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Causality Relationship between Agricultural Exports and Economic Growth in Ethiopia: A Case of Coffee,Oilseed and Pulses

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Abstract
This article investigated the causal relationships between agricultural exports and economic growth (GDP) in Ethiopia usin time series data for forty one years from 1973 to 2013. The study used Augmented Dickey Fuller (Dickey and Fuller, 1979) and Phillips-Perron(PP) (Phillips and Perron, 1988) to test for unit root and Granger model to test causality. The result of stationarity test reveals that the null hypothesis that the variables have a unit root is not rejected in the case of all the variables at level form I (0). However, the null hypothesis that the first-differences of these variables have a unit root is rejected. This showed that, the series data is stationary at first difference and hence the variables are considered as integrated of order one or I (1) process. On the other hand the causality relationship found that there is bidirectional relationship between coffee export, oilseed export and economic growth whereas unidirectional relationship was found between pulses export and economic growth which is running from pulse export to economic growth (GDP). Based on the findings, it is recommended that policies aimed at increasing the productivity and quality of these cash crops should be implemented. Also additional value should be added to them before exporting. Correspondingly, there is also a need to devote resources on the production of non-export goods in order to increase exports since they have bi directional relationship. When this is done, it will lead to a higher rate of economic growth in Ethiopia
Keywords: Agriculture, Agricultural exports, Economic growth, causality

Introduction

More than 80 percent of the population in Ethiopia lives in rural areas and their main source of income is agriculture. Agriculture accounts for 45 percent of the Gross Domestic Product (GDP), employs 85 percent of the labour force and generates 86 percent of export earnings (MoFED, 2010). However, Ethiopian farming is largely characterised by peasant holders who grow food mainly for family consumption thus leaving little for commercial purposes. This inadequate volume of production is mainly due to the tardy progress in farming methods and scattered pieces of land holdings. Most of the farm land is cultivated by small scale farmers with traditional agricultural practices. However, the rural and agricultural sector is the foundation of Ethiopian development. Due to this, the sector gets priority in government policies and in the five-year (2003-2007 E.C) development and transformation program. Among others, the rural and agricultural development policy encourages the expansion of large-scale farms, which would have a relative advantage to introduce modern technology and farm management to raise production. The new economic policy resulted in fast economic growth which grew at about 11 percent per annum on average over the last ten years between 2003/04 and 2012/13(MoFED, 2014).

Ethiopia is following agricultural led industrialization economic policy. In the 2011/12 fiscal year the agricultural sector, service sector and industrial sector contributed 44 percent, 45 percent and 11 percent to real GDP of the country respectively (MoFED, 2013).The share of the agricultural sector to the whole economy is decreasing from time to time whereas the growth in service sectors increasing at high rate while the industrial sector is increasing at a low rate. However, even though the agricultural sector has been showing a decreasing contribution to the country's GDP, it still contributes 85 percent of employment and 70 percent of raw materials for local industries (MoFED, 2012).

The economy of the country is mainly dependent on the agricultural sector thus the export sector is also highly dependent on agricultural productivity. Since the export sector is characterized by dependence on primary commodities, the country faces different problems. For instance, in 1983 the provisional government of socialist Ethiopia (Derg) noted that the basic constraints for Ethiopia exports included: the low volume of

exportable products, the limited degree of diversification of exports, frequent economic crises and artificial trade barriers by trading partners among others. Moreover, after the downfall of the Derg regime, the transitional government of Ethiopia stated that it is essential to increase and diversify exports (Abay and Zewudu, 1999). Thus, Ethiopia has taken different measures such as export trade duty incentive scheme which incorporates duty draw-back scheme, voucher scheme and bonded manufacturing warehouse, export credit guarantee scheme and foreign exchange retention scheme to those wholly engaged in supplying their products to foreign markets. When compared to the pre-1991period, the trade policy regime has become more liberal (Yishak, 2009).

Owing to this policy shift, some improvements in export earnings have improved during the post reform period. According to the Ministry of Trade (MOT), the value of export earnings increased from $1.03 billion during the first six years of the Derg regime ((1974-1980) to $15.48 billion in the last six years of the EPRDF regime ((2008-2014)).However, the exports of the country contributed only 0.02 percent in 2012 to the world market (WTO, 2013).The country`s export sector has depended on export of a few agricultural products like coffee, oil seeds, pulses, skins and hides(Yishak,2009).

Overview of agricultural exports in Ethiopia

The share of international trade of Ethiopia is insignificant and the export sector is dominated by primary products for which the income elasticity of the developed country slowly increases as their income increases when compared to consumer goods and producer goods. Ethiopia is the main producer and exporter of coffee in Africa which is grown mainly in two regions of the country; Oromiya and Southern Nation, Nationalities and People (SNNP) region in the south and west part of the country (Bart *et al.*, 2014).Coffee is cultivated by over4million primary smallholder households and a high percentage of coffee is supplied to the local market (CSA, 2013). In 2012 fiscal year, Ethiopia was the major coffee producer and exporter in Africa and ranked tenth of the largest coffee exporters in the world. The country exported 3.2 million bags of coffee and accounted for 3 percent of internationally traded coffee in the same year (Bart *et al.*, 2014). According to Ethiopia Revenue and Customs Authority (ERCA, 2013), coffee contributes a large portion of total exports of the country, has high contributions to the country's gross domestic product (GDP) and the most crucial source of hard currency. However, since investment in agriculture as a whole is weak in the country, the production of coffee fluctuates from year to year and international coffee market experiences significant price variations.

On the other hand, oil seed is the second major export earner of Ethiopia. The country produces different types of oilseed varieties such as sesame seed, linseed, niger seed, sunflower seed, soybeans, cottonseed, and rapeseed. From these sesame seed, linseed and niger seed are the major export crops. According to ERCA, in 2011/12 the country exported 367,436.15tonnes of oilseeds valued at 472.31 million dollars which was an increase of 113,249.69tonnes from 2010/11 period.

The other crop that Ethiopia exports in high volume next to coffee and oilseeds is pulses. In 2012/13, the country exported 357,518.77tonnesvalued at 233.35 million dollars (ERCA, 2013). The increase in demand for pulse in local and international market created economic incentives which resulted in high production and supply of the commodity. The general overview of these three commodities given in Figure 1 below indicate two things; first, through time, the export of the commodities was increasing in volume as well as in values and highly contributed to the total exports of the country on average. Second, the export volume was fluctuating from year to year depending on different factors such as world market price, climate change which can affect the production volume of the commodity, change in government policy among others.

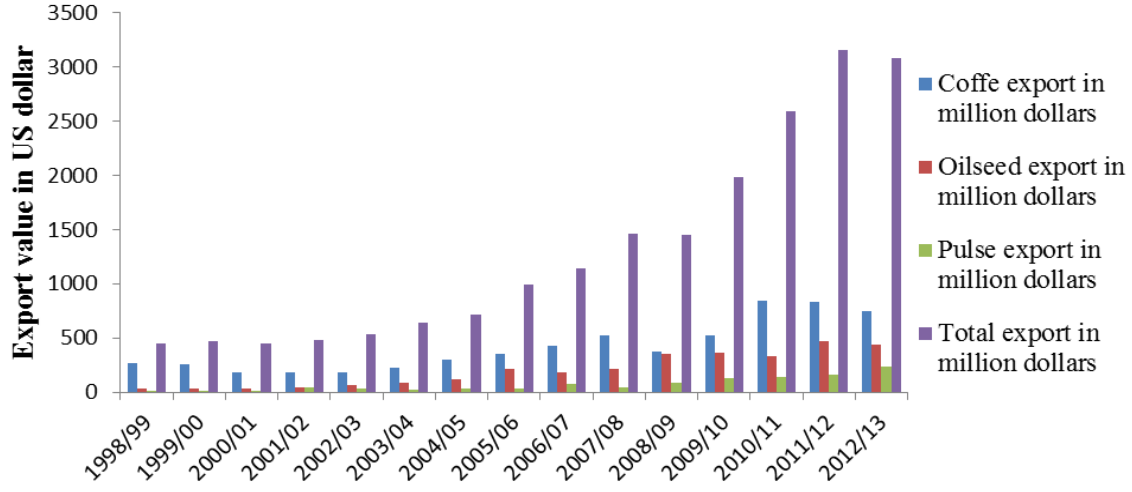

Figure 1: The share of Agricultural exports from total exports of the country (1999-2012/13)
Source: Author's calculation based on data from ERCA.

Methodology

Method of data collection

This study was mainly based on secondary yearly export data on selected commodities obtained from Central Statistical Agency (CSA), National Bank of Ethiopia (NBE), Ministry of Finance and Economic Development (MoFED), Ethiopian Revenue and Customs Authority (ERCA) and various publications of International Monetary Fund (IMF) and World Bank (WB) covering the period from 1973-2013.

Method of data analysis

Testing for unit root

A non-stationary time series has a different mean at different points in time and its variance increases with the sample size. Non-stationary data, as a rule, are unpredictable and cannot be modeled or forecasted. The results obtained by using non-stationary time series may be spurious in that they may indicate a relationship between two variables which in essence does not exist. In order to achieve consistent and reliable results, the non-stationary data needs to be transformed into stationary data. Regression of non-stationary time series may cause a spurious or non-sense regression. On the other hand, a series is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed.(Guajarati, 2004). There are a number of methods to test the unit root hypothesis but this study used Augmented Dickey Fuller (Dickey and Fuller 1979) and Phillips-Perron tests (PP) (Phillips and Perron, 1988) on testing for a unit root in time series. The ADF-test requires us to estimate the following equation:

$$\Delta Y_t = \beta_0 + \delta Y_{t-1} + \alpha_t \sum_{t=1}^{m} \Delta Y_{t-1} + \varepsilon_t \quad \text{.....1}$$

Co integration test

Co-integration is the statistical implication of the existence of long run relationship between the variables which are individually non-stationary at their level form but stationary after first difference (Gujarati, 2004). The theory of co integration can therefore be used to study series that are non stationary but a linear combination of which is stationary. Two main procedures were used to test for co integration: The Engle and Granger (1987) test and the Johansen (1988) co integration test by using the following equation respectively:

$$\varepsilon_t = Y_t - \beta_0 - \beta_1 X_t \quad \text{.....2}$$

$$\Delta y_t = \alpha\beta' y_{t-1} + \sum_{i=1}^{p-1} \Pi i \Delta y_{t-I} + \varepsilon_t \quad \text{.....3}$$

Granger causality test

Granger starts from the premise that the future cannot cause the present or the past. In multivariate time series analysis, causality test is done to check which variable causes (precedes) another variable. Given two variables X and Y, X is said to Granger cause Y if lagged values of X predicts Y well. If lagged values of X predict Y and at the same time lagged values of Y predict X, then there is a bi-directional causality between X and Y. Granger (1969) devised some tests for causality which proceed as follows. Consider two time series, Y_t and X_t: The Series y_t fails to Granger cause X_t: if in a regression of Y_t on lagged Y's and lagged X's, the coefficients of the latter are zero. That is, consider:

$$Y_t = b_0 + \sum b_j Y_{t-j} + \sum c_j X_{t-j} + \varepsilon_t \quad \text{.....(4)}$$

Then, if c_j=0 and j = 1, 2 . . . k, X_t fails to cause Y_t .We test the hypothesis that H_0:c_j=0 against $H_1 : c_i \neq 0$ by using an F test.In this study, where we was examined if coffee, oilseed and pulse exports granger causes economic growth(proxied by GDP) or vice versa, the model is given by:

$$LnRGDP_t = b0 + \sum b_j lnRGDP_{t-j} + \sum c_j lnCOFX_{t-j} + \varepsilon_t \quad \text{.....(5)}$$

$$lnCOFXt = b0 + \sum b_j lnCOFX_{t-j} + \sum c_j lnRGDP_{t-j} + \varepsilon_t \quad \text{.....(6)}$$

$$LnRGDP_t = b0 + \sum b_j RGDP_{t-j} + \sum c_j lnOLX_{t-j} + \varepsilon_t \quad \text{.....(7)}$$

$$lnOLXt = b0 + \sum b_j lnOLX_{t-j} + \sum c_j lnRGDP_{t-j} + \varepsilon_t \quad \text{.....(8)}$$

$$LnRGDP_t = b0 + \sum b_j RGDP_{t-j} + \sum c_j lnPUX_{t-j} + \varepsilon_t \quad \text{.....(9)}$$

$$lnPUXt = b0 + \sum b_j lnPUX_{t-j} + \sum c_j lnRGDP_{t-j} + \varepsilon_t \quad \text{.....(10)}$$

Where lnRGDPt is natural logarithm of real gross domestic product, lnRGDPt-j is lagged value of natural logarithm of real gross domestic product, lnCOFXt is natural logarithm of coffee export, lnCOFXt-j is natural logarithm of lagged coffee export, lnOLXt is natural logarithm of oilseed export, lnOLXt-j is natural logarithm of lagged value of oilseed export, lnPUXt is natural logarithm of pulse export, lnPUXt-j is natural logarithm of lagged pulse export and ε_t error term. From the above equation if cj=0 and j=1,2,3….k then lnCOFXt-j fail to cause lnRGDPt under the null hypothesis of cj=0 against the alternative hypothesis cj#0 by using F-test.

lnRGPt-j fail to cause lnCOFXt in equation 5 and 6;,lnOLXt-j fail to cause lnRGDPt, lnRGDPt-j fail to cause lnOLXt in equation 7 and 8 respectively; lnPUXt-j fail to cause lnRGDPt and lnRGDPt-j fail to cause lnPUXt in equation 9 and 10. In the view of the Granger, the presence of co-integration vector shows that granger causality must exist in at least one direction.

Results and discussion

The results of Augmented Dickey fuller test and Phillips-Peron tests were applied to the variables mentioned in the model of this study at level I (0) and first difference I (1) data are presented in table 1 and 2.

Table 1: Unit Root Test at level form I (0)

Variables	**ADF**		**Phillips-Peron(PP)**	
	P-value	**test- statistics**	**P-value**	**test -statistics**
LGDP	1.000	3.074	1.000	3.074
LCOFX	0.935	-0.224	0.936	-0.224
LOLX	0.993	-0.965	0.993	-0.965
LPUX	0.915	-0.370	0.915	-0.370

* Significant at 10%, ** significant at 5%, ***significant at 1%

The result reported in table 1 above indicates stationarity test of the variables at level form I(0).The null hypothesis of non-stationarity cannot be rejected even at 10% level for any of the variables because the critical values of Mackinnon test for ADF and PP are (-3.5) at 1%; (-2.888) at 5%and (-2.578) at 10%. To reject the null hypothesis, ADF and PP test statistics should be greater than the critical value, or in other words, the P-value should be significant at specific level of confidence. Since the null hypothesis was not rejected for all the variables at any convenient significant level, so all the variables had unit root at levels. Therefore, we can conclude that all the variables data are non- stationary at level.

Table 2: First Difference Unit Root Test I (1)

Variables	ADF		Phillips-Peron(PP)	
	P-value	**test statistics**	**P-value**	**test statistics**
LRGDP	0.008	-3.506***	0.008	-4.159***
LCOFX	0.001	-3.983***	0.000	-5.077***
LOLX	0.009	-4.108***	0.001	-4.631***
LPUX	0.000	-5.216***	0.000	-8.420***

* Significant at 10%, ** significant at 5%, ***significant at 1%

From the result in Table 2, the Augmented Dickey Fuller (ADF) and the Phillips-Perron (PP) test statistics for the first differences of all the variables series data were significant at 1% level of significance. This showed that, the series data is stationary at first difference and hence the variables are considered as integrated of order one or I (1) process.

The order of integration which inters the specified economic growth model is already specified for each variable. All the variables are integrated of order one I (1).The next step is to estimate the long-run relationship between economic growth and agricultural export in Ethiopia using Johansson maximum likelihood methods and the two steps Engel and Granger procedure. One lag length was selected by Schwarz information criterion and Sequential Modified Likelihood Ratio approach for the VAR. The result for co integration test by Engle and Granger procedure is given in table 1 which shows the existence of long run relationship between the variables and Johansson co integration test also indicated the existence of one co integration vector see Appendix 1.

Table 3: unit root test for residual

Test-statistics p -value		
Augmented Dickey-Fuller test statistic	-4.074**	0.0011
Phillips-perron (PP)	-4.074**	0.0011
Test critical values:1% level	-4.29	
5% level	-3.74	
10% level	-3.45	

* Significant at 10%, ** significant at 5%, ***significant at 1%

Results of Granger causality test between Economic growth and Agricultural exports

The finding of stationarity of the variables and co integration between Agricultural exports and gross domestic product immediately implies that there is long-run causality in at least one direction (Granger 1988), either from Agricultural exports to gross domestic product or vice versa. Therefore, it would be useful to test long-run non-

causality if co integration is found. The result of the long run causality between Agricultural (coffee, oilseed and pulse) exports and economic growth is presented in table 4

Table 4: Result of causality test

Null hyphotesis	F-statistics	P-value
lnCOFX does not granger cause lnRGDP	9.024	0.028 **
lnRGDP does not granger cause lnCOFX	7.457	0.039**
lnOLX does not granger cause lnRGDP	10.07	0.023**
lnRGDP does not granger cause lnOLX	33.89	0.002***
lnPUX does not granger cause lnRGDP	9.812	0.024**
lnRGDP does not granger cause lnPUX	0.771	0.473

* Significant at 10%, ** significant at 5%, ***significant at 1%

The causal relationship between Agricultural exports and economic growth of the country was analyzed with the application of Granger (1969) causality test Table (14) indicates both the null hypothesis that coffee export and oilseed exports does not Granger causes economic growth and economic growth does not Granger cause coffee and oilseed exports are rejected. While the null hypothesis that economic growth does not Granger causes pulses export is accepted and the null hypothesis that pulses export does not granger cause economic growth is rejected. These results provide evidence of bi-directional causality between coffee exports and economic growth as well as oilseed export and economic growth running in both directions. Whereas unidirectional causality between pulses exports and economic growth running from pulse export to economic growth. The result implies that agricultural export growth causes economic growth and *vice versa* in case of coffee and oilseed exports. These results provide evidence in support of the export-led growth hypothesis and as well as the existence of reverse causality. The findings also suggest that there is a need to promote value added agricultural export expansion policies in order to achieve high economic growth. Correspondingly, there is also a need to devote resources on the production of non-export goods in order to increase exports.

Conclusions

The main objective of this study was to empirically determine the causality relationship between agricultural exports and economic growth(GDP) in Ethiopia using annual data for the period 1973- 2013.Time series techniques were used to test for the causal relationship between real GDP and agricultural exports. These are Unit root tests (ADF and PP tests), a co-integration test (Johansen's procedure and Engle and granger) and Granger causality.The results of the unit roots test indicated that all the variables are stationary in first differences I(1), therefore, I(1) series were adopted to test for co-integration. The co-integration tests results showed that the long-run relationships exist between the GDP and agricultural exports and in it is set up. The causality relationship results found the bidirectional relationship between coffee export, oilseed exports and economic growth whereas unidirectional relationship was found between pulses export and economic growth which is running from pulse export to economic growth (GDP).

Agricultural exports growth is one of the fundamental reasons for economic growth in Ethiopia and economic growth also cause agricultural exports to grow. Therefore effort should be direct towards policies that will enhance economic growth (GDP) such as improvement of human capital ,lobur force skills, investment, import substitution and technological development which will prepares required facility background for more quality and value added agricultural exports.

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APPENDICES

Appendix 1: Results of the test for the number of co integration vectors

H0:rank=0 rank	Eigen value	λ_{max}	5%critical value	1%critical value
0	-	77.729	51.42	57.69
1	0.816	38.589	45.28	51.57
2	0.618	30.983	39.37	45.10
3	0.539	25.823	33.46	38.77
4	0.476	17.150	27.07	32.24
5	0.349	10.454	20.97	25.52
6	0.230	7.849	14.07	18.63

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