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Causality Relationship between Agricultural Exports and Economic Growth: Evidence from South Africa

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ABSTRACT This study examines the export-led growth hypothesis via agricultural export in South Africa. The causality direction between processed and unprocessed agricultural exports and economic growth is examined for the time period 1975-2012. The empirical investigation indicates that there is no existence of causality between the agricultural export components and GDP. Thus, export-led growth hypothesis through agricultural exports is not valid for the case of South Africa. The non-causality between agricultural export components and economic growth in South Africa indicates that the level of agricultural export in the past was insufficient to stimulate economic growth, and the present economic growth in South Africa either does not exclusively rely on the level of processed and unprocessed agricultural export. Experiencing an export-led growth from agricultural sector, necessitates an increase in domestic and foreign investment, including agricultural export participation through strategic incentives.

INTRODUCTION

Economic growth is, undeniably, a key indicator reflecting the economic welfare and status of any country, and it is an indispensable need for economic development. It is referred to as the sustained increase in the quantity of goods and services produced in a country over time. Economic growth earnings are expected to have a trickling down effect of providing monetary resources for embarking on developmental programmes in every country. It is therefore seen as a goal for any government to achieve and sustain. Amongst the macro-economic drivers of economic growth is the export of goods and services. According to Iqbal et al. (2012), the theoretical link between a country's economic performance and its export can be traced to Adams Smith and David Richardo who both emphasize the significance of foreign trade for a countrys' economic progress. Both economists highlight that a country could have an absolute or comparative advantage if it produces a certain product and exports it to other countries that lack the product. Shihab et al. (2014) also noted that export is a vital source of foreign exchange earnings that could help generate the much needed employment in a country. International trading through export incorporates a country into the world economy and aids economies of scale for domestic production (Ray 2011). These export benefits, therefore, motivate countries interested in striving to increase their exports more than imports. Questions, however, continue to arise on whether export actually does cause growth.

Theoretically, the causality direction between export and economic growth can be seen from the perspective of export-led growth or growth-led export hypotesis. Export-led growth explains that export focused countries have a better capacity to obtain advanced technologies that have been generated in leading countries and also benefit from improved specialization or efficient utilization of resources. On the contrary, output drives export due to skill enhancements and technology, thereby increasing efficiency and promoting a comparative advantage for the country to export its products (Tiwari and Ludwig 2014). However, empirical evidence has largely focused on export-growth nexus at the aggregate level with less attention at the disaggregated level (nexus at sector level and sector-aggregate level). It needs to be emphasized that understanding export channels that cause desired economic growth is important. This is so because the export sectors are insignificant in causing the expected economic growth. Identifying sector export causing growth at the disaggregated level, thus, becomes important. The diversification of an export base of a country is also necessary because it helps to lessen the vulnerability of the domestic economy to global economic shocks.

Numerous studies have empirically examined the export-economic growth relationship at aggregate level. A summary of literature reviewed is provided in Venkatraja (2015), Ee (2016), Shibab et al. (2014), Kumari et al. (2014) and Dreger and Herzer (2013). However, relatively relevant studies in the South African context and studies specifically on agricultural export-growth relationships are further explored in this study. Aside from these few studies (Dodora 1993; Dutt and Gosh 1996; Ukpolo 1994) carried out in the 1990s, relatively scanty studies have been identified to have been conducted in South Africa recently. These include studies of Rangasamy (2009), Ziramba (2011), Cipamba 2012, 2015), Change et al. (2013) and Ajmi et al. (2015).

According to the study of Rangasamy (2009), at an aggregate level, export growth was found to cause growth in GDP in the short-run and not vice-versa. Disaggregating export further into primary and non-primary export, a unidirectional causality running from both primary and non-primary export to growth was established. The primary sector export was, however, observed to be of more significance in the economy. The constituent of the primary sector that causes growth was not identified in the study, thereby making it difficult to track the specific constituent that causes growth.

Ziramba (2011) analysed the causal relationship between export components (merchandise export, gold export and service exports) and economic growth applying the bound test co-integration test and Toda and Tamamoto Granger causality approach. A long-run co-integration relationship was confirmed. The export-led growth hypothesis was found to be valid for only merchandise export. Other export, service and gold exports show the reverse (that is growth-led export) and no causality with growth respectively. Cipamba and Cipwamba (2013) applied the Johansen Cointegration technique, VECM Granger causality and Toda-Yamamoto Granger Causality test to investigate the relationships between export and economic growth in same South African context. Their result shows the presence of a long-term relationship between the examined variables; a bi-directional causality between export and GDP growth was also confirmed. Thus, the study validated export-led growth and growth-led export hypothesis in the case of South Africa. This is contrary to the finding of Rangasamy (2009) that GDP does not cause export.

Chang et al. (2013) explored causality relationship between export and economic growth at a provincial disaggregated level consisting of nine provinces in the country. Employing a panel causality analysis, which accounts for cross-section dependency and heterogeneity across regions, the study found no causality between export and economic growth in seven provinces of the country. However, a unidirectional causality running from export to economic growth was observed for Mpumalanga Province, while a bi-directional causality between export and economic growth was confirmed in Gauteng Province. Ajmi et al. (2015) used three approaches to causality examination between export and economic growth in a similar South African context. Results of linear granger causality showed no evidence of causality between export and economic growth. Results of the Hiemstra and Jones (1994) and Diks and Panchenko (2006) non-linear granger causality tests applied, showed a unidirectional causality from economic growth to exports and bidirectional causality between export and economic growth. All three tests presented different confusing results.

Regarding Agricultural Export-led Growth Relationship

Ramphul (2013) established the export-led growth hypothesis after finding a unidirectional relationship running from agricultural export to the agriculture GDP in India and not vice versa. A study carried out by Mousavi and Leelavathi (2014) in the same environment provides evidence of economic growth-led agricultural export in India. Njimated and Aquilas (2015) found a significant short-run and long-run relationship between timber export and economic growth in Cameroun. This, however, does not justify the direction of causality between the two variables, as concluded in the study.

Syed et al. (2015) invalidated the agriculture export-led growth and vice-versa hypothesis in the case of Pakistan. In the case of Tanzania, while agricultural export-led growth was not supported, growth-led agricultural export was confirmed (Myoulla et al. 2015). Sanjuan-Lopez and Dawson (2010), in their own case, established the agricultural export-led growth hypothesis using a panel data for 42 countries, South Africa included. Similarly, Hyunsoo (2015) investigated the relationship between non-agricultural export, agricultural export and rice export in four countries (Thailand, Vietnam, India and Pakistan). The Granger causality test results indicated that agricultural export causes economic growth in Thailand only. Rice export was found to cause GDP in all the four countries considered. Although results of few studies examined show mixed results, the debate has, however, stimulated the need to further understanding of the dynamics of exports in relation to its causation of economic growth in country contexts.

Objective

The purpose of this paper is to examine the export-led growth hypothesis via agricultural sector export perspective. Specifically, the study examines: patterns and trends in agricultural exports, and the direction of causality between agricultural export components and economic growth in South Africa. Below, the study presents the methodology, results, discussion and conclusion, respectively.

METHODOLOGY

This study utilizes time series data covering the year 1975-2012 for Gross Domestic Product at the 2010 constant market price (proxy for economic growth), agricultural export components (processed agricultural export, X_1 and unprocessed agricultural export, X_2), foreign direct inflow (X_3) and manufacturing output (proxy by volume, X_4) was used for this study. Secondary data were sourced from the 2015 Annual Abstract of Agricultural Statistics, the South Africa Reserve Bank quarterly bulletin and the World Bank Development Indicator.

Descriptive analysis such as line graphs and tables were used to explain the trends and patterns in the South Africa (SA) agricultural exports. In order to determine the existence and direction of causality among the variables, this study employed a methodological approach that involved three stages. These are; unit root testing, co-integration test and the granger causality test.

Unit Root Test

Determining the nature of time series is imperative before finding any long run relationship to avoid spurious regression results. Unit root test is, therefore, applied to examine the stationarity (or otherwise) and the order of integration of time series variables. According to Hill et al. (1998), a time series is stationary if its mean and variance are constant over time and if the covariance between two values from the series depends only on the length of time separating the two values, and not on the actual times at which the variables are observed. The general notation estimation model of a unit root test of a variable, including a constant term without trend is as follows:

$$\Delta Y_t=\alpha+\gamma Y_{\tau-1}+e_t \quad (1)$$

Thus, for each of the variables examined, the unit root test notions are expressed as follows:

$$\Delta loggdp_t = \alpha + \gamma loggdp_{t-1} + e_t \quad (2)$$

$$\Delta log X_{1t} = \alpha + \gamma log X_{1t-1} + e_t \quad (3)$$

$$\Delta log X_{2t} = \alpha + \gamma log X_{2t-1} + e_t \quad (4)$$

The unit root test was examined through Augmented Dickey Fuller and Phillip-Perron tests. The Intercept (constant) term was used in the specification of the unit root test to check for stationarity of the variables. Using a one-tailed test of significance, the decision rule is if the ADF statistics is greater than the ADF critical value at a 5 percent level of significance; we do not reject the null hypothesis that the series is non-stationary. However, if the ADF and PP statistics are less than their respective critical value at a 5 percent level of significance, we reject the null hypothesis that the series is non-stationary.

The co-integration test (which is the second stage) enables the researcher to check if there is a long-run relationship among variables. Two or more variables are said to be co-integrated if they exhibit long-run equilibrium relationships, that is, they share a common trend. Johansens' co-integration Trace test and the maximum eigenvalue test are often used for this purpose.

Granger Causality Test

The idea of Granger causality, as developed by Granger, is that if the past and present values of variable Y significantly contribute to the forecast value of another variable, say X, then Y is said to have a Granger causal relationship with X and vice versa. The general Granger causality test model is stated below:

$$Y_i = \alpha + \Sigma^{n}_{i=1} \beta_i Y_{t-1} + \Sigma^{n}_{i=1} \gamma Y_{t-1} + \varepsilon_{\boxtimes} \quad (5)$$

$$X_i = \alpha + \Sigma^{n}_{i=1} \beta_i X_{t-1} + \Sigma^{n}_{i=1} \gamma Y_{t-1} + \varepsilon_{\boxtimes} \quad (6)$$

Where X_i and Y_i are the tested variables, e_t is the error term, and t implies the time period. The causality approach used is based on the confirmation or non-confirmation of the existence of a long-run relationship from stage two. If a long-run relationship is confirmed, the VEC Granger causality test is employed to test the direction of causality. If variables are not co-integrated, the VAR Granger causality is employed to check the direction of causality.

RESULTS

Pattern of Agricultural Export in South Africa

Figure 1 shows the trend in South Africa's agriculture sector GDP and Export contribution to the total GDP and export. Figure 2, on the other hand, shows the trends of processed and unprocessed AFF of the country. The performance of the AFF sector, with respect to its contribution to the total GDP and total export, as shown in Figure 1, is abysmal. The average contribution between the year 1975-1985, 1986-1994, 1995-2003 and 2004 and 2014 is 6.1 percent, 4.85 percent, 3.67 percent and 2.69 percent respectively.

This Figure 1 shows that the contribution of the AFF sector GDP to the total GDP is higher in the period before democracy than the post-apartheid period. Regarding the AFF export to total export, a sharp decline is visible between year 1975 and 1979. A gradual decline is further observed up to year 2014. Figure 2 shows that between 1975 and 1995, there seems to be a similar pattern in the movement of both processed and unprocessed exports. After 1995, a continuous increase in both products is seen in Figure 2. Processed export, however, appears to be increasing more than unprocessed agriculture export. Income from processed agriculture export increased from R12793.1 million in 2001 to R16517.1 million in 2005 and R38846.2 million in 2012. An opening of the South African borders to the world through trade liberalization policy in the post-apartheid period could be deduced to be the reason for this upward trend. This sub-sector performance of the sector is, however, not significant enough to stimulate expected growth in the AFF sector as a whole.

Generally, agricultural exports, like other exports, can drive economic growth, and apart from receiving foreign currency, they could create sustainable jobs, increase the adaption of advanced technologies and production practices and generally increase attractiveness of the agricultural sector. South Africa is known to be a net exporter of primary and finished agricultural, forestry and fisheries (AFF) products. According to the South Africa Department of Agriculture, Forestry and Fisheries (2014), AFF exports increased by 37 percent in the year 2014. These products are diverse, ranging specifically from quality wine to fruits and cereals. Examples of such products are edible fruits (orange, grapes, apple, pears and lemon), beverages, spirits and vinegar (grape wines, liqueurs and cordials, brandies, ciders and mineral waters), wood pulp (chemical, non-coniferous wood and mechanical wood pulp), cereals (maize, maize seed, rice, wheat and husk) and paper and paper boards which are the top five contributors to agricultural export in South Africa. Each product group

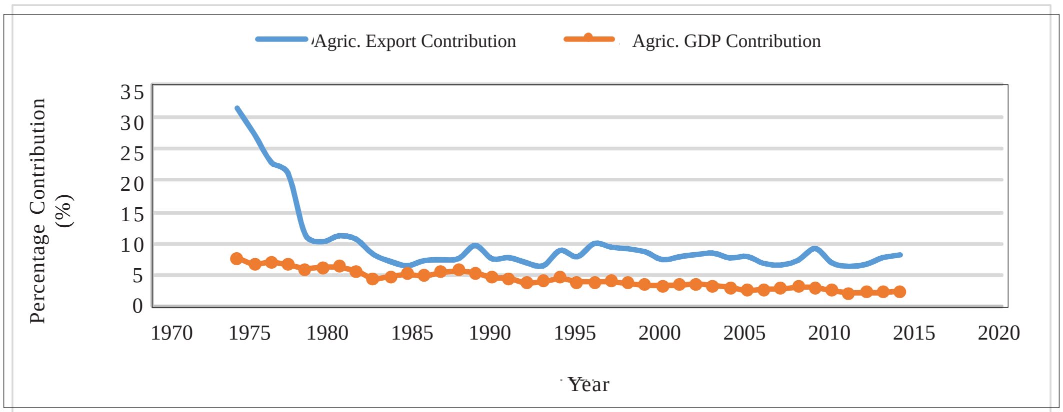

Fig. 1. Trends in the agriculture sector's contribution to total export and GDP

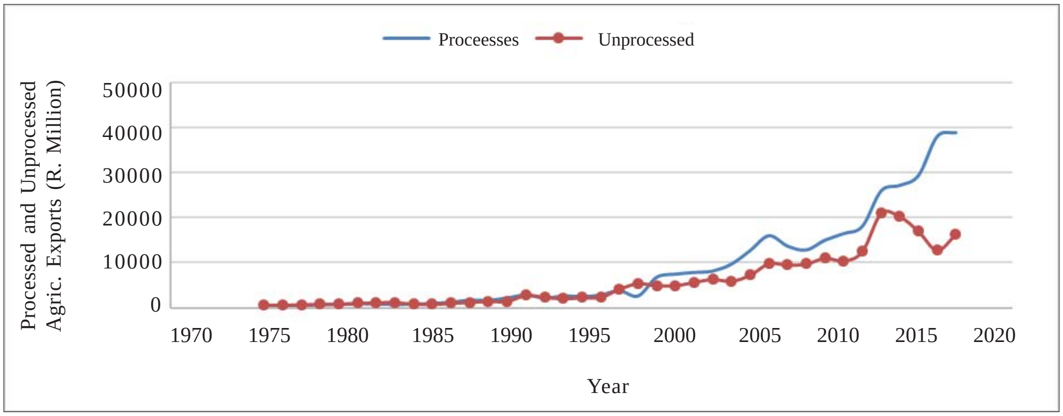

Fig. 2. Trend in processed and unprocessed agricultural export
Source: Author, 2015

contributes about 23 percent, 11 percent, 7 percent, 6 percent and 6 percent, respectively to the total agricultural export in the country, as shown in Table 1. Generally, the top ten AFF product exports constituted about 74 percent to South Africa's AFF exports in 2013. Cereals export, however, experienced growth of 74 percent, which was the highest in 2013.

Statistics on destination distribution of South African agricultural exports reveal that Namibia (7%), Netherlands (7%), Botswana (6%), United Kingdom (6%), China (6%), Zimbabwe (5 %), Mozambique (5%), Lesotho (3%), Japan (3%) and Swaziland (3%) are the top ten agricultural export destinations of South Africa in 2013. The ten countries altogether account for about 51 percent of the AFF export destination**.** It is observed that the variety of products that contribute more than half to agricultural export and export destinations are limited. Taking the product and destination diversification into consideration, South Africa could relatively be affected by international prices instabilities. This was also the opinion of Idsardi (2010) who concluded that South Africa is still fairly susceptible to fluctuations in world prices and economic stability in its export markets even though demand for food products is, in general, more price-inelastic, especially in advanced markets.

Unit Root Tests: ADF and Phillip Perron (PP) Tests

The result of the ADF and PP tests presented in Table 2 showed that the variables examined are non-stationary; however, they became stationary at first difference. Thus, the hypothesis of non-stationarity is rejected at first difference at a 5 percent level of significance. The unit root tests explain that all variables are integrated at order I (1).

Table 1: Top ten major sub-sector shares in South Africa's agricultural, forestry and fisheries exports

S. No.	*Sub-sector*	*Sub-sector share in RSA total AFF Export (%)*
1.	Edible fresh fruits and nuts	23
2.	Beverages, spirits and vinegar	11
3.	Wood pulp	7
4.	Cereals	6
5.	Paper and paper-boards	6
6.	Fruits and vegegables	5
7.	Sugar	4
8.	Wood	4
9.	Fish	4
10.	Miscellaneous food preparations	4

Source: DAFF, 2014

Cointegration Test

The results obtained through unit root confirm that the variables are non-stationary at level form, but after a first differencing, they became stationary. Thus, the Johansen cointegration test was carried out. Trace test and maximum eigenvalue tests were considered in this regard. The result of the Johansen cointegration test as shown in Table 3, indicates that there is one cointegration equation, implying that a long-run equilibrium relationship between gross

Table 2: ADF and PP unit root tests

Variable	*ADF*		*PP*		*Order of integration*
	Level (5%)	*First difference*	*Level (5%)*	*First difference*	
lnGDP	0.4486 (-2.9458)	-4.1216 (-2.9458)*	0.7196 (-2.9434)	-4.0043 (-2.9458)	I (1)
lnX_1	0.2439 (-2.9458)	-8.3133 (-2.9458)*	0.2420 (-2.9434)	-8.9905 (-2.9458)	I (1)
lnX_2	-0.6072 (-2.9434)	-5.8422 (-2.9458)*	-0.3106 (-2.9434)	-10.6268 (-2.9458)	I (1)
lnX_3	-2.7564 (-2.9434)	-9.4390 (-2.9548)*	-2.5662 (-2.9434)	-18.6593 (-2.9458)	I (1)
lnX_4	-1.3801 (-2.9434)	-5.1641 (-2.9458)*	-1.3896 (-2.9434)	-5.6405 (-2.9458)	I (1)

Source: Computed by Author from Eviews

domestic product, processed agricultural export, unprocessed agricultural export, foreign direct investment and manufacturing output exist at a five percent level of significance. Thus, the null hypothesis of no long-run relationship between the series is rejected. This implies that the variables do share the same trend.

Granger Causality Test

The VEC approach to granger causality was employed to determine the direction of short-run causality existing among the variables. The results of the Granger causality tests are reported in Table 4. The results show that a unidirectional causality only exist from manufacturing output to process agricultural export and from foreign direct inflow to unprocessed agricultural export at ten percent and five percent probability level respectively. Focusing on the agricultural exports growth relationship, the table shows that there is no form of causality between process agricultural export, unprocessed agricultural export and economic growth. Hence, it could be inferred that export-led growth hypothesis from the agricultural sector perspective is not valid in the case of South Africa.

From the perspective of agricultural export, the results of this study are similar to the findings of Cipamba and Cipamba (2012) in South Africa. It is, however, contrary to other studies (Ramphur 2013; Myoulla et al. 2015; Mousavi and Leelavathi 2014) who establised some directional causality between economic growth and agricultural export growth in their studies. The results of this study also contradict results of similar studies (Bulagi et al. 2014; Sanjuan-Lopez and Dawson 2010) carried out in South Africa, as mentioned in the literature section. This implies that the history of each of the variables considered cannot be used as a factor towards improving and promoting the future val-

Table 3: Johansen co-integration test

Unrestricted Cointegration Rank Test (Trace Statistic)				
Hypothesized no. of CE(s)	*Eigenvalue*	*Tracestatistic*	*0.05 critical value*	*Prob***
None*	0.714278	80.94543	69.81889	0.0050
At most 1	0.439368	37.09971	47.85613	0.3428
At most 2	0.337003	16.84557	29.79707	0.6514
At most 3	0.065413	2.461082	15.49471	0.9860
At most 4	0.002662	0.093299	3.841466	0.7600
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized no. of CE(s)	*Eigenvalue*	*Max-Eigenstatistic*	*0.05 critical value*	*Prob***
None*	0.714278	43.84572	33.87687	0.0024
At most 1	0.439368	20.25414	27.58434	0.3238
At most 2	0.337003	14.38449	21.13162	0.3343
At most 3	0.065413	2.367784	14.26460	0.9797
At most 4	0.002662	0.093299	3.841466	0.7600

Source: Computed by Author from Eviews
Trace test and Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level.

Table 4: VEC Granger Causality/Block Exogeneity Wald Tests

	D(lnGDP) Chi-square (P-value)	*D(lnX_1) Chi-square (P-value)*	*D(lnX_2) Chi-square (P-value)*	*D(lnX_3) Chi-square (P-value)*	*D(lnX_4) Chi-square (P-value)*
D(lnY)	-	3.305065 (0.1916)	2.162693 (0.3391)	1.580372 (0.4538)	2.813942 (0.2449)
D(lnX_1)	0.145648 (0.9298)	-	2.621329 (0.2696)	0.338941 (0.8441)	1.534409 (0.4643)
D(lnX_2)	1.141429 (0.5651)	3.142588 (0.2078)	-	1.397577 (0.4972)	2.915720 (0.2327)
D(lnX_3)	0.137229 (0.9337)	0.117349 (0.9430)	7.809519 (0.0201)	- -	4.421627 (0.1096)
Ln(X_4)	0.651759 (0.7219)	4.662351 (0.0972)	2.109092 (0.3484)	0.248032 (0.8834)	-
All Together	3.494532 (0.8996)	10.25335 (0.2477)	14.33344 (0.0735)	6.575747 (0.5830)	7.330052 (0.5051)

Source: Computed by Author from Eviews 7

ues of each other. Processed and unprocessed agricultural exports cannot be a booster for economic growth in the country.

CONCLUSION

Export-led growth hypothesis has been empirically considered largely in literature at aggregate levels but scantly at sectoral basis, the results however have been diverse. This study investigated the causality between agricultural exports and economic growth in South Africa. The study employed the Johansen cointegration test and the VEC Granger Causality/Block Exogeneity Wald Tests and the outcomes indicated that there is a long-run relationship between GDP (proxy for economic growth), processed and unprocessed agricultural export, foreign direct investment inflow and manufacturing output. Secondly, from the results, there is no form of causality running between South Africa's agricultural exports to economic growth, as revealed by VEC Granger Causality/Block Exogeneity Wald Tests. Hence, the export-led growth hypothesis via agricultural export is not valid in the case of South Africa. This is however not surprising considering the poor performance of the agricultural sector in the country. This emphasizes that improving the performance of the agricultural sector is firstly important. Also, Since South Africa is a transiting economy whose agricultural system is commercial large-scale farming, the government should maximize the potential of the sector through making export expansion policies that will increase agricultural exports and enable the country to generate maximum foreign exchange through agriculture, such as, increasing foreign and domestic investments in the agricultural sector and agricultural export participation incentives.

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