Exports Multiplicity and The Dutch Disease

Bosupeng, Mpho

University of Botswana

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Mpho Bosupeng

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Abstract

Following macroeconomics, an increase in exports should raise the Gross Domestic Product (GDP). However, the extant literature regarding comovement and causality between exports and GDP has not been consistent. Previous studies mostly attempted to link exports with GDP without attempting to relate each individual export commodity with economic growth. This study attempts to fill this gap using statistics for the Botswana economy by examining the country's major seven export commodities namely: diamonds, gold, beef, soda ash, vehicles, copper-nickel, and textiles for the period 2006Q1-2013:Q4. The evaluation uses the popular Granger causality test and the Johansen cointegration procedure to examine statistical drifts between each merchandise and GDP. While the expectation was that all export commodities would trend together with GDP for the period under examination, the cointegration tests only affirmed long run affiliations between GDP, copper- nickel and textiles. The Granger causality test results were also not consistent in terms of causal relations, revealing causality only between GDP, textiles and Gold. The study then goes ahead in providing several recommendations for the Botswana scenario particularly considering Dutch disease effect.

Keywords: Exports Variety; GDP; Granger Causality; Cointegration; Dutch Disease

JEL: E23; F14; F17; F31; F41

1. Introduction

International finance analysts have postulated that a country can raise its national output by increasing export production. This statement has some implications of course. Firstly, for any economy to produce diverse commodities there is a need to inject more capital. Extra labor, energy and technology are also needed to propel this production. Countries like Botswana whose main exports commodities are mineral resources have to exercise extra caution and prudence in the extraction and exportation of these resources because they are finite. Even though Botswana's economy is robust, a large proportion of her export merchandise is non-renewable and a large share of export income is attributed to diamonds (nearly 80%). This has created a state of dependency on diamonds to an alarming extent. Recently, the country's authorities have been on full swing in promoting the Economic Diversification Drive plans (EDD) which aims to make Botswana a diverse exporter of commodities. Currently Botswana's chief exports are seven namely: diamonds, soda ash; gold; vehicles; textiles; beef and copper-nickel. Botswana's dependency on diamonds was witnessed during the past Global Financial Crisis (GFC) which left Botswana's mineral resources particularly diamonds exhibiting poor sales.

The aim of this study to a reasonable extent is to explore exports variety and economic growth for the Botswana economy. The second aim is to determine the extent to which mineral resources such as diamonds, gold, soda ash, and copper-nickel contribute to Botswana's economy. The aim rises from the fact that mineral resources are finite and dependency on them may be catastrophic for the nation in a long run framework. The other aim of this paper is to determine if Botswana may be suffering from the Dutch Disease where a resource rich economy underperforms because a large proportion of its resources are channeled to that particular economic activity. The other issue is to determine if it is highly compelling for Botswana to accelerate the economic diversification plans. In general, literature supports a positive relationship between exports and GDP growth while the causality between GDP and exports of most economies has been incongruent. Previous studies attempted to determine causality between exports and GDP while overlooking the contributions of each commodity or merchandise to the GDP. This paper addresses this glitch by focusing on each individual export commodity and its unique relations with the GDP for Botswana scenario.

The rest of this paper is as follows. Next is the literature review which summates major findings of the previous studies. This will be followed by the research hypothesis, data description, and research methodology. Logically, then follows hypothesis tests results and discussion of the findings. Finally a conclusion of the study with practical implications will close the objectives of this report.

2. Literature Review

According to Sheridan (2014) the general expectation is that since exports are a component of GDP, increasing exports should subsequently raise the country's productivity levels. Sheridan (2014) argues that an emphasis on exports in addition to increasing GDP directly, may also lead to positive externalities in the non-export sectors in the form of knowledge spillovers, and production techniques (Grossman & Helpman, 1991; Edwards, 1993). Drawing from Sheridan (2014), intuitively exports should provide the foreign exchange needed to purchase inputs which may provide beneficial effects in economic growth (Thirlwall, 2000). Crespo-Cuaresma, & Worz (2005) in consequence, have argued that significant positive externalities accrue to the exporting countries as a result of competition in international markets, including increased returns from spillovers; increased innovation and other efficiency gains all of which should logically increase the rate of economic growth. As a magnitude, many studies document a positive relationship between exports and economic growth (Balassa, 1978; Edwards, 1993; Crespo-Cuaresma & Worz, 2005). This paper analyses the extant literature by considering two perspectives: studies in affirmation of the export-GDP relationship and the potential problem of the Dutch Disease for the Botswana economy.

2.1. Evaluation of the Exports- Economic Growth Relationship

Sheridan (2014) has postulated that many developing economies are heavily dependent on primary exports products as their main source of export revenue. In addition, several studies maintain that countries emphasizing manufacturing products will grow than those that emphasize primary products (Hausmann, et al 2007; Jarreau & Poncet, 2012; Crespo-Cuaresma & Worz, 2005; Berg, et al 2012). The underlying idea is that countries that export particularly highly technological commodities benefit from positive externalities that help the economies grow. From this premise, Pistoresis & Rinaldi (2012) attempted to explain the nexus between trade and economic growth in Italy which has been debated by historiography. The study contributed to the literature by investigating the relationship between exports and GDP from 1863-2004 through cointegration and causality analysis. Pistoresis & Rinaldi (2012) suggested that the variables co-move in the long run but the direction of causality varies from time to time. The wide data interval reported that in the period prior to the First World War, imports growth led GDP growth which in turn led exports growth. On the other hand, the post Second World War period demonstrated a strong bi-directional relation between imports and exports consequent on the increase in intra technology. Nonetheless, historiography explanation of the late industrialization of Italy was that the economy was restrained by some fundamental facts among which was the limited size of the domestic market, constraints on capital, and lack of natural resources (Romeo, 1959; Sereni, 1966; Michaelv, 1977; Amatori & Colli, 1999). Italy however, recovered after the Second World War which saw the country increasing its percentage of the international market until the 1970's. This was explained as "export-led economic growth" (Kindleberger, 1967; Stern, 1967; Graziani, 1998a; 1969b). Feenstra & Kee (2008) contributed to the literature by attempting to provide evidence on monopolistic competition with heterogeneous and endogenous productivity using data

from 48 countries for the interval 1980- 2000. Al-Mulali & Sheau-Ting, (2014) aimed to explore the bidirectional long run relationship between trade, energy consumption, carbon dioxide emission and several other interdependencies. The study examined 189 countries from six different regions and proved the positive relationship between the trade variables and carbon dioxide emission relations with other economic variables. In contribution to this affirmation, Sheridan (2014) aimed to examine why developing countries still rely on primary goods as their main source of income while there is ample evidence that there could earn higher returns from exporting manufactured goods. The study used data for a cross section of countries over the period 1970-2009 and found out that although increasing manufacturing exports is important for sustained growth, this relationship only holds once a threshold level of development is reached. Sheridan (2014) used endogenous sample spiting technique known better as regression tree analysis to identify positive economic development thresholds in the relationship between the level of manufacturing exports and GDP capita growth. The results imply that a country needs to achieve a minimal level of human capital before its transition from primary exports to manufacturing exports (Sheridan, 2014). Drawing from Michaelv (1977) and Greenaway & Wright (1999) a causal relationship between exports and GDP is anticipated to be strong. Chen & Dong (2012) noted that since reform and open policy was been adopted in 1978 in China, the economic development of the Chinese economy has been robust. The growth rate of imports and exports has been higher than GDP implicating an export- led economy which has been favored well by previous studies (Henderson et al, 2008; Shan & Sun 1998; Zhou & Sheng, 2008).

Konya (2006) investigated the possibility of Granger Causality between logarithm of real exports and real GDP in 24 OECD countries from 1960-1997. The study applied panel data approach which is based on Wald tests. The results were not consistent as they provided evidence for one-way causality from exports to GDP in Belgium, Denmark, Iceland, Italy, New-Zealand, Spain and Sweden and one way causality from GDP to exports in Austria, France Greece, Japan, Mexico, Norway and Portugal. There was a two way causality conveyed between exports and economic growth in Canada, Finland, and Netherlands while in the case of Australia, Luxembourg, the UK and US there was no evidence of causality in either direction. In addition to the extant literature, Awokube & Christopoulus (2009) examined the relationship between exports and economic growth in 5 industrialized economies (Canada, Italy, Japan, UK and the US) with emphasis on the effect of non-linearities in causal relations. To the extent possible, results from the tests show that non-linearities do exist in the dynamic relationship between exports and GDP growth. Sahoo et al, (2014) used cointegration analysis and the results confirmed that mineral exports, industrial production and economic growth are cointegrated and there exists a long run equilibrium relationship among the variables. Similarly, the VECM Granger causality tests held that there is long run causality relationship running from economic growth and industrial production to mineral exports in India (Sahoo et al, 2014). He and Zhong (2010) compared China's export dependency for economic growth for input-output analysis. Using econometric analysis, the study presented evidence that China's exports dependency is significantly lower than reported.

2.2. The Dutch Disease, Exchange Rates and Aggregate Production

Section 2.1 above proved the positive relationship between exports and economic growth to a considerable extent. However, exports cannot be considered to have positive effects on the whole economy while overlooking problems associated with natural resources exploitations. According to Rehner et al, (2014) the concept of the Dutch Disease addresses the dependence of the developing countries on their natural resources and the relationship between exports of these resources and economic growth (Davis, 1995; Sachs & Warner, 2001a, 1995b; Ross, 1999; Auty, 1993; Collier, 2008). Scholars have stipulated that countries characterized by resource abundance have a high possibility of underperforming in terms of economic growth and expansion than resource poor countries. This stems from the fact that such economies tend to allocate more resources such as capital, labor and energy to that single major export which in the long run will hamper economic growth of other sectors. Nonetheless, exchange rates have to be factored in the exports –GDP relations drawing from Chaudhry & Bukhari (2013). The scholars found out that real depreciation of the Pakistani exchange rates leads to sustained increase in the levels of finished textiles exports.

A summary of the extant literature shows that there is evidence for the positive relationship between exports and GDP growth (Chen & Dong, 2012; Auty, 1993; Greenaway et al, 1999; Sheridan, 2014; Mitchell et al, 2012; Pistoresis & Rinaldi 2012; Al-Mulali & Sheau-Ting, 2014). However, causality between GDP and exports has not been uniform drawing from the previous studies. This paper contributes to the extant literature by using econometric techniques to test the relationship between Botswana's GDP and exports using quarterly data from 2006Q1-2013Q4. Botswana's major exports are: diamonds, copper-nickel, beef, soda ash, textiles, vehicles, and gold. Instead of focusing on exports as a whole, this study considers individual merchandise and its relations with GDP. Table 1 is a summary of the causal relations in different economies.

3. Research Hypotheses

In general literature supports the positive relationship between exports and GDP growth (Chen & Dong, 2012; Auty, 1993; Greenaway et al, 1999; Sheridan, 2014; Mitchell et al, 2012; Pistoresis & Rinaldi 2012; Al-Mulali & Sheau-Ting, 2014). Conversely, the causality between exports and GDP is incongruent as evidenced by Konya (2006). It is also vital to note that even though there is generally a positive affiliation between exports and GDP, Rehner et al, (2014) highlights problems of the resource curse, implicating hindrances in economic development due to focusing intently on a single commodity. Exchange rates effects cannot be overlooked as demonstrated by Chaudhry & Bukhari (2013). From this premise it is hypothesised that for the Botswana economy,

H1: GDP growth will move positively with income from exports commodities

H2: There is a causal relation in either direction between each export commodity and GDP.

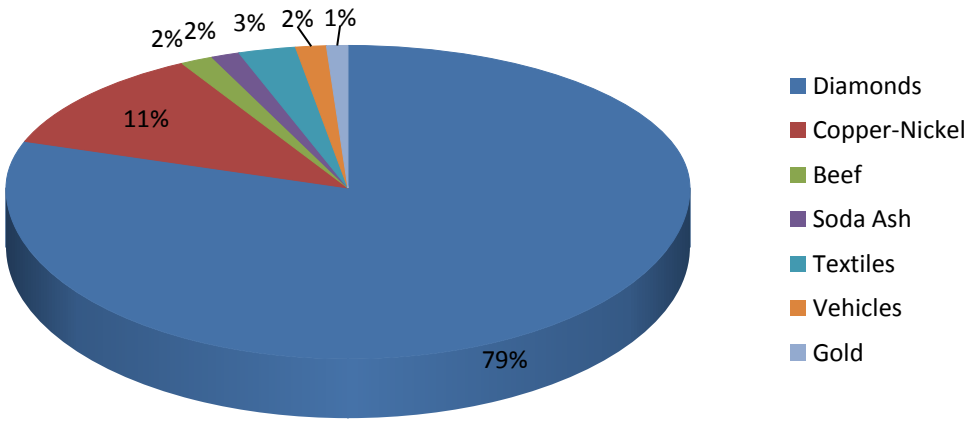
4. Data Description

This study uses quarterly data for Botswana economy from 2006:Q1-2013Q:4. The data was obtained from the central bank publications (Bank of Botswana). The publications are Bank of Botswana Annual Reports, and Botswana Financial Statistics. As reported by table 2, Botswana has seven principal merchandise which are beef, copper-nickel, diamonds, gold, soda ash, textiles and vehicles. Among the seven, Botswana is well known for her diamonds and beef exports. As demonstrated by figure 1, diamonds hold a large share of Botswana's exports income with 79% of the income attributed to diamonds sales. Copper-nickel came second in the share of exports income holding only 11% of the total merchandise income for the period 2006:Q1-2013:Q4. Textiles held only 3%, while beef, soda ash, and vehicles each contributed 2% to revenue from exports. It is clear from table 2 and figure 1 that diamonds are the mainstay of Botswana's economy. An overview of the data as reported by table 2 shows that the revenue from exports was positively skewed with coefficients above zero. The data for Beef, diamond, textiles and soda ash exhibited flat distribution properties. Copper-nickel, gold, vehicle exports and GDP statistics data registered low Kurtosis coefficients thus unveiling peakedness. Table 1 shows descriptive statistics of the data set while figure 1 shows the contribution of each commodity to Botswana's exports revenue.

Table 1: Descriptive Statistics of The Data Set (Figures in Pula Millions) as from 2006:Q1-2013Q:4

Statistic	Beef	Copper-Nickel	Diamonds	Gold	Soda-Ash	Textiles	Vehicles	GDP (Quarterly)
Mean	150.50	1,076.51	6,834.10	98.52	136.39	338.59	131.18	23,282
Median	136.26	1,014.15	5,844.58	98.25	130	318.60	121.90	22,384
Max.	411.97	1,855.20	1,8210	187.90	206.70	1,006.90	296.11	34,984
Min.	38	454.40	1,881.40	35.60	97.50	75.40	38	13,210
Std.Dev.	75.20	349.28	3,477	41.40	24.72	214.50	69.54	6,356.40
Skewness	1.30	0.53	1.51	0.34	1.18	0.97	0.63	0.17
Kurtosis	5.63	2.66	5.43	2.10	4.03	4.25	2.80	1.82
Jarque-B.	18.30	1.63	20.15	1.70	9.0	7.16	2.21	2
Prob.	0	0.44	0	0.43	0.01	0.027	0.32	0.37
Sum	4,816.07	34,448.37	218,681	3,152.63	4,364.34	10,834	4,198.02	745,039
Values	32	32	32	32	32	32	32	32

Figure 1: Botswana's Principal Exports (% Proportion)- 2006Q1-2013:Q4



5. Methodology

An overview of the previous studies emphasized the use of the Granger causality test to determining causal relations between exports and GDP (Konya, 2006; Pistoresis & Rinaldi 2012). Feenstra & Kee (2008) proposed that the set of exports from countries differs but have the same varieties. Feenstra & Kee (2008) noted this common set by setting it as

$$J \equiv J_{it}^{h} \cap J_{it}^{F} \neq \varnothing \qquad (1)$$

From Feenstra & Kee (2008) the regime of export variety from country *h* will then be denoted by

$$\lambda_{it}^{h}(j) = \frac{\sum j \in J P_{it}^{h}(j) q_{it}^{h}(j)}{\sum j \in J_{it}^{h} P_{it}^{h}(j) q_{it}^{h}(j)} \qquad (2)$$

For the Botswana scenario, varieties of the exports will not be a great concern since the merchandise is not too numerous. I will assume that for the period 2006Q1-2013Q4 all outputs and domestic products inputs can be aggregated following Kohli (2004). Botswana's technology in producing exports will then be described by the following aggregate production function

$$y_t = f(y_{EXP,t}, x_{t)} \qquad (3)$$

Where y_t is the quantity of aggregate output at the time *"t,"* $y_{EXP,t}$ will then denote the quantity of exports and x_t will denote the quantity of domestic companies' factor. Botswana's GDP will now be represented as

$$y = \sum C_g + C_h + I_n + K_g + X_n + \varepsilon_t \qquad (4)$$

$y =$ *GDP at current prices;* $C_g =$ *Government Final Consumption;* $C_h =$ *Household Final Consumption;* $I_n =$ *Net Increase in inventories;* $K_g =$ *Gross Fixed Capital Formation;* $X_n =$ *Net Exports;* $\varepsilon_t =$ *Net errors and omissions*

Following Kohli (2004) I will assume that GDP for Botswana has the trans-log function of the form

$$ln\pi_t = \alpha_0 + \sum_i \alpha_i lnp_{i,t} + \sum_i \beta_j lnx_{j,t} + \frac{1}{2}\sum_i\sum_h \gamma_{ih} lnp_{i,t} lnp_{h,t} + \frac{1}{2}\sum_j\sum_k \emptyset_{jk} lnx_{j,t} lnx_{k,t} + \sum_i\sum_j \delta_{ij} lnp_{i,t} lnx_{j,t} + \sum_i \delta_{iT} lnp_{i,t} + \sum_j \emptyset_{jT} lnx_{j,t} + \beta_T t + \frac{1}{2}\emptyset_{TT} t^2, \quad i,h \in \{D,X,M\}; j,k \in \{L,K\} \tag{5}$$

where $\Sigma\alpha_i = 1;\ \Sigma B_j = 1\ ;\ \gamma_{ih} = \gamma_{hi}\ ; \emptyset_{jk} = \emptyset_{kj};\ \ \Sigma\gamma_{ih} = 0;\ \Sigma\emptyset_{jk} = 0\ ; \Sigma_i\delta_{ij} = 0\ ; \Sigma_j\delta_{ij} = 0;\ \ \Sigma\delta_{iT} = 0\ ;$ and $\Sigma\emptyset_{jT} = 0$

5.1. Cointegration Analysis

Hypothesis 1 postulated that there is a positive relationship between exports and GDP. Here the Johansen cointegration test will be applied to test if the variables exhibit long run comovement. Cointegrated variables will never move too far apart and will be attracted to their long run relationship. The current literature is prolific in a variety of tests for cointegration (Engle & Granger, 1987; Phillips & Hansen 1990; Park, 1992a, 1990b). Even though there is no consensus as to which method is the best for cointegration analysis, for this study the Johansen cointegration test is found to be more suitable as it provides long run relationship assessment of the variables. The error correction model representation of the cointegration will be represented as

$$\Delta z_t = \phi D_t + \Pi z_{t-1} + \sum_{i=1}^{k} \Pi_i \Delta z_{t_{t-1}} + \varepsilon_{it} \tag{6}$$

Where $\Pi = \overline{\alpha}\beta^{'}$ $(7a)$

$$\overline{\alpha} = (\rho - 1)\Phi(1)\alpha \tag{7b}$$

$$= \left[(\rho - 1)\Phi_{12}(1)^{'}(\rho - 1)\Phi_{22}(1)\right]^{'} \tag{7c}$$

If GDP and exports are cointegrated we will the reduced rank condition indicated by above equation. The trace test was computed as

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} \ln(1-n) \quad (8)$$

5.2. Investigating Causal Relations

Hypothesis 2 postulated that there is causality between exports and GDP in either direction. The Granger causality test will be applied to test this claim. According to Granger (1969) if two variable y_t and x_t are a pair of stationary time series, then y_t will have the spectrum $fg(\omega)$ and Cramer representation of the form

$$Y_t = \int_{-\pi}^{\pi} e^{itw} dz_y(\omega) \quad (9)$$

Granger (1969) stated that non-relevant and non-stochastic variables will rely entirely on the assumption that the future cannot cause the past. From this fundamental, for this study we will allow GDP_t and EXP_t (Gross Domestic Product and Exports) to be stationary series with zero meas. The simple causal relation models will then be

$$GDP_t = \sum_{j=1}^{m} a_j GDP_{t-j} + \sum_{j=1}^{m} b_j EXP_{t-j} + \varepsilon_t \quad (10a)$$

$$EXP_t = \sum_{j=1}^{m} c_j GDP_{t-j} + \sum_{j=1}^{m} d_j EXP_{t-j} + \eta_t \quad (10b)$$

Where η_t and ε_t are white nose series. Nonetheless, I will assume that GDP is cointegrated with the exports, so the Vector Error Correction Models (VECM) for testing causality will then be

For Gold exports

$$\Delta GDP_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1t} \Delta GOLD_{t-i} + \sum_{i=1}^{n} \delta_{1t} \Delta GOLD_{t-i} + \sum_{i=1}^{r} \varphi_{1i} ECM_{r,t-1} + \varepsilon_{1t} \quad (11a)$$

$$\Delta GOLD_t = \alpha_2 + \sum_{i=1}^{m} \beta_{2t} \Delta GOLD_{t-i} + \sum_{i=1}^{n} \delta_{2t} \Delta GOLD_{t-i} + \sum_{i=1}^{r} \varphi_{2i} ECM_{r,t-1} + \varepsilon_{2t} \quad (11b)$$

For Diamond exports

$$\Delta GDP_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1t} \Delta DIA_{t-i} + \sum_{i=1}^{n} \delta_{1t} \Delta DIA_{t-i} + \sum_{i=1}^{r} \varphi_{1i} ECM_{r,t-1} + \varepsilon_{1t} \quad (12a)$$

$$\Delta DIA_t = \alpha_2 + \sum_{i=1}^{m} \beta_{2t} \Delta DIA_{t-i} + \sum_{i=1}^{n} \delta_{2t} \Delta DIA_{t-i} + \sum_{i=1}^{r} \varphi_{2i} ECM_{r,t-1} + \varepsilon_{2t} \qquad (12b)$$

For Textiles

$$\Delta GDP_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1t} \Delta TEX_{t-i} + \sum_{i=1}^{n} \delta_{1t} \Delta TEX_{t-i} + \sum_{i=1}^{r} \varphi_{1i} ECM_{r,t-1} + \varepsilon_{1t} \qquad (13a)$$

$$\Delta TEX_t = \alpha_2 + \sum_{i=1}^{m} \beta_{2t} \Delta TEX_{t-i} + \sum_{i=1}^{n} \delta_{2t} \Delta TEX_{t-i} + \sum_{i=1}^{r} \varphi_{2i} ECM_{r,t-1} + \varepsilon_{2t} \quad (13b)$$

For Vehicles Exports

$$\Delta GDP_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1t} \Delta VEH_{t-i} + \sum_{i=1}^{n} \delta_{1t} \Delta VEH_{t-i} + \sum_{i=1}^{r} \varphi_{1i} ECM_{r,t-1} + \varepsilon_{1t} \qquad (14a)$$

$$\Delta VEH_t = \alpha_2 + \sum_{i=1}^{m} \beta_{2t} \Delta VEH_{t-i} + \sum_{i=1}^{n} \delta_{2t} \Delta VEH_{t-i} + \sum_{i=1}^{r} \varphi_{2i} ECM_{r,t-1} + \varepsilon_{2t} \quad (14b)$$

For Copper Nickel

$$\Delta GDP_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1t} \Delta COP_{t-i} + \sum_{i=1}^{n} \delta_{1t} \Delta COP_{t-i} + \sum_{i=1}^{r} \varphi_{1i} ECM_{r,t-1} + \varepsilon_{1t} \qquad (15a)$$

$$\Delta COP_t = \alpha_2 + \sum_{i=1}^{m} \beta_{2t} \Delta COP_{t-i} + \sum_{i=1}^{n} \delta_{2t} \Delta COP_{t-i} + \sum_{i=1}^{r} \varphi_{2i} ECM_{r,t-1} + \varepsilon_{2t} \quad (15b)$$

For Beef exports

$$\Delta GDP_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1t} \Delta BEEF_{t-i} + \sum_{i=1}^{n} \delta_{1t} \Delta BEEF_{t-i} + \sum_{i=1}^{r} \varphi_{1i} ECM_{r,t-1} + \varepsilon_{1t} \quad (16a)$$

$$\Delta BEEF_t = \alpha_2 + \sum_{i=1}^{m} \beta_{2t} \Delta BEEF_{t-i} + \sum_{i=1}^{n} \delta_{2t} \Delta BEEF_{t-i} + \sum_{i=1}^{r} \varphi_{2i} ECM_{r,t-1} + \varepsilon_{2t} \quad (16b)$$

For Soda Ash Exports

$$\Delta GDP_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1t} \Delta SODA_{t-i} + \sum_{i=1}^{n} \delta_{1t} \Delta SODA_{t-i} + \sum_{i=1}^{r} \varphi_{1i} ECM_{r,t-1} + \varepsilon_{1t} \quad (17a)$$

$$\Delta SODA_t = \alpha_2 + \sum_{i=1}^{m} \beta_{2t} \Delta SODA_{t-i} + \sum_{i=1}^{n} \delta_{2t} \Delta SODA_{t-i} + \sum_{i=1}^{r} \varphi_{2i} ECM_{r,t-1} + \varepsilon_{2t} \quad (17b)$$

6. Hypothesis Test Results

Hypothesis 1 postulated that there is a positive relationship between exports and GDP. For the relationship between diamonds and GDP the ρ-values reported were 0.86 and 0.46 which are both greater the critical level of 0.05, therefore the hypothesis was rejected. For copper nickel –GDP relation, the ρ-values reported were 0.035 and 0.57. This postulates that there is one cointegrating equation between copper-nickel income and GDP at a critical level of 0.05. However for beef, there was no cointegrating equation with both ρ-values greater than the critical level of 0.05 (0.09 & 0.60). This was the same for gold, vehicles and soda ash. Textiles income and GDP suggested one cointegrating equation at a critical level of 0.05 with ρ-values of 0.049 and 0.92. In summary, cointegration was only registered for only copper nickel and textiles. Table 3 shows results of the trace test.

Table 2: Trace Test Results

Coint. Vectors	Eigenvalue	Trace Statistic	Critical Value[1]	ρ-values[2]
		Diamonds		
$r = 0$	0.12	4.54	15.50	0.86
$r \leq 1$	0.020	0.55	3.84	0.46
		Copper Nickel		
$r = 0$	0.42	16.50	15.50	0.035*
$r \leq 1$	0.010	0.32	3.84	0.57
		Beef		
$r = 0$	0.36	13.75	15.50	0.09
$r \leq 1$	0.009	0.27	3.84	0.60
		Soda Ash		
$r = 0$	0.11	4.22	15.50	0.90
$r \leq 1$	0.02	0.68	3.84	0.41
		Textiles		
$r = 0$	0.40	15.52	15.50	0.049*
$r \leq 1$	0	0.007	3.84	0.92
		Vehicles		
$r = 0$	0.24	8.83	15.50	0.38
$r \leq 1$	0.017	0.50	3.84	0.47
		Gold		
$r = 0$	0.36	13.65	15.50	0.093
$r \leq 1$	0.004	0.12	3.84	0.73

[1]*critical level of 0.05*
[2]*based on the MacKinnon-Haug-Michelis (1999) ρ-values*
**represents cointegration at 0.05 critical level*

Hypothesis 2 postulated that there is a causal relationship between exports and GDP. The results of the Granger causality test show that we have to accept the null hypothesis that there is no causality between GDP and exports commodities at a critical level of 0.05. However for textiles, there was a solitary directional causality from GDP with a ρ-value less than 0.05 (0.034). Gold also registered one way causality from Gold to GDP with a ρ-value of 0.024. In summary, the causality tests only registered directional causality for textiles and Gold.

Table 3: Pairwise Granger Causality Test Results

Causality	Observations	F-Statistic	ρ-values	R^2 Coefficients
	Diamonds			
DIA → GDP	30	2.11	0.14	0.47
GDP → DIA	30	0.51	0.61	
	Copper Nickel			
CN → GDP	30	0.50	0.61	0.048
GDP → CN	30	2.43	0.11	
	Beef			
BEEF → GDP	30	0.98	0.39	0.023
GDP → BEEF	30	0.21	0.81	
	Soda Ash			
SODA → GDP	30	0.97	0.39	0.56
GDP → SODA	30	1.39	0.27	
	Textiles			
TEX → GDP	30	1.55	0.23	0.010
GDP → TEX	30	3.90	0.034*	
	Vehicles			
VEH →GDP	30	2.60	0.095	0.52
GDP→ VEH	30	1.12	0.34	
	Gold			
GOLD → GDP	30	4.34	0.024*	0.53
GDP → GOLD	30	2	0.16	

**represents a causal relation*

7. Discussion

Hypothesis 1 postulated that GDP and exports move positively together. The results of the tests showed cointegration between GDP, copper-nickel and textiles. Other export commodities such as beef, gold, vehicles, reported no cointegration. The expectation was that all the diverse exports should exhibit long run comovement together with economic growth. The results are consistent with Pistoresis & Rinaldi (2012). Pistoresis & Rinaldi (2012) investigated the relationship between real exports and GDP from 1863-2004 by using cointegration analysis and causality tests.

Consistently, the outcomes suggested that the variables co-move in the long run but causality varied over time. The results are also consistent with Chen & Dong (2012) who revealed that the Chinese economy was export–led. Konya (2006) explains the relations between exports and GDP growth sensitivity using bivariate and trivariate models and showed disparities in causality in various economies. Botswana to the extent possible, only registered causality from GDP to textiles and from gold to GDP. While the results are not uniform, Konya (2006) revealed that increased exports may promote the imports of high technological change, labor productivity, capital efficiency and eventually the country's production. The positive affiliation for copper-nickel and textile may help explain the robust increase in Botswana's GDP, starting of as one of the poorest countries in the world to be one of Africa's largest economies. Even though the positive relationship between exports and GDP has been affirmed by the cointegration test, Awokube & Christopoulus (2009) demonstrated the relationship may not be consistent for long because there are possible nonlinearities in the dynamic relation between exports and GDP growth. Hypothesis 2 on the other hand proposed a causal relationship between GDP and exports in either direction. The results of the tests were not consistent as they demonstrated causality from GDP to textiles and from gold to GDP for the period 2006Q1: 2013Q4. It is reasonable to expect inconsistent causality between GDP and Botswana's exports extrapolating from the extant literature. While the results are conceivable, other factors cannot be put a blind eye to. As a matter of concern, Botswana's economy is based on diamond exports with total revenue holding 79% of this mineral resource. This may bring in resource curse problems which stipulate that the dependency of a developing economy on its natural resource leads such states to underperform in national production. The concern is that 79% is quite a considerable figure and the government may be tempted to more allocate to resources to the mining sector thus hampering the progression of other vital economic organs such as tourism. In conclusion of the discussion, the results of this study are plausible according to the extant literature. Next is a conclusion and practical implications of the study.

8. Conclusion and Practical Implications

This study attempted to find the associations between Botswana's GDP and her various exports. Results demonstrate that there is cointegration between textiles and copper- nickel. Causality tests reported Granger causality from GDP to textiles and from gold to GDP. The inconsistency of the results has been justified by the extant literature. This study provides several implications of the relationship between exports and GDP growth for the Botswana situation. Firstly, in a long run perspective, Botswana should broaden her exports and not rely on the seven major commodities. Diamonds for instance are susceptible to changes in the business cycle and are finite. During the Global Financial Crisis (GFC), Botswana's minerals reached troughs in their sales and this slowed economic growth to a large extent. The other problem is with a percentage as high as 79% Botswana may be tempted to channel most of her budget to the Ministry of Minerals, Water and Energy and other sectors may be sidelined (natural resource curse). Botswana will have to imitate

economies like Australia that have branded themselves with education thus reducing dependency on finite resources. In consequence, the government will have to further accelerate the Economic Diversification Drive (EDD) plans in order to reduce enslavement to these finite resources. If sales of these resources slump like during the GFC, a large proportion of the citizens will also be left unemployed creating more social and economic complications for the government to address.

In conclusion of the study, this study has proved the positive relationship between exports and economic growth. It is proposed that further research be carried out in this area by using quantile cointegration or the Self Exciting Autoregressive models (SETAR) to determine the associations.

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