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The short- and long-run relationship between trade openness and economic growth in Uganda

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Abstract: Using data covering the period from 1983 to 2019, we apply the auto-regressive distributed lag (ARDL) bound testing approach to investigate whether trade openness has spurred economic growth in Uganda. The extant literature shows that trade openness increases economic growth, but this empirical evidence remains contested. Our empirical results on the long-run relationship reveal the existence of a positive and statistically significant relationship between trade openness and economic growth. Except for the use of exports to measure trade openness, using openness index and imports to proxy for trade openness indicates that an increase in the above indexes leads to increased economic growth in the long-run. In the short-run, however, more openness, exports and imports lead to increased economic growth. This implies that a significant proportion of economic growth in Uganda has been due to short-run increase in the country's openness, more exports and imports. This paper confirms that using openness and imports indexes to proxy for trade yields more robust results compared to the use of export indices. At the policy level, these results show that encouraging more trade and imports that embody technology or intermediate inputs is essential in the production process could increase economic growth in the long-run. In the short-run, expanding the scope of exports and imports is important for economic growth.

Subjects: Development Studies; Africa - Regional Development; Development Policy; Economics and Development; InternationalTrade; incl; trade agreements & tariffs; Development Economics; Political Economy

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PUBLIC INTEREST STATEMENT

International trade brings in foreign exchange, improved technology and productivity growth, which eventually lead to economic growth. However, empirical evidence of the above is mixed and disputed. Moreover, the evidence is country-specific, that is, it varies from country to country. In this paper, we investigate the short- and long-run relationship between trade openness and economic growth in Uganda. We find evidence that the impact of trade openness in the long-run depends on the measure of trade openness used. The use of exports to measure the level of openness results into insignificant results. In the short-run, both measures give positive and statistically significant relationships between trade openness and economic growth. At the policy level, expanding the scope of exports and imports that embody technology is important for economic growth.

Keywords: Trade; growth; ARDL; exports; imports
JEL classification: C5; C22; F13; F14; F43; O4

1. Introduction

The recent global evidence shows that a number of countries are becoming more integrated into the world economy. The likely gains of international trade for economic growth have become the focus of theoretical and empirical investigations (Keho, 2017). Given the growing importance of international trade, various scholars have empirically investigated the potential benefits of opening up the economy for trade (trade openness). There is empirical evidence showing that trade openness increases economic growth through its ability to provide consumers with a wide variety of goods and services, which leads to improved wellbeing among the citizens (Krugman, 1980). Further, Rivera-Batiz and Romer (1991) show that liberalizing trade is beneficial to the home country because imported intermediate inputs may embody some technology components that can enhance technology of production in the home country, thereby increasing total factor productivity (Esaku, 2020c; Esaku & Krugell, 2020a). Therefore, one can argue that open economies should be expected to grow faster than those that restrict trade as shown by Esaku and Krugell (2020b). In this perspective, trade openness increases exports (export-led growth) and importation of the much needed production technology (import-led growth hypothesis) as shown by a number of studies (see, Awokuse, 2008; Balassa, 1985; Bhagwati, 1978). The expected gains from trade provide incentives for countries to open up their economies to trade and integrate into the world economy. Therefore, calls for more openness are emphasized due to failure of import substitution industrial policies adopted by most developing countries in the 1960s and 1970s to enhance economic growth. This resulted in the adoption of policies that dismantle restrictions to trade with the hope of reaping immense gains from external trade.

Accordingly, different studies have examined the relationship between trade openness and economic growth (see, Burange et al., 2019; Malefane & Odhiambo, 2019). The focus of these studies has been on whether trade can be considered as an engine of economic growth, as originally indicated by the trade-led growth hypothesis. Studies that have investigated the relationship between trade and economic growth do find evidence that more trade induces economic growth (Chang & Mendy, 2012). For instance, Khan (2014) examines the relationship between trade openness and economic growth in the Asian region and finds that trade significantly increases economic growth. Correspondingly, Brueckner and Lederman (2015) used the instrumental variables method to examine the relationship between economic growth and trade openness in Sub-Saharan Africa and find a positive relationship between these variables. Additionally, Shahbaz (2012) examines the long-run impact of trade openness on economic growth in Pakistan and finds empirical evidence between these variables. Furthermore, Keho (2017) investigates the relationship between trade openness and economic growth in Cote d'Ivoire using data that cover the period from 1965 to 2014 and finds that trade has positive effects on economic growth in the short- and long-run. Correspondingly, Malefane (2020) examines the relationship between trade and economic growth in Botswana and reaches similar conclusions. Relatedly, the impressive growth of the countries in East Asia has been partly attributed to the decision of these countries to open up for trade (Stiglitz, 1996), which supports the notion that trade exerts positive effects on long-run economic growth (see, Makun, 2017). In the above view, trade openness became a trade policy that was supported by most developing countries.

Although there is empirical evidence of a positive relationship between trade openness and economic growth, some studies have found a negative relationship (see Babatunde, 2011; Eris & Ulasan, 2013). For example, Samimi et al. (2012) argue that increased levels of trade

openness could be harmful to economic growth through its effects on inflation and fluctuation in the exchange rate, which creates macroeconomic uncertainty. Correspondingly, Malefane and Odhiambo (2019) investigated the effect of trade openness on economic growth in Lesotho. The above authors find that trade has no significant effect on economic growth in both the short- and long-run regardless of the proxy of trade openness that is used. This finding clearly disputes the results of a positive relationship between trade and economic growth. Furthermore, Hye and Lau (2015) investigate the relationship between trade openness and economic growth in India. The above authors find evidence of a positive impact of trade openness on economic growth in the short-run. However, this relationship was negative in the long-run. Similarly, Singh (2011) adopted the neoclassical growth framework to examine the impact of trade on economic growth in Australia and find evidence of a positive relationship when only exports as a share of GDP are used to proxy trade openness. Additionally, Adhikary (2011) uses data from Bangladesh covering the period from 1986 to 2008 to examine the relationship between trade openness and economic growth and finds a negative relationship.

Given the above discourse, it becomes clear that there is no consensus on the relationship between trade openness and economic growth. This relationship could either be positive, negative or inconclusive. For instance, some empirical evidence argues that, for countries in Sub-Saharan Africa, the benefits of trade openness may be realized only up to some threshold. Once this threshold is reached, the benefits from trade openness start to diminish, and continued exposure to foreign trade is harmful to economic growth (Zahonogo, 2017). This view seems to hold for many Sub-Saharan African countries given that many of these countries export primary products that are vulnerable to demand changes in the world markets (Haussmann et al., 2007). Indeed, the effect of trade on economic growth remains a raging discussion among scholars and policymakers alike. An important question that has spurred debate in the extant literature is, if indeed trade openness is beneficial, why are many developing countries (especially those in Africa) still experiencing stagnant growth despite their efforts to open up to international trade? Answering this question requires continued research on the relationship between trade openness and economic growth using recent annual time series data, various measures of trade and new robust econometric methods.

In this paper, we investigate whether trade openness has spurred economic growth in Uganda, a low-income country in sub-Saharan Africa. Uganda is chosen for various reasons. First, Uganda has had its fair share of economic challenges since the 1970s (Esaku, 2021f). The "economic war" that the government of Uganda declared in 1972 resulted in the expulsion and expropriation of the assets and businesses of Asians of British origin, and the eventual collapse of the business sector in the country (Esaku, 2021b). This led to the nationalization of businesses owned by foreign nationals, causing misallocation of productive resources and eventual collapse of the economy (Esaku, 2021i). However, between 1980 and 1985, attempts were made to revive the economy by carrying out reforms aimed at attracting investment and encouraging exports with the objective of boosting economic growth. This effort did not yield much results and economic growth continued to decline. Experience of past expropriations of foreign capital and nationalization of businesses owned by foreign nationals scared away the much-needed investments from the country (Esaku, 2021h). During this period, there was macroeconomic uncertainty as inflation reached more than 150% per annum in 1985. However, between 1986 and 2000, the new government undertook a number of reforms aimed at jump-starting the economy. These rafts of reforms included enacting the investment law (The Investment code 1991), dismantling trade barriers, and liberalization of the most productive and business sectors of the economy (Esaku, 2021c). Consequently, the economy was turned-around for the better and trade started to boom

again. Second, this is a low-income country that would benefit from international trade rather than closing off its borders. Given that the country conducted massive economic reforms over the past 20 years, it is important to examine whether it has benefitted from trade openness or simply said has trade openness positively impacted the economic growth in Uganda?

This paper contributes to the literature in three important ways. First, we examine an important relationship that has important policy implications. For example, as the country trades with other countries, should it promote export-led or import-led growth or both? Second, a number of previous papers that examined the relationship between trade openness and economic growth relied on a single measure to proxy trade openness. This is one weakness of previous studies, since trade openness is a multidimensional indicator that cannot be summed up to one measure like the widely used trade openness indicator (Huchet-Bourdon et al., 2018). Given that the effect of trade openness on economic growth could be either positive or negative, there is still considerable debate on the nature of this relationship. One can argue that the mixed results from the empirical analyses might be due to the variable(s) used to proxy trade openness. Because of its multidimensionality, recent papers have overcome this limitation by using a variety of indexes to proxy trade openness. Indexes used include the ratio of exports and imports to gross domestic product (GDP), ratio of exports to GDP, ratio of imports to GDP, and trade openness index derived from residuals of the OLS equation (see Malefane, 2020; Malefane & Odhiambo, 2019). Although the literature does not indicate which index is most preferred, recent papers use either one index or a combination of three and in some instances, all the four indexes are used (see, Hye & Lau, 2015; Malefane, 2020; Malefane & Odhiambo, 2018, 2019; Zahonogo, 2017). We bring this innovation into this study by using three indexes to measure trade openness. Accordingly, we use the following indexes: ratio of exports and imports to GDP, ratio of exports to GDP, and ratio of imports to GDP. Third, some papers analyze the relationship between trade openness and economic growth using panel and cross-sectional data regressions, which impose cross-sectional homogeneity on the coefficients (Esaku, 2021g). The above assumption of cross-sectional homogeneity might not hold because of the heterogeneous nature of countries, differences in institutional and business settings, and trade policy stance adopted by each country. This heterogeneous nature of world economies makes it practically impossible to generalize any findings from empirical analysis. With the above limitations of previous studies, it becomes important to revisit the effect of trade openness on economic growth using a country-level analysis and a new approach that addresses the shortcomings of previous research. Fourth, we use a relatively robust econometric technique, the Autoregressive Distributed Lag (ARDL) bounds testing technique proposed by Pesaran et al. (2001), to test the short- and long-run relationship between economic growth and trade openness. This approach is robust in unraveling level relationships between variables regardless of the order of integration, whether the variables are integrated of order zero or order one, that is, I(0) or I(1) (Tang, 2004).

Apart from section 1, section 2 reviews related literature and section 3 presents the methodology and the data. Section 4 is the presentation of the findings and discussion, and section 5 reports the conclusion.

2. Review of related literature

The impact of trade openness on economic growth has been greatly debated in both theoretical and empirical literature over the last decades. Despite the importance of this relationship, there is no agreement on whether increased trade openness generates high rates of economic growth. One can suggest that increased trade openness leads to improvements in economic growth through its effect on improvement in productivity (Esaku, 2020a) and firm performance (see Esaku, 2019; Esaku & Krugell, 2020b). Consequently, trade has also been shown to be a catalyst for firm-level investments since trade creates a competitive atmosphere that requires technology upgrades (Esaku, 2020b; Esaku & Krugell, 2020a). In line with

the theory of comparative advantage, a country producing goods and services in which it has the comparative advantage could still realize gains from trade since specialization results in better utilization of productive resources. Recent developments in new growth models show that a country's trade policy can also influence the adoption of technology on account that openness increases imports of goods, which might embody new technology (Esaku, 2020d; Grossman and Helpman, 1992) and learning mechanisms (Esaku, 2021d). Viewed from this angle, imported goods that embody new technology could enhance domestic technology, which improves the production processes in the domestic economy resulting into increased productivity and economic growth. Given the above theoretical propositions, one can argue that domestic economies that are more open to world trade should be expected to realize positive gains from trade, which positively affects economic growth compared to closed economies. However, recent evidence indicates that this suggestion might be spurious given that the relationship between trade openness and economic growth remains debatable.

From an empirical point of view, there is increasing evidence from a number of studies indicating that openness to trade can either positively or negatively influence the level of economic growth. Thus, the empirical evidence from the extant literature across econometrical methods and countries is quite mixed and controversial with no consensus on the nature of the relationship between trade openness and economic growth. Accordingly, different studies have examined the relationship between trade openness and economic growth (see, Malefane & Odhiambo, 2019). Their main focus has been to ascertain whether trade openness has had a positive impact on economic growth. Consequently, some studies that have investigated this relationship have found evidence of a positive relationship between trade openness and economic growth (Keho, 2017). Therefore, Khan (2014) examines the relationship between trade openness and economic growth in the Asian region and finds that trade significantly increases economic growth. Correspondingly, Shahbaz (2012) examines the long-run impact of trade openness on economic growth in Pakistan and finds empirical evidence between these variables. Furthermore, Brueckner and Lederman (2015) examined the relationship between economic growth and trade openness in Sub-Saharan Africa and found that trade openness has a positive effect on economic growth. Relatedly, Shayanewako (2018) examines the relationship between trade openness and economic growth in the BRICS countries. The above author confirms the existence of a long-run relationship between trade openness and economic growth. Additionally, Malefane (2020) examines the relationship between trade and economic growth in Botswana and reaches similar conclusions.

Conversely, some other studies in a variety of contexts found a negative effect of trade openness on economic growth (see Rigobon & Rodrik, 2005). For example, Zahonogo (2017) used a dynamic growth model to investigate how trade openness affects economic growth in 42 countries in Sub-Saharan Africa and finds a positive effect of trade openness on economic growth up to some threshold above which trade openness causes growth decline. This implies that trade openness does not increase economic growth forever, but up to only a given threshold. This implies that one has to understand what kind of threshold is required for the positive relationship between trade openness and economic growth to stand. Correspondingly, Kim and Lin (2009) using threshold regression approach studied the relationship between trade openness and economic growth in 61 countries. Their study shows that this relationship is based on an income-level threshold beyond which more trade openness increases economic growth. Below this income level threshold, more trade openness causes decline in economic growth. Some studies show that the relationship between trade openness and economic growth depends on the geographical context under investigation. For instance, Dufrenot et al. (2010) studied the relationship between trade openness and economic growth across 75 developing countries and found evidence that low-growth countries benefit more from trade openness than high-growth countries. This implies that this relationship also depends on the level of economic growth a given country has attained. Similarly, Were (2015) finds that trade openness has pronounced impact in developing and developed countries, however this impact

is insignificant for developing countries, especially those in Africa. From a global perspective, the relationship between trade openness and economic growth could either be positive, negative or weak (see Fenira, 2015).

In the African context, there is no general consensus in the literature on the causal relationship between trade openness and economic growth. Sakyi (2011) investigates the relationship between trade and economic growth in Ghana and finds that trade openness positively and significantly affects economic growth in the short- and long-run. Similarly, Asfaw (2014) investigates how openness affects economic growth in a panel of 47 countries in Sub-Saharan Africa. The above author finds that trade openness induces economic growth and investment in countries that are more open to world trade. Keho (2017) investigates how trade openness influences economic growth in Cote d'Ivoire and finds a positive effect of trade on economic growth in both the long- and short-run. Brueckner and Lederman (2015) investigated the relationship between trade and economic growth in a panel of 41 countries in Sub-Saharan Africa and found a significant short- and long-run effect of trade openness on economic growth. However, Musila and Yiheyis (2015) study of Kenya shows no evidence of a significant relationship between trade openness and economic growth. Similarly, Malefane and Odhiambo (2019) investigated how trade openness affects economic growth in Lesotho. Their findings show no evidence of a positive relationship between openness and economic growth.

As the above literature review indicates, there is not yet any agreed position on the relationship between trade openness and economic growth given that the above studies reveal mixed and inconclusive results that cannot be generalized across countries. One can argue that more country-level studies may be more reliable in investigating the relationship between trade openness and economic growth since this relationship might also depend on the income level and geographical context (see, Dufrenot et al., 2010; Kim & Lin, 2009). This paper intends to provide additional evidence on the relationship between trade openness and economic trade in a different context, Uganda, a low-income country.

3. Methodology

In this section, we present the data, the model and estimation technique that are employed to test for the long- and short-run relationship between the variables.

3.1. Data and descriptive statistics

In this study, we use annual time series data from Uganda that cover the period from 1983 to 2019. These data are drawn from the World Bank, World Development Indicators (World Bank, 2020). We report descriptive statistics and correlation matrix in Table 1. In Table 1, panel (a) reports summary statistics, while panel (b) presents the correlation matrix. We can observe that the mean of the annual growth rate of gross domestic product (GDP) per capita is about 2.422, which peaked at 8.14. Similarly, trade openness, measured by openness, exports and imports, has average levels of 35.086, 12.637 and 22.449, respectively. These variables peaked at 56.26, 24.28 and 31.978, respectively. Further, government spending (Gov/gdp), inflation, financial development (Fd) and investment (Inv/gdp) have a mean of 10.846, 29.704, 7.424 and 18.663, respectively. Finally, the average value for primary school enrolment (enrol) is 100.653. In panel (b), we can observe that there is a positive correlation between growth and all the three measures of trade openness (that is, openness, exports and imports). However, the observed correlation does not necessarily imply a causal relationship. To understand if there is any empirical relationship, one needs to estimate a particular empirical model to test for this relationship.

3.2. Model specification

In this section, we present the empirical model used for testing the relationship between trade openness and economic growth. In what follows, this paper adapts the empirical model of Jin

Table 1. Descriptive statistics and correlation matrix

	Growth	Open	Exports	imports	Gov/gdp	inf	Fd	Inv/gdp	Enrol
Panel (a): Summary statistic									
Mean	2.422	35.086	12.637	22.449	10.846	29.704	7.424	18.663	100.653
Median	2.510	35.385	12.692	22.098	10.976	7.311	6.622	20.146	104.001
Maximum	8.140	56.260	24.280	31.978	16.792	200.026	13.785	27.935	138.275
Minimum	−6.471	22.303	7.063	13.644	6.636	−0.290	2.646	7.410	63.976
Std. dev.	2.897	7.420	3.803	4.464	3.037	54.526	3.771	6.044	25.751
# Obs.	37	37	37	37	37	37	37	37	37
Panel (b): Correlation matrix									
Growth	1.000								
Open	0.331	1.000							
Exports	0.037	0.879	1.000						
Imports	0.519	0.914	0.609	1.000					
Gov/gdp	0.213	0.065	−0.061	0.160	1.000				
Inf	−0.425	−0.462	−0.289	−0.521	−0.204	1.000			
Fd	0.194	0.787	0.752	0.668	−0.124	−0.511	1.000		
Inv/gdp	0.285	0.784	0.638	0.760	−0.037	−0.637	0.912	1.000	1.000
Enroll	0.242	0.650	0.505	0.649	0.443	−0.478	0.590	0.684	

Source: Author's calculation

Note: growth is annual growth rate of GDP per capita, open is openness, Gov/gdp is government spending as a share of GDP, inf is inflation; Fd is financial development, Inv/gdp is investment as a share of GDP (proxied by gross fixed capital formation to GDP)

(2000). Thus, we posit that economic growth is a function of variables that can be expressed as:

$$growth = F(trade, gov/gdp, \text{inf}, fd, inv/gdp, enroll) \quad (1)$$

Where growth denotes economic growth measured by growth rate of GDP per capita (annual percent), trade represents the three measures of trade openness, that is, open, exports and imports, where, open denotes the sum of exports plus imports of goods and services as a ratio of gross domestic product (GDP), while exports and imports represent exports of goods plus services, and imports of goods and services, all as a percent of gross domestic product respectively. Furthermore, gov/gdp is the proportion of government consumption expenditure to GDP; inf is inflation, annual consumer prices to GDP; fd is financial development proxied by the ratio of domestic credit to private sector by banks to GDP, inv/gdp is the proportion of investment to GDP, proxied by gross fixed capital formation and finally, enroll denotes primary school enrolment (% gross). Our choice of these explanatory variables stems from a number of factors as reviewed in the previous section. Notably, trade openness has been shown to be an important factor that drives economic

growth and total factor productivity (see, Brueckner & Lederman, 2015; Esaku & Krugell, 2020b; Keho, 2017). Increased exposure of a country to trade could bring in the much needed foreign exchange and investment that positively influence the country's economic growth. Consequently, trade liberalization policies that increase a country's exposure to trade may reinforce the relationship between economic growth and trade openness (Esaku & Krugell, 2020b).

Furthermore, the inclusion of government consumption expenditure is in line with previous studies that show that this variable is important in mediating the relationship between trade openness and economic growth (Eris & Ulasan, 2013; Keho, 2017). Relative to high recurrent government expenditure, it has been shown that high government expenditure directed at capital investment enhances economic growth and as such should be included as a determinant of economic growth (Malefane & Odhiambo, 2019). This study expects government expenditure to be positively correlated with economic growth. Correspondingly, we also include financial development as proxied by the ratio of domestic credit to private sector by banks to GDP. Theoretical evidence shows that a developed financial structure positively influences economic growth (Bittencourt et al., 2015). In this study, we expect a positive correlation between financial development and economic growth.

Similarly, we include investment as one of the explanatory variables since some studies have shown it to be a significant determinant of economic growth (Malefane, 2020). Consequently, we expect investment to be positively correlated with economic growth. Additionally, we include inflation in the empirical analysis since high inflation reflects macroeconomic instability that can discourage investment leading to a fall in economic growth (see, Eris & Ulasan, 2013). Given this, one can argue that high inflation exerts negative pressure on economic growth because it distorts macroeconomic variables, especially prices.

3.3. Econometric methodology

To examine the relationship between trade openness and economic growth, we follow three steps in the estimation process. In the first step, stationarity of the variables using unit root tests is analyzed. In the second step, tests of the presence of both short-run and long-run relationships between the variables are carried out, and the third step conducts the diagnostics to ensure that the coefficients are stable and not driven by biases. In this study, we follow the autoregressive distributed lag (ARDL) bounds testing technique to cointegration pioneered by Pesaran et al. (2001). This econometric technique has advantages over other traditional cointegration techniques. Firstly, it is a more robust econometric technique for analyzing level relationships even when the sample size is small (Tang, 2004) and it can be employed regardless of whether the variables are integrated of order zero or one, that is, the variables can either be I(0)s and or I(1)s. Second, the power of the bounds test is not limited in finite samples when invalid restrictions are imposed unlike other cointegration techniques (Banerjee et al., 1998). Third, the use of ARDL method is advised because it can correct for any possible endogeneity among the independent variables as shown by Wolde-Rufael (2010).

Consequently, the ARDL specification of the empirical model in equation (1) can be formulated as follows:

$$\begin{aligned}\Delta growth &= \beta_0 + \sum_{i=1}^{n}\beta_{1i}\Delta growth_{t-i} + \sum_{i=0}^{n}\beta_{2i}\Delta trade_{t-i} + \sum_{i=0}^{n}\beta_{3i}\Delta gov/gdp_{t-i} + \sum_{i=0}^{n}\beta_{4i}\Delta \inf_{t-i} \\ &+ \sum_{i=0}^{n}\beta_{5i}\Delta fd_{t-i} + \sum_{i=0}^{n}\beta_{6i}\Delta inv/gdp_{t-i} + \sum_{i=0}^{n}\beta_{7i}\Delta enroll_{t-i} + \varphi_1 growth_{t-1} + \varphi_2 trade_{t-1} \\ &+ \varphi_3 gov/gdp_{t-1} + \varphi_4 \inf_{t-1} + \varphi_5 fd_{t-1} + \varphi_6 inv/gdp_{t-1} + \varphi_7 enroll_{t-1} + \mu_t\end{aligned} \tag{2}$$

Here, β_0 denotes the constant term, $\beta_1, \ldots, \beta_7$ *and* $\varphi_1, \ldots, \varphi_7$ represent the short-run and long-run coefficients respectively, and μ_t denotes the error term.

To implement the ARDL bounds testing approach, this paper follows two steps. In the first step, we test for cointegration among variables with the purpose of determining whether there exists a long-run relationship. The presence of the long-run relationship among variables can be tested using the F-statistic and t-statistic. From the calculated F-statistic, the null hypothesis of no cointegration, that is, $(H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0)$, is evaluated against the alternative hypothesis of cointegration, that is, $(H_a = \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq 0)$. The computed F-statistic results are compared to the critical values in Pesaran et al. (2001). If the computed values of F-statistic exceed the upper critical bound values, the H_0 (the null hypothesis) is rejected and vice versa. However, if the F-statistic values fall within the bounds, then it denotes inconclusive test results. In the second step, we employ ARDL bounds testing procedure to test for relationships. During this step, the optimal lag length for the ARDL model is chosen using appropriate lag selection criteria based on the Schwartz Information Criterion (SIC).

If the results of the cointegration test on equation (2) show cointegration among variables, then we can proceed to express the error correction model (ECM) as:

$$\Delta growth_t = \beta_0 + \sum_{i=1}^{n}\beta_{1i}\Delta growth_{t-i} + \sum_{i=0}^{n}\beta_{2i}\Delta trade_{t-i} + \sum_{i=0}^{n}\beta_{3i}\Delta gov/gdp_{t-i} + \sum_{i=0}^{n}\beta_{4i}\Delta \mathrm{inf}_{t-i} + \sum_{i=0}^{n}\beta_{5i}\Delta fd_{t-i} + \sum_{i=0}^{n}\beta_{6i}\Delta inv/gdp_{t-i} + \sum_{i=0}^{n}\beta_{7i}\Delta enroll_{t-i} + \phi ECT_{t-1} + \mu_t \quad (3)$$

Where ϕ represents the coefficient of the ECT (error correction term) which captures the long-run adjustment to the equilibrium after any deviations, while μ_t is the residual error term. The importance of the ECT coefficient lies in its sign and size, which represents the speed of adjustment and validity of the results. Consequently, the coefficient of the error correction term (ϕ) should be negative, less than or equal to 1 and statistically significant as emphasized by Enders (2004).

4. Results and discussion

In this section, we report the results of stationarity and cointegration tests and the long-run and short-run empirical analysis of the relationship between trade openness and economic growth. First, this paper tested for the existence of unit roots and reports the results in Table 2. The unit root test results facilitated the determination of the order of integration among the variables so as to implement the ARDL estimation procedure.

Table 2. Results of stationarity tests for all the variables

	Level: Trend & intercept			First difference: Trend & intercept			
	ADF	PP	KPSS	ADF	PP	KPSS	Decision
Growth	−4.953***	−4.984***	0.132	−10.011***	−22.408***	-	I(1)
Open	−1.678	−1.635	0.087	−7.760***	−7.615***	0.152	I(1)
Inf	−2.383	−2.761	0.129	−4.687**	−4.687**	0.074	I(1)
Gov/gdp	−2.060	−2.015	0.150	−5.956***	−5.956***	0.087	I(1)
Inv/gdp	−1.742	−1.679	0.128	−6.911***	−6.914***	0.068	I(1)
Fd	−2.315	−2.154	0.141	−6.342***	−14.398***	-	I(1)
Exports	−2.898	−2.861	0.130	−7.330***	−8.021***	-	I(1)
Imports	−2.748	−2.633	0.097	−6.716***	−11.429***	-	I(1)
Enroll	−1.014	−1.241	0.141	−4.896***	−4.892***	0.086	I(1)

Source: Author's calculations. **,***, indicate statistical significance at 5% and 1% levels, respectively.

4.1. Stationarity tests

We used three different tests to establish whether the variables are integrated of order zero or one, that is, I(0) or I(1); namely, Augmented Dickey–Fuller test (ADF), Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test and Phillip–Perron (PP) test. Accordingly, the stationarity test results in Table 2 indicate that the variables are either stationary in levels or after first differencing, and different tests yield different test results. Consequent upon the stationarity test results, this study conducted the ARDL bounds testing procedure and reports the results of the ARDL bounds test for cointegration in Table 3.

In Table 3 that reports the ARDL bounds test results, we first express the equations for ARDL bounds tests in panel (a), while panel (b) presents the results of the ARDL bounds test. From Table 3, we can observe that in all the equations, eq.(1)-eq.(3), the computed F-statistic is clearly higher than the bounds of the critical values at 1% level of statistical significance. This confirms the existence of cointegration among variables and the rejection of the null hypothesis of no cointegration. This conclusion provides a direction for the estimation of the long-run and short-run relationship among the variables. Thus, the optimal lag length for models (1)–(3), selected using the Schwartz information criterion (SIC), is ARDL (3,3,3,3,2,3,3) for eq.(1); ARDL (3,1,2,3,1,3,3) for eq. (2); and ARDL (3,3,3,3,2,3,3) for eq.(3).

4.2. Long-run relationship between trade openness and economic growth

Therefore, having determined the optimal lag length for the respective equations, this paper then proceeds with the empirical estimation of the long-run and short-run relationship between trade openness and economic growth. Table 4 reports the estimation results for all the three equations.

In Table 4, columns 2, 5 and 8, we report the long-run coefficients of equations (1), (2) and (3), respectively. We can note that the long-run estimates indicate a positive relationship when openness index and import index are used to measure the level of a country's exposure to international trade. This implies that an increase in a country's exposure to international trade leads to increased rate of economic growth in the long-run, all else equal. Consequently, this paper establishes that much of the economic growth that has taken place in Uganda can partly be attributed to the effect of opening up the economy to international trade and the effect of imports (which could also embody imported intermediate goods) which could have improved productivity.

However, when exports of goods and services to GDP are used as a measure of openness, there is a positive long-run relationship between trade openness and economic growth but the coefficient on exports is statistically insignificant. This implies that although exports of goods and services are important for economic growth, they do not cause long-run economic growth in Uganda. Conversely, long-run economic growth in Uganda seems to be the result of an increase in the openness to trade and increased imports. For example, columns 2 and 8 show that an increase in openness and imports increases economic growth by 0.097 units and 0.327 units, respectively, all statistically significant at 5% level.

This implies that the use of openness index and imports to measure trade openness significantly impacts the long-run relationship between trade openness and economic growth. One can argue that this is a possibility especially if imports embody some components of technology or capital goods that may be used to improve the production processes (Grossman and Helpman, 1992; Esaku & Krugell, 2020b). Extant literature shows that economic growth is driven by capital accumulation and technological progress (see Esaku & Krugell, 2020a; Romer, 1990) and exposure to international trade also provides the incentives to invest in technology to enhance the production process (see, Esaku, 2020d). If this is the case, then the significant impact of trade openness on economic growth might be a result of more trade openness and increases in capital accumulation from imports. This could be a plausible explanation for this positive and statistically significant relationship between trade openness and economic growth.

Table 3. Results of the ARDL Bounds test

Panel (a) Equations to be tested

Equation	Dependent variable	Function
(1)	Growth	F(growth|open, gov/gdp, inf, fd, inv/gdp, enroll)
(2)	Growth	F(growth| exports, gov/gdp, inf, fd, inv/gdp, enroll)
(3)	Growth	F(growth| imports, gov/gdp, inf, fd, inv/gdp, enroll)

Panel (b) Results of ARDL bounds test

Model	ARDL	F-Statistic	Diagnostics		
			X^2(Normality)	X^2 (Heteroscedasticity)	X^2 (Correlation)
Eq.(1)	(3,3,3,3,2,3,3)	7.157	0.502	0.695	0.162
Eq.(2)	(3,1,2,3,1,3,3)	5.361	0.924	0.592	0.507
Eq.(3)	(3,3,3,3,2,3,3)	8.422	0.502	0.603	0.171

Actual sample size (T = 34)

			Critical values	
	Lower Bound I(0)			Upper Bound I(1)
10%	2.12			3.23
5%	2.45			3.61
2.5%	2.75			3.99
1%	3.15			4.43

Source: Author's calculation.

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Table 4. Results of Long-run relationship between trade openness and economic growth

Explanatory variable	Outcome variable: Growth								
	Equation 1			Equation 2			Equation 3		
	Coef.	t-stat.	Prob.	Coeff.	t-stat.	Prob.	Coeff.	t-stat.	Prob
Open	0.097**	2.540	0.017						
Exports				0.167	0.828	0.415			
Imports							0.327**	2.707	0.012
Inflation	0.011	1.518	0.141	0.017	1.555	0.132	0.010	1.341	0.192
Gov/gdp	0.385***	3.783	0.000	0.180	1.019	0.317	0.367***	2.891	0.008
Inv/gdp	0.512**	2.752	0.011	0.580**	2.520	0.018	0.396**	2.548	0.017
Fd Enroll	0.736*** 0.032	3.047 1.611	0.005 0.119	0.881** -0.004	2.109 −0.169	0.045 0.867	0.683*** 0.034*	3.515 1.731	0.002 0.095
Constant	−5.712**	−2.125	0.043	−5.314	−1.493	0.147	−7.227***	−3.312	0.003
R-squared	0.424			0.226			0.499		
R-bar-sq.	0.269			0.018			0.364		
Durbin W.	1.926			1.760			2.000		
Residual diagnostics:			Eq.1		Eq.2		Eq.3		
X^2 (Correlation-BG LM Test)			0.343		0.707		0.573		
X^2 (Heteroskedasticity-BPG)			0.576		0.673		0.460		
X^2 (Normality)			0.980		0.659		0.801		

Source: Author's calculations. *,**,***, denote statistical significance at 10%, 5% and 1% level.

Furthermore, the long-run results also indicate that in all the three estimated equations, the coefficient of inflation is positive and statistically insignificant. This seems contrary to previous studies indicating that high inflation is detrimental to economic growth (Bittencourt et al., 2015). Correspondingly, long-run coefficients on financial development and investment are positive and statistically significant in all the three equations estimated. This bodes well with previous studies that show the importance of investment in capital and the development of the financial sector in positively affecting economic growth (Esaku & Krugell, 2020a; Malefane & Odhiambo, 2019). These findings confirm the expectations of this study. Thus, an increase in government spending, especially if this is on capital investments, coupled with a developed bank-based financial system that can extend both short-term and long-term loans without so many hurdles, might hold the key to economic growth in a country like Uganda in the long-run.

Finally, we conduct a robustness check of the coefficients by employing residual diagnostic tests. Specifically, we tested for serial correlation (BG LM Test), heteroskedasticity (BPG test) and normality test. The results of these tests are shown on the lower panel of Table 4. The results indicate that in all these tests, there is no evidence of biasedness in the estimation results. This gives further evidence that supports the findings of the long-run relationship between trade openness and economic growth.

4.3. Short-run relationship between trade openness and economic growth

Next, we turn to the short-run results of the relationship between trade openness and economic growth. Table 5 reports the results of the empirical analysis of this relationship. The columns are labeled as before. In the short-run, there is evidence that increase in trade openness does increase economic growth in Uganda in the short-run, all else equal.

Additionally, all the other explanatory variables except for inflation, have the expected sign, implying that an increase in government spending, financial development, investment in capital and primary school enrolment all lead to economic growth in the short-run. This implies that the above variables are significant determinants of economic growth in the short-run. In other short-run results, we can observe that the lagged coefficients of the error term in all the three specifications are negative and statistically significant. We note that, for each of the three equations estimated, the coefficient of ECM shows that economic growth adjusts to any departures from the long-run equilibrium at the speed of adjustment indicated by the estimates of the lagged error terms, which give the economic importance of the speed of adjustment. For eq. (1)-Eq.(3), the ECM results indicate that economic growth adjusts to any deviations from long-run equilibrium at a speed of 78.8% for eq. (1), 88.5% for eq. (2) and 82.0% for eq. (3) respectively. All statistically significant at 1% level.

In sum, the empirical results on the long-run relationship between trade openness and economic growth show evidence of a positive and statistically significant relationship between trade openness and economic growth when openness index and imports are used as measures of the economy's exposure to international trade. The use of exports to proxy for trade openness does not significantly influence this relationship in the long run contrary to the popularly held view that exports are important for long-run economic growth. The implication of the above findings is that exposure to international trade spurs economic growth (see Keho, 2017).

In the short-run, however, both measures of trade openness lead to increased economic growth, implying that a significant proportion of economic growth in Uganda has been due to short-run growth in exposure to trade, exports and imports in the country. These results imply that, in the long-run, increased economic growth in Uganda has been driven by more openness and increase in imports rather than exports. In the short-run, economic growth is the result of increase in openness, exports and imports (see Esaku, 2021a). Overall, we observe clearly that more exports

Table 5. Results of the Short-run relationship between trade openness and economic growth

Explanatory variable	Outcome variable: Growth								
	Equation 1			Equation 2			Equation 3		
	Coeff.	t-stat.	Prob.	Coeff.	t-stat.	Prob.	Coeff.	t-stat.	Prob.
Δopen	0.166***	4.465	0.000						
Δexports				0.279*	1.789	0.086			
Δimports							0.316***	3.126	0.005
Δinflation	0.013***	3.438	0.002	0.025***	2.800	0.009	0.013	1.692	0.104
ΔGov/gdp	0.268***	3.964	0.000	0.025	0.199	0.844	0.264**	2.601	0.015
ΔInv/gdp	0.350***	4.682	0.000	0.592***	3.487	0.002	0.288*	2.057	0.051
Δfd Enroll	0.773*** 0.102***	4.615 4.914	0.000 0.000	−0.081 0.081**	−1.292 2.559	0.209 0.017	0.835*** 0.094***	4.319 3.266	0.000 0.003
Ecm(−1)	−0.786***	−5.714	0.000	−0.885***	−6.451	0.000	−0.820***	−4.922	0.000
Constant	0.269	0.916	0.369	0.018	0.063	0.951	0.272	1.011	0.322
R-squared	0.715			0.665			0.730		
R-bar-sq.	0.620			0.554			0.641		
DW	1.919			1.714			1.794		
Residual diagnostics:			Eq.1		Eq.2			Eq.3	
X^2 (Correlation-BG LM Test)			0.724		0.208			0.331	
X^2 (Heteroskedasticity-BPG)			0.845		0.745			0.812	
X^2 (Normality)			0.272		0.640			0.462	

Source: Author's calculations. *,**,*** denote statistical significance at 10%, 5% and 1% level.

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do not influence economic growth in any significant manner in Uganda in the long-run, but only in the short-run.

4.4. Model diagnostics

To ensure that these results are not driven by any biases, we conduct one more main diagnostics (stability test) to ascertain the stability of the coefficients. We carried out stability diagnostics that include the plots for the cumulative sum of recursive residuals (CUSUM) and the plots for the cumulative sum of squared residuals (CUSUMQ). We report on these plots (CUSUM) in Figures 1–6, and then results for CUSUMQ are presented in Appendix A. We can observe that CUSUM plots reported in these figures provide additional evidence on the stability of the estimated model. The line of plots is within the boundaries at 5% level of significance, thus providing further evidence that the parameters from the estimated ARDL models are stable and results should be viewed as reassuring.

5. Conclusion and practical policy implications

In this study, we have examined the relationship between trade openness (proxied by three indicators: openness, exports and imports) and economic growth in Uganda over the period 1983 to 2019. This study examines this relationship using the ARDL bounds testing approach to cointegration that has recently gained importance in testing both the long-run and short-run relationships among variables. We use three equations, each employing different measures of trade openness, to analyze this relationship, since trade is a multidimensional concept. The empirical results on the long-run relationship reveal the existence of a positive and statistically significant relationship when openness index and imports are used as proxy for trade openness. In the long-run, using exports to proxy for trade openness does not influence the relationship between trade openness and economic growth in any significant manner. In the short-run, however, openness, exports and imports do lead to increased economic growth. This implies that a significant proportion of economic growth in Uganda has been due to short-run increase in exposure to trade, exports and imports in the country.

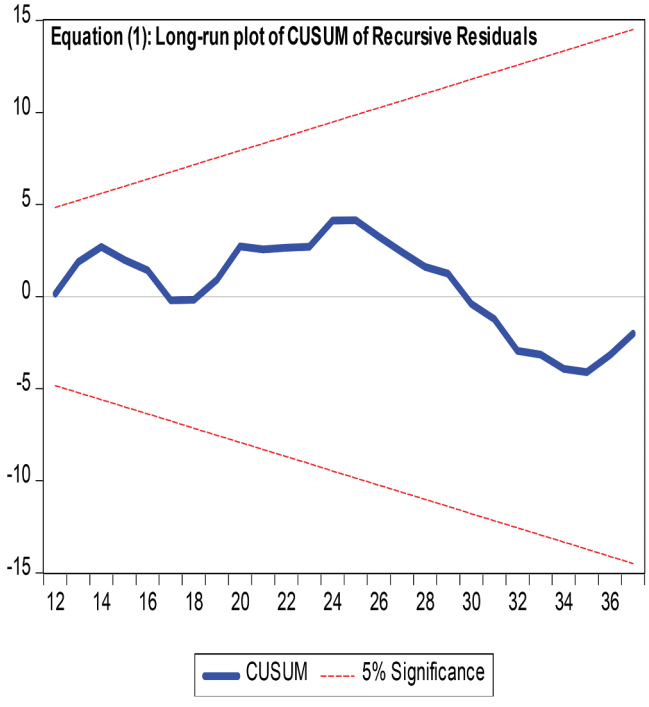

Figure 1. Long-run and Short-run plots of CUSUM Recursive Residuals for Equation (1).

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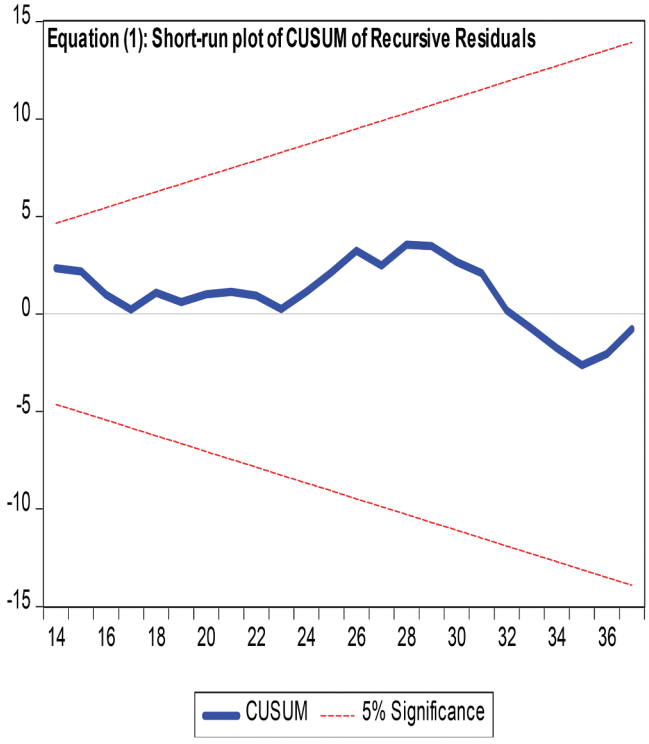

Figure 2. Long-run and Short-run plots of CUSUM Recursive Residuals for Equation (1).

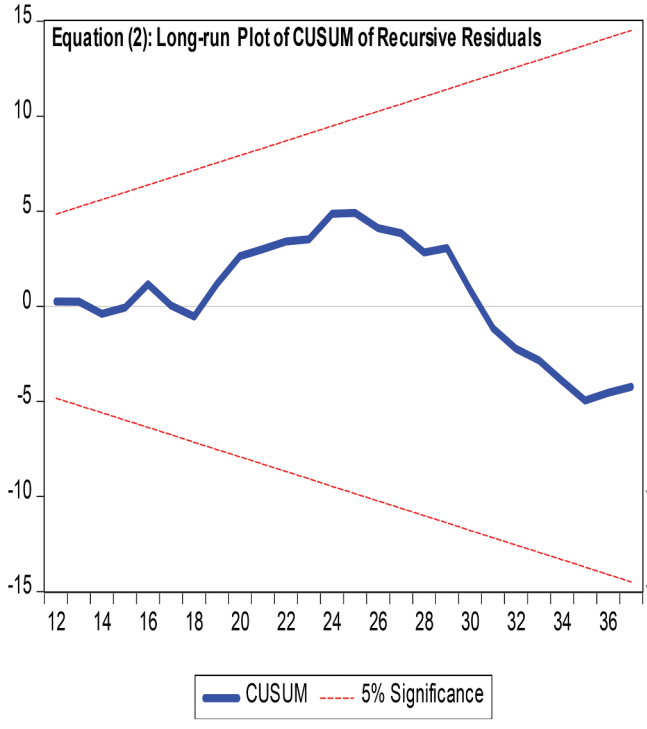

Figure 3. Long-run and Short-run plots of CUSUM Recursive Residuals for Equation (2).

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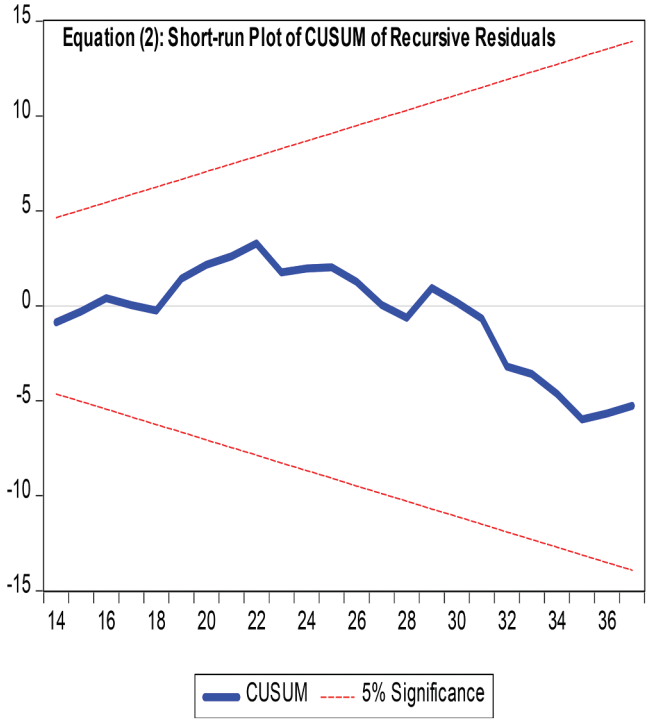

Figure 4. Long-run and Short-run plots of CUSUM Recursive Residuals for Equation (2).

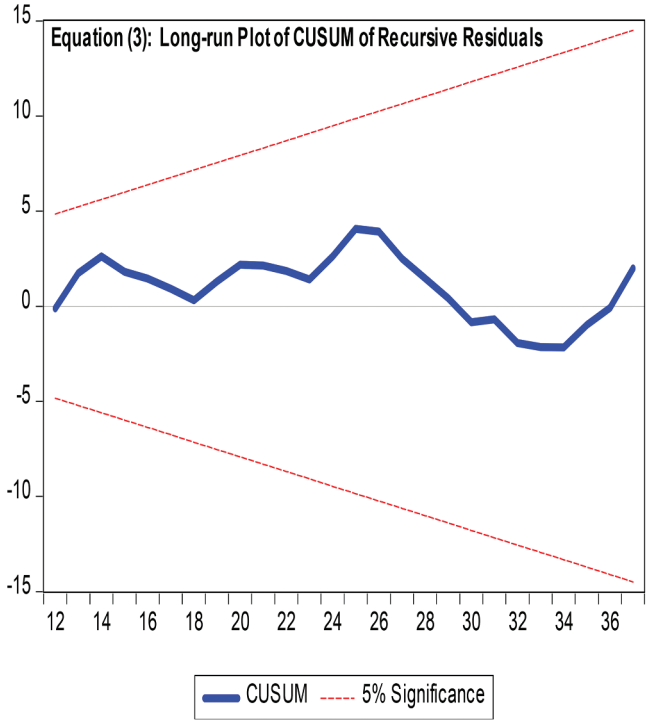

Figure 5. Long-run and Short-run plots of CUSUM Recursive Residuals for Equation (3).

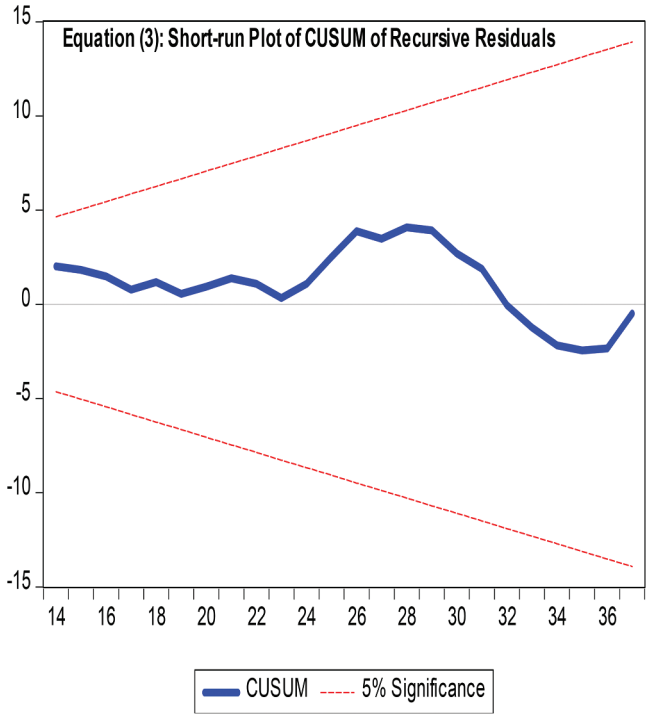

Figure 6. Long-run and Short-run plots of CUSUM Recursive Residuals for Equation (3).

In sum, these results indicate that trade openness has a long-run positive impact on economic growth. These results have important policy implications. First, the results indicate that a significant proportion of economic growth in this country has been due to the opening up of the economy to trade. This implies that policymakers should continue to develop policies that strengthen the integration of the country's economy into the world economy. Second, these results also indicate that imports have a positive effect on economic growth, which implies that policies that facilitate importation of intermediate inputs should be encouraged. Imports that embody some form of technology enhance productivity and innovation capabilities of a nation thereby increasing economic growth in the process. As shown by some studies, some of the factors that impede long-run economic growth in Africa include low levels of technology; poor infrastructure and high dependence on exports of primary products. Policies that break these bottlenecks could be helpful. Third, the above results also indicate that increased exposure to international trade alone without complementary policies cannot increase economic growth. Complementary policies that increase the allocation of resources towards infrastructure improvement projects such as roads, telecommunication networks, electricity and water should be prioritized so as to realize economic growth in the long-run. Fourth, in the short-run, expanding the scope of exports and imports is important for economic growth since exports of primary products are unsustainable because of price fluctuations in the international markets. Achieving sustained economic growth requires policies that encourage broadening the scope of exports, improving investment in requisite infrastructure and widening the range of incentives that attract technology into the country.

One limitation of this study is that we have used three proxies of trade openness. We suggest that future research could benefit from adopting the use of other proxies that capture the direct impact of trade policy changes. Additionally, this study relies on data aggregated at the level of the wide economy instead of sectoral level. Future studies could unearth the importance of trade openness on economic growth by using data aggregated at the sectoral or industry level.

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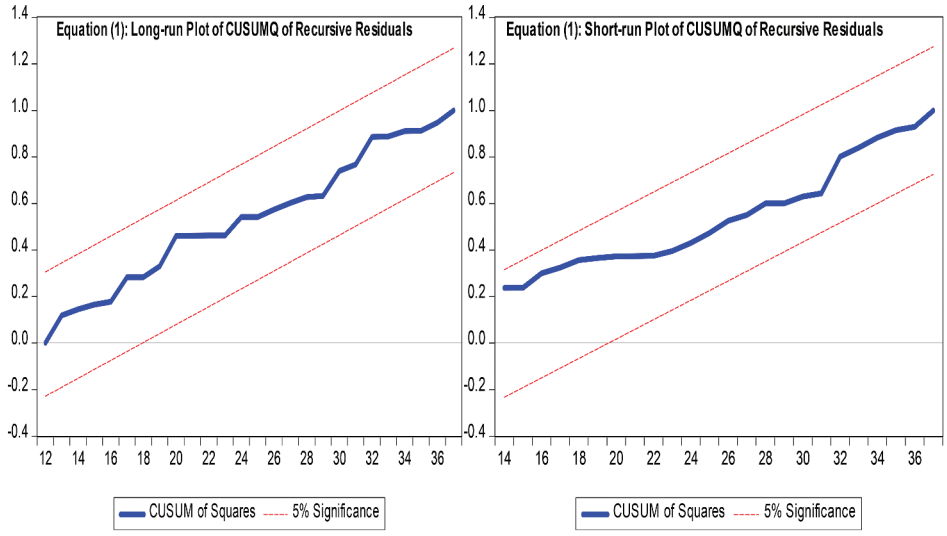
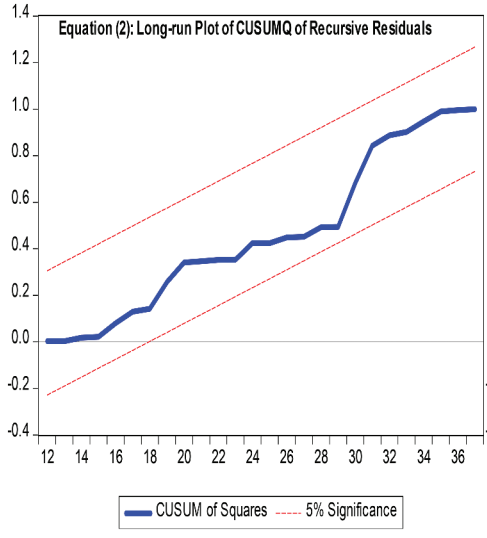
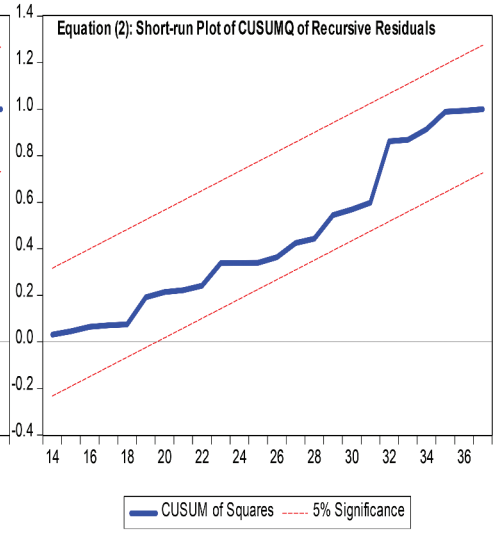
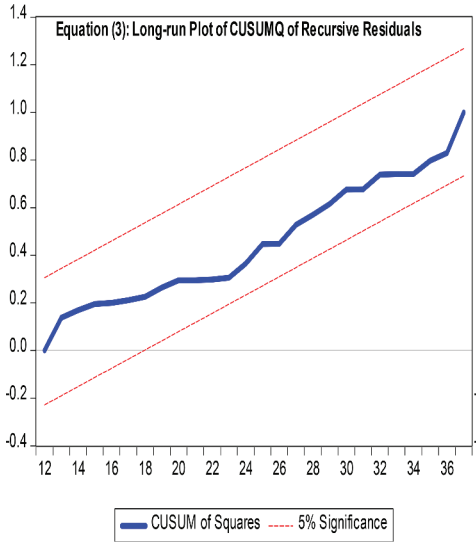
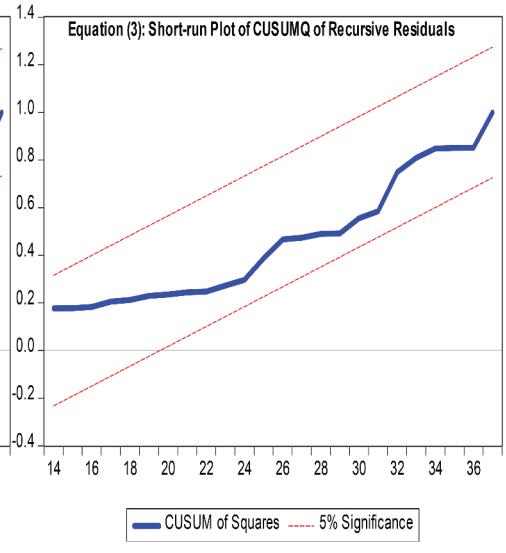
Appendix A. Long-run and Short-run CUSUMQ Recursive Residuals for Equations (1)-(3)











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