

International Trade and Economic Growth: A Cointegration Analysis for Botswana

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Abstract

This paper assesses the cointegrating relationship between international trade and economic growth in Botswana from the period of 2011 to 2020 using quarterly time series data. The data was checked for stationarity using the Augmented Dickey Fuller (ADF) and found to be integrated at the same level or order. Johansen Cointegration approach and VECM technique were employed to assess the long run and short-run relationships. The long run relationship estimation result shows a positive and significant relationship between trade openness, trade balance and GDP in the long run while inflation and custom duties were found to be negatively related to GDP. The short-run relationship estimation result shows a positive and significant relationship between trade openness and inflation while trade balances have no effect on GDP, and custom duties were negatively related to Gross Domestic Product. The speed of adjustment was found to be statistically significant with a negative sign. Based on these results, the conclusion was that there is dynamic relationship between international trade and economic growth

Keywords: International trade, economic growth, Cointegration approach, gross domestic product,

1. Introduction

International trade has been a major part of Botswana's economy. International trade is the exchange of goods and services between two or more countries. The trade-related activities including imports and exports undertaken by Botswana count significantly towards the country's gross domestic product (GDP). After attaining independence in 1966, Botswana continued with trade-related activities with its trading partners and trade-led strategies that assisted the country's broader economic objectives. Botswana's past strategic plans, including the current National Development Plan (NDP) 11, sustainable economic growth has been given utmost priority as a main target to improve growth in the country (Republic of Botswana, 2016).

Botswana's economic growth slowed down during the 2008/2009 financial crisis and eventually peaked in 2010 by recording 7.2% growth as compared to the negative growth of 4.9% in 2009. The growth was associated with the increase in the global demand of diamonds which are the major export commodity for Botswana. In 2011, Botswana's GDP increased by 6.3%, 5.7% and 7.8% during the first 3 quarters of 2011 respectively. However, this was not the case in 2020 following the COVID 19 pandemic as economic growth declined. Report by Bank of Botswana (BoB) (2020) revealed that the hard-hit sectors in 2020 included the mining sector (especially the diamond industry), travel, tourism, hospitality, and entertainment. As a result, the value of exports fell from \$5.13 billion in 2019 to \$4.39 billion in 2020, worsening the current account deficit from 7.6% of GDP in 2019 to 9.8% in 2020. The aggregate economy constricted by approximately 7.9% in 2020 with reference to the corresponding period in 2019 in which it expanded by 3%.

The balance of payments for Botswana recorded a deficit of P14.8 billion compared to a P5.8 billion deficit in the same period in 2019 (BoB, 2020). This was largely due to the decline in the level of exports of goods and services valued at P35.21 billion in the first nine months of 2019. This resulted in Botswana encountering a trade balance deficit in 2019 which was even carried to the following year of the COVID-19 pandemic in 2020.

The inflation rate for the periods 2015, 2016 and 2017 was 3.07%, 2.90% and 3.03% respectively (BoB, 2020). This was within the allowed range of Bank of Botswana mid-term objective of 3-6 %. This was different in 2020 due to the outbreak of COVID-19 pandemic which resulted in an inflation rate of 8.7% which was outside the targeted Bank of Botswana range of 3-6%. The main cause for this inflation was the rise in the price of goods and services as well as fuel prices because of imported inflation from the neighbouring exporting countries.

Botswana's international trade and economic growth relationship is not clear in terms of what leads to the prominent negative balances of trade despite the economic growth. The aim of this study was to analyze the relationship between international trade variables such as inflation, custom duties, trade balances and trade openness and economic growth by using quarterly time series data from the period of 2011 to 2020.

2. International Trade And Economic Growth In Botswana

According to Statistics Botswana (2020), in the past 3 decades, the GDP for Botswana measured at current prices rose from US\$ 3.943 billion in 1991 to US\$ 15.78 billion in 2020. Furthermore, exports were 53.03% of GDP in 1991 and by 2020 it was 29.664% of GDP while imports of goods and services accounted for 46.529% of GDP in 1991 and 46.370% by 2020 (World Bank, 2020). This resulted in Botswana recording negative balance of trade consecutively in 2019 and 2020. The contraction was mainly due to the mining output which fell by 21.9% in 2020, since Botswana's trade balance is tied largely to the global demand for diamonds, which represents over 80% of the country's export revenues. Based on the statistics, it is evident that from the year 2011 to 2020 the trade balance of exports and imports have been declining while the level of GDP increased. This has brought about some questions on whether there is any relationship between the international trade components and economic growth or whether the exiting strategies in Botswana concerning international trade not working?

The problem faced by the Botswana economy is the decline in international trade and an increase in economic growth. However, it is important to evaluate if this rapid decline in imports and exports is due to the readily implemented policies in Botswana concerning import substitution policy aiming at reducing imports and promoting local production thus initiating an increase in goods and services to be exported in the long run.

Studies by (Mogoe, 2013) and Abdullahi et al.(2016), carried out in South and Western Africa respectively revealed that exports have a positive significant impact on economic growth while imports do not have a definite causal relationship to economic growth. On the other hand, Njikam (2003) observed that there was correlation between trade and growth.

For Botswana, the international trade and economic growth relationship is not yet clear hence, this study sought to find out if there is co-integration between the two economic variables for the period 2011 to 2020.

3. Literature Review

Botswana exchanges goods and services with other countries like South Africa and many other countries. On the other hand, Mankiw (2009), defines economic growth as the rate of the increase in the physical output factor of the economy or the quality improvement of the readily available input levels. It is measured in terms of the Gross Domestic Product (GDP).

Adam Smith in his book on the "Wealth of nations" (1776-1997) asserted the theory of absolute advantage. In the modern economics, there are increasing returns as labour becomes more and more specialized. This was part of Smith's argument for dynamic notion of increasing returns. This idea resulted in the recognition of an essential theory for the development of free trade, which points out that over time any nation might achieve absolute cost advantages in the production of certain goods through specialization and division of labor, and that all nations could gain from the resulting international trade (Smith, 1997).

Thereafter, David Ricardo (1772-1823), came up with the theory of comparative advantage. This strengthened the case for free trade by extending Adam Smith's analysis of the gains to be achieved by the free movement of goods across international boundaries. The theory highlights that, if nation X could produce a good at a lower cost than nation Y, and nation Y could produce another good at a lower cost than nation X, then both

nations would gain by practicing territorial specialization and trading. That is, countries can produce goods at the lowest opportunity cost.

Fitzova and Zidek (2015), conducted a study on the relationship between international trade and economic growth. They employed the cointegration as well as the vector error correction model and granger causality tests. The results revealed that there is existence of long run relationship between the variables and further concluded that exports play a pivotal role in economic development of Czech and Slovak Republics.

Another study that was carried out in Kenya by Abdillahi etal (2017), for the period 1970 to 2014 comprising of study variables such as inflation and human capital which were found to be negative and statistically significant. It was concluded that Kenya should speed up the trade openness in order to adjust to the pace of economic growth.

Romer, Lucas and Svensson as cited in Chen (2009) argued that international trade can promote economic growth through technology spill over and external stimulation. Similarly, Grossman and Helpman (1990) used endogenous growth models of trade which demonstrate the importance of technological progress and knowledge accumulation. The model generates an endogenous rate of long-run growth that relates trade and growth by means of diffusing technology and knowledge. Rodriguez and Rodrik (1999) asserted that there is a positive relationship between trade and investment and the resulting growth.

According to Yanikkaya (2003), trade openness can be measured using the simple trade shares, which comprised of exports plus imports divided by GDP. He found out that they have positive and strong relationship with growth. Furthermore, Malefane (2018) carried out empirical research on the effects of trade openness on economic growth in South Africa using trade openness as a ratio of exports, imports to GDP. Evidence showed that even though trade openness is expected to be positively related to GDP it was insignificant.

4. Methodology

This study adopted the Vector Error Correction Model to find the long run and short run relationship between international trade and economic growth. This was chosen over the unrestricted VAR as it yields more efficient estimates, the long run and short run coefficients can be found simultaneously as well the nonstationary and stationary variables integrated in their mixed levels can be dealt with simultaneously. This adopted model was specified in a linear form of parameters as follows:

$$GDP = f(TO, TB, CD, INF) \dots\dots\dots (1)$$

Where:

GDP – is the Gross Domestic Product (dependent variable),

TO – is Trade Openness,

TB – is the Trade Balance

CD – is the Customs Duties and excise and

INF – is the inflation rate.

Equation (1) was expressed as a linear regression model as follows:

$$GDP_t = \beta_0 + \beta_1 TO_t + \beta_2 TB_t + \beta_3 CD_t + \beta_4 INF_t + \epsilon_t \dots\dots\dots (2)$$

To minimize dispersion, multicollinearity, and heteroscedasticity in the series, all variables were converted to natural logarithms, and the log-linear regression to produce consistent results. The log model for the series was as follows,

$$LGDP_t = \beta_0 + \beta_1 LTO_t + \beta_2 LTB_t + \beta_3 LCD_t + \beta_4 LINF_t + \epsilon_t \dots\dots\dots (3)$$

4.1 Definition of variables and expected signs

Trade openness is defined as the ratio of total imports and exports of goods and services to the Gross Domestic Product (GDP). It can be expressed as a percentage. According to Coe and Helpman (1995), the endogenous growth theory postulates that an open attitude towards foreign trade leads to an increase in economic growth in the long run through the improvement of the available technology. Hence this adoption of the new technology favors the idea that for each increase in the impact of trade openness there is also an increase in economic growth. Therefore, a positive sign was expected.

Trade balance is defined as the net amount of both imports and exports of goods of a specific nation or country excluding all savings, capital flows and other capital components. That is, it refers to the difference between the country’s exports and imports. The resulting difference is used to explain whether the nation produces a surplus or deficit over a given period. The sign of the trade balance is influenced by the value of imports and exports. When exports of goods and services are greater than imports of goods and services a positive sign is expected whereas the reverse is true. In this research a positive sign of trade balances was expected since Botswana embarked on the import substitution strategy as a way of reducing imports of foreign goods and services but increasing the exports of domestic goods and services. This assisted in determining whether this strategy is working for Botswana or not.

Customs duties and excise: defined as the indirect tax that is levied on imports or exports in the international market. These are used as an international trade policy and regulation that is meant to impose tax of products bought outside the country to facilitate the local production in the country. These can be treated as fixed or as variable tax. This taxing ensures that consumers cannot purchase some goods outside if they are costly thus ensuring demand of goods and services in the country without the need to import outside. Botswana charges this tax to generate income and this increases economic growth. Trade barriers facilitate trade deficit (negative) while elimination of trade tariffs have positive impact on economic growth.

Inflation is defined as the general increase in the price level of goods and services in a country over a specific period (Anochiwa & Maduka, 2015). Countries like Botswana experience inflation during some points in time and this can be as a result of imported inflation of goods and services from the international market. A negative sign on the inflation variable is expected because an increase in prices implies a declining purchasing power of money, thus reducing consumption and ultimately reducing GDP

Economic growth is the concept that explains the rate of the increase in the physical output factor of the economy or the quality improvement of the readily available input levels (Checchi et al, 2005). Gross Domestic Product (GDP) was used as a proxy to measure economic growth.

5. Empirical Investigations And Results

Table 1: Augmented Dickey Fuller test

VARIABLES	MODEL LEVEL	ADF AT LEVEL	ADF AT FIRST DIFFERENCE	ORDER OF INTEGRATION
LGDP	Intercept	(-1.699731) * (-2.941145)	(-9.566052) * (-2.941145)	I(1)
LTO	Intercept	(-1.615209) * (-2.941145)	(-9.446165) * (-2.941145)	I(1)
LTB	Intercept	(-3.613809) * (-2.938987)	(-8.878143) * (-2.943427)	I(0) and I(1)
LCD	Intercept	(-2.666238) * (2.938987)	(-5.757774) * (-2.941145)	I(1)
LINF	Intercept	(-1.339274) * (-2,938987)	(-5.150610) * (-2.941145)	I(1)

Source: Authors computation using Eviews 10

NOTE: I (0) indicates stationary at levels before differencing

I (1) Indicates stationary at first difference

() indicates critical value at 5% significance level

* indicates ADF test statistic

According to the table 1, the ADF test for stationarity on the log transformed variables showed that all variables except trade balances (TB) were non-stationary at levels since the ADF statistic is greater than all critical values at 5% significance. This allowed for differencing variables and a test for stationarity at first level. The variables were found to be stationary at first level after differencing and at the same time being integrated in the same order. This necessitated for the cointegration test to determine long run relationship between dependent variable and explanatory variables.

Table 2: Lag selection criteria

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1791.449	NA	1.02e + 36	97.10533	97.32302	97.18208
1	-1698.342	156.0161 *	2.61e + 34 *	93.42391 *	94.73006 *	93.88438 *
2	-1676.371	30.87862	3.33e + 34	93.58762	95.982223	94.43183
3	-1663.426	14.69401	7.90e + 34	94.23925	97.72232	95.46720
* Indicates lag order selected by criteria						
LR sequential modified LR test statistic (each test at 5%)						
FPE: Final Prediction Error						
AIC: Akaike Information Criterion						
SC : Schwarz Information Criteria						
HQ: Hannan-Quinn information Criterion						

Source: Authors estimation using E views 10.

To select the optimal lag length from the model, the minimum value is chosen among the model selection criteria. As indicated by the asterisk in table 2 above, the selection criteria are appropriate by using the optimal time lag length of 1 except the LogL criteria since it yields the smallest value. The research adopted the AIC criteria as it has the smallest value of *p* thus selecting lag length of 1. This verified the ADF test results for stationarity that the variables are integrated in the order of 1 allowing for the cointegration tests.

Table 3: Johansen Co-integration (Trace Test)

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized no. of CE(s)	Eigen value	Trace statistic	0.05 critical value	Prob**
None*	0.620643	74.49292	69.81889	0.0202
At most 1	0.352149	37.66034	47.85613	0.3170
At most 2	0.265936	21.16474	29.7907	0.3475
At most 3	0.141559	9.416693	15.49471	0.3282

At most 4	0.090782	3.616479	3.841466	0.0572
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Source: Authors computation using Eviews 10

According to the rank tests results, the trace statistic is greater than the critical values (.ie. 74.49292 > 69.81889) at 5% level of significance. This implies significant results and that there is at least one cointegrating equation and a long run relationship between the dependent variable and the explanatory variables.

Table 4: Johansen Co-integration (maximum Eigenvalue)

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)				
Hypothesized no. of CE(s)	Eigen value	Max- Eigen statistic	0.05 critical value	Prob**
None*	0.620643	36.83258	33.87687	0.0215
At most 1	0.352149	16.49560	27.58434	0.6234
At most 2	0.265936	11.74805	21.13162	0.5727
At most 3	0.141559	5.800214	14.26460	0.6390
At most 4	0.090782	3.616479	3.841456	0.0572

Source: Authors computation using E views 10

Regarding the maximum eigenvalue test results, the null hypothesis of no cointegrating equations was rejected since the maximum Eigen statistic were greater than the critical value (i.e., 36.83258>33.87687) at 5% significance level and while the probability value is less than 5%. This indicated the existence of one cointegrating equation and a long relationship between economic growth and its explanatory variables at 5% level of significance at each test. Since both results in table 3 and 4 are the same, the null hypothesis was rejected, and the conclusion was that there is at least one cointegrating equation thus fulfilling the objective of the research which was to determine if there is any relationship between international trade components(trade openness, trade balance, custom duties, and inflation) and economic growth.

Table 5: Johansen Normalization Interpretation

Co-integration Eq Normalized cointegrating coefficients (standard error in parentheses)				
(LGDP)	(LTO)	(LTB)	(LCD)	(LINF)
1.000000	0.472735 (0.05112)	0.029911 (0.00345)	0.376943 (0.08273)	0.237686 (0.02902)

Source: Authors computation using Eviews 10

The Johansen normalized cointegrating coefficients explain the contribution of each variable in the long run. This was interpreted in terms of reversed signs of coefficients, the positive coefficients were interpreted as negative, and the reverse is true (Ntihemuka, 2021). Results show that all the variables are insignificant since they have a negative impact on the dependent variable. Since the variables were transformed into natural logarithms results could be explained in terms of the long run elasticities. In this case the insignificant values were less than one hence they are inelastic. This implied that the explanatory variables (inflation, trade openness, trade balances and custom duties) decrease proportionately more than economic growth (GDP).

Vector Error Correction model

Table 6: Table Vector Error Correction Estimates

	D(LDGP)	D(LTO)	D(LTB)	D(LINF)	D(LCD)
CoIntEq1	-0.022842 (0.10553) [-0.21646]	-9.00E-06 (4.4E-06) [-2.06033]	-3.06E+08 (6.9E+07) [-4.41871]	3.97E-05 (1.7E-05) [2.39786]	0.010185 (0.01386) [0.73459]

Source: Authors computation using Eviews 10

Results showed that a unit change in trade openness leads to a small significant increase in GDP, a unit change in trade balance leads to an increase in GDP, a unit change in inflation results in a decrease in GDP and lastly a unit change in customs duties leads to a percentage decrease in GDP. The negative signs of the coefficients indicate convergence in the long run. These results were expected as explained earlier.

Table 7: Vector Error Correction model

DEPENDENT VARIABLE: D(LGDP)				
METHOD: LEAST SQUARES(GAUSS NEWTON/MARQUARDT STEPS)				
	COEFFICIENT	STD ERROR	T STATISTIC	PROB
C(1)	-0.272666	0.198963	-1.370437	0.1804
C(2)	-0.328622	0.189423	-1.734857	0.0927
C(3)	0.118774	0.083452	1.423267	0.1646
C(4)	0.001982	0.004423	0.448102	0.6572
C(5)	-0.012765	0.114076	0.111896	0.9116
C(6)	0.017825	0.107658	0.165567	0.8696
C(7)	0.022603	0.013344	1.693864	0.1003

Source: Authors computation using Eviews 10

The results showed that the short run coefficients deviate from long run equilibrium. This implies that the short run coefficient’s deviation from long run equilibrium is adjusted at the speed of 27 % (this is the speed of adjustment towards equilibrium) as shown by the first coefficient C (1). Normally the negative sign of the speed of adjustment symbolizes the ability to bounce back to equilibrium.

Table 8: Wald test

WALD TEST			
EQUATION: UNTITLED			
TEST STATISTIC	VALUE	DF	PROBABILITY
F- STATISTIC	1.522001	(7,31)	0.1966
CHI-SQUARE	10.65400	7	0.1544

Source: Authors computation using Eviews 10

The Wald test was carried out to find if the explanatory variables have short run effect on the dependent variable. The results reveal that all the explanatory variables are significant at 5% critical value. The speed of adjustment of -0.272666 which is equivalent to 27% when expressed in percentages is significant with a negative sign.

Diagnostics and stability test

Table 9: Residual Analysis

TESTS	P- VALUE
Breusch-Godfrey Serial Correlation	0.0712
Breusch-Pagan-Godfrey Heteroskedasticity	0.0048
Jarque-Bera Normality	0.2817

Source: Authors computation using Eviews 10

According to the residual diagnostics tests for testing the adequacy of the model shows that the probability values of the serial correlation test and Jarque-Bera tests are greater than the 5% critical value, thus residuals have no serial correlation and are normally distributed while for the heteroskedasticity the conclusion was that the residuals are not homoscedastic.

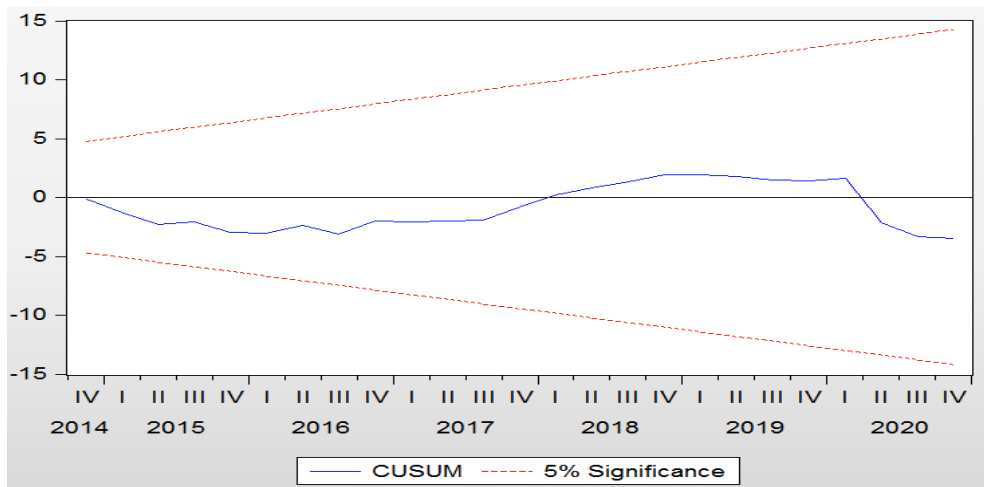


Figure 2: CUSUM test for Stability Diagnostics

The results of the CUSUM test as depicted in the figure above shows that the model is stable and significant at 5%.

6. Conclusion

This research assessed the impact of international trade on economic growth in Botswana. Inflation and custom duties were found to be negatively related to GDP in long-run. The reason behind this negative relationship is that Botswana is mostly dependent on imports from other countries, and this results in the country bearing the inflation from those countries in the form of imported inflation. For example, fuel adjustments in South Africa results in an increase in the prices in Botswana thus affecting the GDP of the country negatively. Custom duties contribute both positively and negatively with reference to the trade tariffs that Botswana imposes. Trade barriers affect Botswana negatively as they limit the number of potential investors to the country thus interfering with trade openness in a country.

Moreover, trade openness was found to have a positive impact on the level of economic growth both in the long run and short run. Hence, government should create an investor friendly environment to attract domestic and foreign investors by promoting local creation of businesses as well as eliminating the tariffs and non-tariff barriers. In that way, Botswana can help diversify the export and imports market.

Based on these findings, it is recommended that Botswana should follow the export-oriented strategy which aims at increasing local productivity to allow for more exports from the country, thus increasing economic growth as all the revenue will be generated from total value of goods and services exported. Government should also stimulate domestic production by exempting importation of raw material and capital goods and develop human capital that can absorb technologies coming from developed countries. This will boost country's economic growth, promote export, and reduce trade deficit.

The negative effect of inflation rate on economic growth in the long run is because people tend to spend more in the earlier times of inflation rather than in future when money has lost its purchasing power, and this reduces output growth. In this case, the banks should not offer credit facilities to people which will help reduce household debt.

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