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Malefa Rose Malefane[1] and Nicholas M. Odhiambo

Abstract

In this paper, the dynamic relationship between trade openness and economic growth in Botswana is examined using the Autoregressive Distributed Lag (ARDL) bounds testing approach. In order to test the robustness of the results, four proxies of trade openness were used in the estimation. Three of the four proxies were constructed from trade ratios, while the fourth proxy was a composite index of trade openness. The idea behind the use of different proxies was to ascertain whether the impact of trade openness in Botswana depends on the type of trade openness taken into consideration. The empirical results of this study reveal that, when the ratio of exports plus imports to GDP is used, and when the ratio of exports to GDP is used as a proxy for trade openness, then , trade openness has a significant positive impact on economic growth in Botswana, both in the short run and in the long run. Likewise, when the trade openness index is employed in the empirical investigation, the results show that in both the short run and the long run, trade openness has a significant positive impact on economic growth. The overall results of this study, therefore, have important policy implications for Botswana. Among other things, Botswana's policy makers should pursue policies that boost the country's exports and total trade.

Keywords: ARDL; Botswana; economic growth; exports; imports; trade openness

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1. INTRODUCTION

In the trade-growth literature, the issue of whether trade openness has a significant impact on economic growth is quite debatable. Although some empirical studies show that trade openness does, in fact, have a positive impact on economic growth (Karras, 2003; Hassan, 2005; Rao and Rao, 2009; Sakyi, 2011), there are other studies that find either mixed results (Singh, 2011; Hye and Lau, 2015), or a negative relationship between trade openness and economic growth (Adhikary, 2011). One other observation from the existing studies in the trade-growth literature is that there is no unanimous indicator for measuring trade openness. Thus, the existing studies tend to employ different proxies of trade openness, depending on the key issues underlying the research question. Even though there are conflicting views regarding the impact of trade openness on economic growth, the empirical investigation of impact of trade openness on economic growth continues to probed (for example see Zanohogo, 2017; Makun, 2017).

This study differs from other previous studies investigating the impact of trade openness on economic growth in that it uses the ARDL technique, which allows the short-run and long-run impacts to be explored. Also, this paper uses four different proxies of trade openness, which in a way, sets this study apart from some previous empirical studies conducted in sub-Saharan Africa (Osabuohien, 2007; Agbetsiafa, 2010; Chang & Mendy, 2012; Musila & Yiheyis, 2015).

The rationale behind focusing on Botswana is that there is little coverage of empirical studies on trade openness and economic growth in this country. Moreover, given that Botswana is one of the fastest growing economies in sub-Saharan Africa, this study serves as one of the platforms that explore the growth dynamics in Botswana, from which other countries could learn. At the core of

Botswana's national policy frameworks lies the export-led growth strategy, which the country adopted as an alternative strategy for industrialization. To reinforce this, the Government of Botswana has committed itself to promoting diversification of its economy through export-led industrialization (World Trade Organisation, WTO, 1998). In line with this commitment, the government has, since 1997, developed new policy frameworks to assist in achieving the country's trade and investment goals.

Some of the key trade-supporting policies and legislation that Botswana adopted during its economic reforms include the National Development Plan 10 (NDP 10), the Industrial Development Policy and Competition Policy, Botswana's National Export Strategy, Investment Strategy for Botswana, and the Private Sector Development Strategy (Republic of Botswana, 2009). The adoption of the National Development Plan 10 together with the implementation of Botswana's Vision 2016 have assisted the country to address the key issues relating to trade openness. In a way, the implementation of the National Development Plan 10 and Botswana's Vision 2016 address the diversification of Botswana's economy, which is one of the key issues pertaining to the country (Organisation for Economic Cooperation and Development, OECD, 2008).

Over and above economic diversification and private sector development, Botswana's trade openness has also been influenced by increased policy effectiveness in the country. During 2013, for instance, the Mid-Term Review of the National Development Plan 10 (NDP 10) was executed with the aim to identify the issues that needed critical attention during the second phase of the NDP 10. In that review, emphasis was placed on efficient resource allocation and on increased policy effectiveness. In addition to these, macroeconomic stability, increased global

competitiveness, governance, and factor productivity became part of the latest articulated strategies (Republic of Botswana, 2013).

Against this background, therefore, the purpose of this paper is to investigate the impact of trade openness on economic growth in Botswana during the period 1975 to 2014. This paper also aims to examine whether the use of different proxies for trade openness influences the dynamic relationship between trade openness and economic growth. In so doing, this study employs four different proxies of trade openness in the Autoregressive Distributed Lag (ARDL) framework. The first indicator of trade openness used in this study is computed from the ratio of trade to gross domestic product (GDP). The second indicator is the ratio of exports to GDP, while the third indicator is the ratio of imports to GDP. The fourth indicator is an index of trade openness capturing the effects of residual openness after purging the country size and geography.

This paper is organized into four sections. Following the introduction, the second section reviews literature on trade openness and economic growth. Thereafter, the third section discusses methodology and the empirical results for the study. The last section provides concluding remarks based on study results.

2. Trade openness and economic growth: theoretical and empirical literature review

2.1 Theoretical linkages between trade openness and economic growth

Studies investigating the relationship between trade openness and economic growth identify various channels through which trade openness may affect economic growth. Based on Wacziarg (2001), Baldwin and Forslid (2000), and Rivera-Batiz and Romer (1991), we review some of the

channels that link trade openness with economic growth. These channels include government policy, reallocation, and distribution of resources. Regarding government policy, the argument is that the impact of trade openness on economic growth is likely to result from either the implementation of macroeconomic policy or from the size of government. In this view, the more open an economy is, the more likely it is to implement stable macroeconomic policies. This is because trade openness may induce domestic economies to adopt policies that improve the competitive environment for domestic firms that trade internationally (Wacziarg, 2001). In the light of this hypothesized positive relationship between government policy and economic performance, it can therefore be argued that trade openness may have a positive impact on economic growth. This argument is consistent with Fischer (1992), who maintained that stable macroeconomic policies are associated with sustained economic growth. Among other factors, such macroeconomic policies are characterized by low and predictable inflation, sustainable fiscal policy, and viable balance of payments.

In addition to government policy, trade openness may also affect economic growth through allocation and distribution of resources. Thus, for various reasons, economies that are more open to trade are more likely to be associated with efficiency in resource allocation. Some of the main reasons why open economies are more likely to have efficient allocation of resources than closed economies include minimal price distortions and specialization. In open economies, there tends to be relatively minimal price distortions that results in an efficient allocation of resources. This is because open economies tend to set their prices of tradable goods levels in line with the world market prices, resulting in a lower degree of price and a more efficient allocation of resources (Wacziarg, 2001). Moreover, by allowing the exchange of products in international markets, trade

openness gives countries an opportunity to specialize in production of products in which they possess a comparative advantage over other products.

Rivera-Batiz and Romer (1991) illustrate how economic growth may be realized through the sectoral allocation of resources. The argument is that the sectoral allocation of resources induces a country to allocate its basic inputs across the sectors based on its resource endowments. Hence, there is a tendency for a country to reallocate its resources toward a sector in which it possesses some comparative advantage. Consequently, through specialization, countries are given an ability to reallocate resources, either between sectors within the borders or across international markets. Suppose that trade results in the reallocation of resources from, for example, the manufacturing sector to the research and development (R&D) sector. Because of resource allocation, there could be an increase in the rate of knowledge accumulation emanating from the increase in the amount of resources devoted to R&D. The increase in the rate of knowledge accumulation contributes to expansion in the extent of innovation, which is considered as one of the engines of growth. Therefore, as countries become more innovative because of knowledge accumulation, their rates of economic growth are likely to increase (Rivera-Batiz and Romer, 1991). This kind of economic growth is known as innovation-driven growth.

2.2 Empirical evidence on trade openness and economic growth

In this section, we review ten (10) different studies that empirically examined the relationship between trade openness and economic growth. These studies include Karras (2003), Hassan (2005), Awokuse (2008), Rao and Rao (2009), Adhikary (2011), Klasra (2011), Singh (2011), Hye and Lau (2015), Makun (2017), and Zanohogo (2017). Karras (2003) investigated the impact of trade openness on economic growth using two panel data sets covering the period 1951–1998

and 1960–1997 for 56 different countries. Using the ratio of exports plus import as a proxy for trade openness, the results from the study showed that trade openness has a significant positive effect on economic growth. The results showed that a 10 percent increase in trade openness permanently causes the real growth rate of GDP per capita to increase by approximately 0.5 percent. Based on the results, the study, therefore, concluded that trade openness has a substantial effect on the promotion of economic growth.

Hassan (2005) investigated the relationship between trade openness and economic growth in Bangladesh during the period 1994–2003. Using the ratio of exports plus imports to GDP as a measure of trade openness, the results revealed that there exists a long-run equilibrium relationship between trade openness and economic growth in Bangladesh. The study, therefore, concluded that trade openness plays an important role in economic growth in Bangladesh.

Awokuse (2008) investigated whether trade openness contributes to economic growth in Argentina, Columbia and Peru using a neoclassical growth modelling framework. Focusing on the separate roles of exports and imports, the study employed two proxies for trade openness, namely, real exports and real imports. The results of the study indicated that both exports and imports play a significant role in stimulating economic growth in the three study countries.

Rao and Rao (2009) estimated the effects of trade openness on economic growth in Fiji during the period 1972 – 2002, using additional explanatory variables in an augmented Solow growth equation. Employing the ratio of exports plus imports to GDP as a measure of trade openness, the study found that trade openness has a significant positive impact on economic growth. The results revealed that a 10 percent increase in trade openness caused a 2 percent increase in economic growth in Fiji. Moreover, the results also revealed that about 70 percent variation in economic

growth rate was explained by factor accumulation and trade openness. These results confirmed the positive effect of trade openness on Fiji's economic growth.

Klasra (2011) investigated the long-run relationship between trade openness and economic growth in Pakistan and Turkey during the period 1975–2004. The study employed the ratio of exports and imports to GDP as a measure of trade openness. The results confirmed that there was a positive long-run relationship between trade openness and economic growth in Pakistan, but not in Turkey.

In another study, Singh (2011) examined the effects of trade on economic growth in Australia during the period 1960–2007, using the neoclassical framework. The study analysed two effects of trade, namely the effects of exports and the effects of imports. The results revealed mixed conclusions regarding the growth-effects of international trade. Evidence from the study showed that exports have positive and significant effects on economic growth while the imports have predominantly negative effects on economic growth. This evidence pointed out to the significance of promotion of exports in Australia, but also the lack of growth impetus from imports.

Hye and Lau (2015) examined the link between trade openness and economic growth in India during the period 1979–2009, using an endogenous growth model. The study employed a composite trade openness index to measure the impact of trade openness on economic growth. This trade openness index was constructed from different proxies of trade openness, which include the share of exports in GDP, the share of imports in GDP, and the share of exports plus imports in GDP. The results showed that in the short run, trade openness has a positive impact on economic growth. However, in the long run, trade openness has a negative impact on economic growth.

While a number of studies concluded that trade openness has a positive effect on economic growth, Adhikary (2011) found that trade openness had a negative but diminishing influence on economic

growth. Using the ratio of export and imports over GDP as a proxy for the degree of trade openness in Bangladesh for the period 1986–2008, the results showed that there was a significant negative relationship between trade openness and economic growth.

In a recent investigation on the effects of trade openness on economic growth, Zahonogo (2017) investigated the impact of trade openness on economic growth in 42 Sub-Saharan African countries during the period 1980–2012. The study employed the ratio of exports to GDP, the ratio of exports to GDP, and the ratio of imports to GDP as proxies for trade openness. Using the Pooled Mean Estimation technique, the results of the study revealed that trade openness that trade openness has a positive and significant effect on economic growth only up to a threshold, above which the effect declines.

In another recent study, Makun (2017) examined the effects of trade openness on economic growth in Malaysia using time series data covering the period 1980–2013. The study employed the ratio of exports plus imports to GDP as a proxy for trade openness. Using LSE-Hendry's general to specific approach, the results showed that trade openness has significant positive effect on economic growth.

3. **Empirical model specification and estimation techniques**

3.1 **Empirical model specification**

To estimate the impact of trade openness on economic growth in Botswana, this study adopts, with modifications, an empirical model based on Jin, 2000; Chang and Mendy 2012, and Yanikkaya, 2003. The empirical model is specified as:

$$GROWTH = \alpha_0 + \beta_1 OPENPROXY + \beta_2 \frac{INV}{GDP} + \beta_3 \frac{GOV}{GDP} + \beta_4 INFL + \beta_5 \frac{M2}{GDP} + \varepsilon_t \ldots\ldots\ldots (1)$$

As illustrated in equation (1), $GROWTH$ is the growth rate of real GDP per capita; $OPENPROXY$ represents any one of the four proxies of trade openness (OPEN1,OPEN2, OPEN3 and OPEN4); (INV/GDP) represents investment; (GOV/GDP) is the share of government consumption expenditure in GDP; (INF) is the inflation rate; and $(M2/GDP)$ is the level of financial development. The term ε_t is the error term, while α_0 is the constant term. $\beta_1 ... \beta_5$ are the regression coefficients.

3.2 Data type and sources

This study uses annual time series data for Botswana covering the period 1980 to 2014. Economic growth, measured by the growth rate in real GDP per capita, is the dependent variable in the growth equation. To measure trade openness, this study uses four different proxies of trade, which are OPEN1, OPEN 2, OPEN 3, and OPEN 4. OPEN 1 is expressed by the ratio of exports plus imports to GDP to GDP; while OPEN 2 is the ratio of exports to GDP. The third proxy, OPEN 3, is the ratio of imports to GDP whereas OPEN 4 is an index of trade openness index. This index was derived from a regression equation constructed from country size and geographic characteristics. Frankel and Romer (1999) indicate that countries' geographic characteristics have significant influence on trade, hence the inclusion of this particular index of trade openness in this current study. Apart from the proxies of trade openness, other explanatory variables are measured as follows: The ratio of gross fixed capital formation to GDP is used as a proxy for investment, whereas government consumption expenditure is measured by the ratio of final consumption expenditure to GDP. Inflation rate is given by the annual growth rate in the consumer price index.

The last explanatory variable is the ratio of liquid liabilities to gross domestic product (M2/GDP), which is a proxy for financial development. All data was obtained from the World Bank, World Development Indicators (World Bank, 2015).

3.3 Estimation Techniques

For the purposes of cointegration analysis, this study applies the ARDL modelling technique in line with Pesaran *et al*. (2001). The ARDL representation of the empirical model for this study can be expressed as follows:

$$\Delta GROWTH = \alpha_0 + \sum_{i=1}^{n} \beta_{1i} \Delta GROWTH_{t-i} + \sum_{i=0}^{n} \beta_{2i}\, \Delta OPENPROXY_{t-i} + \sum_{i=0}^{n} \beta_{3i}\, \Delta \frac{INV}{GDP}_{t-i}$$
$$+ \sum_{i=0}^{n} \beta_{4i}\, \Delta \frac{GOV}{GDP}_{t-i} + \sum_{i=0}^{n} \beta_{5i} \Delta INF_{t-i} + \sum_{i=o}^{n} \beta_{6i} \Delta \frac{M2}{GDP}_{t-i} + \lambda_1 GROWTH_{t-1}$$
$$+ \lambda_2 OPEN_{t-1} + \lambda_3 \frac{INV}{GDP}_{t-1} + \lambda_4 \frac{GOV}{GDP}_{t-1} + \lambda_5 INF_{t-1} + \lambda_6 \frac{M2}{GDP}_{t-1}$$
$$+ u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

In equation (2), Δ is the difference operator; n is the lag length; α_0 is a constant term; $\beta_1 \ldots, \beta_6$ represent the short-run coefficients while $\lambda_1 \ldots, \lambda_6$ are long run coefficients. Using the parameters expressed in equation (2), the null hypothesis for testing for no cointegration is given by:

$$H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$$

This is tested against the alternative hypothesis:

$$H_1: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq 0$$

One of the advantages of the ARDL approach to cointegration modelling relates to the consistency of parameters. With the ARDL approach, the ordinary least squares (OLS) estimators of short-run parameters are √T consistent. This means that the OLS parameter estimates converge to their true values at rate √T, where T represents the sample size (Bentzen and Engsted, 2001). Moreover, the ARDL approach also has the advantage of being suitable in studies that have a smaller sample size (Wolde-Rufael, 2010).

Following the cointegration test based on equation (2), the error correction model (ECM) for the current study is expressed as:

$$\Delta GROWTH_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i}\, \Delta GROWTH_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta OPENPROXY_{t-i} + \sum_{i=}^{n} \alpha_{3i} \Delta INV/GDP_{t-i} + \sum_{i=1}^{n} \alpha_{4i} \Delta GOV/GDP_{t-i} + \sum_{i=1}^{n} \alpha_{5i} \Delta INF_{t-i} + \sum_{i=1}^{n} \alpha_{6i} \Delta M2/GDP_{t-i} + \varphi ECT_{t-1} + \mu_t \dots\dots\dots (3)$$

In equation (3), $\alpha_1, \dots \alpha_6$ are the short-run coefficients; while φ is the speed of adjustment towards long-run equilibrium path. ECT is the error-correction term. μ_t is the residual error term. The validity of the error correction mechanism lies in the size and sign of the coefficient representing the speed of adjustment. This coefficient of the error correction term (φ) is expected to be negative and statistically significant, and to be less than 1.

In order to detect the presence of unit roots, all variables were examined using three different types of unit root tests. These include the Dickey Fuller (DF) test with Generalized Least Squared (GLS) de-trending, Phillip-Perron test, and the Perron (1997) test. The reason behind running stationarity

tests is that if a particular series is stationary, then the mean, variance and autocorrelations can be well approximated using long-time averages based on a single set of realizations (Enders, 2004). However, if a series is nonstationary, it will tend to drift away from its long-run mean, leading to inference being based on spurious results. Table 1 reports the results of the three unit root tests for this study.

The stationarity test results reported in Table 1 indicate that with the exception of economic growth, all variables are non-stationary in levels. The results further indicate that after first differencing, all the variables become stationary. Having confirmed the order of integration of the variables, the next step involves the ARDL bounds test for cointegration. Table 2 reports the results of the ARDL bounds test.

Table 1: Unit Root Test Results

Dickey-Fuller General Least Square (DF-GLS)												
	Dickey Fuller GLS				Phillip-Perron				Perron (1997)			
Variable	Stationarity of all Variables in Levels		Stationarity of all Variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all Variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all Variables in First Difference	
	No trend	Trend	No trend	Trend	No Trend	Trend	No trend	Trend	No trend	Trend	No trend	Trend
GROWTH	-4.651***	-5.405***	–	–	-4.596***	-5.391***	–	–	-6.573***	-6.426***	–	–
OPEN1	-1.443	-2.389	-5.228***	-5.330***	-1.415	-2.645	-6.259***	-6.167***	-4.553**	-4.350	–	-6.438***
OPEN2	-2.024	-2.444	-5.466***	-6.061***	-2.510	-2.979	-6.378***	-6.306***	-3.580	-3.330	-7.307***	-7.353***
OPEN3	-1.253	-1.831	-5.385***	-4.733***	-1.619	-1.925	-4.676***	-4.591***	-1.985	-3.692	-6.128***	-6.035***
OPEN4	-2.428	-2.493	-4.771***	-5.776***	-2.492	-2.639	-6.699***	-8.133***	-3.603	-3.973	-6.824***	-6.732***
INV/GDP	-2.293	-2.401	-4.318***	-4.646***	-2.614*	-2.613	–	-4.629***	-5.177***	-6.634***	–	–
GOV/GDP	-1.269	-1.652	-4.515***	-5.296***	-4.596***	-5.391***	–	–	-3.231	-3.281	-6.622***	-6.688***
INFL	-2.473**	-3.926***	–	–	-1.415	-2.645	-6.259***	-6.167***	-3.851	4.539	-9.129***	-8.632***
M2/GDP	-1.212	-2.369	-1.667*	-5.055***	-2.510	-2.979	-6.378***	-6.306***	-6.573***	-6.426***	–	–

Note: *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively.

Table 2: Results for the ARDL Bounds Test

Equation	**Dependent Variable**		**Function**			**F-Statistic**
Equation 1	GROWTH		F(GROWTH | OPEN1, INV/GDP, GOV/GDP, INFL, M2/GDP)			3.366*
Equation 2	GROWTH		F(GROWTH | OPEN2, INV/GDP, GOV/GDP, INFL, M2/GDP)			4.461**
Equation 3	GROWTH		F(GROWTH | OPEN3, INV/GDP, GOV/GDP, INFL, M2/GDP)			5.022**
Equation 4	GROWTH		F(GROWTH | OPEN4, INV/GDP, GOV/GDP, INFL, M2/GDP)			4.133**
Asymptotic Critical Values						
Pesaran *et al*. (2001), p.300, Table CI(iii) Case III	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	3.41	4.68	2.62	3.79	2.26	3.35

Note: *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively.

Based on the results of the ARDL test, it can be concluded that there is cointegration among the variables used in all the four models of this study. This is because in all the four models of this study, the calculated F-statistics are higher than the critical value bounds at 5% level of statistical significance for Equation 2, Equation 3 and Equation 4 and at 10% level of statistical significance for Equation 1.

Following the cointegration test, the estimation of the long-run and the short-run coefficients was one. The optimal lag length was determined using the Schwartz Information Criterion (SIC). The SIC selected ARDL(1, 2 ,1, 2, 1, 0) for Equation 1; ARDL(1, 0, 0, 2, 0, 0) for Equation 2; ARDL(1, 0, 2, 1, 3, 1) for Equation 3; and ARDL(1, 2, 1, 2, 1, 0) for Equation 4. Table 3 reports the empirical results indicating the coefficients for the short-run and long-run estimations.

Table 3 - Results of the Long-Run and Short-Run Estimations of the ARDL (All Equations)

Panel 1: Long-run coefficients, Dependent variable is GROWTH								
	Equation 1		**Equation 2**		**Equation 3**		**Equation 4**	
Regressor	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
OPENPROXY	0.170*** (2.891)	0.008	0.352*** (5.287)	0.000	0.078 (0.856)	0.400	0.240** (2.674)	0.013
INV/GDP	0.100 (0.541)	0.593	0.331** (2.366)	0.025	-0.332 (-1.048)	0.305	0.045 (0.223)	0.825
GOV/GDP	-0.155 (-0.529)	0.601	-0.439** (-2.379)	0.024	-0.682** (-2.216)	0.036	-0.269 (-0.917)	0.368
INFL	-0.096 (-0.213)	0.833	0.271 (1.349)	0.187	-0.237 (-0.466)	0.645	0.116 (0.250)	0.805
M2/GDP	-0.082 (-0.658)	0.516	-0.090 (-1.260)	0.217	-0.309** (-2.617)	0.015	-0.177 (-1.614)	0.119
C	-8.459 (-0.466)	0.645	-13.173 (-1.255)	0.219	38.485*** (2.989)	0.006	13.744 (0.962)	0.345
Panel 2: Short-run coefficients, Dependent variable is ΔGROWTH								
	Equation 1		**Equation 2**		**Equation 3**		**Equation 4**	
Regressor	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
ΔGROWTH	…	…	…	…	…	…	…	…
ΔOPENPROXY	0.407*** (4.177)	0.000	0.424*** (5.234)	0.000	0.072 (0.851)	0.402	0.409*** (4.499)	0.000
ΔOPEN(1)	-0.052 (-0.433)	0.668	…	…	…	…	-0.070 (-0.725)	0.474
ΔINV/GDP	0.313 (1.183)	0.246	0.399** (2.244)	0.032	0.135 (0.369)	0.715	0.256 (0.952)	0.349
ΔINV/GDP(1)	…	…	…	…	0.455 (1.520)	0.140	…	…
ΔGOV/GDP	-1.275*** (-3.192)	0.003	-0.946*** (-2.931)	0.006	-0.630** (-2.007)	0.054	-1.340*** (-3.436)	0.002

ΔGOV/GDP(1)	0.578 (1.137)	0.265	0.333 (1.164)	0.253		…	0.733 (1.550)	0.133
ΔINFL	0.507* (1.826)	0.078	0.326 (1.334)	0.192	0.013 (0.047)	0.962	0.670** (2.459)	0.020
ΔINFL(1)	…	…	…	…	-0.341 (-0.800)	0.431	…	…
ΔINFL(2)					0.507 (1.441)	0.161	…	…
ΔM2/GDP	-0.081 (-0.659)	0.515	-0.108 (-1.213)	0.234	-0.404** (-2.468)	0.020	-0.158 (-1.499)	0.144
ECM(-1)	-0.985*** (-4.832)	0.000	-1.204*** (-8.066)	0.000	-0.924*** (-4.811)	0.000	-0.893*** (-4.247)	0.000
Test Statistic	**Equation 1**		**Equation 2**		**Equation 3**		**Equation 4**	
R-Squared	0.752		0.729		0.675		0.755	
R-Bar Squared	0.638		0.657		0.519		0.641	
S.E.	3.045		2.964		3.551		3.032	
F. Statistic	9.879[0.000]		9.8794[0.000]		5.7661[0.000]		9.994[0.000]	
RSS	241.035		263.547		315.212		238.944	
DW	1.983		1.762		2.034		1.983	
AIC	-103.856		-101.597		-107.117		-103.686	
SBC	-114.669		-109.083		-117.762		-114.499	

Note: *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. T-ratios are in parentheses ( ).

Based on the long-run results displayed in Table 3, there is an indication that trade openness has a significant positive impact on economic growth in all the equations except the case of Equation 3. Starting with Equation 1, the results show that an increase in the ratio of total trade to GDP in Botswana has a positive impact on economic growth in the country. Likewise, there is strong evidence from Equation 2 results showing that an increase in the ratio of exports to GDP has a significant positive impact on economic growth in the long run. The results for Equation 4 provide a different dimension to the current argument. In Equation 4, the trade openness index represents the residual index after purging the effects of country since and geography. Based on the results of Equation 4, therefore, it can be concluded that trade openness has a significant, positive impact on economic growth in Botswana irrespective of the dynamics in country size and geography.

Other long-run results reveal that investment has a significant positive impact on economic growth in the cases of Equation 2 only. The long-run results further show that in two of the four models investigated, the coefficient of government consumption expenditure is negative and statistically significant. This implies that government consumption expenditure has a negative impact on economic investigated, which is consistent with Landau (1983). The long-run results reading financial development variable (M2/GDP) indicate that bank-based financial development has a significant negative impact on economic growth in Botswana, which could be regarded as a signal for inadequate level of financial development in the country. These results are consistent with Akinboade (1998), who found that Botswana has a small financial sector that is predominantly characterised by a limited range of financial assess and undeveloped capital markets.

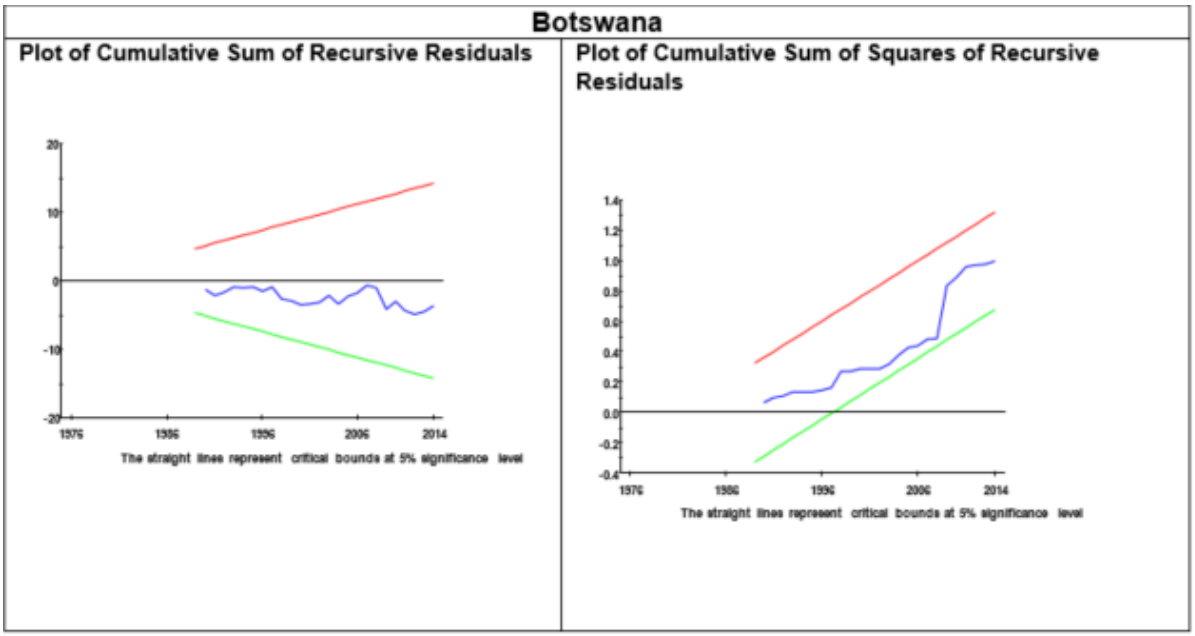
The results for the short-run estimations show that the coefficient of trade openness is positive and statistically significant for Equation 1, Equation 2 and Equation 4, as was the case with the long-run

results. The short-run results further show that in all the four models, the coefficients of government expenditure variable are negative and statistically significant. These negative signs indicate that in the short run, an increase in government consumption expenditure may reduce Botswana's economic growth. These results are consisted with Landau (1983), who found a negative relationship between government consumption expenditure and economic growth. The results further reveal that consistent with the Mundell-Tobin effect, inflation rate has a positive impact on Botswana's economic growth in the short run. This is confirmed by a positive and significant coefficient of inflation rate in Equation 1 and Equation 4. The Mundell-Tobin effect demonstrates how an increase in inflation rate could lead to an increase in economic growth, and normally this effect is more practical in low-inflation countries (Bullard and Keating, 1995). The lagged coefficient of the error correction term is negative and is statistically significant in all equations, indicating convergence towards long-run equilibrium.

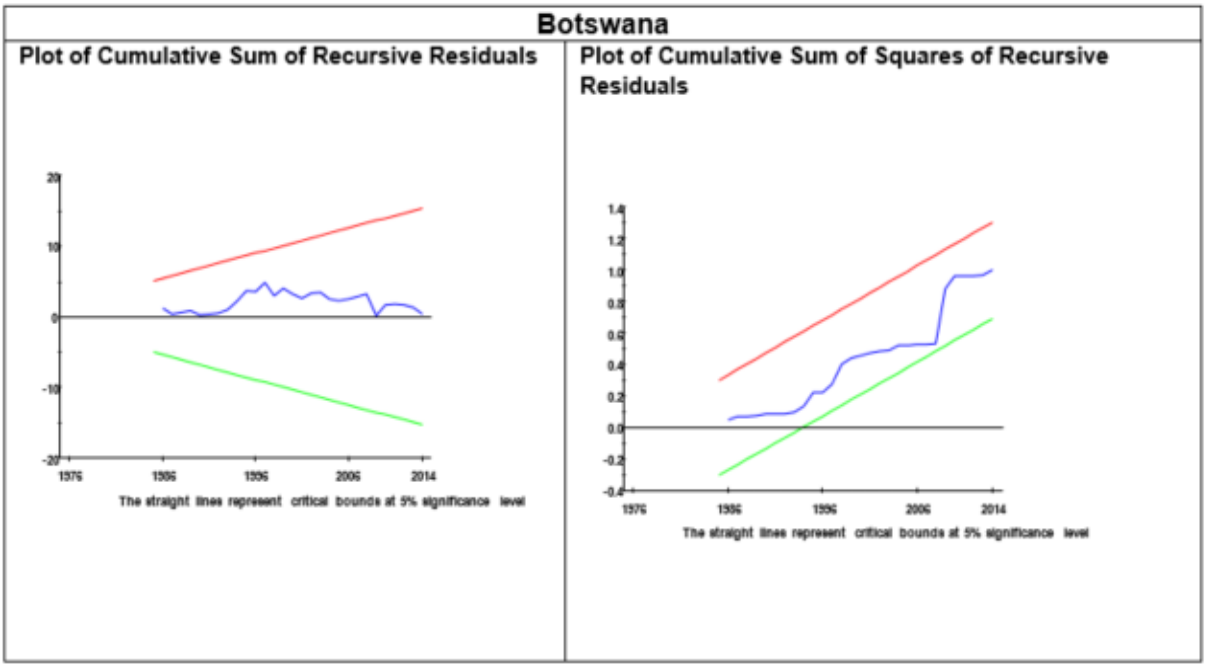
To provide further insights into the stability of the equations used in empirical analysis, this study examines the plots for cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squared residuals (CUSUMQ). Figure 1 (a) – (d) show the residual plots for Equation 1, Equation 2, Equation 3 and Equation 4 respectively.

Figure 1: Plot of CUSUM and CUSUMQ (All Equations)

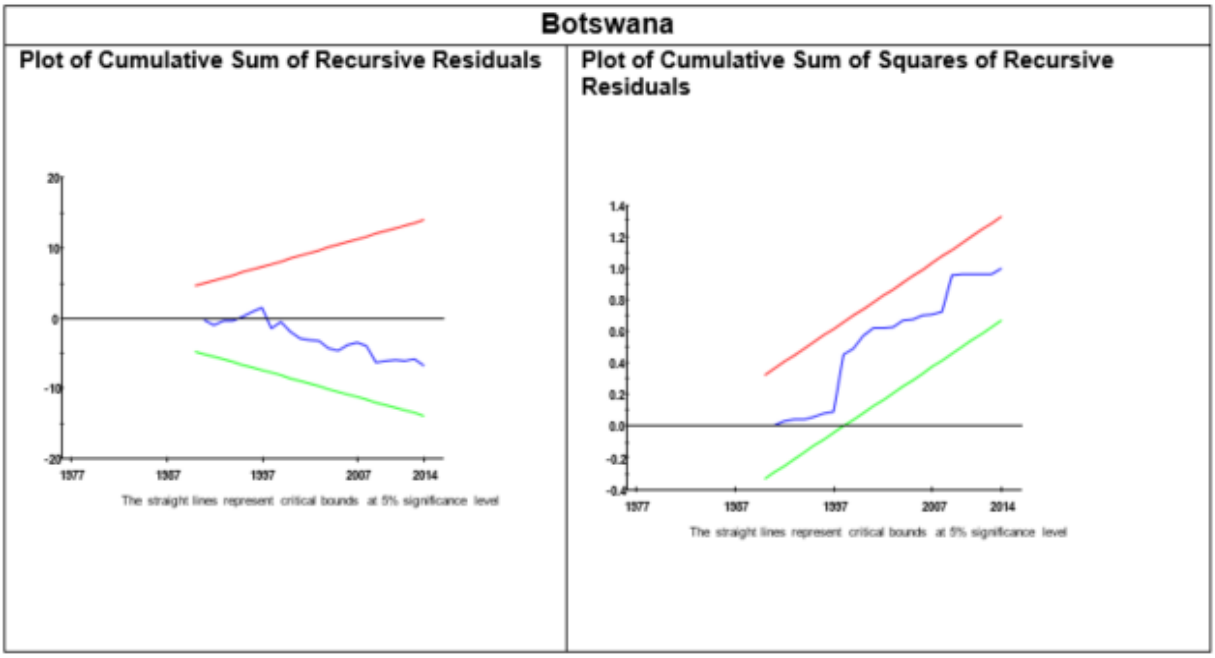
(a) CUSUM and CUSUMQ for equation 1



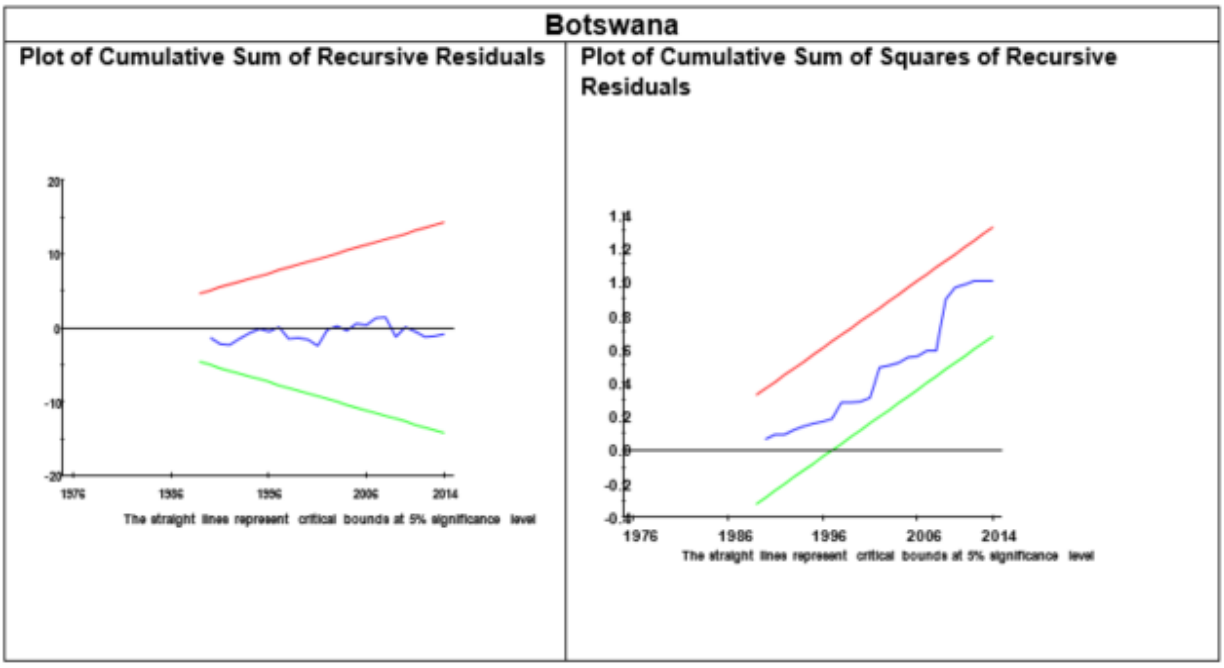
(b) CUSUM and CUSUMQ for equation 2



(c) CUSUM and CUSUMQ for equation 3



(d) CUSUM and CUSUMQ for equation 4



As displayed in Figure 2, the plots for the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squared residuals (CUSUMQ) do not cross the boundaries. This is an indication that there is stability in the parameters of all the four equations used in the empirical analysis for Botswana.

4. **Conclusion**

This paper examined the impact of trade openness on economic growth in Botswana during the period 1975–2014. Unlike some previous studies, the current study adopted one of the most recent time-series econometric techniques, namely the auto regressive distributed lag (ARDL) bounds testing approach to examine this linkage. The main aim of this paper was to investigate whether the extent to which trade openness affects economic growth in Botswana depends on the manner in which trade openness is measured. To this effect, four different proxies were used to measure the level of trade openness, whereby each proxy addresses a different aspect of trade openness. These proxies consist of three different trade-based indicators of trade openness, and an index of trade openness. To our knowledge, this may be the first study of its kind to examine the dynamic impact of trade openness in Botswana using modern econometric techniques. Our empirical results show that in three out of four equations examined in this study, trade openness does have a positive impact on economic growth in Botswana – both in the short run and in the long run. Specifically, the study found that when the ratio of total trade to GDP, the ratio of exports to GDP, and the trade openness index are used as proxies of trade openness, then trade openness has a significant positive impact on economic growth. However, when the ratio of imports to GDP is used as a proxy for openness, the study fails to find any significant impact of trade openness on economic growth. These results of this study,

therefore, suggest that increased trade openness generally contributes towards economic growth in Botswana.

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