

**The Determinants of Economic Growth in Ethiopia:  
A Time Series Analysis**

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**Abstract**

*The main objective of this study was to investigate the determinants of economic growth in Ethiopia during the period of 1981-2015. Co-integration and Error Correction Model were applied in order to investigate the long-run and short run relationship between the dependent variable (real GDP) and its determinants. The finding of the test shows that there was a stable long run relationship between real GDP, Physical capital, human capital, labor force and export. The empirical results reveal that both physical and human capital were found to have positive impact on economic growth both in long run and short run analysis while term of trade and foreign aid affect economic growth negatively and statically insignificant at 1 percent. However, the study found out that export of goods and service had statistically insignificant impact on economic growth with positive sign in the long run, but labor force had statistically significant impact on economic growth. This study has also an important policy implication. The findings of this study imply that economic growth can be improved significantly when the physical capital increases. Hence, policy makers and/or the government should strive to increase capital formation (gross capital accumulation) which is believed as a back bone of growth and has allocate adequate finance for human capital, which will help to work on quality of education.*

**1. Introduction**

In this part, the concept and definition with different theories of economic growth have been introduced and also the determinant of economic growth was described. The main focus of this paper was the Ethiopian economy because Ethiopia is the second-most populous country in Sub-Saharan Africa with a population of 99.4 million, and population growth rate of 2.5% in 2015 (WB: 2016). But now as World Bank studied in 2017 indicated, the population of Ethiopia reached 103,471,937. Almost 50% of Ethiopia's population is under the age of 18, and even though education enrollment at primary and tertiary level has increased significantly, job creation has not caught up with the increased output from educational institutes. Due to low job creation, the number of migrant labor is high and pay high migration cost. This high labor

migration costs tends to reduce the benefits for migrants and their families and the development potential for their countries. Therefore, the country has to create hundreds of thousands of jobs every year just to keep up with population growth.

### **1. Background of the Study**

Economic growth can be generally defined as an increase in per capital output or income over a period of time. It is an issue of primary concern to policy makers in both developed and developing countries. Economic growth is a fundamental requisite to economic development. The process of economic growth and the source of differences in economic performance across nations are some of the most interesting, important and challenging areas in modern social science (Tewodros: 2016). Development has become the primary goal of every nation. The basic function of all economic activities are to provide as many people as possible which means enough to meet basic needs and esteems. Economic growth increases the range of human choice i.e. freedom (Etsubdink: 2014).

Over the last two decades, the determinants of economic growth have attracted increasing attention in both theoretical and applied research. Economic growth is influenced by numerous factors. Population, physical and human capital, level of technology, international trade, income, etc. are considered to be source of economic growth in most countries. Human capital is the main source of growth in several indigenous growth models as well as one of the key extensions of the neoclassical model. The term human capital refers principally to work acquisition of skills and know how through education and training. The majority of studies have measured the quality of human capital using proxies related to education (Pro.George and Paschalis: 2008). Traditional explanations for growth have centered on the growth of physical and the growth of the labor force (Steve Dowrick). An educated labor force is a key determinant of economic growth (Barro, 1991; Mankiw et al, 1992; Barro and Sala-i-Marin, 1995; Brunetti; et al, 1998, Hanushek and Kinko, 2000).

There is economic difference from nation to nation, country to country, region to region. etc... In Ethiopian case, the economy is a mixed and transition economy with a large public sector. Ethiopian government is in the process privatizing many of the state-owned businesses and moving toward a market

economy. However, certain sectors such as telecommunications, financial and insurance services, air and land transportation services, and retail are considered as strategic sectors and are expected to remain under state control for the foreseeable future. The current government has embarked on a program of economic reform, including privatization of state enterprises and rationalization of government regulation. Many properties owned by the government during the previous regime have now been privatized and are in the process of privatization. While the process is still ongoing, the reforms have begun to attract much-needed foreign investment. Despite the recent improvements, Ethiopia remains one of the poorest nations in the world. High incidence of poverty, low social service facilities, exponential population growth, unemployment of labor, backward technology, low productivity, income inequality, and environmental degradation, etc. have been the characteristic feature of Ethiopian economy (Jarra: 2013). Economic growth in Ethiopia since 2003/4 demonstrates that it clearly draws and leaves behind it discernible trajectories. Ethiopia's growth trajectory as a phenomenon is least comparable with industrialized countries in the west for one fundamental and key justification (Habitamu, 2013).

The economic growth of Ethiopia has shown various changes during different political regime This difference is due to the share of different sectors. Three-fourths of the GDP growth in 2013/14 can be explained by the developments in three sub-sectors: agriculture, construction, and services. In the agriculture sector, the crop production value added increased by 6.6 percent and was significantly higher than 8.2 percent increase in 2012/13. The country performs much effort and economic activities while face some challenges.

But now a day, Ethiopia is one of the fastest growing countries in the world. Ethiopia has grown at a rate between 8% and 11% annually for more than a decade. As a result, the country is the fifth fastest growing country among the 188 IMF member countries. This growth has been driven by sustained progress in the agricultural and services sectors for almost 80% of Ethiopia's population is still employed in the agricultural sector. But services have surpassed agriculture as the principal source of GDP. Ethiopia remains a one-party state with a planned economy. In the fall of 2015, the government finalized and published the current 2016-2020 five year plan, known as the Growth and Transformation plan... GTP II emphasizes developing

manufactures in sectors where Ethiopia has a comparative advantage in exporting, including textiles and garments, leather goods, and processed agricultural products (World fact Book:2017).

## **1.2. Statement of the Problem**

Economic growth is unevenly distributed across countries over time. Countries have different level of development. As a result, living standard of citizens across countries show large gap. Some nations had achieved highest level of development while others on the bottom level of development and vicious circle of poverty, and some others on the track of fast and sustained economic growth. Thus, the difference in the level of growth and development of nations can be explained both in comparison among themselves and in terms of the time difference in one nation (Moti: 2011).

As Lonel Zamfir (2016) defined, African economic growth for the past two decades, and especially since the turn of the millennium, has represented a period of sustained economic growth for the continent. This economic boom followed two decades of economic stagnation in most Sub-Saharan African (SSA) countries, characterized in many of them by military conflicts, economic mismanagement and an unsustainable external debt. Many African countries are dependent on one or few export commodities, exposing them to external shocks. The linkage of the extractive sectors with the rest of the economy has also remained low and resource-rich countries have usually failed to diversify their economy. Thus, the jobs generated by the extractive industries have been few. This is the situation for oil in Nigeria, gold in Ghana, copper in Zambia's, cobalt in Democratic Republic of Congo's, uranium in Namibia's and Niger's, bauxite in Guinea, and until recently diamonds Botswana's. The situation is similar for agricultural exporters like Kenya, the third tea exporter in the world after China, and India, and Ethiopia, a major coffee producer. Coffee is critical to Ethiopian economy. More than 15 million people (25% of the population) derive their livelihood from the coffee sector (World Bank: 2017).

According to various scholars, Ethiopian economy differs from time to time due to the variation of population growth and due to different factors. As Fentaye studied in 2015, Ethiopia was the second populous country next to Nigeria in Africa, with an estimated population of nearly 79 million (in 2007) and a growth rate of 2.6 percent per year. Peter Mwana and Lamin Barrow

(2010) studied real GDP growth averaged 11.2% per annum during the 2003/04 and 2008/09 period, placing Ethiopia among the top performing economies in Sub-Sahara Africa. This growth performance was well in excess of the population growth rate and the 7 percent rate required for attaining the MDG goal of halving poverty by 2015. According to Alemayehu and Befekadu (2005), Ethiopia's history was full of conflict drastic, policy change, and reversals. Today, the history of Ethiopia is changing from drought, famine, war and low economic growth to fast and sustainable economic growth. Ethiopia has continued to be one of the fastest growing countries in Africa, with Business Monitor International (BMI) predicting close to a 7.5% growth maintained over the next four years. As the government pushes ahead with its Growth and Transformation of Plan (GTP), it can be expected that the GDP will peak at cloth to 3% of deficit, in order to help industries in the country attain growth over all.

Ethiopian economy can be determined by different factors. The major factors for the growth of developed countries are technology, labor, capital, etc. But these conventional determinants of economic growth can't fully explain the growth process of least developed countries (Seid: 2000). There are other more important factors that determine the growth level and rate of developing countries. These include: nature and resource endowment, political and institutional factors, historical and cultural aspect and policy issue etc. (Zerebruk: 2014). Tewodros also mentioned some macro level variables that determined economic growth. These were export: aid, inflation and external debt, which were not, addressed in other studies.

Other studies that were conducted to explain determinant of growth in Ethiopia include: a study by Aysha (2013), Jalene (2013), Hailesellasi (2013), and Lebse (2013). But they were interested in examining the link between economic growth and only single determinant of growth such as foreign aid, foreign trade, government budget deficit, and domestic saving respectively which were less representative in explaining growth (Feyisa: 2014). Feyisa concluded that actual labor force is insignificance in both long run and short run of economic growth. But this paper considers the contribution of labor in economic growth of Ethiopia. Because, Ethiopia is more populous country and some labors are unemployed. These unemployed and employed labors have some impact on economic growth. Due to the

unemployment, labors migrate into different countries. This international labor migration has emerged as a major global issue and ranks high on international, regional and national policy agendas. Patterns of migration are evolving rapidly, with the result that most countries are countries of origin, transit or destination.

Labor migration can be a vehicle for responding in a timely and effective manner to labor market needs and changes, for stimulating innovation and development, as well as for transferring and upgrading skills. So, this thesis focuses on the relationship between population capital, labors employed, labors unemployed, and income distribution with economic growth.

### **1.3. Research Questions**

The research sought to provide answers to the following research questions:

- What are the determinant factors for economic growth in Ethiopia?
- What is the contribution or the impact of labor force for economic growth?
- What is the relationship between labor force and economic growth?

### **1.4. Objective of the Study**

The main objective of this paper was to examine the determinant of economic growth in Ethiopia. The study specifically tried to:-

- Analyze the major determinant factors of economic growth;
- Asses the relationship between economic growth and determinant factors;
- See the contribution of labor force for economic growth in Ethiopia.

### **1.5. Significance of the Study**

Understanding the contribution of labor force in economic growth leads to knowing the behavior and effects of growth by depending up on economic structure. Therefore, this study has tried to provide comprehensive evidence on the selected determinants of economic growth in Ethiopia during the periods of 1981-----2015. It has attempted to analyze the growth process of the countries by giving due attention to the determinants of growth.

## **1.6. Organization of the Paper**

The remaining part of this paper has been organized into four chapters. The second chapter deals with the related theoretical and empirical literature reviews. The third chapter tries to address methodological frame work of the study. The fourth chapter presents data results and analysis of the study. The last chapter, chapter 5 presents conclusion and recommendations.

## **3.1. Methodology of the Study**

This section presents a simple growth model that attempted to capture some of the major macroeconomic factors affecting economic growth in Ethiopia. Understanding the characteristics and determinants of economic growth requires an empirical framework that can be applied to a relatively long time frame. Methods of data analysis, source of data and model specification were also explained in this section.

### **3.1.1. Methods of Data Analysis**

In this research, techniques of analysis ranging from simple descriptive analysis to advanced econometrics (OLS) method were employed. The descriptive analysis includes averages, percentiles, variances, and standard deviations. While the main tool of this study was the econometrics approach that the study attempted to visualize the state of variables using descriptive statistics. The descriptive part explained the trend of the economy by using graphs and tables whereas the econometrics part applied time series regression mechanism.

### **3.1.2. Source of Data**

This study employed secondary data for the period of 1981-2015 by using time series data. The data were taken from journals, books and annual reports of different organizations mainly from Ministry of Finance and Economic Cooperation (MOFEC), National Bank of Ethiopia (NBE) and Central Statistical Authority (CSA).

For this study the following data sources were used:

- The data that described about labor force and gross capital accumulation were collected from Central Statistical Authority (CSA).
- Data for real GDP was collected from Ministry of Finance and Economic Cooperation (MOFEC).

- The data for total export, term of trade and expenditure for education were collected from National Bank of Ethiopia (NBE)

### **3.1.3. Model Specification**

A number of factors affect the economic growth in Ethiopia. These factors include: natural resources, investment, human capital, innovation, technology, economic policies, foreign aid, trade openness, institutional framework, foreign direct investment, political factors, socio-cultural factors, geography, demography and many others. Understanding characteristics and determinants of economic growth requires an empirical framework that can be applied to a relatively long time frame. To examine the empirical evidence of the macroeconomic determinants of economic growth in Ethiopia, the study considered most of these factors. But most of them could not be quantified. Even among the quantifiable, it is difficult to have reliable and timely data. Due to this fact, this study tried to pick out what were considered to be major factors in explaining the performance of the Ethiopian economy namely: labor, human capital, and physical capital, term of trade, foreign aid and export. Origin of the econometric model is extended neoclassical growth model. Thus:

$Y=f(PK, Lf)$ , Where,  $Pk$  and  $Lf$  represents Physical capital and human capital, respectively.

Studies like Patrick Enuet *al.* (2013), Biswas and Saha (2014) applied similar economic function to analyze macroeconomic determinants of economic growth in Ghana and India respectively. Moreover, the variables were preferred based on their relevance and data availability. Therefore, the mathematical relationship between real GDP and its major macroeconomic determinant were expressed as follows.

$Y=f(L, K, H, T, F, EX)$   $YT=$ , Where,

$Y_t$ =Real GDP at a given time,  $t$

$L_t$ = Labor force at a given time,  $t$

$K_t$ = Physical capital stock (capital accumulation) at a given time,  $t$

$H_t$ = Human capital (expenditure for education) at a given time,  $t$

$T_t$ = Term of trade at time,  $t$

$F_t$ = Foreign aid at time,  $t$

$Ext$ =Total export at a given time,  $t$



Stochastic form at a given time,  $t$

The relationship between variables and GDP is not linear. So it can be transformed into logarithm function. I.e. to test the long run relationship between dependent variable (real GDP) and independent variable (labor, physical capital, human capital, and term of trade, foreign aid and export); the study first investigated the time series properties of our data by using Augmented Dickey-Fuller (ADF) tests by checking the stationarity of the variables under unit root test.

### **3. Descriptive and Econometric Analysis**

#### **3.1. Over view of Ethiopian Economy**

The Ethiopian economy has continued to register high overall economic growth in the first year of implementation of the GTP. During 2010/11, real GDP growth rate stood at 11.4 percent which was well above the target and previous year performance by 0.4 percent and 0.8 percent respectively. This sustainable growth rate of real GDP explained the availability of prudent macro economy and sectorial policies and implies that Ethiopia will achieve MDG targets. The growth rates of the GDP by major economic classification during the period under review indicated that agriculture, industry and services had registered growth rates of 9 percent, 15 percent and 12.5 percent, respectively (MOFED: 2012).

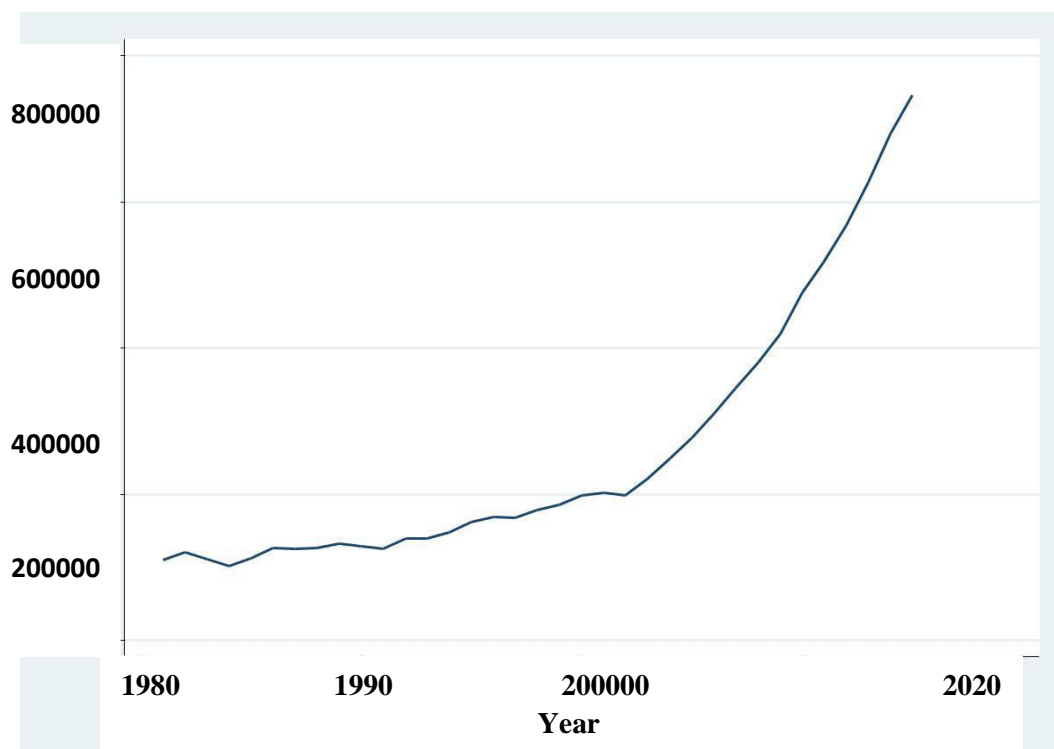
##### **3.1.1. Trends in Ethiopian Real GDP Growth**

Ethiopia has experienced strong economic growth in the recent years with real GDP grows faster or near double-digit level since 2003/2004. Ethiopia has consistently outperformed most in Africa and other countries and has expanded much faster than the continent. At the same time, the country still faces some structural weakness that present significant challenge in the medium term.

The available evidence indicates that the rate of economic growth over the last three decades has been unsatisfactory. Regardless of the policy regimes, real total GDP grew on average by 3.0%, per annum during the period 1980/81-2000/2001. During 2010, the country had registered 11.4 % real GDP growth rate surpassing the GTP target of 11 percent. But in recent time, International Monetary Fund (IMF) has ranked Ethiopia as among the five fastest growing

economies in the world. After a decade of continuous expansion (during which real GDP growth averaged 10.8% per annum), in 2013/14 the economy grew for its 11<sup>th</sup> consecutive year posting 10.3% growth.

**Figure 4.1: Trends of Ethiopian Real GDP Growth in Millions of Birr from 1981-2015**

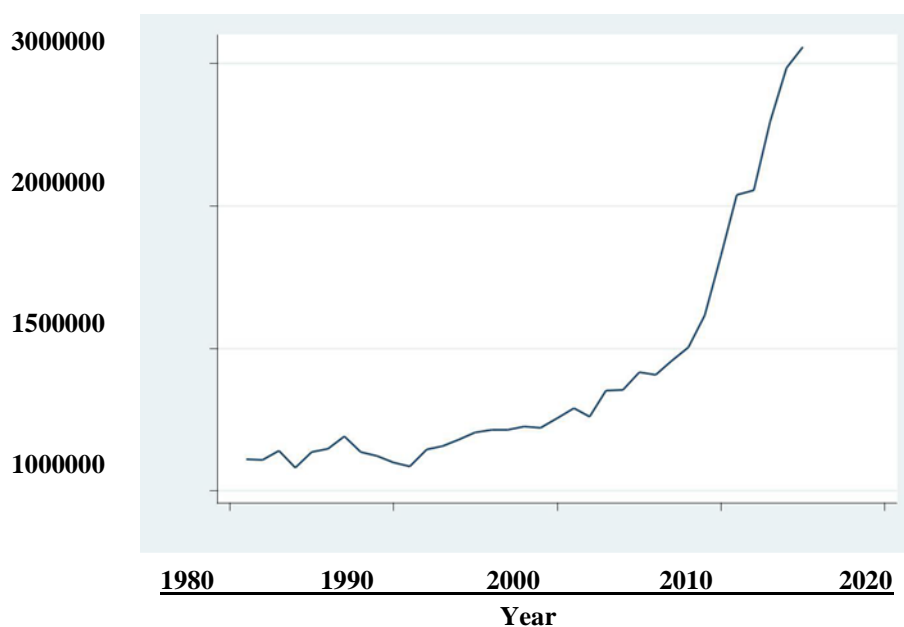


*Source: Data from MOFEC*

### **3.1.2. Trends in Ethiopian Physical Capital Growth**

As described in the description of determinants, physical capital has major contribution for economic growth. This physical capital can be measured as accumulation of capitals for that country. The growth rate for physical capital from 1980-1985, 1985-1990, and 1990-1995, was 2.4%, -2.7%, and 10.7% respectively. This paper has tried to show physical capital by using graphical representation.

**Figure 4.2: Trends of Ethiopian Physical Capital Growth in Millions of Birr from 1981-2015**

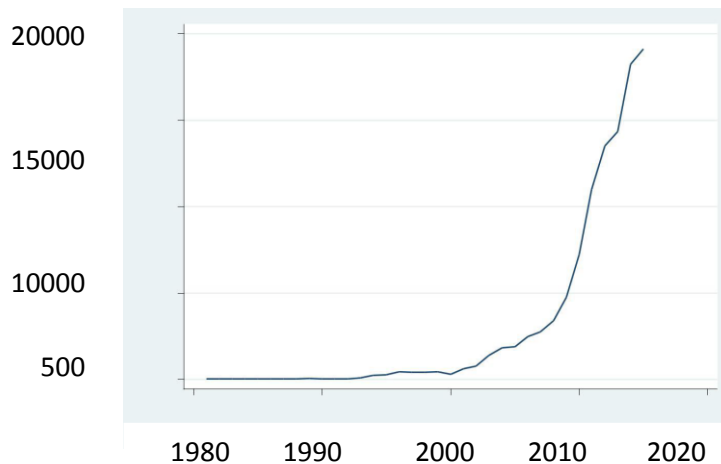


Source: Data from CSA

### **3.1.3. Trends in Ethiopian Human Capital Growth**

Most of the time expenditures (both recurrent and capital) of health, education and training are employed to measure human capital, which are the major driving force of economic growth. But this paper focused on government expenditure for educational purpose. The total budget allocated to education in 1981 was 22.7 Million Birr (i.e. 0.02 percent of GDP) and reached 19121.04 Million Birr (2.6 percent of GDP) in the year of 2015, which showed that the government consideration was on education (own calculation from collected data from NBE). Parallel to fast growing in human capital expenditure, economic growth was also robust and registered 8 percent annual growth in 2015..

**Figure 4.3: Trends of Ethiopian Human Capital Growth in Millions of birr from 1981-2015**

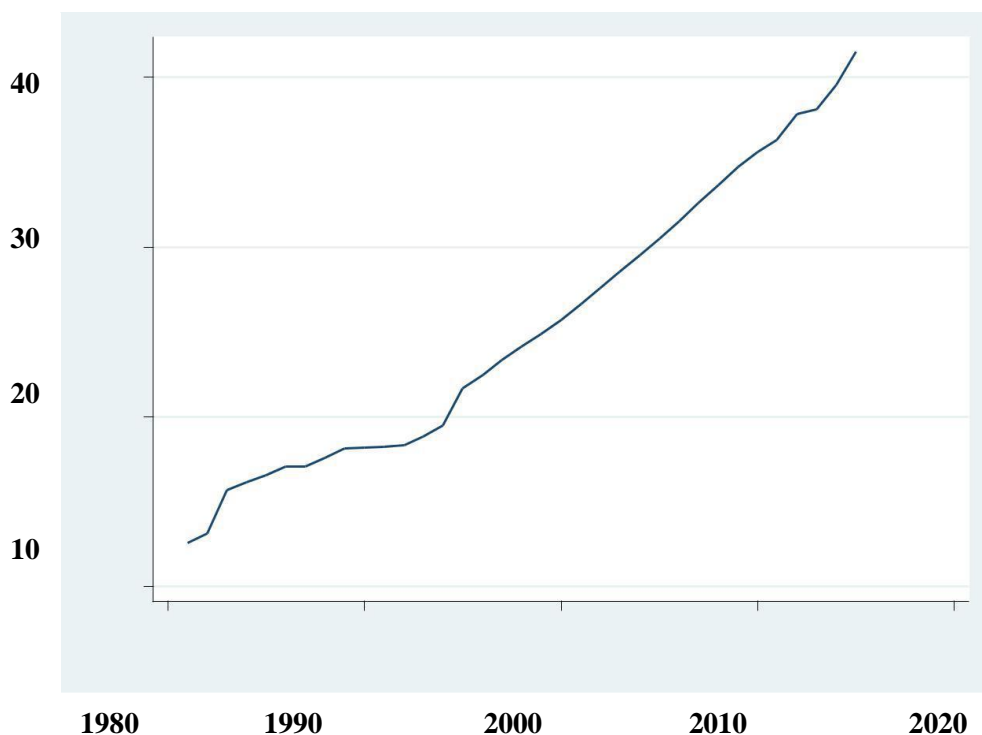


Source: Data from NBE

### **3.1.4. Trends in Ethiopian Labor Force Growth**

Whether they are subsistence farmers, salaried workers, or self-employed entrepreneurs, poor people derive most of their income from work. This basic fact means that the level of employment, the quality of jobs, and the access which the poor have to decent earnings opportunities will be crucial determinants of poverty reduction. The intuition that jobs matter for development has not been lost on the governments of low income countries and the vast majority of national development strategies look to employment generation as a major channel for poverty reduction (Katy Hull: 2009). Since there is strong evidence to suggest that labor markets in developing countries are usually segmented between “more productive” and “less productive” jobs sectors.

**Figure 4.4: Trends of Ethiopian Labor Force Growth in Millions of Birr from 1981-2015**

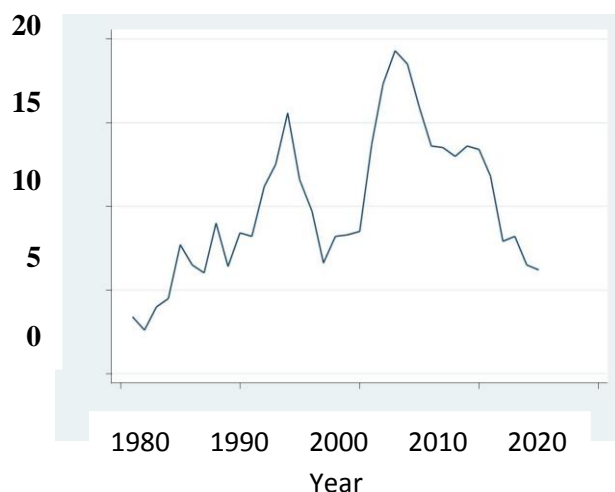


Source: Data from CSA

#### **4.1.5. Trends in Ethiopian Foreign Aid Growth**

As we observed from the graph below (Figure 4.5), even though the Aid Ratio to real GDP continuously grew from -32% in 1997 to 11.6% (the highest ratio) in 2003, the economic growth fluctuated, which registered the highest growth rate (11.7%) in 2003 and lowest growth rate (0.79% below zero point) in 1997. Aid was served for consumption of the society rather than financing economic developments. However, aid ratio to real GDP decreased to 4.6% (below zero) in 2015, the economic growth also went in the same direction and registered growth rate of 8% for the period of 2015.

**Figure 4.5: Trends of Ethiopian Foreign Aid Growth in Millions of Birr from 1981-2015**



Source: Data from MOFEC

### **Econometric Analysis**

Many economic time series have common tendency of growing over time. In many cases, time series processes appear to be correlated simply because they all are tending over time for seasons related to observable factors. Ignoring this fact may lead one to falsely conclude that changes in one variable are caused by other variables (Wooldridge: 2003). Models based on time series data are used for forecasting. But its validity depends on the stationary of time series variables. Therefore, researches employing a time series data must be subject to stationary tests. Most economic time series variables are non-stationary unless differenced. Therefore, one solution for the problem of non-stationary is to use the difference of variables.

#### **4.2.1. Unit Root Test**

A standard classical method of estimation that are used in the applied time series economics work are based on a set of assumptions, and one of which is the stationary of the time series variables. A time series data is said to be stationary if its mean and variance are constant over time and the value of covariance between time periods depends only on the disturbance or lag between the two periods and not the actual time at which the covariance is computed (Gujarati, 1995). Time series data are rarely stationary in level

forms. If a time series is not stationary in the sense just defined, it is called a non-stationary time series. In other words, a non-stationary time series will have a time varying mean and variance or both. Here, the ADF test is employed to test for the unit root, the null hypothesis that say variables are non-stationary against the alternative hypothesis. The variables 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-stationary 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  $I(2)$ .

As Gujarati (2004) has noted, different methods can be used to test for the stationarity of a series, but unit root test is the recently developed and widely used test of stationery. Dickey –Fuller (DF) and Augmented Dickey-Fuller (ADF) tests are the two methods, among other, that are used to test for the existence of unit roots. In this study, the variables of the model were tested for unit roots using ADF-test which augments DF test by lags of the dependent variable.

The ADF test involves testing the null hypothesis of non-stationery of the variables against the alternative hypothesis of stationary. The logs of the dependent and independent variables in this study were tested for stationary. All of them except gross domestic product ( $Lnyt$ ) and term of trade ( $Lntt$ ) are non-stationary at a level  $I(0)$ . Then, they were tested at first difference in which the results showed stationary in all variables.

The results of the ADF test for each of the variables at level and at first difference are given below.

**Table 4.1: Result of Unit Root Test Using ADF-Test**

Variables	At level	P-value	Decision	At 1 <sup>st</sup> difference	P-value	Decision
Ln yt	3.020	1.000	S**	-4.060	0.011	S*
Ln kt	0.378	0.9807	NS	-7.490	0.0000	S*
Ln ht	0.204	0.9725	NS	-5.491	0.0000	S*
Ln lt	-1.231	0.6603	NS	-5.053	0.0000	S*
Ln tt	-6.177	0.000	S*	-11.423	0.0000	S*
Ln ft	-2.193	0.2088	NS	-6.056	0.0000	S*
Ln ext	0.254	0.9751	NS	-5.515	0.0000	S*

S\*=Stationary at 1%

S\*\*=Stationary at 5%

S\*\*\*=Stationary at 10%

NS=Non-Stationary

The above table shows that all the variables were tested at a level. But all of them except gross domestic product (Lnyt) and term of trade (Lntt) are non-stationary. Lnyt is stationary at 5% and 10% in order 0, or I (0) and Lntt is stationary at all the three significance level (1%, 5% and 10%) in order 0, or I (0). But all the variables are stationary of order one, or I (1). That is, Lnyt, Lnkt, Lnht, Lnlt, Lntt, Lnft and Lnext are stationary using the augmented dickey fuller (ADF) test. As seen from table 4.1, the hypothesis of non-stationary (H0: each variable has a unit root) can be rejected looking at ADF test result. The p-value of all the variables are less than 0.05 in orders one, or I (1). This implies that the null hypothesis cannot be accepted for all the variables in the logs. Thus, the first difference of the variables are integrated of order one, or I (1). The result from the test suggests that all the variables indicate that the variables are stationary at 1<sup>st</sup> 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 value at all the three significance level (1%, 5%, and 10%) in order one, or I (1). The more negative the calculated t-value, the more the null hypothesis (the existence of non-stationary) was rejected and that of the alternative hypothesis (variables are stationary) was accepted.



#### **4.2.2. Multicollinearity Test**

Multicollinearity refers to a situation where a number of independent variables in a multiple regression model are closely correlated to one another. Multicollinearity occurs when two or more predictors in the model are correlated and provided redundant information about the response. Multicollinearity can lead to skewed or misleading results when a researcher or analyst is attempting to determine how well each one of a number of individual independent variables can most effectively be utilized to predict or understand the dependent variable in a statistical model. In general, multicollinearity can lead to wider confidence intervals and less reliable probability values (P values) for the independent variables. The existence of the problem of multicollinearity is tested using correlation coefficient test and variance inflation factor (VIF). Correlation above 0.8 between independent variables indicates the existence of problem of multicollinearity. Furthermore, VIF above 10 shows the existence of multicollinearity (Guajarati, 2007).

**Table 4.2: Result of Multicollinearity Test at a Level**

Variable	VIF	1/VIF
Lnlt	28.89	0.034609
Lnkt	24.67	0.040535
Lnht	36.68	0.027262
Lntt	1.23	0.815997
Lnft	3.17	0.315186
Lnext	8.32	0.120218
Mean VIF	17.16	

From the above result, we have seen that the variance inflation factor (VIF) is 17.16 which is greater than 10; implying the presence of multicollinearity problem.

#### **Remedial for Multicollinearity Test:**

There are two methods for solving multicollinearity problems. These do nothing or follow some rule of thumb. For simplicity, rule of thumb was used in this paper. Dropping variable/variables that cause the problem of multicollinearity may cause an omitted variable bias. Therefore, to solve these problems, first difference in logarithm form was involved.

**Table 4.3: Result of Multicollinearity Test at First Difference**

Variable	VIF	1/VIF
Ln11	1.03	0.971078
Lnk1	1.11	0.904448
Ln1	1.07	0.933230
Ln1	1.03	0.967961
Ln1	1.07	0.938209
Lnex1	1.13	0.887528
Mean VIF	1.07	

As we have seen from the table above, the value of VIF (1.07) is less than 10; implies the absence of multicollinearity problem.

### 3.2.3. Heteroscedasticity Test

The existence of heteroscedasticity is a major concern in the application of regression analysis including the analysis of variance, as it invalidate statistical tests of significance that assume the modeling errors are uncorrelated and uniform; hence their variances do not vary with the effects being modeled. Heteroscedasticity relates the distribution of the disturbance term, when the distribution of the error term is not the same for varies observations (i.e. if the errors do not have a constant variance i.e. var (then the disturbance term is said to be subject to heteroscedasticity).

If the value of probability (p) is less than 0.05, then heteroscedasticity problem exists. But if the value of p is greater than 0.05, heteroscedasticity problem is not involved between the regresors. In this research, the results in stata calculation during testing of the heteroscedasticity problem the value of p is 0.1808 which is greater than 0.05, implies that no heteroscedasticity problem between the repressors. Therefore, the regresors have constant variance, implying that homoscedasticity of the variables.

### 3.2.4. Co-Integration Test

Time series variables may be non-stationary at a level, but their linear combination might be stationary. That is, co-integration means that despite being individually non-stationary, a linear combination of two or more time series can be stationary (Gujarati: 1996). And also, if the residual found to be 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-stationary in the variables at a level.

The best way is to make variables stationary is by taking the first difference; however, valuable long run relationships among the variables would be lost after differencing. The test that employed for co-integration was the Engle-Granger test. This test helped to check whether there was long run relationship or not. After, applying the unit root test (test for non-stationary), the task that followed was to test for long run relationship. The long run relationship exists if and only if the variables are co-integrated i.e. the integrations of the variables of interest indicates that there is long run equilibrium relationship between variables. If the residuals are found to be stationary, then it means that the variables are co-integrated. Similarly if the variables are co-integrated, it means that even if all variables are not stationary at a level, their linear combination is stationary.

**Table 4.4: Result of Co-integration Test by Using Unit Root Test of Residual**

Tests	Z(t) value	P-Value of Z(t)
Test Statistic	-2.696	0.0747
1% Critical Value	-3.689	
5% Critical Value	-2.975	
10% Critical Value	-2.619	

From the above table 4.4, we have understood that, the residual is stationary at critical value of 10% because absolute value of test statistic 10% is critical value. Therefore, if the residuals are found to be stationary, then it means that the variables are co-integrated at critical value of 10%, implying a long run relationship. In addition to the residual test method, co integration of the variable can be also tested by using F-test. By using of F-test the long run relationship is detected between the regresors. As it can be calculated in the stata form the probability, F-table is greater than F-statistics is 0.0000. This implies that F-statistics can be greater than f-table with a probability of 1. We reject the null hypothesis that has no long run relationship. So there is long run relationship between the regresser.

### **3.2.5. Long -Run Analysis**

The model specified for estimation purpose has been the following, as in chapter three specified. Estimation equation:-

Substituted coefficient:-

Where:  $\alpha$  = is a constant term  $\epsilon$  is an error term

**Table 4.5: Results Showing Long –Run Estimation of Log Real GDP**

Variables	Coef.	Std.Error	T-statistic	Prob	95% conf.	Interval
LnLt	0.5698079	0.2580224	2.21	0.036	0.0412729	1.098143
LnKt	0.3573535	0.0954545	3.74	0.001	0.1618239	0.5528831
LnHt	0.0461963	0.044641	1.03	0.310	-0.0452466	0.1376392
LnTt	-0.008765	0.0159718	-0.55	0.580	-0.0414819	0.0239517
LnFt	-0.119055	0.0601539	-1.98	0.058	-0.2422749	0.0041645
LnExt	0.009221	0.0125261	0.74	0.468	-0.0164375	0.0348795
Constant	6.486077	0.9173828	7.07	0.000	4.606903	8.36525

R-Square = 0.9795

Adjusted R-Square = 0.9751

No of observation = 35

In the above table 4.5, the coefficient of determination (R-squared) is high explaining about 98 % of variation in the real GDP. It is attributed to variations in the explanatory variables in the model. All coefficients have the anticipated signs indicating that labor force, physical capital, human capital and exports positively affect output while term of trade and foreign aid is negatively related with output. This shows that the much dependency on foreign aid for different activities of the country has negatively affected the growth of the economy.

As a result, we can infer that in the long run an increase of labor force by 1% leads to increase of economic growth by 0.57%. A 1% increase in the physical capital which is peroxide by gross capital accumulation has resulted in 0.36% change in real GDP under the study period. Real gross domestic product (GDP) increases by 0.05% due to a 1% change in human capital which is peroxide by expenditure for education. This shows that the expenditure for education does not affect economic growth in Ethiopian context. On the other hand a 1% increases in term of trade and foreign aid led to 0.01% and 0.12% decrease in economic growth (GDP) respectively.

### 3.2.6. Short-Run Analysis

To analyze the short run regression, the study considered error correction model which has both the long run and short run information. It has been explained by using the difference of the entire variable with their respective lag including one period lagged error correction term. Finding the long-run estimation result of the time series data is only the first step in economic analysis, so one should give information about the short-run result of the series. This analysis was usually done after differentiating the variables. However, differenced variables give only the short run dynamics. Therefore, there exists a loss of potential long run information regarding the differenced variables, which are the sources for economic theories to formulate economic model. Thus, the most appropriate technique is an Error Correction Model (ECM), which contains both the short-run and the long-run properties of the model, with disequilibria as a process of adjustment to the long-run model. The error correction term (ECM) indicates the speed of adjustment to restore equilibrium in the dynamic model. It is a one lagged period residual obtained from the estimated dynamic long run model. The coefficient of the error correction term indicates how quickly variables converge to equilibrium. Moreover, it should have a negative sign and statistically significant at a standard significant level (i.e. p-value should be less than 0.05).

Estimation equation: - Or, Substituted coefficient:-

Where = is a constant term = is lag of an error term

Variables	Coef.	Std. Error	T- statistic	Prob	95% conf.	Interval
Ln11	-0.4105073	0.2610911	-1.57	0.128	-0.9471878	0.1261733
Lnk1	0.1902583	0.0415497	4.58	0.000	0.1048517	0.2756649
Lnh1	0.0226686	0.0256445	0.88	0.385	-0.0300436	0.0753808
Lnt1	-0.0018473	0.0047889	-0.39	0.703	-0.0116911	0.0079964
Lnfl	-0.1051425	0.0331731	-3.17	0.004	-0.1733307	-0.036954
Lnex1	-0.0020747	0.0063515	-0.33	0.747	-0.0151303	0.010981
	-0.1178372	0.1020803	-1.15	0.259	-0.3276661	0.0919918
Constant	0.054063	0.0131276	4.12	0.000	0.0810472	0.0810472

prob>F = 0.0024      Root MSE = 0.04523      F (7, 26) = 4.41

R-Square for the ECM is 54.29% which means that 54.29% the variation in lny in the short run is explained by the ln11, lnk1, lnh1, lnt1, lnfl and lnex1.

The signs are expected, except  $\ln l_1$ , which was expected to be positive but now it is negative. The signs of the coefficient for labor force and export are different with the long run results. Like long run results, many of the coefficients in short run are statistically insignificant. But physical capital and foreign aid have statistically significant in the short run.

The error term is included in this model with in the lagged form. This has an implication on the adjustment. That is the coefficient of the error term shows the speed of going back to equilibrium. From this investigation, the error term has coefficient of -0.1178372. This implies the deviation from the long run real GDP in the current period will be corrected by -12% in the next period(s). From the above table we have seen that the error term has a negative sign and statistically insignificant at a standard significant level.

#### **4. Conclusion and Policy Implication**

##### **4.1. Conclusion**

The main objective of this study was to analyze the determinants of economic growth in Ethiopia during the specified period. As a result, real GDP and term of trade variables are stationary (no unit root problem) at a level. But all the variables are stationary in first difference. The empirical result showed that physical capital (gross capital accumulation), human capital (expenditure of education), labor force and export are found to have positive impact on Ethiopian economy in long run, but in short run physical capital and human capital have positive impact on Ethiopian economy.

A one percent increase in physical capital (gross capital accumulation) results in 0.36 and 0.19 percent increase in real GDP in the long run and short run, respectively. Likewise, a one percent increase in human capital (expenditure for education) will result in 0.05 and 0.02 percent increase in real GDP in long run and short run, respectively. Term of trade and foreign aid have negative impact in economic growth during the study period in both long run and short run. The finding by Fentaye Setargie (2015) has showed that foreign aid positively affects economic growth. But as far as this study is concerned, the relation between growth and foreign aid is negative. However, the study found out that export of goods and service has statistically insignificant impact on economic growth with positive sign in the long run and labor force has statistically significant impact on economic growth with positive sign in the

long run by increasing real GDP with 0.56%. From this, one can understand that so far the GDP of Ethiopia is more affected by labor force in the long run.

#### **4.2. Policy Implication**

As many empirical literatures have concluded, the economic growth of Ethiopia when compared to other nations is low. As a result, the current government is emphasizing on economic growth especially using labor force. Because of the very reason, the government has promised to increase the employment level, which is one of the millennium development goals (MDGs). By the outcome of the long run and short run improvement of physical and human capital, the productivity and economic growth of Ethiopia improves. This shows us that to achieve economic growth it is also necessary to consider the structural and institutional transformation which goes with the development of gross accumulation of capital and increasing the expenditure on education sector in a proper manner.

**Given the strength in promoting economic growth in Ethiopia, the following points have been recommended:**

- The Ethiopian term of trade and foreign aid system should be organized so as to accelerate the effects of exchange rate in the economic growth of Ethiopia. Because as we have seen in the long run and short run analysis, term of trade and foreign aid have negative impact for economic growth in Ethiopia.
- The government should focus on the emphasis of gross accumulation of capital and the expenditure of money for education.
- Government of Ethiopia should motivate export of goods and services in long run analysis. This adds to the country's national income and in general promotes the real GDP.
- In Ethiopian context, Ethiopian economy is labor intensive. Therefore, the government should focus on job opportunity for labor. If this condition is fulfilling, economic growth will achieve the targeted goal. This improves economic well-being of the country.

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