

Determinants of Agricultural Commodities Export in Ethiopia

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ABSTRACT

Despite massive potential of agricultural production than other sub-Saharan countries, Ethiopia's share, in total world exports, is still very low, amounting to 0.01% in 2010 (WTO, 2011). Ethiopia's agricultural export performance has typically been portrayed as poor.. Ethiopia's agricultural export performance has typically been portrayed as poor's share in total world exports is still very low, amounting to 0.01% in 2010 (WTO, 2011). Ethiopia's agricultural export performance has typically been portrayed as poor compared with other sub-Saharan African countries. According to IMF, 2017 Ethiopia has a small export base its exports-to-GDP ratio in 2015 was the fifth lowest in the world highly concentrated in primary products. The major objective of this research is to investigate factors that determine the Ethiopia's agricultural export performance in the period 1983/84-2017/18. The study has reviewed agricultural export performance and examines the long run and short run determinants of agricultural export performance of the country. The long run and short run estimates are investigated using co-integration and error correction approaches respectively. The data is collected from NBE, ERA, CSA World Bank website, UNCTADSTAT and IMF and World Economic Outlook Website. The findings of the study revealed that in the long run agricultural export performance has found to be positively influenced by Inflation, foreign direct investment real effective exchange rate, trade openness, infrastructural development and fertilizer input. In the short run, inflation and foreign direct investment have statically insignificant effects on the performance of agricultural export. All of the rest variables have statically significant impact on the agricultural export performance of the country. Maintaining high and sustainable economic growth, improvements in infrastructural facilities and increasing fertilizer import, and maintaining conducive and stable exchange rate policies as well as working to reduce trade restriction mechanism should due emphasis so as to improve Ethiopia's export performance.

Keywords: *Ethiopia, Agricultural Export Performance, Co-integration and the Error Correction Model*

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Introduction

Export is considered as one of the very important accelerators of growth. The economics literature supports the contention that development requires economic growth to alleviate poverty, and greater access to world markets is perceived as a necessary condition for more rapid growth. Agosin (2007), for example, finds that export diversification has a stronger effect on per capita income growth.

Evident from its high share in GDP, the prospects of the agricultural sector heavily influence economic development in most countries in Sub-Saharan Africa (SSA) Andrew M. and A. Prizzon (2008). Its productivity growth does contribute to the reduction of poverty in areas where most of the workforce is still engaged in agriculture. The agricultural sector has a pivotal role in employment in SSA, employing more than half of the total workforce. While its importance to the rural population is well documented, recent surveys suggest that agriculture is also the primary source of livelihood for 10% to 25% of urban households.

According to NEPAD (2003), for most countries in SSA, agriculture contributes an average of 30%-60% of GDP and about 30% of the values of Agricultural exports. However, trade liberalization and tariff barriers have been just some of the areas that have been detrimental to African farmers. Structural adjustment, policies and trade conditions have resulted in the collapse of agricultural support institutions, the elimination of subsidies and reduction in tariffs for most African countries. Thus the share of agricultural exports of SSA to the world has declined from 8% in early 1960s to 2% in the early 2000, and in addition to this it become from a net food exporter to net food importer (Hag blade et al., 2004).Based on agricultural trade balance, there is an increasing dependence on agricultural imports, with

imported food replacing traditional food where Agricultural imports are growing at faster rates than agricultural exports (Obwona and Chirwa, 2018).

The Ethiopian agricultural sector is the mainstay of the country's economy, contributing 41.4% of the country's gross domestic product (GDP), 83.9% of the total exports, and 80% of all employment (Matousa, Todob, & Mojoc, 2013).. Despite Ethiopia's comparative advantage, low cost labor and favorable climate for producing primary agricultural commodities, the country's Agricultural export performance has not been satisfactory (Alwang and Siegel, 1994). According to Mouze (2005) price policy instruments such as real exchange rate devaluation and institutional factors significantly affect agricultural export of the country.

According to the World Bank (2009), the share of Ethiopia's manufactured products export in the total export is only 9.0 percent (implying primary agricultural commodity to be 91 per cent). Ethiopia's agriculture remains an important source of economic growth that not only contributes 39 percent of the country's Gross Domestic Product (GDP) but also employs 73 percent of the population. It is also extending its leading role in agricultural export performance by contributing over 75 percent of the 2.91 billion USD that the country has secured in the 2016/17 fiscal year. Despite its pivotal role for national economy and peoples' livelihoods, quality gaps challenged the agricultural export performance.

Moreover, the share of agriculture to total export proceeds increased consistently from about 63% in 2002/3 to 82% in 2008/9, though it slightly declined to 71% in 2010/11 and then it showed an increment starting from 2014/15 to 2016/17 by contributing 73% of share. Even if there was some improvement in agricultural export recently, it has not been to a satisfactory

level in light of the country's comparative advantage in exporting several agricultural commodities both in raw form as well as in processed forms (Berhanu, 2003). According to IMF (2017), Ethiopia has a small export base in exports-to-GDP ratio in 2015,

According to the IMF report in 2009/10 and 2010 /11 around 30 percent, the real exchange rate of the country was overvalued. This has affected the agricultural export performance of the country, also the type of the nation's export items, which is primarily dominated by "unprocessed and undifferentiated" agricultural products, made it susceptible to the fluctuations of the prices of these commodities in the international market.

Wondaferahu (2013), has studied the determinants of export performance in Ethiopia. while Tigist (2015) has undertaken a study on impact of selected agricultural exports in Ethiopia and Samuel (2012) has conducted a study on the factors affecting agricultural export. These studies lacks a comprehensive empirical study which determines factors affecting agricultural Export performance, that include all important variables ,i.e real effective exchange rate, inflation, trade openness, foreign direct investment, infrastructure and fertilizer input. Hence, a closer look at the major factors determining the agricultural export of the country, theoretically and empirically, is indispensable in order to help the country to experience or achieve a sustainable growth in agricultural exports. Hence, this study has assessed and empirically analyzed the performance of Agricultural commodities export of Ethiopia using selected macroeconomic determinants and secondary data over the time from 1983 – 2018.

Research Methodology

Research Design

The study implemented longitudinal research design identifying the determinants of agricultural export performance in Ethiopian economy using time series data.

Data type and Data Sources

Time series data were used in this study for the period 1983-2018. The data set was collected from National Bank of Ethiopia, Ethiopian Revenue and Custom Authority, Ethiopian Roads Authority, CSA, World Bank Website, UNCTADSTAT and IMF World Economic Outlook Website.

For analyzing the country's determinants of agricultural export performance, the Agricultural export equation in this study has been estimated using time series data for the period 1983-2018 and the time series data that used in this study are Agricultural export of Agricultural goods valued in US dollar.

Econometric Model Specification

Hence, the study signifies Ethiopia's agricultural export performance as a function of real effective exchange rate, and openness, infrastructural development, fertilizer input. The model that has been used in this paper is thus the adopted Goldstein and Khan (1985) imperfect substitution model, which is expressed as follows:

$$AGEX = f(REER, OPEN, ROAD, INF, FERT, FDI)$$

Next, we convert into equation forms

$$AGREX_t = \beta_0 + \beta_1 OPEN_t + \beta_2 REER_t + \beta_3 FERT_t + \beta_4 ROAD_t + \beta_5 INF_t + \beta_6 FDI_t + \varepsilon_t$$

Thus, to determine Ethiopia's agricultural export performance, a log-linear form agricultural export determination model is employed incorporating the supply related variables. The model is adopted from Samuel Tekeste (2012) in estimating determinants of agricultural export in Ethiopia and Wondaferahu Mulugeta (2013) in estimating determinants of Agricultural export performance in Ethiopia was used similar model. In contrast, however, the model includes inflation and FDI. Therefore, the regression equation is given by:

$$\ln AGREX_t = \beta_0 + \beta_1 \ln OPEN_t + \beta_2 \ln REER_t + \beta_3 \ln FERT_t + \beta_4 \ln ROAD_t + \beta_5 \ln INF_t + \beta_6 \ln FDI_t + \varepsilon_t$$

Where;

AGREX_t = Agricultural export earnings at time t in log linear form is the dependent variable.

OPEN = exports plus imports as a percentage of GDP, a proxy for degree of openness in log linear form

INF = Inflation in log linear form

FERT = Fertilizer input during a period in log linear form

FDI = Foreign direct investment during a period in log linear form

REER = Real Effective Exchange Rate in log linear form (which is found by trade weighted Birr/foreign currency*foreign price index/domestic price index)

ROAD = Kilometers of paved roads which is a proxy of transportation infrastructure.

ε = Error terms

Definition of Variables

Dependent Variable

Agricultural exports are the agricultural output produced in one country and purchased by residents of another country. It doesn't matter what the good is. It doesn't matter how it is sent. It can be shipped, or carried in personal luggage on a plane. If it is produced domestically and sold to someone in a foreign country, it is an export.

Independent Variables

Trade Openness

Trade Openness is the sum of imports and Agricultural exports normalized by GDP. As definition indicates, openness can affect Agricultural exports as it promotes the efficient allocation of resources, factor accumulation, technology diffusion, and knowledge spillovers. According to Kuroda (2006), Asia has been a showcase of economic performance where an outward trade policy takes a central role (Trejos and Barboza, 2015). Other explanations regarding the Singer-Prebisch thesis, however, suggest that trade openness might have a negative impact on growth (Tekin, 2012a, b; Tekin, 2012a; Tekin, 2012b). Spilimbergo (2000) presents a model in which trade between an advanced country and a less developed country can reduce long-term growth rates in the developed country.

Mishra (2007) and Lane and Milesi-Ferretti (2008b) state that bilateral equity investment is strongly correlated with underlying patterns of trade. Greater trade liberalization produces antigrowth and pro-growth effects. The neoclassical economists argue that Agricultural export growth is the main driver of economic growth (Helpman and Krugman, 1985; Hye et al., 2013).

Real effective Exchange Rate (REER)

The price of one currency in terms of another is called exchange rate. Exchange rates play a central role in international trade because they allow the computation of the relative prices of goods and services produced in different countries thereby allowing the comparison of those prices across countries. Changes in exchange rates are described either as depreciations or appreciations. There are two indicators to measure exchange rate changes. These are Nominal Effective Exchange Rate (NEER) and Real Effective Exchange Rate (REER).

REER is the real effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.

An increase in REER implies that exports become more expensive and imports become cheaper; therefore, an increase indicates a loss in trade competitiveness.

Infrastructure

Infrastructure is one of the major non-price factors, which affects or constrains Agricultural exports especially in least developing countries. Of the factors that boost production as well as Agricultural export supply of commodities, infrastructural facilities come at the forefront. Its development is a key element of countries ability to produce and move goods. Weak infrastructure is a major impediment to trade, competitiveness and sustainable development in most African countries, particularly land -locked and Small Island countries. It reduces the return to trade and economic activity and hinders growth prospects of a given country.

According to Eyayu, (2011), internal physical infrastructural facilities of a given country can be proxy by indexes such as percentage of paved roads out of the total road; number of fixed and mobile telephone subscribers (per 1000 people); number of internet subscribers (per 1000 people), freight of air transport (in mill ton-km) and so on. In this study, the impact of infrastructure is captured by kilometers of total paved roads. Since the availability of road creates marketing opportunities in the international market and also the absence of such facilities does not bring the desired agricultural export performance of the country, therefore, we expect the sign of this variable to be positive.

Fertilizer Input

Fertilizer is the ingredient, which increases the productivity of agricultural products. When fertilizer import increases, its consumption will also increase which in turn increases the productivity and hence increases Agricultural export supply of the country. Hence, we expect the sign of the coefficient of fertilizer input import to be positive Samuel (2012).

Inflation

Inflation is a situation of rising prices in the economy. A more exact definition of inflation is a sustained increase in the general price level in an economy. Inflation means an increase in the cost of living as the price of goods and services rise. The rate of inflation measures the annual percentage change in the general price level.

Inflation is measured by consumer prices (monthly %). Inflation as measured by the consumer price index reflects the percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals.

According to the aggregate demand curve, when the price level is higher, the real GDP demanded is lower. One of the explanations given is a consequence of the Mundell-Fleming model: "As the price level drops, interest rates fall, domestic investment in foreign countries increases, the real exchange rate depreciates, net Agricultural exports increase, and aggregate demand increases." Therefore, this seems to suggest that increased inflation means more imports and fewer Agricultural exports. However, increased inflation should also increase the exchange rate (currency depreciation). If you can trade foreign currency for more domestic currency, then Agricultural exports should increase and (conversely) imports should decrease.

According to Asian Journal of Economics, Business and Accounting (2017) inflation has a significant positive long run relationship with total Agricultural exports.

Stationary and Non-Stationary Series

The standard classical methods of estimation that are used in the applied econometric work are based on a set of assumptions one of which is the stationarity of the variables. A variable is said to be covariance (weakly) stationary if the mean and the variances of the variable are constant over time.

In addition, the covariance between two periods depends only on the gap between the periods not the actual time at which this covariance is considered. Whereas a non-stationary series has a different mean at different points in time and its variance, increases with the sample size (Debel 2002).

According to Madala (1992), a time series is said to be strictly stationary if the joint distribution of any set of N observations Y_1, Y_2, \dots

Y_t is the same as the joint distribution of $Y_{1+k}, Y_{2+k}, \dots, Y_{t+k}$ for all N and K . The distribution of Y_t is independent of time and thus it is not only the mean and the variance that is constant but also all higher values of t are independent of t . In time series analysis, most encountered series are in fact non-stationary. Contrary to the situation of stationary process which fluctuates around their mean, the reversion to a fixed value rarely occurs for non-stationary process. If a non-stationary time series is regressed on one or more non-stationary time series, the results are prone to spurious regression problems. This is a situation where results obtained suggest there are statistically significant relationships between the variables in the regression model when in fact all that is obtained is evidence of contemporary correlations rather than meaningful causal relations (J. Gudeta, 2010).

Therefore, it is necessary to check whether the variables included in the model are stationary or not before going to the next step which is regression analysis.

Testing for Unit-Roots

Unit-roots are important to detect the stationarity of time-series data. To test if the series, used have unit-roots the researcher applies a test based on the work of Fuller (1976) and Dickey and Fuller (1979, 1981). The Augmented Dickey-Fuller test is a similar but modified version of the Dickey-Fuller test which is used when error term is not a white noise. While testing for stationarity, if a variable becomes stationary at level, then it is said to be integrated of order zero, $I(0)$. In addition, if the variable is stationary at its first difference, it is said to be integrated of order one $I(1)$. Similarly, if a variable can be transformed to stationary series by differencing n times, then it is integrated of order n , $I(n)$ (Verbeck, 2004).

Co-integration and the Error Correction Model

Once the order of integration of the non-stationary variables has been determined and of variables is found to be non-stationary the next step is Co-integration. The test for co-integration is to check for the existence of co-integrating relationships between non-stationary explanatory variables, are co-integrated, if they have a linear combination of their data series that is stationary even though the individual series are non-stationary. In other words, we want to test for the stationarity of the linear combinations of these variables. The theory of co-integration addresses the issue of integrating short-run dynamics with long run equilibrium. Two $I(1)$ series are said to be co-integrated if there exists a linear combination of the series which is stationary. Suppose that Y_t is $I(1)$ and X_t is also $I(1)$, then Y_t and X_t are said to be co-integrated if there exists a β such that $Y_t - \beta X_t$ is $I(0)$. In that case, the regression equation $Y_t = \beta X_t + U_t$ makes sense because Y_t and X_t do not drift too far apart from each other over time (Madala, 1992). In general, if X_t and Y_t are co-integrated, that means there is a long-run relationship between them and furthermore, the short-run dynamics can be described by the error correction model (ECM).

Regarding the test for the existence of co-integration, there are a number of methods for testing it. Among these, the Engle Granger two step residual based procedures and the Johansen test are the major ones used by many researchers. Therefore, in this paper, the co-integration test carried out is Engle Granger two-step procedures. This model first estimates the relationship between the variables by ordinary least square (OLS) and test for stationarity of the error term. If the error term is found to be stationary then the variables are co-integrated. In economic terms,

variables will be co-integrated if they have a long term equilibrium relationship between them (Maddala,1992).

Results and Discussions

Estimation Technique

Many macroeconomic time series are not stationary at levels and are most adequately represented by first differences. Non-stationarity of time series data has often been regarded as a problem in empirical analysis. Working with non-stationary variables lead to spurious regression results, from which further inference is meaningless. Thus, it is better to distinguish between stationary and non-stationary variables. Harris (1995:15) noted "... a data series is said to be stationary if its error term has zero mean, constant variance, and the covariance between any two-time periods depends only on the distance or lag between the two periods and not on the actual time at which it is computed."

Hence, the first step in time series econometric analysis is to carry out unit root test on the variables of interest. The test examines whether the data series is stationary or not. To conduct the test, the conventional Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) test has been used with and without a trend. Since the actual data generating process is not known a priori, the test of determining the orders of integration of the variables has conducted first by including a constant only and then both a constant and a trend. The ADF test is based on the regressions run in the following forms.

$$\Delta Y_t = \alpha_1 + \beta Y_{t-1} + \mu_t \text{-----} 4.1$$

$$\Delta Y_t = \alpha_1 + \alpha_{2t} + \beta Y_{t-1} + \mu_t \text{-----} 4.2$$

Where, t is the time or trend variable. Equation (4.1) adds a drift, and equation (4.2) introduces both a drift and a time trend. In each case the null hypothesis is that $\beta = 0$, that is, there is a unit root. The null hypothesis (H_0) is thus a series contains a unit-root (non-stationary) against the alternative hypothesis (H_1) stationary (deterministic trend).

Result of Unit Roots Tests

The first task before any meaningful regression in time series analysis is to test the existence of unit roots in the variables and establishing their order of integration. Because the variables used in the analysis need to be stationary and/or should be co integrated in order to infer a meaningful relationship from the regression.

All the variables used in the estimation process are tested using Augmented-Dickey Fuller test statistic and the results are presented in table 1 below.

Table 1: ADF Test at First Difference Level

Variables	ADF	t-statics at 5% level	Prob.	Result
lnAGREX	3.469836	2.954021	0.0154	Stationary
lnFDI	3.783750	2.981038	0.0084	Stationary
lnFERT	7.886700	2.954021	0.0000	Stationary
lnINFL	8.020495	2.957110	0.0000	Stationary
lnOPNE	3.505667	2.967767	0.0151	Stationary
lnREER	5.010174	2.960411	0.0003	Stationary
lnROAD	2.955947	2.971853	0.0517	Stationary

The result of ADF test at level of first difference showed in Table above clearly indicates that all variables are stationary at level of first difference

(the null hypothesis of a unit root is rejected for all variables with a drift term). Hence, they are regarded as integrated of order one or $I(1)$. Because, if a time series is differentiated at once and the differentiated series is stationary, then the original series is termed as integrated of order (Gujarati, 2004).

Determining the Optimal Lag Length (p) for the Model

As shown on table 3 below, the lags (p) of VAR model, AIC criterion the lags (p) and other criterion the order of VAR is 2. All criteria gave the same results, so the lag (p) of 2 was used in the model as the order of VAR. Then the Johansen (1988) test of was applied and results are shown in the following table. Following the unit root tests and lag length section co-integration test was carried out using Eviews10 using the Johansen (1988) co-integration method.

Table 2: Lag Length Selection of the Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1809.208	NA	4.69e+40	113.5130	113.8336	113.6193
1	-1617.441	287.6511	6.74e+36	104.5900	107.1551	105.4403
2	-1521.201	102.2551*	5.69e+35*	101.6375*	106.4470*	103.2317*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level), **FPE**: Final prediction error **AIC**: Akaike information criterion, **SC**: Schwarz information criterion, **HQ**: Hannan-Quinn information criterion

Johansen Co-integration Test

Engle and Granger (1987) defined Co-integration as a condition where two or more variables are associated to form equilibrium relationships over the period of time. Even though the individual time series are not stationary, a linear combination of these variables could be stationary (i.e. they may be co-integrated). If these variables are co-integrated, then they have a stable relationship and cannot move “too far” away from each other.

There are two common methods for testing co-integration and estimating the relationship among co-integrated variables. These are the Engle and Granger (1987) two-step procedure and the Johansen’s (1988) maximum likelihood methods. The Johansen procedure takes care of the above shortcomings by assuming that there are multiple co-integrating vectors.

Thus, testing for co-integration using the multivariate VAR approach developed by Johansen (1988) is necessary because failure to capture the existence of more than one co-integrating vector yields misleading long-run coefficients. In which case, the estimated parameters of the long run coefficient would only be a linear combination of the parameters of the two or more co-integrating long-run relationship (Harris, 1995). Thus, an unrestricted VAR can be formulated to estimate the long run relationship among jointly endogenous variables. Here table 4.4 below indicates the Johansen co-integration test of the model

Table 3: Johansen co-integration Test

Null hypothesis	Eigen values	Maximum Eigenvalues			Trace Statistics		
		Johansen's Test	Critical Value (0.05)	Prob**	Johansen's Test	Critical Value (0.05)	Prob**
None *	0.985088	130.3731	46.23142	0.0000	335.2620	125.6154	0.0000
At most 1 *	0.926210	80.80256	40.07757	0.0000	204.8889	95.75366	0.0000
At most 2 *	0.858490	60.61693	33.87687	0.0000	124.0863	69.81889	0.0000
At most 3 *	0.611412	29.30231	27.58434	0.0298	63.46941	47.85613	0.0009
At most 4 *	0.532444	23.56731	21.13162	0.0223	34.16709	29.79707	0.0147
At most 5	0.287959	10.52821	14.26460	0.1795	10.59978	15.49471	0.2373
At most 6	0.002306	0.071567	3.841466	0.7891	0.071567	3.841466	0.7891

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The maximum value was greater than critical value at zero co-integrating vectors for both trace test and Maximum-Eigenvalue test. Thus, the above table shows that the null hypothesis of no co-integration is rejected at the conventional level 5% and this indicated the existence of one co-integrating relationship. The study concludes that there exists a relationship among the proposed variables in the long run. (i.e. Trace test and maximum Eigen value test indicates that there are 5 co-integrating vector at level of 5%). All the variables are co-integrated of order one having the long run relationship.

The co-integration regression so far considers only the long-run property of the model, and does not deal with the short-run dynamics explicitly. Obviously, a good time series modeling should describe both short-run dynamics and the long-run equilibrium simultaneously.

Finally, whether the long run parameters are obtained using the Johansen co-integration analysis, the Johansen (1988) Vector Error Correction Model

(VECM) has been estimated. Diagnosis tests on the estimation technique should also be performed at each stage of reduction to check parameter consistency.

Long Run Estimation and Error correction Models

Long run Estimation

After co-integration test has been conducted and its presence is confirmed, the next task is to estimate the long run relationship between Ethiopian Agricultural export performance and its determinants LS estimation method.

Table 4: Result of the Estimated Long Run Model

Variables	Coefficient	Std error	t-Statistic	P-value
C	-20536.31	3607.732	-5.692306	0.0000
LNFDI	-1.880279	0.747576	-2.515169	0.0179
LNFBERT	1.319289	0.799149	1.650866	0.0099
LNINF	7.798559	71.20414	0.109524	0.0136
LNOPNE	46.13202	9.921261	4.649814	0.0001
LNREER	64.50309	17.09630	3.772927	0.0008
LNROAD	3.721777	0.919137	4.049207	0.0004

- ❖ Number of observation=35
- ❖ R-squared = 0.971850
- ❖ Adjusted R-squared = 0.965818
- ❖ F-statistic = 161.1108
- ❖ Prob (F-statistic) = 0.0000

❖ Durbin-Watson (DW) = 1.767996

The results of residual diagnostic tests such as Breush-Pagan-Godfrey test for heteroscedasticity (Annex V), Breush-Godfrey LM Test for serial correlation (Annex VI), and Jarque-Beratest for normality (Annex VII), Ramsey test for model specification (VIII) CUSUM stability test Annex (IX) are reported (i.e all tests did not detect the problem of serial correlation, heteroscedasticity, non-normality and model misspecification & no stability.)

In the estimation of long-run model, foreign direct investment shows negative coefficient (unexpected sign) and has significant effect in a long run on performance of agricultural export. Fertilizer input, trade openness, real effective exchange rate, inflation rate and infrastructure (paved road) have positive and significantly affect the performance of Ethiopian agricultural export and showed expected signs.

As it can see from t-ratios and probabilities (table above) except inflation rate, all other variables (i.e foreign direct investment, fertilizer input, openness, real effective exchange rate and kilometers of paved road) are significantly affected the agricultural export performance in the long run. Having already obtained the long-run model and estimated the coefficients, the next step will be estimation of coefficients of the short-run dynamics that have important policy implications.

Short Run Error Correction Model

Hence, an error correction model will be estimated that incorporates the short term interactions and the speed of adjustment towards long run

equilibrium. So the error correction model has been estimated using the OLS technique and the results are summarized in table 5 below.

Table 5: Result of the Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	734.2646	825.9587	0.888985	0.0836
D(LNAGREX(-1))	0.440540	0.185914	2.369589	0.0270
D(LNFDI(-1))	-0.544935	0.608063	-0.896183	0.3799
D(LNFERT(-1))	5.525588	0.499309	-1.052630	0.0039
D(LNINF(-1))	-71.50458	42.56979	-1.679702	0.1072
D(LNOPNE(-1))	3.837685	11.62195	0.330210	0.0444
D(LNREER(-1))	67.84100	19.44208	3.489390	0.0021
D(LNROAD(-1))	1.945371	1.535051	1.267301	0.0183
D(ECM(-1))	0.777094	0.189826	1.986524	0.0496

Number of observation=31 after adjustments

- ❖ R-squared=0.879551
- ❖ F-statistic=3.790623
- ❖ Prob. (F-statistic) =0.005185
- ❖ Adjusted R-squared=0.726660
- ❖ Durbin-Watson (DW) =1.923778

Similar to the case of long run model, the results of various diagnostic tests such as Breush-Pagan-Godfrey test for heteroskedasticity, Breush-Godfrey LM Test for serial correlation, Jarque-Bera test for normality and Ramsey's general test of model misspecification did not detect any problem. From the estimation results of the short run error correction model the coefficient of the error correction term is significant and has large magnitude

(0.777094). Its magnitude indicates that deviation from the long run equilibrium is adjusted fairly quickly where 77.7% of the disequilibrium is removed each period. The result of R^2 is also 0.72666 which reveals that 72.7% of Ethiopian agricultural export performance is determined by the explanatory variables included in the model and other determinants which are not included in the model account only 27.3% in determining it. Furthermore, F-statistic is significant with a probability of 0.005185 which implies that the model fit. Additionally, estimate of the short run model show that fertilizer input, real effective exchange rate, trade openness and kilometers of paved road are indicating that the variables significantly affect the agricultural export performance of Ethiopia in the short run and showed positive sign.

Conversely, inflation and foreign direct invest are insignificantly affecting the agricultural export performance of Ethiopia in the short run and the coefficients showed negative sign. The study reveals that inflation does not affect the performance of agricultural export in Ethiopia in short run. It contradicts with theoretical (theoretically, if inflation occurs in a country domestic exports will become costlier and foreign imports will become cheaper assuming no change in foreign exchange rates following domestic inflation. If demand for domestic exports in foreign countries is elastic, exports may decline following rise in price.) Similarly, foreign imports may rise following decline in import prices due to inflation in domestic country provided demand for imports are elastic. Sharma (2001) has got the same result from his investigation of the determinates of Indian exports using annual times series data by using relative prices and domestic price and exchange rate where he found the fall in export prices increased demand for Indian exports while appreciation of the Indian Rupee against major

currencies of the trading partners had a negative impact on Indian agricultural export volumes.

The impact of agricultural input use which in this paper was captured by fertilizer import over a period of time, the result shows that a 1% an increase in fertilizer input will lead to 0.05% increase in the agricultural export supply. The coefficient of trade openness is also positive and significant as expected. This shows liberalizing by 1% will lead the agricultural export to increase by 0.38%. As trade openness like free trade area can help exports of LDC. Looking at real exchange rate, the outcome of its coefficient is significant and positive in sign as expected. It shows that an improvement by 1% in real effective exchange rate will lead to 0.67% increase in the total agricultural export of the country. Samuel (2012) also found the same result from his study on the determinates of agricultural export of Ethiopia fertilizer input import has significantly affected the agricultural export in the long run and short run

Finally the other important explanatory variable is kilometers of paved roads which are a proxy of infrastructural facilities. The figure shows that an increase in the kilometers of paved roads by 1% will increase the agricultural export by a larger magnitude of 1.9%. As it is theoretically known infrastructural facility, especially the expansion of roads network is the key determinant of country's export performance. Generally, inflation and foreign direct investment in a short run doesn't determine the performance of Ethiopia's agricultural export the same result was also reported by Samuel (2012) from his co integration and error correction in his regression analysis.

Conclusions and Recommendations

Secondary data for the period 1983/84-2017/18 collected from National Bank of Ethiopia, Ethiopian Revenue and Custom Authority, Ethiopian Roads Authority, CSA, World Bank website, UNCTADSTAT and IMF World Economic Outlook Website was used to analyze Ethiopia's agricultural export performance.

Pre-estimation tests of the statistical behavior of the variables using Augmented Dickey Fuller test for the presence of unit root showed that all the variables except inflation and infrastructure were non-stationary at level. However, all the variables were stationary at first difference. Thus, they are regarded as integrated of order one. After co-integration test was conducted using Engle Granger procedure and its presence was confirmed, since the error correction term is significant and negative in sign as expected, the long run equation was estimated and according to the result all the variables were found significantly affect the agricultural export performance of the country. But, the sign coefficient of variable foreign direct investment was found negative (different from what already expected). This might be due to the fact that when foreign direct investment increases, domestic absorption of primary goods will increase (they may processed to manufacturing good) which in turn diminishes agricultural exports.

The regression result showed that inflation and foreign direct invest are insignificantly affecting the agricultural export performance of Ethiopia in the short run and the coefficients showed negative sign.

In the short run, these variables have no impact on the agricultural export performance of Ethiopia. On the other hand, except these two explanatory variables all other variables such as real effective exchange rate, trade openness and kilometers of paved road and fertilizer input import over a period were found to affect the dependent variable significantly and positively as already anticipated.

The empirical result suggests that an increase in the country's real effective exchange rate cause a gain in competitiveness of that country. Thus, a conducive and stable exchange rate policy has to be ensured. Government; therefore, has to control up rising movement of domestic price and allow further nominal depreciation of local currency in longer run in order to encourage more agricultural export. As inflation also significantly affects the performance of agricultural export in Ethiopia, government has to manage the rate of inflation through adopting appropriate policies to encourage export earnings. In promoting Ethiopian agricultural export, the role of maintaining transport infrastructure development facilities is crucial. Thus, it needs investment in infrastructural development. This pertains in particular improvements of the main roads that connect the production areas and central markets. Thus, it needs more investment to improve the role of the sector for agricultural export growth. That is the empirical finding has policy implication that needs encouragement of credit to cash crop producers, tax-free agricultural input import, training supports on agricultural export, institutions that support agricultural export to increase quality agricultural output export.

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