

# Export Performance of Agricultural, Food Commodities and Economic Growth in Ethiopia: Using Co-Integration Approach

**Zekarias Bassa**

Southern Agricultural Research Institute, Areka Agricultural Research Centre, Wolaita, Ethiopia

**Email address:**

aldadakajela@gmail.com, bassazekarias@yahoo.com

**To cite this article:**

Zekarias Bassa. Export Performance of Agricultural, Food Commodities and Economic Growth in Ethiopia: Using Co-Integration Approach. *Research & Development*. Vol. 4, No. 3, 2023, pp. 90-101. doi: 10.11648/j.rd.20230403.14

**Received:** March 17, 2023; **Accepted:** August 1, 2023; **Published:** August 17, 2023

---

**Abstract:** The agricultural and export performance of the country determine the Economic growth in Ethiopia. However, Agricultural export performance, granger causality with GDP, labor and capital, the short run and long run dynamic relationship among the variables is not well studied, documented and updated. Therefore, the study aimed to examine influence of agriculture, trade, labour and capital to the economic growth. The analytical procedure applied were Engle-Granger for causality, Johansen Approach for co-integration and error-correction model. The results indicated that in the long run Ethiopian economic growth defined as positive function of agricultural exports, imports and capital, while population negatively affect the growth. In the short run, lagged gross domestic product explained positively the economic growth, while the agricultural imports, capital and population size influenced negatively. The result implied that the correction in one period draws back to the other period at speed of 41%. Therefore, diversifications, adopting labor intensive industries and improvement in fixed capital formation were policy directions that can stimulate growth of Ethiopia Economy.

**Keywords:** Agricultural Commodities, Export, Import, Economic Growth, Co Integration, Error Correction

---

## 1. Introduction

Export-promoted deeds in unindustrialized countries are frequently under the control of a foreign economic mediator and weakly linked with the rest of the inland economy. Thus, their potential for growth is not yet optimal. The other challenges in the sectors was that specific sector inward looking not explained the context of a inclusive long-term growth-maximizing strategy for the country [11].

The rise of export-led growth as a development paradigm is outdated due to changed conditions in emerging market and developed economies. The global economy needs a recalibration that facilitates a new paradigm of domestic demand-led growth. Globalization has so diversified the global economic activity to the point where no country or region can act as the isolated engine of global growth. Political reasoning suggests that emerging market countries are not likely to abandon export-led growth, nor will the international community implement the international arrangements needed for successful domestic demand-led growth. As a result, the global economy likely faces

asymmetric stagnation [38].

The study results confirmed that the hypothesis that states export led strategy promotes economic growth holds true for emerging economies of Asia namely India, Indonesia, Korea, Malaysia and Philippines. The result also implied that export growth has a causal influence on economic growth in the region. As an effective policy for economic growth, optimizing exports would result in assuring prosperity of the countries [16].

The study results by Mohanty [2012] [29] confirmed that long-run co-integrating relationships exist among GDP, household consumption, government expenditure and openness for trade in India. Short-run dynamics analysis indicates that GDP adjusts rapidly from the long-run equilibrium level in one time period. These results indicate that Export led growth strategies was valid and had export have a long run relationship with the GDP growth in India.

The African growth and development strategies calls for the deepening of regional integration, enhancing productivity and competitiveness through investment in improved technology and education, and the reinventing of African

labor markets to promote productivity and good labor relations [31].

The three important factors that linked to Africa dependence on primary product exports and the region to be in declining position in world trade comprised of failure to diversify primary export commodities into more dynamic export sectors, slow growth in global demand for these primary commodities and Africa's declining market shares for primary exports [14].

Economic growth in East Africa was 5.9 percent in 2017 and the forecast for 2018 and 2019 is to persist. The service sector is generally the main driver of East Africa's growth as agriculture, which has played a leading role for a longtime. Services growth rate was 12.4 percent in 2017 and better than other sectors like 12.0 percent for industry and 7.1 percent for agriculture. The mineral and industrial sectors' role in driving growth is also increasing. On the demand side, household consumption is the main driver of growth, followed by public investment in infrastructure, mineral exploration, and construction [3].

The study result by [44] implied that Ethiopia economic growth sourced from total factor productivity and structural change. The capital and labor accumulation was important for growth of Ethiopia economy. Ethiopia performed well than other non-resource rich fast-growing Sub-Saharan African countries by its very high total factor productivity growth of 3.4 percent per year. Similarly, while most labor productivity growth came from within sectors, inter-sectoral labor shifts [structural change] explain a quarter of decadal of Ethiopia's recent per capita GDP growth. Ethiopia known to be at stage of development that featured by continued high returns to capital.

Ethiopia has made impressive developmental path in the last three decades. It has sustained average economic growth of around 10 percent over the past decade, making it one of the fastest-growing economies in the world, while also achieving substantial progress in social and human development. Poverty declined from 55.5 percent in 2000 to 26.7 percent in 2016. Real gross domestic product continued to expand in 2017 [10.9 percent] and 2018 [estimated at 8.9 percent of GDP], and the country remains a favored destination for foreign direct investment [FDI] in Africa. However, the growth model that has driven these results is now under stress in the macroeconomic situation that becomes more fragile, stagnant exports and less favorable global environment [43].

Agriculture still remains the major supplier to Ethiopia's merchandise exports - accounting for close to 87 percent, on average, during the past decade [2005 to 2014]. While the manufacturing sector contributed about 7 percent for total merchandise exports, all the other sectors [minerals, base metals, etc] account for about 7 percent during the same period. The dominant the export value share of Agriculture fell from 88 percent in 2005/2006 to 85 percent in 2014/2015. On the other hand, the export value share of manufacturing rose from 6.6 percent in 2005/2006 to 10 percent in 2014/2015. In terms of the number of exporters, agriculture

has the largest number of exporters followed by the manufacturing sector. On the contrary, the number of exporters is smallest in Mineral and Base Metals sectors [12].

The rising of exports contributed to Ethiopia's prominent growth performance over the past decade but that a recent drop in export prices has exposed underlying vulnerabilities in export structure. To develop a more competitive trade and business environment in Ethiopia calls for export diversification and reducing vulnerability of exports to price fluctuations and increase benefits earned from the sector. For improvement of export sector to contribute on growth needed scale-up the size of exports, support structural transformation through higher-productivity exports, and promote a more dynamic export business environment and improvement in adoption and implementation of value addition [45].

Even if agricultural export sector known as major source of foreign exchange earnings, labour and capital formations support the economy as basic inputs in the Ethiopia Economy, its short run and long run association with economic growth, granger causality from the economic variables not well studied and documented for policy formulation in the last four to five decades. Hence, the study aimed to examine short run and long run association between economic growth and the country labour, capital, agricultural and food exports and imports and to see granger causality from defined variables toward gross domestic product using time series analysis.

### **1.1. Objectives of the Study**

- 1) To analyze dynamic association between international trade of Ethiopian agricultural and food commodities, labor and capital with growth of the economy.
- 2) To see granger causality between agricultural export and import, capital formation and labor toward Ethiopia economic growth.

### **1.2. Literature Review on Export Performance and Economic Growth**

The study finding by Kamil *et al.* [2017] revealed that real gross domestic product; agricultural output and oil rents have a long-run equilibrium relationship. The speed of adjustment of the variables towards their long run equilibrium path was low, though agricultural output had a positive impact on economic growth. Diversification of exports and giving due attention in allocation of budgeting to the agricultural sector can optimize the sector.

The study results showed that real exports, real gross fixed capital formation, human capital and real GDP are co integrated when real GDP, real exports and real gross fixed capital formation are the endogenous variables [1].

The Export Led Growth Hypotheses is valid in Costa Rica's that stated export growth as one of the key determinants of economic growth. However, the physical investment and population mainly drove Costa Rica's overall economic performance from 1950 onwards [15].

The analysis result by [23] revealed that export and economic growth are co-integrated and long-run equilibrium

relationship between them. Export and index of industrial production as proxy for economic growth are positively related to one another. The export is found to be significant in determining economic growth and economic growth significantly affects export. The granger causality test implied that export causes economic growth and economic growth granger causes exports in both long run and short-run.

The study findings confirmed that export-led growth paradigm works well in Africa models and it illustrated as a 1% increase in export leads to 0.1% increase in economic growth [10]. For most of African countries the highest priority demands to raise the absolute level of exports in all sectors and particularly in the sectors based on natural resources and following a development path more like of land-scarce Asia [3].

For cocoa and coffee export there was an equilibrium relationship among the variables in each of these co-integrating vectors. The combined short-run dynamic effect of lagged quantities of cocoa and coffee, export/domestic price ratio and GDP jointly explain changes in exports of cocoa whereas lagged quantities exported do not seem to have a significant short-run dynamic effect on changes in coffee exports [17]. The study result by [37] indicted that vegetable exports have a positive effect on economic growth in the long run and in the short run. Vegetables exports demand viable policy support for optimization as source of economic growth and needs to refine investment.

In the long-run, previous year export earnings of cocoa is positively support economic growth. In the short run the previous GDP has positive effect on current GDP; and higher export earnings of cocoa have positive effect on GDP. Granger causality is observed between economic growth [GDP] and export earnings of cocoa [40].

The study findings justified that both exports and economic growth are associated with past deviations [error correction terms] from the empirical long-run relationship. It implies that all variables in the system have a tendency to quickly revert back to their equilibrium relationship. The increase in real GDP would have a positive impact on the growth of exports in the long-run [28].

Export growths exert a positive and promoting effect on Economic growth of developing countries [Agugustin, 1990]. Exports generate growth through its positive effect on gross domestic product. For developing countries where domestic markets are small, export is a key engine of growth and allows domestic producers to benefit from economies of scale. Exports can increase productivity for individual firms active on the export market via learning effects, technology transfer to exploit economies of scale. For economic growth to be sustained in the long run productivity increases are essential. In the long run economic growth is a key to poverty alleviation but impacts will be felt faster when combined with less inequality. Exports might directly increase the incomes of the poor through income and employment effects [18].

In the short run, agricultural export diversification granger causes economic growth in Barbados and Belize. In the long

run, agricultural export diversification granger cause economic growth in the Dominican Republic. On the contrary, agricultural export diversification is the outcome of the economic growth process in Belize, Costa Rica, Haiti, and Jamaica, in the long run [21].

There is bi-direction long-run causality between exports of manufactured goods as a whole and economic growth in few Egyptian export industries like textile products, chemical products, fabricated metal products and food-processing. The direction of causality from growth to exports was inferred only in the case of chemical products. There is a long run circular causality between manufactured exports and economic growth in Egypt [39]. There was Granger causality between exports, capital formation and GDP for the 1991-2003 sub-periods in Egypt [20].

The findings by [34] implied that the agricultural exports have mixed effect on economic growth in Cameroon. Coffee export and banana export has a positive and significant relationship on economic growth. On the other hand, cocoa export was found to have a negative and insignificant effect on economic growth.

The study findings by [19] implied that agricultural export commodities are less diversified in sub-Saharan Africa as compared to Asia. But the diversification evolves more favorably in Africa compared to Asia for primary, as opposed to processed, agricultural exports.

The study result indicated that export Granger causes gross domestic product and vice versa. The study support the validity of export-led growth and growth driven export hypothesizes in the case of South Africa. A speedy and sound execution of government's plans aimed at stimulating and diversifying production for export can contribute to the improvement of growth and employment prospects [35].

The study result by [11] revealed that real exchange rate, real private sector credit and real private consumption affect the country's exports in the long-run. In the short-run, export defined as function of real GDP, real private sector credit and real private consumption. As reported by [24] Ethiopia's export competitiveness is hindered by an overvalued exchange rate and lagging export productivity.

GDP found to be positively and significantly explaining the flow of trade between Ethiopia and its partners [7]. The study results by [6] show that Ethiopia's export, import and total trade are positively influenced by GDP of the country and openness of the trading countries' economies.

Ethiopia export sector known by its highly depends on traditional primary agricultural and food commodities [4]. The finding of the study by [33] revealed that food export supply of Ethiopia is defined as function of trade openness of the country in the long run. It is also explained by the domestic national income, rural population, world oil price and urban population, agricultural land, overall investment and the domestic inflation significantly determined the food export supply of Ethiopia both in the short run and long run operation.

High dependency on traditional primary agricultural and food commodities for export and recurrent world market

price fluctuations resulted in Ethiopia to foreign earnings instability. To optimize the benefit from international trade and reduce the high dependence on primary agricultural and food commodities the sector demands diversification of trade from primary agricultural and food commodities into high-value agricultural and food commodities [4].

### 1.3. Empirical Review of Time Series Analysis

Error-correction models applied for co integrated economic variables in reflecting partial adjustment of one variable to another. Error-correction models used for forecasting one variable based on times series data from other variables [13]. Error correction models enforce strong and testable non-linear margins on dynamic econometric equations. It is referred as one of effective ways of characterizing the dynamic multivariate interactions among economic variables defined from characteristic of economic data [22].

Econometrics applied time series analysis to integrate short run dynamics with long run dynamics. The analysis of short run dynamics is carried out by first eliminating trends in the variables by differencing. Detrending or running a regression in time assumes the presence of deterministic trend and differencing assumes presence of stochastic trend. Co-integration associated to stochastic trends. Co-integration analysis first note static regression and then estimating the short run dynamics by variants of VECM by two stage estimation method using estimation coefficients from co-integration regression [27].

Co integration test have been used for testing permanent income hypothesis, trade and economic growth covariance, rationality of expectations, marketing efficiency in different markets and purchasing power parity. The co-integration regression captures long run equilibrium relationships of economic variables. The VECM can be used to merge the short run and long run forecasts in consistent and efficient manner [27].

## 2. Methodology

In the study, co-integration and Vector error correction Model were applied on annual data from 1970 to 2016. The economic variables defined and included in the model were value of agricultural and food commodities export and import, population size at active age category and Gross domestic

### Variable definitions and Model specification

$$\text{Log}(\text{GDP}_{t-1})\text{Log}(\text{Import\_value}_{t-1})\text{Log}(\text{EXport\_value}_{t-1})\text{Log}[\text{Pop15\_64}]_{t-1}\text{Log}[\text{Gfcf}]_{t-1} \quad (3)$$

*Gross Domestic product:* The economic activity and production performance the country was estimated by gross domestic product across years. As Ethiopia know by its Agrarian economy, its export value assumed to positively and significantly affect and used to estimate economic performance of the country.

*Population size aged between 14 to 64 years:* The population size time series data gathered from world

product. The appraisal of the effect of agricultural and food commodities export performance on economic growth was carried out in a production function framework where agricultural exports and capital used as additional inputs in the production process. The model to be used can be derived from a general production function:

$$Y_t = f[L_t, K_t] \quad (1)$$

Where,  $Y_t$  is aggregate real output,  $L_t$  and  $K_t$  are the usual labor and capital inputs. The additional assumption can be considered for model specification that defined the rate of technical change for economic country as a linear function of agricultural and food commodities export growth. Therefore, the production function including export and other basic variables as input for economic growth can be written as,

$$Y_t = f(L_t, K_t, I_t, X_t) \quad (2)$$

Where,  $X_t$  and  $I_t$  refers to value agricultural and food commodities export and import in the specific period, which introduced as additional input in the production of economic goods.

In this study, gross fixed capital formation was used as a proxy measure for capital. For labor variable, population size data for people aged between 14 to 65 years were used for the time period under consideration. Output growth was estimated by GDP growth. As justified by trade and development theory, Agriculture based economy like Ethiopia agricultural export and import are one of the important independent variables in explaining and estimating economic growth. It is also known that the GDP of any country is equal to the sum of its total local production [to fulfill final domestic demand] and trade [exports less imports]. Thus, economic growth is very much dependent on the external sector performance. For existence of common measure in the definition of the variable, value of all agricultural and food commodities exported and imported used in the model. The value of agricultural and food commodities export and import estimated by multiplying price of the commodities exported and quantity of commodities exported. The time series data gathered and compiled from faostat.org #en data base for whole data used in analysis. The collected data organized and analyzed using statistical software Eviewu version 9 and excel 2007.

development index data base and Faostat. Org. data base. The size of population under active labour force category was estimated by multiplying percent of the specific people category by total population of the country across years. The specific age category defined as one of economic variable due to its strong association with agricultural commodity production and consumption. Since the agricultural production system is subsistence type, the country the

population sized expected to have negative influence in extent of exported.

*Value of agricultural commodity exports:* This is one of the variables included in the model for dynamically explain gross domestic product for Ethiopia with other variables. It assumed to have provoking role in supporting Economic growth. As the level of agricultural commodity export increased, the extent of growth of economy expected to have increasing effect through improving opportunity of foreign exchange earnings, spillover effect of the technology and creating marketing options.

*Value of agricultural commodity imports [USA\$]:* Value

of agricultural commodity imported to the country assumed to significantly and negatively influence the economic performance of the country. It is also assumed that its level depends on gross domestic products, capital formation and local level production.

*Gross Fixed capital formation:* Gross fixed capital formation used to estimate capital in the country. It is considered as one of the major inputs used in production and technical advancement of the country economy. Both in short run and long run, the improvement and increase in the level of gross fixed capital formation was assumed to influence positively the growth of economy.

### 3. Results and Discussion

#### 3.1. Pre Estimation Test and Validation

##### 3.1.1. Unit Root Test of Integration of Orders

Table 1. Augmented Dickey Fuller Unit root Test for Variables included in the Model.

Variable	Critical value at different level			ADF statistics at station level	Prob.*	Critical value at or t at different level			ADF statistics for 1 <sup>st</sup> difference	Prob.*
	1%	5%	10%			1%	5%	10%		
GDP	-3.59	-2.93	-2.60	0.65	0.99	-3.58	-2.93	-2.60	-3.75	0.006
Import Value	-3.58	-2.93	-2.60	-0.88	0.78	-3.58	-2.93	-2.60	-12.32	0.00
Export Value	-3.61	-2.94	-2.61	-0.44	0.89	-3.62	-2.94	-2.61	-6.24	0.00
Gross fixed capital formation	-3.61	-2.94	-2.61	1.07	0.99	-3.62	-2.94	-2.61	-3.02	0.04
Population aged 14 to 64	-4.17	-3.51	-3.19	-0.65	0.97	-4.18	-3.51	-3.19	-6.35	0.00
Exchange rate	-3.58	-2.93	-2.60	0.09	0.96	-3.58	-2.93	-2.60	-3.63	0.01

The table above implied that all the variables were not stationary at the level and all the variables converted in to first difference to be of the same order. From the test result it is confirmed that the variables are non-stationary at levels but

are stationary at first difference hence the variables are considered as order of I [1] that can be regressed further. Hence, the pre estimation implied the appropriateness of the data for further analysis and policy implication.

##### 3.1.2. Optimum Lag Selection

Table 2. VAR Lag Order Selection Criteria for 43 observations for 1970 to 2016 periods.

Endogenous variables: Log[GDPA] Log[Import Value\$] Log[Export Value\$] Log[POP15_64] Log[GFCF] and Exogenous variables: C							
Lag	LogL	LR	FPE	AIC	SC	HQ	
0	-53.37	NA	1.04e-05	2.714754	2.92	2.79	
1	217.36	465.90*	1.14e-10*	-8.71	-7.49*	-8.26*	
2	235.75	27.37	1.63e-10	-8.41	-6.15	-7.58	
3	260.66	31.29	1.86e-10	-8.40	-5.13	-7.19	
4	297.22	37.41	1.42e-10	-8.94*	-4.64	-7.35	

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic [each test at 5% level]

FPE: Final prediction error and AIC: Akaike information criterion

SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion

As indicated in the table 2 above the optimal lag length selected for the model would be one. This implies that the specific data complied directed to use the one year's lag data for forecasting the next year's information.

##### 3.1.3. Johansen Co Integration Test

Table 3. Johansen Co integration Test Results using Trace Test.

Unrestricted Co-integration Rank Test [Trace]				
Hypothesized	Eigen value	Trace	0.05	Prob.**
No. of CE[s]		Statistic	Critical Value	
None *	0.62	81.89	69.82	0.00
At most 1	0.43	45.05	47.86	0.10

Unrestricted Co-integration Rank Test [Trace]				
Hypothesized	Eigen value	Trace	0.05	Prob.**
At most 2	0.37	23.61	29.80	0.22
At most 3	0.12	6.15	15.50	0.68
At most 4	0.03	1.31	3.84	0.25

Trace test indicates 1 co-integrating eqn[s] at the 0.05 level, \* denotes rejection of the hypothesis at the 0.05 level, \*\*MacKinnon-Haug-Michelis [1999] p-values

The table 3 above illustrated the Johansen co integration test result using Trace value implied the existence of single co integration equation and directs for further estimation of vector error correction model.

**Table 4.** Unrestricted Co integration Rank Test [Maximum Eigen value].

Hypothesized	Eigen value	Max-Eigen	0.05	Prob.**
No. of CE[s]		Statistic	Critical Value	
None *	0.62	36.84	33.89	0.02
At most 1	0.43	21.44	27.58	0.25
At most 2	0.37	17.45	21.13	0.15
At most 3	0.12	4.84	14.27	0.76
At most 4	0.03	1.31	3.84	0.25

Max-eigen value test indicates 1 co-integrating eqn[s] at the 0.05 level  
 \* denotes rejection of the hypothesis at the 0.05 level  
 \*\*MacKinnon-Haug-Michelis [1999] p-values

As indicated in the table 4 above in the Johansen co integration test using Maximum Eigen value, the result implied the existence of single co-integrating equation and it pointed out for further estimation of vector error correction model.

#### *Johansen Normalized Equations*

As illustrated in co-integration equation, the coefficient of co-integration model is negative and significant, which indicates the existence long run causality running from agricultural and food commodities export and import and population aged between 15 to 64 and toward gross domestic product equilibrium. Multivariate co integration results revealed that there exists a single co-integrating vector in the estimation. This means the variables included in the model are linked together in achieving their steady state equilibrium. The finding is in line with [1] that reported in the short-run and the long-run coefficients conform to theoretical anticipation and demonstrate that exports and capital formation have a substantial and positive effect on GDP growth of Pakistan.

*Value of Export Agricultural and food commodities export:* The agricultural and food commodities export elasticity of normalized equation is -0.29 and reported as 0.29 by reversing the sign and statistically significant at 1% level. The sign of export values and its statistical significance was as expected. The time series analysis result implied that 1% increase in agricultural commodity export would bring about 0.29% increase in Economic growth of Ethiopia, holding other variables fixed. The finding is in line with [45] that revealed rising exports contributed to Ethiopia's remarkable growth performance over the past decade. The study finding pointed out that through improving export level of agricultural and food commodities, it is possible to accelerate and support economic growth. The findings are agreed with [26] implied in the long run exports granger cause income

growth and the export promotion policy contributes to the economic growth in Libya. It is also agrees with the findings of [32] that shows that in long run exports affect positively GDP per capita in China. The finding implies that that exports agricultural and food commodities are a viable source of economic growth in Ethiopia and needs strong policy support for optimizing the sector.

*Value of Agricultural and food commodities Import:* The elasticity coefficient of agricultural and food commodities import is estimated to be -0.28 and reported as 0.28 in the normalized long run equation and it is statistically significant at 1%. In the long run, it tells 1% increase in value of agricultural and food commodities import value results in a 0.28% increase in Ethiopian gross domestic product, other variables are held constant. The result implied that the economic performance and value of agricultural and food commodities imported related positively. When the country secured economic growth, its consumption and demand to import from abroad increase.

*The population Size of Active labour force:* The elasticity of the parameter estimate named population aged between 14 to 64 was estimated to be 0.88 and it was significant at 1% level. The estimate of population parameter pointed out that, holding other variables fixed, 1% increase in population of active labour force, resulted in 0.88% decrease in gross domestic product. This implies that active labour force played decreasing effect in level of economic growth in relation labour un productivity in the country and major economic firms not linked with the labour resource in the country. The result is in line with [42] that indicated exports have been an important factor in Africa's recent economic growth but the growth has not been job-creating to a degree needed to tackle unemployment and promote inclusive development in Africa. The study is not in line with [30] that implied labour has an impact on economic growth only in the long run.

*Gross fixed capital formation:* The elasticity of gross fixed capital formation in the normalized equation was estimated to be -0.51 and it was statistically significant at 1% level. The estimated elasticity [-0.51] value of gross fixed capital pointed out that 1% increase in quantity of gross fixed capital formation in the long run would have 0.51% increase in growth of Ethiopian economy, holding other variables fixed. The improvement in level of capital investment play supporting and accelerating role over economic growth in the country. Hence, it implied that through fixed capital

formation and improvement in capital level, it is possible to sustain economic growth.

To sum up, the findings implied that 1% increase in export of agricultural commodities, import of agricultural and food commodities and gross fixed capital formation measured would have promoting and accelerating effect on Economic growth of the country by proportion of 0.29, 0.28 and 0.51%, other variables held fixed. But the growth of active labour force 1% owned decreasing effect on growth of gross domestic product by 0.88%, other variables fixed.

### 3.2. Estimating Vector Error Correction Models

#### 3.2.1. The Co-integrating Equation and Long Run Model

$$ECT_{t-1} = [1.00\log GDP_{t-1} - 0.51\log(GFCF_{t-1}) - 0.29\log(Agri.export_{t-1}) - 0.28[\log(agri.) + 0.88\log(pop14 - 64_{t-1}) - 16.11] \quad (4)$$

#### 3.2.2. Estimating VECM Equation with Gross Domestic Product as Target Variable

$$\begin{aligned} \Delta\log[GDP_t] = & -0.41\Delta ECT_{t-1} + 0.49\Delta GDP_{t-1} - 0.2\log Capital_{t-1} \\ & + 0.03\Delta\log Agri.Export_{t-1} - 0.07\Delta\log Agri.commdtyImport_{t-1} \\ & - 4.17\Delta\log popaged14_{64_{t-1}} + 0.18 \end{aligned} \quad (5)$$

Table 5. Short Run Model /Least Squares for 1972 to 2016 times of 45 observations.

Variable defined in short run model	Coefficient	Std. Error	t-Statistic	Prob.
C[1]=coefficients of adjustments	-0.41	0.08	-4.85	0.00
C[2]=lagged gross domestic production	0.49	0.13	3.74	0.00
C[3]=lagged value of agricultural imports	-0.07	0.03	-1.96	0.06
C[4]=lagged value of agricultural export	0.03	0.05	0.65	0.52
C[5]= lagged population size aged 14 to 64 years	-4.17	1.50	-2.78	0.008
C[6]=lagged gross fixed capital formation	-0.20	0.11	-1.84	0.07
C[7] =intercept	0.18	0.05	3.89	0.00
R-squared	0.60	Prob[F-statistic]		0.00
Adjusted R-squared	0.54			

*Interpretations of Estimated VECM with GDP as target variable:*

$ECT_{t-1}$ =The parameter estimate of the coefficients adjustment or errors correction was estimated to be -0.41. As shown in the table above, the C [1] the long run coefficient of adjustment value is negative and significant at 1%. The speed of adjustment measures the rate at which Ethiopian gross domestic product returns to equilibrium after changes in defined previous year agricultural and food commodities export and import, population and gross fixed capital formation. The value of error correction coefficient measures the running speed at which economic growth in returns toward the equilibrium after changes in agricultural and food commodities export and import, and capital in Ethiopia. The result showed that the last year period deviation from long run equilibrium influences the short run dynamics of Ethiopian Economic growth. This is to mean that long run equilibrium adjusted at speed of 41% annually. The Error correction term implied that the last period deviation from long run equilibrium [the error] influences the short run dynamics of gross domestic product growth in Ethiopia. The departure in one correction, the correction would fall back to

other correction to retain in the equilibrium. The speed of adjustment in the long run causality running from population [aged between 15 to 64], lagged year export and import of agricultural and food commodities and gross fixed capital formation 41%. This implied that the previous year deviation from the long run equilibrium is corrected at current period by an adjustment speed of 41%.

Having already defined the long run model and estimation of the coefficients of adjustments, the next procedure adopted was estimating the coefficients of the short run dynamics that have important implications in analysis. Hence, an error incorporates the short term interactions and the speed of adjustments towards long run equilibrium.

$D[LOG[GDP]_{t-1}$ : The parameter estimated for lagged year gross domestic product was 0.49 that significantly affect the model. This indicates that at ceteris paribus condition a 1% increase in lagged period growth of the country gross domestic product would bring about 0.49% increase in current period Economic growth. The finding confirmed that lagged improvement and growth in Economy play supporting and promoting role of this year economic growth.

*Gross fixed capital formation<sub>t-1</sub>*: The parameter estimate

for the variable defined gross fixed capital formation was estimated to be -0.20 in short run. The result indicated that in the short run 1% increase in proportion of capital investment for infrastructures in the economy in previous period resulted in 0.20% decrease in growth of gross domestic product current year, holding other variables fixed. The result implied that investment in the country is at cost stage and could not start to yield return by now.

*Agricultural and food commodities Import<sub>t-1</sub>*: The coefficient of the variable defined import level was -0.07. The parameter estimate implied that in short run 1% increase in import of agricultural and food commodities in the last year brings about -0.07% decrease in extent of Ethiopia gross domestic product in short run, holding other variables fixed. This informs for further work on negative effect of agricultural imports value that could reduce the level of local country productivity and thereby reduce the growth of the country.

*Population [aged between 14 to 64]<sub>t-1</sub>*: The parameter estimate for the variable defined as population was estimated to be -4.17. The result indicated that 1% increase in population size in previous period brings about 4.17% decrease in growth of gross domestic product of the country, holding other variables constant. The result implied that in the short run the major economic sectors are not linked with active labour force in the country and the resources are not in a position for supporting economic growth. The result also implied that working industries installed are not labour intensive, rather capital intensive.

### 3.3. Granger Causality Tests

The purpose of the analysis is to test whether export led

growth hypothesis works in Ethiopia that states growth led agricultural export granger cause GDP and to examine granger causality between exports, capital and labour in Ethiopia for the Period 1970 to 2016. As implied in the table below, the summary report indicated that the agricultural export growth and improvement in gross fixed capital formation granger cause growth of the Economy that hypothesized in modern economic theory. This is to mean that agricultural export and capital leads economic growth as input in Economy of the country for performing well and flourishing. The granger causality test result also implied that growth in Economy promotes increase in extent of import of agricultural and food commodities for increased demands. This calls for systematic intervention in import of agricultural and food commodities that assumed to negatively affect performance of agricultural sector with low technology and weak capability to compete internationally. In addition to these, the pair wise test result confirmed that growth in agricultural and food commodities export granger caused improvement in capital resource allocation and improvement in capital formation ranger caused agricultural and food commodities import. The results of the study also agreed with [5] that show that there is evidence of uni-directional causality between export and economic growth for Ethiopia. It justified that Export growth cause's economic growth. The findings are in line with [8] that indicated exports granger cause GDP and GDP per capita and this suggests the positive influence of export on growth justified export-led growth strategy prevalence in the region. The finding is also supported by [36] that obtained results revealed existence unidirectional causation from economic growth to export for Bangladesh and India.

Table 6. Pair wise Granger Causality Tests.

Null Hypothesis:	Obs	F-Statistic	Prob.
Log[Import Value \$] Does Not Granger Cause log[GDP]	46	0.16	0.69
Log[GDP] Does Not Granger Cause log[Import Value\$]		7.73	0.008
Log[Export Value\$] Does Not Granger Cause log[GDP]	46	28.90	3.E-06
Log[GDP] Does Not Granger Cause Log[Export Value\$]		0.12	0.73
Log[capital] Does Not Granger Cause log[GDP]	46	10.83	0.002
Log[GDP] Does Not Granger Cause log[capital]		0.21	0.65
Log[Export Value\$] Does Not Granger Cause log[Import Value\$]	46	3.59	0.07
Log[Import Value\$] Does Not Granger Cause log[Export Value\$]		0.35	0.56
Log[capital] Does Not Granger Cause Log[Import Value\$]	46	14.32	0.0005
Log[Import Value\$] Does Not Granger Cause log[capital]		1.86	0.18
Log[capital] Does Not Granger Cause log[Export Value\$]	46	1.61	0.21
Log[Export Value\$] Does Not Granger Cause log[capital]		9.12	0.004

### 3.4. Model Post Estimation Diagnostic Checking and Validation

After estimating the VEC equation, the validation of the model carried out by undertaking residual Diagnostics, coefficient diagnostic and stability diagnostics. The residual diagnostic tested applied for normality, heteroscedasticity and serial correlation. The coefficient diagnostics carried out by Wald test and the Custom test under recursive estimation

for OLS that are necessary to verify if the hypotheses of classical regression are confirmed. All of diagnostic test result found that the data is devoid of any problem and validated the findings for policy formation.

#### 3.4.1. Dynamic Stability Test

The stability diagnostics applied to measure parameter constancy that critical issue for Ethiopian Economic performance measure equations. In particular, to be able to

interpret the estimated equation as a gross domestic product equation, it is necessary to assure that the parameters are stable over the estimation period. To achieve this, the study implemented the methodology based on the cumulative sum

[CUSUM] tests. The decision about the parameter stability relies on the position of the plot relative to the 5% critical bound. As implied by the result the blue trend line lies between the two red lines, the test confirmed that there is no problem stability.

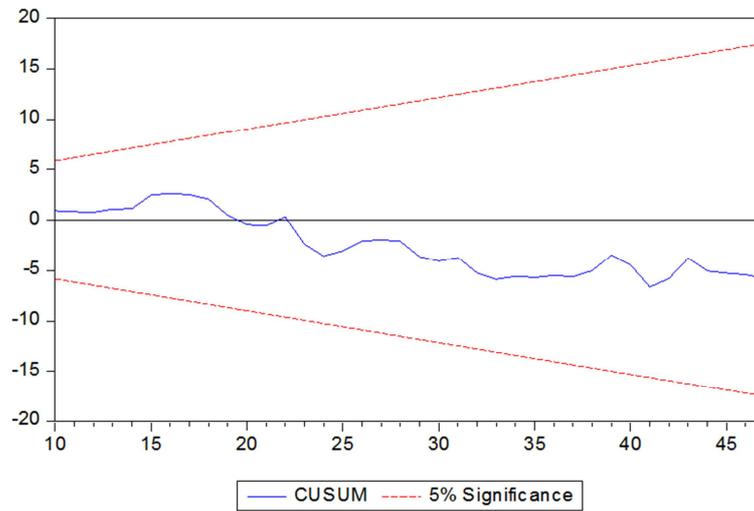


Figure 1. Dynamic stability Testing.

3.4.2. Normality Test

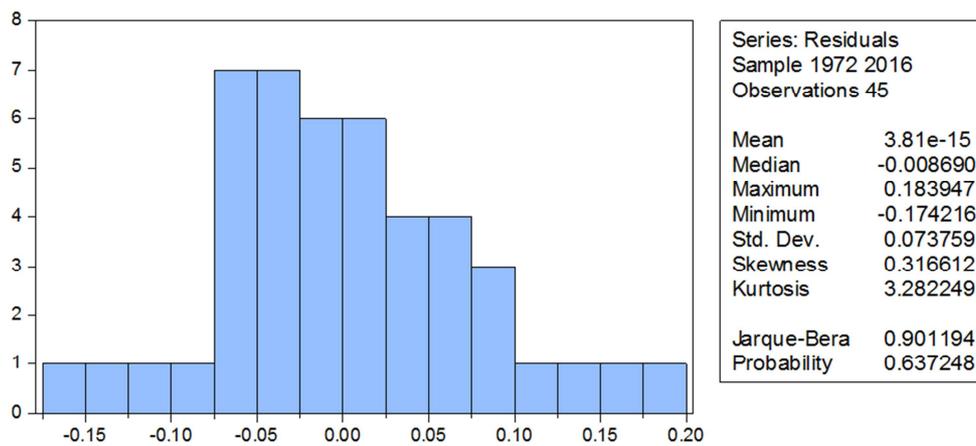


Figure 2. Normality Test of Residuals.

As indicated in the graph above, the tests results of the residuals diagnostic of specific variables are normally distributed. The normality test graph above indicated the Probability value is above 5% that implies the residuals are

normally distributed. Therefore, based on the residual diagnostics the results are reliable and can be used for policy implication.

3.4.3. Serial Correlation Test

Table 7. Serial Correlation Test.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.048215	Prob. F[1,37]	0.83
Obs*R-squared	0.058564	Prob. Chi-Square[1]	0.81

The result in the table 7 indicated that there is no serial correlation and our model fits well. The Probability value is more than 5% and we can reject null hypothesis by confirming no autocorrelation in the model. The null hypothesis states that there is no serial autocorrelation in the

model, the probability value more than 5% implied that, we cannot reject  $H_0$ , that states there is no serial correlation, this model does not have any serial correlation, good sign of the model. This implied that there is no evidence of serial correlation.

### 3.4.4. Heteroskedasticity Test

Table 8. Heteroskedasticity Test.

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.57	Prob. F[5,39]	0.19
Obs*R-squared	7.52	Prob. Chi-Square[5]	0.19
Scaled explained SS	6.12	Prob. Chi-Square[5]	0.29

As indicate in the table 8 above, since the probability value is higher than 5% we cannot reject null hypotheses and accept  $H_0$ , this implies that there is no heteroscedasticity in the model that is desirable. The table above illustrated that the model is not suffering from heteroscedasticity that validates the model to be good.

### 3.4.5. Wald Test

Table 9. Wald Test.

Test Statistic	Value	Df	Probability
F-statistic	3.51	[5, 38]	0.01
Chi-square	17.54	5	0.00
Null Hypothesis: C[2]=C[3]=C[4]=C[5]=C[6]=0			
Null Hypothesis Summary:			
Normalized Restriction [= 0]	Value	Std. Err.	
C[2]	0.49	0.13	
C[3]	-0.07	0.03	
C[4]	0.03	0.05	
C[5]	-4.17	1.50	
C[6]	-0.20	0.11	
Restrictions are linear in coefficients.			

#### Short run association of Variables by Wald test

As show in table 9 above, the null hypothesis rejected and alternative hypothesis accepted for existence of short run association between variables defined in the movement towards equilibrium. The result assured the existence of evidence in movement from value of agricultural and food commodities exported and imported and active population size, gross capital formations to extent of Ethiopia gross domestic product in short run. The summary of this regression indicated that there is short run and long run causality running from world agricultural and food commodities export and import, labour, capital population to the equilibrium. It implied that the explanatory variables included in the model caused granger causality of Ethiopian Economic performance export jointly. It also showed there is evidence of shorten causality running from defined explanatory variables to economic growth.

## 4. Conclusion

The study applied modern econometric time series analysis approach such as co integration and error-correction to analyze the dynamic relationship between agricultural and food commodities export and import growth, capital and labour growth and economic growth in Ethiopia, using FAO data from 1970 to 2016. For validation of data and information the analysis applied both pre model estimation tests and post estimation tests. Pres model estimation testes undertaken comprised of unit root test, Johansen co-

integration test and granger causality test, while the post estimation tests carried out include dynamic stability, autocorrelation and normality, heteroscedasticity and Wald tests. From empirical research result it is concluded that there is single directional long term causality exists from agricultural export growth to economic growth in Ethiopian Economy. From error correction analysis result, there is evidence for short-run granger causality running from agricultural export growth to economic growth. The study result justified the existence of single long run and short association from agricultural export, import, capital formation and active labour force toward equilibrium of Economic growth. From time series analysis result it is concluded that Ethiopia Economic growth explained positively by agricultural export, agricultural import and fixed capital formation and negatively explained by population size under actively labour category in the long run. The result also pointed out that in the short run the gross domestic product of the country defined as negative function of lagged year agricultural import and capital formation, but it is found to be positive function of lagged economic growth. From granger causality result it is concluded that agricultural exports granger cause economic growth and capital formation. The result implied that economic growth ganger cause agricultural import and capital formation thereby capital cause economic growth and agricultural imports.

The estimated model is normally distributed and does not suffer from problems of autocorrelation, instability and specification errors. Therefore, the OLS standard errors are correct and can be used for inference and policy implication. The result implied that in the short run Ethiopia economic growth defined as negative function of capital, labour and agricultural imports and positive function of lagged gross domestic product. But in long run, value of lagged agricultural export, capital and value of agricultural import positively and significantly affect the economic growth.

The result implied both in long run and short run, the economic growth of the country was known to be defined as negative function of population size. This implies that economically viable and exporting agricultural sectors are not in a position to use the labour resource efficiently and it seems capital intensive than labour intensive. The estimated coefficient of the VECM suggests the last period disequilibrium is corrected by about 41% or more in the next period. The policy implication of the result directed to give due attention on agricultural export promotion and import substitution, linking the active labour force with economically viable sector of the country and optimal utilization of capital in the country.

## References

- [1] Adeel Saleem And Maqbool Hussain Sial. 2015. Exports-Growth Nexus in Pakistan Cointegration and Causality Analysis. *Pakistan Economic and Social Review Volume 53, No. 1, pp. 17-46.*

- [2] Adrian Wood and Jörg Mayer. 2001. Africa's export structure in a comparative perspective. *Cambridge Journal of Economics*, Vol. 25, No. 3, Special Issue on African Economic Development in A Comparative Perspective, pp. 369-39.
- [3] African Development Bank group. 2018. East Africa Economic Outlook. Macroeconomic developments manufacturing's comparative advantage and competitiveness. ISBN 978-9938-882-69-8 [electronic].
- [4] Ahmed Kasim, Burhan Ozkan and Ramu Govindasamy. 2018. Analyzing the Export Performance of the Horticultural Sub-Sector in Ethiopia: ARDL Bound Test Co-integration Analysis. *Horticulturae*, 4, 34.
- [5] Alaro Biramo Hailegiorgis. 2012. The Effect of Export-Led Growth Strategy on the Ethiopian Economy. *American Journal of Economics*, 2 [3]: 50-56 DOI: 10.5923/j.economics.20120203.05.
- [6] Alekaw Kebede. 2016. Determinants and Potential of Foreign Trade in Ethiopia: A Gravity Model Analysis. *MPRA Paper No. 74509*. Ethiopian Development Research Institute Addis Ababa, Ethiopia.
- [7] Amin Abidella. 2011. Ethiopia's Trade Potential in the Inter Governmental Authority on Development [IGAD]. Ethiopian Economics Association. *Ethiopian Economics Policy Research Institute, Working Paper No 2*.
- [8] Andre C. Jordaan and Joel Hinaunye Eita. 2007. Export and Economic Growth in Namibia: A Granger Causality Analysis. *South African Journal of Economics*, Volume 75 issue 3, pp 540-547.
- [9] Augustin Kwasi. 1990. Exports and Economic growth: The African Case. *World development*. Vol. 18. No. 16. pp. 831-835.
- [10] Biyase, M. and Zwane, T., 2014. Is the export-led growth hypothesis valid for African countries? An application of panel data approach. *Public and Municipal Finance*, 3 [2], pp. 93-110.
- [11] Berhanu Lakew. 2003. Prospects for Export Diversification in Ethiopia. National Bank of Ethiopia Economic Research Department. *NBE Staff Working Paper ERD/SWP/007*.
- [12] Berihu Assefa and Kiflu Gedefe. 2016. An Economic Inquiry into Ethiopian Exports: Pattern, Characteristics, Dynamics and Survival. *EDRI Working Paper 14*. Addis Ababa: Ethiopian Development Research Institute. *MPRA Paper No. 29427*.
- [13] Campbell, John Y. and Robert J. Shiller. 1988. Interpreting co-integrated models. *Journal of Economic Dynamics and Control* 12 [2-3]: 505-522.
- [14] ECA [Economic Commission for Africa]. 2000. Africa in the Global Economy: Issues of Trade and Development for Africa. Africa. *Knowledge Networks Forum Preparatory Workshop*, 17-18. Addis Ababa, Ethiopia.
- [15] Emilio J. Medina-Smit. 2001. Is the Export-Led Growth Hypothesis Valid for Developing Countries? A Case Study of Costa Rica. *United Nations Conference on Trade and Development, Policy Issues In International Trade And Commodities Study Series No. 7*.
- [16] Emmanuel Anoruo and Sanjay Ramchander. 2000. Exports and Economic Growth: An Error Correction Model. *CO 80523 Ph: [970] 491-66*.
- [17] Emmanuel Tambi, N. 1999. Co-integration and error-correction modeling of agricultural export supply in Cameroon. *Agricultural Economics* 20, 57-67.
- [18] European Union. 2015. Export Performance and Poverty Reduction. *Volume II Assessment of economic benefits generated by the EU Trade Regimes towards developing countries*.
- [19] Floribert Ngaruko. 2003. Agricultural Export Performance in Africa: Elements of Comparison with Asia. *ESA working paper No. 03-09*.
- [20] Fouad Abou-Stait. 2005. Are Exports the Engine of Economic Growth? An Application of Co-integration and Causality Analysis for Egypt, 1977-2003. *Economic Research Working Paper No 76*.
- [21] Francis Brian, Osaretin Sunday and Troy Iyare Lorde. 2007. Agricultural Export diversification and Economic Growth in Caribbean Countries: Co-integration and Error-Correction Models. *The International Trade Journal*, Volume XXI, No. 3.
- [22] George Alogoskoufis and Ron Smith. 1991. On Error Correction Models: Specification, Interpretation And Estimation. *Journal of Economic Surveys* Vol. 5, No. 1.
- [23] Gurmeet Singh. 2015. Causality Between Export and Economic Growth: A Case Study of India. *Indian Journal of Accounting*, Vol XIVII [1], ISSN-0972-1479.
- [24] IMF [International Monetary Fund]. 2014. The Federal Democratic Republic of Ethiopia. *Selected Issues Paper, Country Report No. 14/304*.
- [25] Kamil Sertoğlu, Sevin Ugural and Festus Victor Beku. 2017. The Contribution of Agricultural Sector on Economic Growth of Nigeria. *International Journal of Economics and Financial Issues*, 7 [1], 547-552.
- [26] Khaled R. M. Elbeydi, Abdulbaset M. Hamuda, Vladimir Gazda. 2010. The Relationship between Export and Economic Growth in Libya Arab Jamahiriya. *Theoretical and Applied Economics* Volume XVII, No. 1 [542], pp. 69-76.
- [27] Maddala. G. S. 1992. Introduction to Econometrics. *Second edition, specially priced student text*. Macmillan publishing company, New York United States of America.
- [28] Mishra P. K. 2010. The Dynamics of Relationship between exports and economic growth in India. *International Journal of Economic Sciences and Applied Research* 4 [2]: 53-70.
- [29] Mohanty, S. K. 2012. *Economic Growth, Exports and Domestic Demand in India: In Search of a New Paradigm of Development, Moving Toward a New Development Model for East Asia- The Role of Domestic Policy and Regional Cooperation*. ERIA Research Project Report 2011-10, Jakarta: ERIA. pp. 191-222.
- [30] Muna Sulaiman and Norma Md. 2009. An Analysis of Export Performance and Economic Growth of Malaysia Using Co-Integration and Error Correction Models. *The Journal of Developing Areas*, Vol. 43, No. 1, pp. 217-231.
- [31] Musibau Adetunji Babatunde. 2012. Africa's Growth and Development Strategies: A Critical Review. *Africa Development*, Vol. XXXVII, No. 4, pp. 141-178.

- [32] Neena Malhotra and Deepika Kumari. 2016. Export Performance and Economic Growth in East Asian Economies – Application of Co-integration and Vector Error Correction Model. *Eurasian Journal of Business and Economics*, 9 [18], 135-152.
- [33] Negussie Zeray and Ashebir Demie. 2016. Agricultural Food Export Performance In Ethiopia: An Error Correction Approach. *International Working Paper Series paper no. 16/5*. ISBN 978-88-96189-45-0.
- [34] Noula Armand, Sama Gustave and Gwah Munchunga. 2013. Impact of Agricultural Export on Economic Growth in Cameroon: Case of Banana, Coffee and Cocoa. *International Journal of Business and Management Review*, Vol. 1, No. 1, pp. 44-71.
- [35] Paul Cipamba Wa Cipamba. 2013. The Export-Output Relationship in South Africa: An Empirical Investigation. *Economics Research South Africa working paper* 355.
- [36] Sampathkumar. T and Rajeshkuma S. 2016. Causal Relationship between Export and Economic Growth: Evidence from SAARC Countries. *IOSR Journal of Economics and Finance [IOSR-JEF]* e-ISSN: 2321-5933, p-ISSN: 2321-5925. Volume 7, Issue 3.
- [37] Sayef Bakari. 2017. The Impact of Vegetables Exports on Economic Growth in Tunisia. *MPRA Paper No. 80722*, 23: 12 UTC.
- [38] Thomas I. Palley. 2011. The Rise and Fall of Export-led Growth. *New America Foundation Levy Economics Institute, Working Paper No. 675*.
- [39] Torayeh, Neveen M 2011. Manufactured Exports and Economic Growth in Egypt: Co-integration and Causality Analysis. *Applied Econometrics and International Development Vol. 11-1*.
- [40] Twumasi-Ankrah, S. and Wiah, E. N. 2016. Testing for Long-Run Relation between Economic Growth and Export Earnings of Cocoa in Ghana using Co-Integration Techniques”, *Ghana Mining Journal*, pp. 89-95.
- [41] UNCTAD [United Nations Conference on Trade and Development]. 2004. Exports of service and economic growth in developing countries. *The report has been prepared on Economic Division on International Goods and Services, and Commodities*.
- [42] Vinaye Ancharaz. 2011. Trade, Jobs and Growth in Africa: An empirical investigation of the export-led jobless growth hypothesis. *A paper prepared for the 3rd ICITE Regional Conference on “Trade, Jobs and Inclusive Development in Africa, Gammarth, Tunisia*.
- [43] World Bank Group. 2019. Country Private Sector Diagnostic Creating Markets in Ethiopia, Sustaining Progress Towards Industrialization. *World Bank Group and International Monetary Fund Spring Meetings 2019 edition*.
- [44] World Bank Group. 2017. Ethiopia’s Great Run the Growth Acceleration and How to Pace it. *Public Disclosure Authorized. P 161-171*.
- [45] World Bank Group. 2014. 3rd Ethiopia Economic Update: Strengthening Export Performance through Improved Competitiveness. *Public Disclosure Authorized. P 49-51*.