Global Journal of Management and Business Research: B
Economics and Commerce
Volume 22 Issue 1 Version 1.0 Year 2022
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4588 & Print ISSN: 0975-5853

Effect of Depreciation on Trade Balances in Selected African Countries

By Lilian Onose Okpeku & Osman Nuri Aras
Nile University of Nigeria

Abstract- Balance of trade is a key indicator of the health of any open economy. Therefore, every developing economy strives to achieve this. Currency devaluation (depreciation) is seen as an opportunity for the achievement of trade surplus. This paper aims to examine the impact of depreciation and devaluation on trade balance in Algeria, Tunisia, Gabon, South Africa, Zambia, Nigeria, Morocco, Ghana, Malawi, and Burundi. Dynamic Panel Ordinary Least square (DOLS) method and Toda-Yamamoto for impulse response analysis are employed to predict the effect of depreciation on trade balances as well as the response of trade balances to shocks from depreciation. The results show that depreciation negatively affects the trade balance in the long run and shows that there is no evidence of the J-curve in the selected countries. Moreover, the result for the impulse response function shows that trade balances respond negatively to shocks in exchange rate.

GJMBR-B Classification: DDC Code: 382.1, LCC Code: HF1408

EFFECTOFDEPRECIATIONONTRADEBALANCESINSELECTEDAFRICANCOUNTRIES

Strictly as per the compliance and regulations of:

Effect of Depreciation on Trade Balances in Selected African Countries

Lilian Onose Okpeku [α] & Osman Nuri Aras [σ]

Abstract- Balance of trade is a key indicator of the health of any open economy. Therefore, every developing economy strives to achieve this. Currency devaluation (depreciation) is seen as an opportunity for the achievement of trade surplus. This paper aims to examine the impact of depreciation and devaluation on trade balance in Algeria, Tunisia, Gabon, South Africa, Zambia, Nigeria, Morocco, Ghana, Malawi, and Burundi. Dynamic Panel Ordinary Least square (DOLS) method and Toda-Yamamoto for impulse response analysis are employed to predict the effect of depreciation on trade balances as well as the response of trade balances to shocks from depreciation. The results show that depreciation negatively affects the trade balance in the long run and shows that there is no evidence of the J-curve in the selected countries. Moreover, the result for the impulse response function shows that trade balances respond negatively to shocks in exchange rate.

I. Introduction

The adaptation of a faultless system of exchange rate has been a difficulty that is faced by both developed and developing economies in the world with African countries not being an exception. A fixed exchange rate system is best for developing African countries due to the low level of financial development, high inflation and the fact that majority are small, pen economies (Simwaka 2010; Carbaugh 2014)). The floating exchange rate system has been implemented in several countries such as Mozambique, Malawi, and Sierra Leone while countries such as Cote D'Ivoire, Gabon, and Niger have a pegged system. The selection of an exchange rate regime puts various trade, macroeconomic and developmental factors into consideration. This is because the shocks on these factors affect exchange rates positively or negatively.

The Bretton Woods system of 1973 as well as several economic crises faced by the world has made developing economies face uncertain times which have required them to strengthen monetary and fiscal policies to control the financial activities of different sectors and avoid trade deficits. However, these implementations seemed not to be strong enough as many African countries face currency depreciation and massive effect on global economic shocks.

Various economic concepts state that depreciation can be a way of correcting these trade imbalances when proper macroeconomic and trade policies are put in place. This is because depreciation lowers the prices of exports compared to other currencies. Hence, it increases the competitive advantage of a country by increasing the output of the nation (Kamugisha and Assoua, 2020).

However, the positive impact of depreciation is questionable where depreciation is majorly or solely caused by external factors such as budget deficits, inflation, political instability, recessions, and global market conditions. Being that African countries are not the forerunner of the global market; the global market conditions have a major role to play in the impact of depreciation. Many African countries including some of those studies in this paper are import-dependent and likely to face shocks in time of the global market condition. This implies that most of these countries including Algeria, Tunisia, Nigeria, Morocco, and Ghana have a negative balance of trade.

Consequently, this paper aims to study the depreciation-trade balance nexus in 10 African countries including Algeria, Tunisia, Gabon, South Africa, Zambia, Nigeria, Morocco, Ghana, Malawi, and Burundi to analyse the success of various countries balance of trade under conditions of economic shocks from 1996-2021. This study adds to the existing literature by offering a rigorous study on a mixture of countries with high, medium, and low levels of development in Africa. Section 2 discusses the views and arguments on this relationship while section 3 explains the chosen empirical models, data used, and their sources. Section 4 and 5 confer the results and conclusion.

II. Literature Review

Theoretically, the relationship between depreciation and international trade balances has been seen to be positive under some conditions. The Marshall-Lerner elasticity approach posits that exchange rate depreciation can correct trade imbalance only if the nation's export is elasticity coefficient exceeds 1.0. In extension, the Marshall-Lerner condition theorised the J-curve effect that although the depreciation leads to trade imbalance ab initio due to how long it takes for information on price effects to disseminate, this trade imbalance will improve as time passes. Similarly, Alexander (1952) stated that depreciation will only be positive if the spending behaviour of the domestic economy is less than the output.

Various empirical studies have examined the validity of these theories on the effect of depreciation on

Author α σ: Nile University of Nigeria. e-mail: lilianokpeku@gmail.com

trade balances. Anoke et al (2019) examined this relationship in Nigeria using VECM and their results stated that the positive effect of depreciation in Nigeria was not seen in the short run because Nigeria was not an export-based region before the depreciation. Contrary to this finding. Using ARDL and ECM, Berhe (2020) found evidence of the absorption approach and elasticity approach in Ethiopia. The results showed that devaluation positively impacts while the monetary measures put in place deteriorated the trade balance.

Several studies have focused on the J-curve phenomenon of depreciation in trade balances. Dongfack and Ouyang (2019) examined the elasticity and J-curve phenomenon and elasticity approach in Cameroon using the Johansen Cointegration and VECM. The results showed that there is evidence of correction trade imbalance in the long run while the depreciation caused more trade imbalance in the short run suggesting the presence of the J-curve phenomenon. Bhat and Bhat (2017) on the other hand, used the nonlinear cointegration approach and found no evidence of it in India. However, the elasticity effect does not hold in Cameroon. In contrast, Thuy and Thuy (2019) using the ARDL bound testing approach found the presence of the J-curve phenomenon in Vietnam. In Albania, Kurtovic (2017) used the VECM and cointegration test and the results showed evidence of the elasticity approach in Albania well as a weak J-curve effect.

Furthermore, researchers have also tested depreciation as a balance of trade adjustment approaches, the monetary and absorption approach in different economies. Bosnjak et al (2018) tested both the monetary and absorption approach on Croatia's current account. Using the Non-linear ARDL, they found that these approaches have been effective in aiding the positive impact of depreciation in Croatia. A study on Ethiopia showed that both approaches are both significant in the trade balance and devaluation explanation (Fassil 2017). Mushendami et al (2017) studied the monetary approach in Namibia using the VECM showed that, and their results showed that the monetary approach is important in Namibia since there is a unidirectional causality between the monetary variables and the trade balance. Another study in Nigeria also acknowledged the monetary approach of depreciation and trade balance in Nigeria using the Two-stage Least Square (TSLS) method (Atoi 2020). Downes and Khemraj (2019) tested the monetary approach in Barbados while considering the external determinants depreciation. The conclusion was that the monetary approach was strongly supported from the analysis.

Additionally, Rajkovic et al. (2020) emphasised relationship between depreciation effect of the economic crises on western Balkan countries. The results showed that the effect reduced during the crisis which limited the ability to use depreciation as an appropriate instrument in reducing trade imbalances. Also, countries with fixed exchange rates showed quicker adjustments after the crisis with their trade balances improve. Similarly, Dzanan and Masih (2017) studied this impact in Norway by using a forecasting technique to test for a long-run correlation. The study that exports did not respond as expected since Norway's major export is petroleum and petroleum goods are known to have low elasticity. Hence, there was no long-run effect detected. Turnaer Vural (2016) also studied this impact in Turkey using cointegration and ECM between Turkey and Germany. Interestingly, the paper found no evidence of a relationship in Turkey. Michael and Emeka (2017) also carried out an empirical analysis on the devaluation impact of trade balance using the VECM approach in Nigeria. The results show that the Marshall-Lerner condition does not apply in Nigeria. Using the ARDL approach in Uganda, Kamugisha and Assoua (2020) found the effect of exchange rate depreciation on trade balances to be positive only in the short run. A panel cointegration and Fully modified least square estimation research by BekeruGenemo (2017) shows that the exchange rate affects trade balance in an inelastic but significant way in major east African countries. Following the Marshall Lerner condition, the inelasticity of devaluation shows that the trade deficit will increase.

Many studies also analyse the impact of exchange rate fluctuation on trade balances. It is also important to understand this relationship since fluctuation determines the shocks of the exchange rate on trade balances. Ikechi and Nwadiubu (2020) tested the exchange rate volatility on international trade in Nigeria. Using the GARCH model and Impulse Response Function, the results showed that there exists a negative relationship between the export and Real Effective Exchange Rate in Nigeria. This is because of the high volatility portrayed in the resulted trade imbalance. Doing the asymmetry analysis, Bahmani-Oskooee and Nouira (2019) tested the impact of exchange rate volatility on Tunisia particularly to 16 of its trading partners. The findings show that in the three largest trading partners, volatility does not affect the trade flows. However, a sign of volatility is found in the long-run symmetry but not in the short run. Bahmani-Oskooee and Gelan (2018) tested the volatility in 12 African countries and found that exchange rate volatility affects trade in the countries only in the short run while the effect was limited to only five countries exports and one country's import. The work was extended by Bahmani-Okooee and Arize (2019) to 13 different African countries using the GARCH model found that in the long run, exchange rate uncertainties significantly affected trade flows in most of the countries, showing an asymmetric effect. A single-country analysis also performed by Iyke and Ho (2017) concluded that the exchange rate volatility has a non-linear effect on the trade balance in Ghana.

Also, Loermann (2019) also measured the CHF/EUR exchange rate volatility on Swiss trade with the Eurozone using the threshold VAR method. It finds that the high uncertainty was associated with the times of recession and the low uncertainty was associated with a period of expansion. Li and Wang (2019) also found a significant impact of exchange rate fluctuation on the improvement of trade balances in the bilateral trade between China and South Korea. In addition, Njoroge (2020) analysed COMESA's exchange rate volatility on exports with the results showing that both the internal and external COMESA trade is affected by the exchange rate volatility.

III. Empirical Model

This study employs the model specification of Kurtovic (2017) on the relationship between depreciation of exchange rate and trade openness in the single country case scenario. However, the model is modified for a panel study in selected African economies. Based on the postulation of the earlier studies of Goldstein and Kahn (1976) and Rose and Yellen (1989) on trade elasticity, the theoretical underpinning of this study is the imperfect substitute model. This model is hinged on some assumptions. One, domestic goods and international goods are perfect substitutes. Two, there is a difference between domestic and foreign countries. Three, each country engages in the production of a good with a fixed price. This model consists of the demand function for domestic and international country's importation and exportation. For the domestic country, the demand function is a function of price and income level given mathematically below:

$$M_d = M_d\left(P_{md},Y\right) \quad (1)$$

Where M= the import demand function for the home economy, P= relative price of the domestic country's goods and services, and Y= real income of the domestic economy.

$$M_d^I = M_d^I(P_{md}^I, Y^I) \quad (2)$$

Where M^I is the import demand function for the international economy, P^I is the relative price of the international country's goods and services, and Y is the international economy's real income. The export supply function can equally be expressed for both domestic and international countries.

$$E_s = E_s(P_{ed}) \quad (3)$$

Where E_s is the domestic country's export supply function while P_{ed} is the relative price of goods and services exported domestically. The export supply function for the international country is stated as:

$$E_s^I = E_s^I(P_{eI}^I) \quad (4)$$

Similarly, E_s^I is the international country's export supply function, while P_{ed}^I is also the international country's relative price for imported goods. Following from (1) to (4) the domestically produced goods relative price is the coefficient of the domestically and internationally produced goods home and abroad. This is further represented as:

$$P_{md} = \frac{\emptyset P_e^I}{P} = \left(\frac{\emptyset P^I}{P}\right)\left(\frac{P_e^I}{P^I}\right) = \left(\frac{QP_e^I}{P^I}\right) = QP_{eI}^I \quad (5)$$

Where ∅ represents the nominal exchange rate and Q stands for the real exchange rate. The international country's import price is expressed as: $P_{mI}^I = P_{eI}/Q$. Thus the equilibrium condition is the point where the quantity of goods traded and their prices equate.

$$M_d = E_s^I \text{ and } M_d^I = E_s \quad (6)$$

Equation (5) equates the exports and imports of both the home and international country where the price levels, exchange rate and real income are independent determinants. Thus, the trade balance of the domestic country is a function of these determinants. That is,

$$TB = TB(Q, Y, Y^I) \quad (7)$$

Where T.B.= balance of trade of home country and trading partners. Q= the real exchange rate; Y= income of home country and Y^I is the income of the international country. Expressing (7) econometrically in log-linear model, we have;

$$LTB_{it} = \delta_1 + \delta_2 EXR_{it} + \delta_3 LGDP_{it} + \delta_4 LFDI_{it} + \varepsilon_{it} \quad (8)$$

Where $LFDI_{it}$ represents the foreign direct investment, a control variable included in the model. The a priori expectation is given as are $\delta_1 <> 0, \delta_2 > 0, \delta_3 < 0, \delta_4 < 0$

In addition, the Toda-Yamamoto model is used to achieve the other objective of the study to examine the response of trade balances to depreciation using the impulse response function and variance decomposition. Due to the conditional nature of the standard VAR on the stationarity assumption not being met, the co-integration and Toda Yamamoto Model (TY) become more appropriate in examining the relationship among the series. The T.Y. model uses a VAR (p+d) model where d is the maximum integration degree of the variables. Specifically, model (8) is re-expressed into the T.Y. models for the two main variables as stated below:

$$LTB_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} LTB_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{2j} LTB_{t-j} + \sum_{i=1}^{k} \beta_{3i} EXR_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{4j} EXR_{t-j} + \sum_{i=1}^{k} \beta_{5i} LGDP_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{6j} LGDP_{t-j} + \sum_{i=1}^{k} \beta_{7i} LFDI_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{8j} LFDI_{t-j} + \varepsilon_{1t} \quad (9)$$

$$EXR_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} EXR_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{2j} EXR_{t-j} + \sum_{i=1}^{k} \beta_{3i} LTB_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{4j} LTB_{t-j} + \sum_{i=1}^{k} \beta_{5i} LGDP_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{6j} LGDP_{t-j} + \sum_{i=1}^{k} \beta_{7i} LFDI_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{8j} LFDI_{t-j} + \varepsilon_{1t} \quad (10)$$

K is the optimal lag length determined by the usual information criteria including Schwarz information criterion (SIC) and Akaike information criterion (AIC). d_{max} is the maximum order of integration. ε_{it} is the error term. β_i are the parameters of the models. We reject the null hypothesis and accept the alternative that their explanatory variables granger cause the respective dependent variable in each model.

IV. Data and Sources

The study employed panel data of 10 African countries covering the period 1996-2020. The countries and selected studies are used due to the availability of data. Annual data on trade balance, gross domestic products, foreign direct investment, and exchange rate were sourced from the World Development Indicator (WDI). All the series are measured in the current US$ excluding the exchange rate. the exchange rate on the other hand, is measure in local currency unit against the dollar. The countries include Algeria, Tunisia, Gabon, South Africa, Zambia, Nigeria, Morocco, Ghana, Malawi, and Burundi. The gross domestic product is a measure of economic growth, an essential determinant of balance of trade in domestic countries. The trade balance is the difference between export and import of goods and services and is negative if the importation is greater than exportation and positive if the exportation is greater than the importation. Depreciation is measured as the exchange rate increase, while appreciation is represented by a decrease in the exchange rate. Foreign direct investment is a control variable. Hence, it is an important factor affecting trade balance measured in the current U.S$.

V. Estimation Techniques

The study employed the co-integrating regression to investigate the depreciation effect of the exchange rate on the balance of trade in emerging economies of Africa. More specifically, the Dynamic Panel Ordinary Least square (DOLS) method like the estimation by Bekeru Genemo (2017) and Toda-Yamamoto. These techniques are known for their flexible requirements, which include the mixed order of integration among the series, that is, some series stationary at levels I(0) and others I (1) as opposed to other similar techniques like Vector Error Correction Model and Fully modified Ordinary Least Square model which requires that all the series be stationary at either levels or first difference (Ayad and Belmokaddem, 2017; Yorucu and Kirikkaleli 2017). The procedure for empirical analysis of any multivariate model involves some preliminary diagnostic tests: the normality of the series needs to be established. Then, the stationarity properties of the variables also need to be examined as well as their long-run co-integrating relationship. These are examined through the descriptive statistics of mean, standard deviation, JarqueBera statistics and correlation statistics. At the same time, individual unit root tests of Im, Pesaran and Shin (IPS), ADF-Fisher and PP-Fisher are used to examine the stationarity properties of the series. We further employed Pedroni and Kao co-integration test before applying the DOLS to estimate the co-integrating regressions.

VI. Preliminary Analysis

Tables 1 and 2 present the description of the data to examine their properties and suitability for the study. The investigation of the normality of the data series shows that none of the series are normally distributed at a 5% level of significance. This implies that further examination of the properties of the data through the stationarity test is required. However, gross domestic income (log), trade balance (log), foreign direct investment (log) and exchange rate show a mean value of 24.15, 7.46, 12.93 and 0.013, respectively, and they fall within reasonable range given their standard deviation, minimum and maximum values. Meanwhile, the correlation coefficient indicates that the series is moderately related, removing the problem of collinearity. Furthermore, foreign direct investment (log), increase in the exchange rate and gross domestic product (log) are positively related to trade balance (log).

Table 1: Descriptive Statistics

Variable	Observation	Mean value	Standard deviation	Minimum	Maximum	Jarque-Bera
LGDP	250	24.14616	1.673377	20.48075	27.02712	10.67590***
LTB	250	7.457183	10.43578	0.000000	24.20378	43.36806***
LFDI	250	12.93640	8.359475	0.000000	22.76346	37.93962***
DEP	249	0.013085	0.194426	-0.746542	2.129815	48210.04***

*Source: Author's compilation (EViews 10) *** p-value<1%, ** p-value<5%, * p-value<10%*

Table 2: Correlation matrix

	LGDP	LTB	LFDI	DEP
LGDP	1			
LTB	0.3074	1		
LFDI	0.6919	0.2543	1	
DEP	-0.0117	0.1087	0.0003	1

Source: Author computation (EViews 10)

Another critical test needed for this study is the cross-dependency test. Table 3shows result of the test for cross-dependency. This result indicates that the countries are cross-independent. Two of the three tests of cross-sectional dependency failed to reject the null hypothesis of no cross-sectional dependency at a 10% level of significance.

Table 3: Result of Cross-sectional dependency Tests

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	61.30711	45	0.0532
Pesaran scaled LM	0.664828		0.5062
Pesaran CD	1.017255		0.3090

Source: Authors Compilation (EViews 10).

VII. Unit Root Test

The result of the stationary test is presented in table 4. This test is essential as it helps determine the series' suitability, mean reversion, and constant variance. We employed the IPS, ADF Fisher and PP-Fisher tests. The results show that gross domestic product is stationary at first difference given the three tests. That is, it is integrated at order 1(I).

Similarly, trade balance (log) is stationary at a level based on PP-Fisher. There is no sufficient evidence to show that the series is stationary at levels based on IPS and ADF-Fisher. However, IPS, ADF-Fisher and PP-Fisher show that foreign direct investment (log) and increase in the exchange rate are stationary at levels at 10% level of significance. These results imply that the series exhibit means reversion and constant variance. Therefore, the series is suitable for analysis.

Table 4: Results of Panel unit root tests

Test	IPS		ADF-FISHER		PP-FISHER	
Variable	Constant	Constant + Trend	Constant only	Constant + Trend	Constant only	Constant and Trend
LGDP	1.12635 (0.8700)	2.85748 (0.9979)	10.0544 (0.9382)	7.12624 (0.9963)	9.63375 (0.9743)	4.02649 (1.0000)
LTB	-1.32153 (0.0932) *	-0.96055 (0.1684)	15.5922 (0.1119)	14.1941 (0.1643)	24.3551 (0.0067) ***	21.8529 (0.0159) **
LFDI	-2.08641 (0.0185) **	-0.06836 (0.4727)	35.1054 (0.0196) **	31.1105 (0.0537) *	53.1684 (0.0001) ***	41.0512 (0.0037) ***
DEP	-2.92313 (0.0017) ***	-1.51304 (0.0651) *	47.8280 (0.0004) ***	39.0395 (0.0066) ***	63.3914 (0.0000) ***	51.8664 (0.0001) ***
ΔLGDP	-4.21046 (0.0000) ***	-2.86221 (0.0021) ***	52.3199 (0.0001) ***	37.7188 (0.0096) ***	86.5515 (0.0000) ***	64.3406 (0.0000) ***
ΔLTB	-9.66327 (0.0000) ***	-10.1043 (0.0000) ***	89.5260 (0.0000) ***	139.667 (0.0000) ***	271.340 (0.0000) ***	331.857 (0.0000) ***
ΔLFDI	-9.67841 (0.0000) ***	-8.07164 (0.0000) ***	131.370 (0.0000) ***	109.425 (0.0000) ***	259.830 (0.0000) ***	638.864 (0.0000) ***
ΔDEP	-8.11064 (0.0000) ***	-6.76852 (0.0000) ***	110.876 (0.0000) ***	98.2331 (0.0000) ***	352.166 (0.0000) ***	688.002 (0.0000) ***
Notes: LGDP, LTB, LFDI implies logarithm of GDP, trade balance, and FDI, while DEP is depreciation. Δ is first difference operator. *** p-value<1%, ** p-value<5%, * p-value<10%						

Source: Author compilation (EViews 10)

VIII. Test for Cointegration

Using the Pedroni and Kao Residual Co-integration test, which shows within and between statistics. In the model with determinist intercept and trend out of the seven indicators, five statistics show co-integration at a 10% level. At the same time, the other two statistics failed to reject the null hypothesis of no co-integration. Moreover, four out of seven statistics show that co-integration exists among the series without a deterministic trend.

In comparison, the three other statistics accept the alternate hypothesis that there is no cointegration. Kao test, on the other hand, shows that there is no co-integration. Combining these tests, there is sufficient evidence to show that co-integration exists in the study. Table 5 shows the cointegration test result.

Table 5: Results of Panel Co-integration Test

Alternative hypothesis: common A.R. coefficients (within-dimension)				
	Statistics	Probability	Weighted statistics	Probability
Panel v-Statistic	-0.562390	0.9714	-1.240286	0.8926
Panel rho-Statistic	-0.060640	0.0735	0.948203	0.1715
Panel ADF-Statistic	-3.255741	0.0000	-1.534218	0.0625
Panel PP-Statistic	-3.831821	0.0000	-3.200839	0.0007
Alternative hypothesis: individual A.R. coefficients (between-dimension)				
	Statistics	Probability	Weighted statistics	Probability
Group rho-Statistic	-1.240286	0.6048	0.432975	0.7028
Group PP-Statistic	0.948203	0.0000	-1.910481	0.0280
Group ADF-Statistic	-3.200839	0.0000	-0.936837	0.1744

**** p-value<1%, ** p-value<5%, * p-value<10%*

IX. Estimation Results

a) *Co-integrating Regression*

Table 6 present the DOLS estimation of the model specified. Using a maximum lead and lag of 2, the post estimation test shows no serial correlation since the p-value of the Q stats of the correlograms fails to reject the null hypothesis of no serial correlation. Moreover, the R-Square of 0.924638 denotes that 92% of the variation in the trade balance is explained by the variables put together in the model. More specifically, an increase in the exchange rate (DEP) negatively and significantly affects the trade balance before any improvement can be experienced as expected. This implies that as the exchange rate increases, the trade balance decreases. This result is against a priori expectation based on theory. It suggests that in the countries in consideration, reducing the value of the countries' currency improves the importation and worsen exportation in the long run. More specifically, a 1% increase in depreciation worsens the trade balance by 199% on average, holding other variables constant. This result is contrary to the findings of Kurtovic (2017) in terms of findings but aligns in conclusion. This suggests the absence of J-curve in the countries since the expected positive effect of depreciation on the trade balance in the long run does not exist. Moreover, economic growth measured by the log of GDP impacts trade balance positively and significantly in the countries. A 1% increase in economic growth increase the trade balance by 11% on average, holding other variables constant while foreign direct investment like depreciation also worsens the trade balance.

Table 6: Co-integrating Regression Result

Model: LTB = f (DEP, LFDI, LGDP)				
Panel Dynamic Ordinary Least Square (DOLS)				
Variable	Coefficient	Std. Error	T-Stat	P-value
DEP	-199.3288	65.39761	-3.047953	0.0073***
LFDI	-0.676586	0.233879	-2.892893	0.0101***
LGDP	11.25491	4.010631	2.806268	0.0121**
R-Squared	0.924638			
Total Panel Observation	100			
Q-Stat (-2)	0.234			
Normality	5.475263 (0.064723)			

*Notes: LGDP, LTB, LFDI implies logarithm of gross domestic product, trade balance, and foreign direct investment, while DEP is depreciation. Lead and Lag (max=2), *** p-value<0.01, ** p-value<0.05, * p-value<0.1*

Source: Author computation from the output of EViews 10

To further answer the other research question of the study requires selecting the appropriate lag length and serial correlation test. To select the appropriate lag for the Toda-Yamamoto model, we estimated the VAR Lag Order Selection test. The result is presented in table 8 (see appendix). This lag length is employed in the estimation of the stipulated model. The result shows that most of the test statistics indicate lag lengths of 1 and 2. This study employs the lag length of 2, favouring the Akaike criterion. After the estimation, the study examined the post estimation diagnostic of the model to check if there is evidence of correlation of the residuals in the model. The result indicates that the VAR model is has no autocorrelation (See table 7). From the null hypothesis, we see that there is no serial correlation which shows that no serial correlation exists at the selected lag length at a 10% significance level. This suggests that estimates of the model are reliable and can be used for further analysis. Tables 9 and 10, therefore, presents the estimation of the model through the variance decomposition estimates. The Forecast error variance decomposition (FEVD) is used in measuring the contribution of each type of shock and it tells us the extent to which a change in a variable is caused by itself or other variables. Table 9 presents the variance decomposition for an exchange rate increase. The result allows us to infer the proportion of movements due to own market shock in comparison to shocks from other variables. Reported within the 10 years horizon, results show that 97.85% of the innovation in the foreign exchange market is due to its past values in the short run while 2.15% is due to shocks in the trade balance. In the long run, 79.72% of innovation is due to its shock, while 12.42% is due to the shocks in the gross domestic product, 7.52%is due to shocks in the trade balance, and 0.34% is due to shock in foreign direct investment.

Table 10 presents the variance decomposition for the trade balance. Reported within the 10 years horizon, results show that in the short run, 99.48% of the innovation in the trade balance is due to its past values, and 0.001266% is due to shocks in the exchange rate. Overtime, however, 80.59% of innovation is due to its shock, 10.163% is due to shocks in the gross domestic product, while 8.43% is due to the shocks in exchange rate and 0.82% foreign direct investment.

Table 9: Variance Decomposition of Trade Balance:

Period	S.E.	LTB	DEP	LFDIN	LGDP
1	5.881899	100.0000	0.000000	0.000000	0.000000
2	7.161189	99.47635	0.001266	0.407187	0.115201
3	7.672567	98.78547	0.113235	0.691041	0.410256
4	7.888607	97.84303	0.414224	0.816797	0.925945
5	7.997649	96.47828	0.970465	0.846716	1.704540
6	8.086430	94.56104	1.825317	0.834703	2.778945
7	8.197896	92.01436	3.003624	0.813569	4.168447
8	8.355324	88.81350	4.510183	0.800360	5.875953
9	8.573547	84.98228	6.329431	0.802387	7.885898
10	8.864315	80.59055	8.425248	0.821376	10.16282

Source: EViews, 2021

Table 10: Variance Decomposition of depreciation:

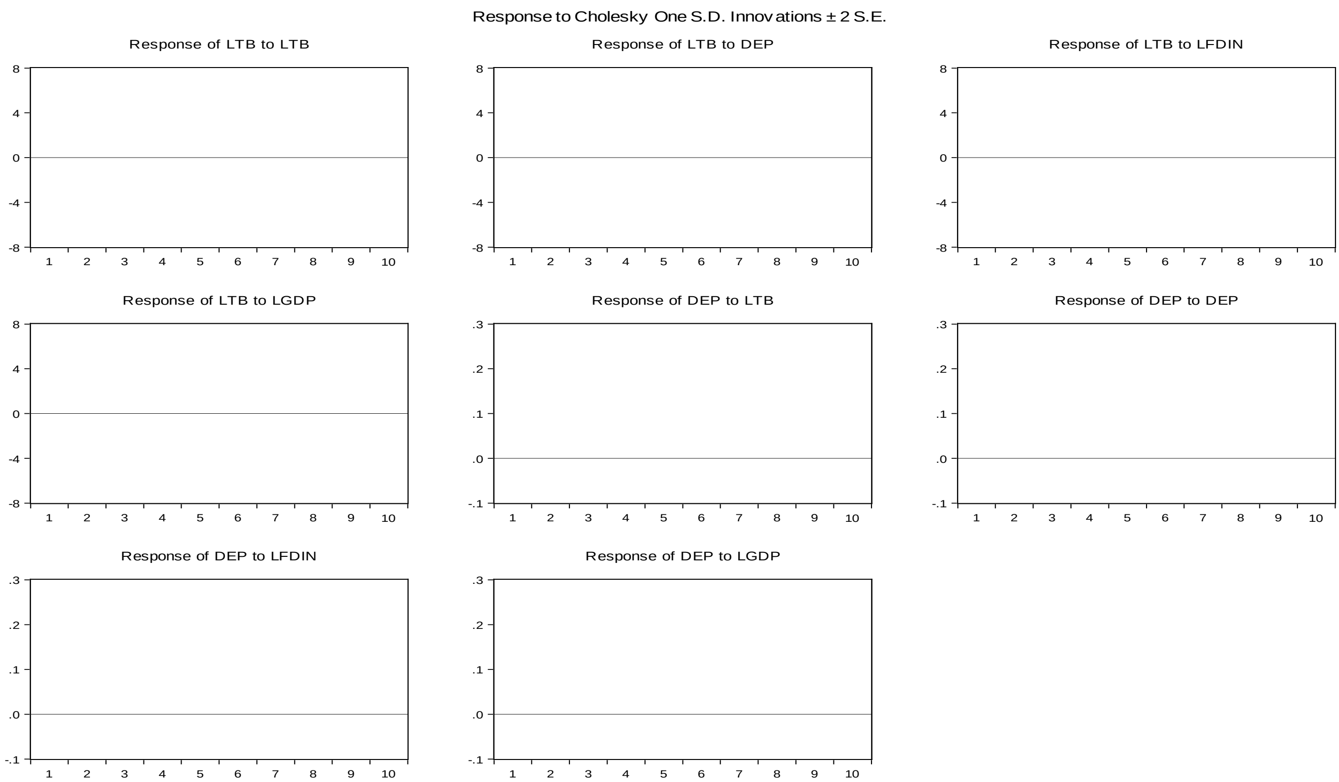
Period	S.E.	LTB	DEP	LFDIN	LGDP
1	0.197759	2.145842	97.85416	0.000000	0.000000
2	0.203526	3.776992	95.68592	0.059720	0.477365
3	0.204881	4.131768	94.72370	0.058949	1.085585
4	0.206586	4.089491	93.91573	0.058984	1.935789
5	0.208864	4.049874	92.85089	0.064899	3.034339
6	0.212101	4.201297	91.31773	0.083884	4.397084
7	0.216544	4.622027	89.22720	0.120311	6.030463
8	0.222429	5.329677	86.56554	0.175536	7.929248
9	0.230003	6.307707	83.37087	0.248655	10.07277
10	0.239541	7.518091	79.72208	0.337222	12.42261

Source: EViews, 2021

b) Impulse Response Function

Impulse response functions (IRFs) show how variables adjust to shocks. It is represented graphically and shows the effects of shocks on present and future changes of different variables The IRFs is presented in figure 1 to explain how the trade balance reacts to shocks from depreciation, foreign direct investment, and gross domestic product. This reveals a negative response of the trade balance to an increase in the exchange rate in the long run. This does not conform with the J-curve theory. . However, the trade balance responds positively to foreign direct investment but converges to equilibrium overtime.

Interestingly, there is also a negative response of trade balance to the economic growth. This is understandable because when income increases, the capacity to import is boosted, leading to a decreasing trade balance. On the other hand, trade balance initially shows a positive response to the international market, converges to equilibrium after a while then respond negatively afterwards. Similarly, the exchange rate depreciation negatively responds to development within the foreign exchange market and international market. It responds negatively to own shocks and trade balance on the larger part but positively initially.



X. Conclusion and Policy Recommendation

This study aimed toexaminethe impact of the depreciation of the exchange rate on the trade balance in 10 African Economies between 1996-2020. Employing co-integrating regression and Toda-Yamamoto models, the study provides valuable insight into the validity of J-curve in these countries. More specifically, employing the Dynamic Panel Ordinary Least Square method, findings show there is no evidence of the J-curve phenomenon in the countries by implication. The results further show that in the long run, the presence of depreciation negatively affects the trade. This is supported by the impulse response function and is further buttressed by the result of the co-integrating regression. These findings imply that government should formulate policies that would help harness the positive impact of exchange rate depreciation over the long run. This policy could be geared toward boosting the productive capacity and income level of the economy.

References Références Referencias

1. Atoi, Ngozi V (2020): *Macroeconometric Assessment of Monetary Approach to Balance of Payments in a Small Open Economy: The Nigeria Experience.* Published in: International Journal of Economics and Financial Research, Vol. 6, No. 3, 41-50.
2. Alexander, S.S., 1952, Effects of a Devaluation on a Trade Balance, International Monetary Fund Staff Papers 2, 263–278; reprinted in: R.E. Caves and H.G. Johnson (eds.), 1968, 359–373.
3. Anoke, I., Odo, S., & Ogbonna, B. (2016). Effect of Exchange Rate Depreciation on Trade Balance in Nigeria. Journal of Humanities and Social Science, 21(3), 72-81.
4. Asghar, F., Asif, M., Haseeb Aslam, M., Qamar Bahadur, R., & Mahmood, K. (2020). Does exchange rate effects the trade balances really? Evidence from Pakistan. *Journal of Administrative and Business Studies*, 6(2). https://doi.org/10.20474/jabs-6.2.2.

5. Ayad, H., and Belmokaddem, M. (2017). Financial development, trade openness and economic growth in MENA countries: TYDL panel causality approach. Theoretical and Applied Economics, 24(1), 233-246.
6. Bahmani-Oskooee, M., &Arize, A. (2019). On the Asymmetric Effects of Exchange Rate Volatility on Trade Flows: Evidence from Africa. *Emerging Markets Finance and Trade*, *56*(4), 913-939. https://doi.org/10.1080/1540496x.2018.1543582
7. Bahmani-Oskooee, M., & Gelan, A. (2018). Exchange-rate volatility and international trade performance: Evidence from 12 African countries. *Economic Analysis and Policy*, *58*, 14-21. https://doi.org/10.1016/j.eap.2017.12.005
8. Bahmani-Oskooee, M., &Nouira, R. (2019). On the impact of exchange rate volatility on Tunisia's trade with 16 partners: an asymmetry analysis. *Economic Change and Restructuring*, *53*(3), 357-378. https://doi.org/10.1007/s10644-019-09250-y
9. BekeruGenemo, K. (2017). Effect of Exchange Rate on Trade Balance in Major East African Countries: Evidence from Panel Cointegration. *European Business & Management*, *3*(6), 95. https://doi.org/10.11648/j.ebm.20170306.11
10. Berhe, W.T. (2020). The Effect of Domestic Currency Devaluation on Trade Balance in Ethiopia. Research Journal of Finance and Accounting, 11, 27-38.
11. Berman, S. M., Horovitz, M. W., Blumstein, C. J., Adams, V. A., Anderson, K. B., Caesar, P., and Weisenmiller, R. B. (1976). Electrical energy consumption in California: data collection and analysis.
12. Bhat, S., & Bhat, J. (2020). Impact of Exchange Rate Changes on the Trade Balance of India: An Asymmetric Nonlinear Cointegration Approach. *Foreign Trade Review*, *56*(1), 71-88. https://doi.org/10.1177/0015732520961328
13. Bosnjak, M., Novak, I., &Kristo, A. (2018). Monetary and absorption approach to explain the Croatian current account. *Zbornik Radova Ekonomskog Fakulteta U Rijeci:Časopis Za Ekonomsku Teoriju I Praksu/Proceedings of Rijeka Faculty of Economics: Journal of Economics and Business*, *36*(2). https://doi.org/10.18045/zbefri.2018.2.929
14. Carbaugh., R. (2014). *International economics* (15th ed., pp. 453-457). Cengage.
15. Downes, D., & Khemraj, T. (2019). Foreign Exchange Pressure in Barbados: Monetary Approach or Monetary Dependence?. *Review of Political Economy*, *31*(2), 159-177. https://doi.org/10.1080/09538259.2019.1621504
16. Dzanan, H., & Masih, M. 2017. "Does currency depreciation necessarily result in positive trade balance ? new evidence from Norway," MPRA Paper 82103, University Library of Munich, Germany.
17. Fassil, E. (2017). Birr devaluation and its effect on trade balance of Ethiopia: An empirical analysis. *Journal of Economics and International Finance*, *9*(11), 103-119. https://doi.org/10.5897/jeif2017.0864
18. Ikechi, K., &Nwadiubu, A. (2020). Exchange Rate Volatility and International Trade-in. *THE INTERNATIONAL JOURNAL OF MANAGEMENT SCIENCE AND BUSINESS ADMINISTRATION*, *6*(5), 56-72. https://doi.org/10.18775/ijmsba.1849-5664-5419.2014.65.1007
19. Iyke, B., & Ho, S. (2017). The Real Exchange Rate, the Ghanaian Trade Balance, and the J-curve. *Journal of African Business*, *18*(3), 380-392. https://doi.org/10.1080/15228916.2017.1315706
20. Kamugisha, G., &Assoua, J. (2020). Effects of a Devaluation on Trade Balance in Uganda: An ARDL Cointegration Approach. International Journal of Economics and Finance, 12(7), 42. https://doi.org/10.5539/ijef.v12n7p42
21. Kurtovic, S. (2017). The effect of depreciation of the exchange rate on the trade balance of Albania. Review of Economic Perspectives, 17(2), 141-158.
22. Li, Y., & Wang, X. (2019). Analysis of the Impact of Exchange Rate Changes on China-South Korea Bilateral Trade Balance. *IOP Conference Series: Earth and Environmental Science*, *304*. https://doi.org/10.1088/1755-1315/304/3/032099
23. Loermann, J. (2019). The impact of CHF/EUR exchange rate uncertainty on Swiss exports to the Eurozone: evidence from a threshold VAR. *Empirical Economics*, *60*(3), 1363-1385. https://doi.org/10.1007/s00181-019-01780-8
24. Magee, Stephen P., (1973), Currency Contracts, Pass-Through, and Devaluation, Brookings Papers on Economic Activity, 4, issue 1, p. 303-325, https://EconPapers.repec.org/RePEc:bin:bpeajo:v:4:y:1973:i:1973-1:p:303-325.
25. Michael, E., & Emeka, A. (2017). An Empirical Analysis of the Impact of Exchange Rate Devaluation on Trade Balance of Nigeria: Vector Error Correction Model Approach. *Asian Journal of Economics, Business and Accounting*, *3*(3), 1-15. https://doi.org/10.9734/ajeba/2017/33355
26. Mushendami, P., Manuel, V., Shifotoka, H., &Nakusera, F. (2017). Empirical Analysis of the Monetary Approach to the Balance of Payment in Namibia. *International Review Of Research In Emerging Markets And The Global Economy*, *3*(1).
27. Njoroge, L. (2020). The Effects of Exchange Rate Volatility on Exports in COMESA: A Panel Gravity Model Approach. *Journal of Applied Finance & Banking*. https://doi.org/10.47260/jafb/10610
28. Rajković, M., Bjelić, P., Jaćimović, D., &Verbič, M. (2020). The impact of the exchange rate on the foreign trade imbalance during the economic crisis

in the new EU member states and the Western Balkan countries. Economic Research-Ekonomskalstraživanja, 33(1), 182-203. https://doi.org/10.1080/1331677x.2019.1708771
29. Rose, A. K., and Yellen, J. L. (1989). Is there a J-curve? Journal of Monetary economics, 24(1), 53-68.
30. Simwaka, Kisu, 2010. "Choice of exchange rate regimes for African countries: Fixed or Flexible Exchange rate regimes?," MPRA Paper 23129, University Library of Munich, Germany.
31. Sokeng Dongfack, Laetitia P. & Ouyang, Hongbing, 2019. "The Impact of Real Exchange Rate Depreciation on Cameroon's Trade Balance: Is Devaluation a Remedy for Persistent Trade Deficits?," Journal of Economic Integration, Center for Economic Integration, Sejong University, vol. 34(1), pages 189-213.
32. Thuy, V., & Thuy, D. (2019). The Impact of Exchange Rate Volatility on Exports in Vietnam: A Bounds Testing Approach. *Journal of Risk and Financial Management*, *12*(1), 6. https://doi.org/10.3390/jrfm12010006
33. Tunaer Vural, B. (2016). Effect of Real Exchange Rate on Trade Balance: Commodity Level Evidence from Turkish Bilateral Trade Data1. Procedia Economics And Finance, 38, 499-507. https://doi.org/10.1016/s2212-5671(16)30221-0
34. Yorucu, V., and Kirikkaleli, D. (2017). Empirical Modelling of education expenditures for Balkans: Evidence from panel FMOLS and DOLS estimations. Review of Research and Social Intervention.