2.254596
Log likelihood	45.72313	Hannan-Quinn criter.	-2.476949
F-statistic	214.9687	Durbin-Watson stat	1.512395
Prob(F-statistic)	0.000000		

As table 6 indicates R^2 is 98.2% signifying that 98.2% of the variation in lnGDP in the long run is explained by explanatory variables lnF, lnh, lnK, Lnp, lnR, and lnT. All the variable but lnT have resulted as they are expected. In addition, human capital, lnH, physical capital, lnK, and population, lnP are significant i.e. the result shows that there effect is robust on the dependent variable, lnGDP.

The study expected the long run effect of foreign aid to be negative considering the effect of debt servicing on the performance of the Ethiopian economy. But the result shows that its effect is positive even though it is not

robust. But as attempted to explain the findings concerning the relationship between aid and growth, the dust has not settled down yet. Rajan et al (2006) has found a positive relationship between growth and aid. Whereas, Asteriou(2008), Feeny (2004), and Minoiu et al (2007) have found empirical evidences confirming a positive relationship between growth and foreign aid, particularly if the aid comes in the form of projects.

One reason behind the positive effect of aid on the Ethiopian economy might be that the period covered is too short to experience the negative effect of debt servicing on growth. When it comes to the results regarding the effect of foreign aid on growth, it showed that they are positively related as indicated by the coefficient (0.002824). Foreign aid in this paper includes grants and loans. If foreign aid increases by one unit, real GDP rises by 0.0028%. This shows that even if the effect of aid on the long run growth is positive, it has a very weak effect. An interesting result has come in relation to the impact of human capital on long run growth. Here, human capital is approximated using total expenditure on education for the period under study. The result as it can be seen from the table is both significant and robust. A unit rise in the level of education expenditure is expected to raise the level of real GDP by 58.12%. This is compatible with findings of Barro (1997) and Seid (2000). The sign is as expected.

Similar to that of human capital the effect of physical capital, K on the long run growth is relatively strong and significant. Physical capital, here, is proxied by gross capital formation (investment). Its sign is as expected. A change in physical capital stock affects growth positively. A one unit rise or fall raises/lowers real GDP by about 20%. This shows how the relation between growth and investment is strong in the long run. The relationship between population and economic growth is negative which is in line with expectation. Like that of human capital and physical capital, the result shows

that population strongly and significantly affects economic growth. A unit rise in the level of population decreases long run growth by 69.8%. This shows how high population growth in Ethiopia is against economic advancement in the long run. This finding is also similar to that of Barro (1997). Even though weak and insignificant the direction in which the amount of rainfall affects growth is as expected- they are positively related. The national annual average rainfall was calculated by the author using data from seventeen stations which are spread all over the country (the stations are almost representative). Ethiopia being an agrarian country, the effect of weather (rainfall) on the overall performance of the economy is believed to be huge. But, here, the influence of rain is found to be weak as compared to other variables like human capital. A one unit (mm) fall in annual average rainfall is expected to decrease the long run growth of the economy by 0.52%. Seid (2000) has found a positive relationship between growth and amount of rainfall.

The result that went against the expected is the terms of trade. It was expected to positively affect long run growth, but this is not supported by the result. This may be attributed to many factors. Many findings show those terms of trade is highly volatile in LDCs. There are empirical evidences which show that terms of trade in LDCs are not that much growth promoting. Eicher et al (2007) found that a decrease in terms of trade will have a negative effect on income and wealth. High volatility of the terms of trade reduces growth. Imported inputs make domestic capital more productive, but export prices are uncertain. Growth is negatively affected by terms of trade instability. Lutz (1994) has found evidence for the hypothesis that there is a negative relationship between terms-of-trade volatility and output growth

According to Blattman et al (2007)

> Most countries in the periphery specialized in the export of just a handful of primary products for most of their history. Some of these commodities have been more price volatile than others, and those with more volatility have grown much more slowly relative to the industrial leaders and to other primary product exporters. This fact helps explain the growth puzzle

According to Blattman et al (2007) there is no statistically significant relationship between terms of trade trend growth and income growth in the commodity-specialized Periphery. Positive terms of trade movements reduced growth in a sample of commodity exporters. Negative trends and volatility in the terms of trade depressed export revenues and capital inflows for many developing countries, creating a reinforcing cycle of current and capital account shocks which led to financial crises and poor growth. Countries with higher terms of trade volatility grow more slowly than countries with more stable terms of trade.

The Error Correction Model (ECM)

After doing the cointegration test, if variables are found integrated then follows ECM. Here, the first difference of the dependent variable is regressed on the first difference of explanatory variables and the first lag of the residual obtained from the long run model. This is done because there may be disequilibrium in the short-run. ECM is used to tie short run behavior to its longh-run dynamics.

Short Run Dynamics

Estimation Equation:

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DLNGDP = C(1) + C(2)*DLNF + C(3)*DLNH + C(4)*DLNK + C(5)*DLNP + C(6)*DLNR + C(7)*DLNT + C(8)*RESIDUAL(-1)

Substituted Coefficients:

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DLNGDP = 0.105758106198 + 0.0341338586786*DLNF + 0.393466430255*DLNH + 0.0657127635527*DLNK - 3.4808326144*DLNP + 0.00831518140549*DLNR - 0.021880281098*DLNT - 0.546115682717*RESIDUAL(-1)

Table 7: Results Showing the Short –run dynamics

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.105758	0.052158	2.027636	0.0555
DLNF	0.034134	0.018458	1.849267	0.0785
DLNH	0.393466	0.240650	1.635014	0.1169
DLNK	0.065713	0.055217	1.190082	0.2473
DLNP	-3.480833	1.480309	-2.351423	0.0285
DLNR	0.008315	0.039759	0.209139	0.8364
DLNT	-0.021880	0.079105	-0.276599	0.7848
RESIDUAL(-1)	-0.546116	0.201746	-2.706948	0.0132

R-squared	0.660244	Mean dependent var	0.049257
Adjusted R-squared	0.546992	S.D. dependent var	0.075275
S.E. of regression	0.050665	Akaike info criterion	-2.898230
Sum squared resid	0.053905	Schwarz criterion	-2.521045
Log likelihood	50.02434	Hannan-Quinn criter.	-2.780100
F-statistic	5.829868	Durbin-Watson stat	1.509597
Prob(F-statistic)	0.000746		

The R^2 for the ECM is 66.02% which means that 66.02% the variation in DlnGDP in the short run is explained by the DLNF, DLNH, DLNK, DLNP, DLNR, DLNT. The signs are as expected except for DlnT which was expected to be positive but now it is negative. The signs of coefficients are similar with the long run results. But many of the coefficients in the short run are statistically insignificant.

The error correction lag (residual (-1)) has a negative sign (-0.546116) which is desirable. It is also statistically significant because the p-value (0.0132)is less than that of 0.05. More over the Durbin-Watson statistics (1.509597) is

greater than that of R^2 (0.660244) .The implication is that the rate at which adjustment is made towards long run equilibrium annually 54.6%. In this case, the economy rectifies the disequilibrium at rate of 54.6% every year.

Conclusion and Policy Implications

Conclusion

This study examined the of sources of economic growth in Ethiopia for the period 1981 to 2011.The data employed and the results found provide information necessary to isolate and focus on determinants of economic growth. With respect to investment (capital accumulation), the evidence indicates that the growth rate of real per capita GDP is enhanced by better stimulating it. If capital accumulation increases by one unit GDP is raised by 20%. Human capital is also another important variables stimulating and sustaining economic growth in Ethiopia. If expenditure on education rises by one unit growth is accelerated by 58.12 % .Similarly, rainfall positively and significantly affects the growth performance. A unit increases in the amount of average rainfall raise GDP by 0.52 % the effect if very low though positive. This may be attributed to the small number of stations (17) for which data is available. Had there been well gathered national average, the impact of rainfall on growth would have been dealt well.

On the other hand, some variables are found to negatively affect growth. Population growth has an impending effect on growth. The effect is significant and strong. A one unit increase in population growth is found to affect growth rate by 69.8 % percent. Similarly, terms of trade is found to negatively affect long run growth of GDP in Ethiopia. This result is in fact out of the expectation. The finding by Robert Barro (1997) has showed that

terms of trade positively affects growth. But, as far as this study is concerned the relationship between growth and terms of trade is negative. One reason may be that terms of trade affects growth positively if the value of export as a result of the increase in production outweighs that of import. But in our case, terms of trade (export price/import price) has deteriorated over time. This implies that the economy is import dependent than export promoting one- leading to a negative relationship between growth in GDP and terms of trade.

Policy Implication

Given the results of the regression that shows positive effect of investment (capital formation), human capital, rainfall, and foreign aid on the long run economic growth, policy should focus to improve these variables. The government should encourage saving and investment by designing and implementing policies that encourages the citizens to save and creating conducive environment for investment. In relation to human capital, expenditure on education should increase as its effect in achieving and maintaining sustainable growth is critical. Investment on school building, teachers training, and educational facilities will have a high return. Moreover the government should work towards minimizing the dependence of the economy on rain-fed agriculture. This can be done in two ways. In the short run, policies that focus on the expansion of irrigation practices, exploitation of ground water, and environmental conservation should be done. On the other hand, the long run objective should be aligned to secure the economy from weather shocks by transforming the structure of the economy- bringing manufacturing and service sector to the front as key players in the economy.

This paper has also found a positive relationship between aid and growth. This will happen if aid funds are directed towards productive areas (sectors) where there is maximum social benefit. In contrast to the above variables, population is found to negatively affect growth. The negative effect of population can be alleviated through controlling birth by family planning mechanism. In general, the government, by manipulating these and other variables can help the economy grow and achieve sustainable development. Only then and there the miserable life of citizens due to poverty can be brought to an end.

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