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The impact of currency devaluation on non-oil exports in Africa

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Aim: This study assesses how devaluation in official exchange rate and change in relative prices influenced non-oil export in African countries for the period of 30 years (1991-2020) in 11 African countries (Nigeria, Burkina Faso, Burundi, Eswatini, Mauritius, Mozambique, Niger, Rwanda, Sierra Leone, Tanzania and Uganda).

Design/Research methods: This study utilized different estimators namely Mean Group, Pooled Mean Group as well as dynamic panel GMM methods. The major advantage of the MG estimator is that it is reliably efficient even in presence of weak cross-sectional dependence of the errors by estimating separate regressions to calculate coefficient means. Moreover, it applicability knows no bounds even when estimator for each individual country is weakly cross correlated. With a PMG estimator, a large scale individual panel heterogeneity in short-run responses is accommodated given homogenous long-run relations across countries.

Findings: The results of the panel co-integration suggest a long-run equilibrating relation amongst the variables in the study. This was validated on the basis of absolute t-value of 5.0781under the t-bound. Our results for both MG and PMG estimators show significant negative devaluation and relative prices effects on non-oil exports in 11 African countries. The dynamic panel GMM results are robust and in agreement with the estimates of MG and PMG. From the results of cross-sectional analysis by country, results for countries revealed exchange rate devaluation had negative and significant impact on non-oil exports. Consequently, depreciation of the exchange rate has a short-run adverse effect on non-oil export due to high inelastic import dependence. Similarly, with exemption of Rwanda, and South Africa, the relative price effect was negatively significant for every other country in the study.

Originality: The originality is based on fact that the paper establishes both static and dynamic responses of non-oil export to devaluation in official exchange rate, relative prices, and foreign capital from trading partners in 11 African countries.

Limitations: It would be desirable to study 30 countries in Africa. We could not proceed with all countries due to inaccessibility of relevant data. Hence, caution should be taken in generalizing our findings.

Key words: exchange rate devaluation, relative prices, foreign capital, panel ARDL, African countries
JEL: C33, F13, F21

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1. Introduction

The economically strongest countries in the world are also strong in aggregate export of goods and services. China, the United States of America and Germany export value was USD2.5 trillion, USD2.4 trillion, and USD1.3 trillion respectively in 2019 (WTO 2020). This corroborates findings of Marin (1992) that nations exporting huge share of their output grow faster than others (Bhagwati 1988). It has been argued that foreign trade is an engine of economic growth due to, e.g., taking advantage of specialization, comparative advantage, etc. (Ricardo 1817; Jones 2008).

Generally, export generates employment and supports the emergence of firms and industries supplying the export sector. Grossman and Helpman (1991) show that high volume of foreign trade leads to an increase in the amount of specialized inputs, which in turn intensifies output growth. The non-oil exporting sector in Africa is not developed very well, and underutilizes its capacity (Aku 2006). This problem is strengthened by the establishment of the variable exchange rate system, as the exchange rate volatility raised the risk of doing business with other country. The exchange rate volatility has a negative impact on international trade (McKenzie, Brooks 2017). Exchange rate regimes that allow for currency devaluation, increased taxation and hamper capital flow, are expected to have a negative on the volume of non-oil exports. While currency depreciation could lead to development of domestic output and exports, the threat are worsened by poor economic policy. As is shown in Table 1, the importance of non-oil exports is low in countries like Nigeria, Lybia, Angola and Algeria. The table provides an overview of the share of oil in total exports as well as the country's share in total exports from the African continent.

Non-oil export products can be categorized into (a) Agricultural commodities (b) Solid minerals, and (c) Manufactured products (Central Bank Africa 2001). The increasing exports of oil have led to a decrease in the share of these categories of products in total exports in a country like Nigeria. The first category of export products (groundnuts, rubber, and cotton) was Nigeria's main source of export earnings in the late 1960s and 1970s. In recent years, the exports of cashew nuts and cassava products to Europe and Asia amounted to more than $4 billion. Due to increased export demand, the country saw a cassava crop revolution related to the

government's effort to increase the agricultural exports to improve economic development (Shah et al. 2015).

Table 1. Share of oil exports in total export, 2020

Country	Total Exports ($)	% Share of all African exports
South Africa	16.7%	19.1%
Guinea	85%	13.4%
Nigeria	96%	9.6%
Algeria	96.1%	7.6%
Angola	95.6%	7.5%
Egypt	19.5%	5.6%
Morocco	16.5%	5.5%
Libya	96.8%	3.8%
Tunisia	28.4%	3.1%
Ghana	40.3%	2.5%

Source: World Trade Organization (2020).

Devaluation of the exchange rate means a decline in the value of the local currency relative to other currencies, authorized by the government. The devaluation of African currencies as an easing measure to improve exports and reduce imports seems not to have succeeded, as planned exports of non-petroleum commodities are still lagging to satisfy domestic economic consumers and the overwhelming abundance of imported products locks in competition. Furthermore, the economic crisis in Africa has undermined the relative effectiveness of currency devaluation. Reduced exchange rate and low capital flow have continued to serve as obstructions to the development of non-oil product exports. Strong foreign competition on national markets limit the development of production and export of non-oil commodities. Political mistakes and poor economic policy tend to strengthen this. In this context, the question is how the currency devaluation has hurt African exports. The ineffectiveness in exchange rate control in Africa reduces exportability of African non-oil commodities. The inadequacies in the control of exchange rate in Africa repeatedly drive devalued currency from other nations into the African market, reducing exportability of African non-oil commodities.

Against this background, our research questions are whether exchange rate devaluation influences non-oil export in Africa, whether relative export prices influence non-oil exports in Africa and whether foreign capital influence non-oil

exports in Africa. The main objective of this study is to evaluate the impact of exchange rate devaluation, relative prices and foreign capital flows on non-oil exports in Africa. We hypothesized that according to the J-curve effect, that devaluation will lead to a reduction in export earnings in the short-term. First, we will present the theoretical background and existing empirical research. This is followed by methods of data analysis, analysis of results and conclusions.

2. Theoretical background

The theoretical framework of this research is the J curve effect of currency devaluation. The J curve theory of devaluation (Mages 1973) explains the initial deterioration of a country's trade deficit that emanates from a depreciation of its currency. The basis for this theory is that in the immediate period of exchange rate depreciation or devaluation, costly imports still outweigh the benefits of declined volume of importation by the residents of the devaluing nation. Umoru (2022) noted that such depreciation worsens the trade balance in the short run as a result of the slow change in consumption of the now more expensive imported due to the lack of locally produced substitutes. In the long term, the trade balance improves due to the benefits cheaper exports. A series of empirical research has been carried out regarding the J-curve hypothesis, showing mixed evidence (Umoru, Eboreime 2013a).

The theoretical implication of the J-curve effect is that developing countries should export more than they import and most importantly, such exports should be highly competitive at the international market for a devaluation policy to achieve trade deficit reduction and improving the competitive advantage of the exporting country (Umoru 2022). In Africa a problem is monoculture and lack of diversification in exports (Umoru, Amedu 2022). Furthermore, non-oil commodities are rarely major export commodities of developing countries. For example, for Egypt, Nigeria, Gabon, Algeria, Angola, Libya, and Congo, oil and oil products remain one or two commodities that dominate aggregate commodity export. Only a handful of African nations have competitive advantage in their non-oil export commodities. These commodities include cotton, coffee, copper, iron ore exported by Chad, Ghana,

Zambia, and Mauritania respectively. These commodities majorly exported abroad are traded in the world market in American dollars rather than the local currency of each these African nations. In effect, the non-oil export items are not competitive in the global market and hence, foreign buyers do not find such goods as relatively cheaper. The combination of these effects on the purchasing power of the buyer could hinder the advantages of a devaluation policy in these countries.

Capital flows represent funds for investment, trade, and business operations. The flow of financial resources from one geographic area to another constitutes an influx of foreign capital. Foreign capital inflows include a wide range of financial transactions, such as loans from government and foreign institutions, short- and long-term bank loans, investments in public or private bonds, equity investments, and direct investments in production capacity (Oyatoye 2009). Foreign capital inflows (FCI) continue to be a driver of economic globalization in countries around the world (Khan 2007). FCI can trigger economic development in case of lack of domestic investment capital, when properly and effectively used. However, most developing countries have not seen significant growth in their gross domestic product (GDP) and suffer from severe external and domestic debt repayment problems, low living standards and extreme poverty (Khan 2007).

3. Empirical research

A number of studies have been carried out on determinants of non-oil exports. Ezike and Ogege (2012) reported negative effects of trade policies on non-oil exports in Nigeria. while the coefficient of the exchange rate was positive. Mauna and Reza (2001) investigated the effects of real exchange rates in Morocco, Algeria, and Tunisia. The overall result of the investigation revealed that exchange rate devaluation had positive effect on exports while exchange rate misalignment or variability had a negative effect. The authors specifically noted that all manufacturing sub-sectors of countries studied are sensitive to exchange rate changes with varying degree of responsiveness from one sector to another. Mauna and Reza (2001) investigated the effect of exchange advancement, real exchange scale unpredictability, and exchange

expansion in selected North African countries, including Morocco, Algeria, and Tunisia. The overall result of the investigation revealed that all manufacturing sub-sectors are reactive to exchange rate unpredictability, but the degree of response varies across sectors. Kandil (2004) investigated the effect of exchange rate fluctuations on real output growth in 22 developing countries. Based on the theory of rational expectations, it was found that devaluation of exchange rates reduces real output growth and cause an increase in price inflation. In other words, currency depreciation negatively affects the economic performance of developing countries

Akinlo and Lawal (2012) used a Vector Error Correction Model (VECM) to examine the effect of exchange rates on industrial production in Nigeria over the period 1986–2010. They reported that depreciation of the exchange rate did not have a noticeable effect on industrial production in the short term but had a positive effect in the long term. Aliyu (2011) argues that when exchange rate rises, imports increase and exports decrease, whereas when the exchange rate falls, exports expand and imports decrease. Moreover, currency depreciation tends to shift demand from foreign goods to domestic goods. Therefore, through changes in terms of trade, income is diverted from the importing country to the exporting country, which tends to affect the economic growth of both the exporting country and the importing country.

Dada and Oyeranti (2012) found no evidence of a direct relationship between exchange rate changes and GDP growth for Nigeria. It was concluded that Nigeria's economic growth is directly affected by fiscal and monetary policies and other economic variables, especially export growth (oil), which requires improved exchange rate management but is not enough to revive Nigeria's economy. According to Okafor et al. (2016) increase in foreign capital inflows leads to an increase in gross domestic product in Nigeria.

Adegboye et al. (2014) found that the disaggregation of capital flow and the gross domestic product is very important to the Nigerian economy. They found that, when compared to foreign capital indicators, foreign debt has the greatest impact on the Nigerian economy. Nkoro and Uko (2013) confirmed a positive and significant relationship between capital flow and gross domestic product. In contrast, Kolawole (2013) showed a negative relation between capital flow and the gross domestic product has a detrimental influence on Nigeria's real gross domestic product.

4. Methodology

According to the relative Purchasing Power Parity theory, the purchasing power of procurement intensity domestic money determines the terms of trade. Once the purchasing power of currency is equal in both trading countries, the volume and value of imports and exports balance. In this case, when a national currency is devalued by an amount equal to the inflation rate of trading partner, the currency maintains an equal purchasing power. Relative prices are determined as follows:

$$R_n = R_0 \times (P_{dn}/P_{do}/P_{fn}/P_{fo}) \quad (1)$$

Where R_0, R_1 are exchange rates in the base and current years respectively, P_{a0} is the price index of domestic country in the base year, P_{a1} is the price index of domestic country in the current year, P_{b0} is the price index of foreign country in the base year, P_{b1} is price index of foreign country in the current year. This ratio measures the rate at which good I can be exchanged for good j, determining the volume of exports.

The study is analytical and econometrical, focusing on Africa. Both the Mean Group (MG) and Pooled Mean Group (PMG) estimators were utilized. The MG estimator derives the long-run parameters from the autoregressive distributed lag (ADL) model for each individual country by estimating separate regressions for each country as a cross section. The PMG estimator is a reparametrization of the unrestricted autoregressive distributed lag (ARDL) equation. This is specified as follows:

$$\Delta \ln non\_oil export_{i,t} = \delta_1 + ec(t-1) + \delta_2 \ln non\_oil export_{i,t-i} + \delta_3 \ln forncome_{i,t-i} + \delta_4 \ln relprices_{i,t-i} + \delta_4 \ln exchdeval_{i,t-i} + \sum_{i=1}^{p} \gamma_1 \Delta \ln non\_oil export_{i,t-i} + \sum_{i=1}^{q} \gamma_2 \Delta \ln forncome_{i,t-i} + \sum_{i=1}^{q} \gamma_3 \Delta \ln relprices_{i,t-i} + \sum_{i=1}^{q} \gamma_2 \Delta \ln exchdeval_{i,t-i} + \eta_i + e_{i,t} \quad (2)$$

We also estimated Arellano and Bond's (1991) panel differenced-GMM model with the following specification:

$$\ln non\_oil \exp ort_{i,t} = \delta + \phi \ln non\_oilexport(t-1) + \beta!(\ln forncome_{i,t}, \ln relprices_{i,t}, \ln exchdeval_{i,t}) + v_t \quad (3)$$

With a Z vector, the predictors of equation 3 namely lnforncome, lnrelprices and ln exchdeval are replaced as in equations 4 and 5 respectively. Equation 4 is a level equation while 5 is a differenced equation respectively.

$$\ln non\_oil \exp ort_{i,t} = \delta + \phi \ln non\_oilexport(t-1) + Z^{!}_{i,t}\beta + (\eta_i + \varepsilon_{i,t}) \quad (4)$$

$$\Delta \ln non\_oil \exp ort_{i,t} = \delta + \phi \Delta \ln non\_oilexport(t-1) + \Delta Z^{!}_{i,t}\beta + \Delta e_{i,t} \quad (5)$$

Where $Z^{!} = \begin{bmatrix} \ln forgncome_{i,t} \\ \ln relprices_{i,t} \\ \ln exchdeval_{i,t} \end{bmatrix}$

The GMM used by Blundell and Bond (1998), that is, sys-GMM uses the differences of the lag variables as instruments for the level equation and lags of variables at levels as instruments for the difference equation based on Eviews 10.0 specification. This is expressed by the following specification:

$$ln\,non\_oil\,exp\,ort = C(1) + C(2) * ln\,non\_oilexport(-1) + C(3) * ln\,relprices + C(4) * exchdeval@d(ln\,non\_oil\,exp\,ort(-2)) d(ln\,forgncome(-1))d(exchval(-1)) d(ln\,non\_oil\,exp\,ort) = C(5) + C(6) * d(ln\,non\_oilexport(-1)) + C(7) * d(ln\,relprices) + C(8) * d(exchdeval)@(ln\,non\_oil\,exp\,ort(-2) ln\,forgncome(-1))(exchval(-1)) \quad (6)$$

Where $C(2)$ or $C(6)$ is the coefficient of $\ln non\_oilexport(-1)$. The absolute value of this coefficient should be less than 1. The consistency of GMM is based on the model autoregressive (AR) correlation. In addition to the diagnostics test, the Sargan test was used to ascertain status of over-identification. The value should be less than 1 but greater than 0.05 for over-identification to be ruled out.

This study focuses on the historical period of thirty years (1991–2020). Relevant data could be generated for 11 developing African countries (Nigeria, Burkina Faso, Burundi, Eswatini, Mauritius, Uganda, Rwanda, Niger, Sierra Leone, Tanzania and Mozambique). The variables were transformed into natural log apart from variables

whose series are reported in percentages. Hence, our data were log-transformed to ensure stability of coefficient. The variables are presented in Table 2.

Table 2. Variable used in the study

Variable	Description	Source(s)
non-oilexport	Non-oil export of Goods and Services in US dollars	International Financial Statistics of IMF
Exchdeval	Percentage changes in exchange rates of local currencies per U.S. Dollar,	International Financial Statistics of IMF
Relprices	The relative prices was calculated as the ratio of domestic price of each African country to imported price	International Financial Statistics of IMF
forgncome	Foreign direct investment	International Financial Statistics of IMF

Source: authors' compilations.

5. Results

5.1. Unit root analysis

The panel unit root test is employed to investigate stationarity of panel series. Three tests of stationarity are used in this study to examine the variable in both panels, namely, Levin, Lin and Chu (LLC), Im, Pesaran and Shin W-t-stat (IPS), Hadri LM z-statistic. The results are presented in Table 3.

In the results, absence of no unit root could not be accepted for all variables, using the 3 methods of unit root tests implying the non-stationarity of the panel series at levels. Following, LLC (2002) and IPS (2003) that unit roots in heterogeneous panel data can be differenced at an appropriate difference level to obtain stationarity, the variables were subjected to first differencing. The results of the 3 panel stationarity test (LLC, Hadri-LM, and IPS) show that all variables are stationary after first difference, that is, I[1]. Given that series are I(1), there is a need to examine their cointegration status to determine if they converge in the long run, and in particular the confirmation of the existence of a long-run equilibrium relationship among them.

Table 3. Unit root results

Variable	LLC		Hadri LM		IPS		Order of integration
	Adjusted t-statistic	Prob	z-statistic	Prob	W t bar statistic	Prob	
lnnon-oil_export	1.2879	0.9384	23.5679	0.0000	-2.4690	0.5687	
D(lnnon-oil_expor)t	3.4698	0.0000	4.87034	0.0267	5.8972	0.0000	I(1)
lnrelprices	0.2358	2.0000	56.779	0.0000	-1.7280	0.7823	I(1)
D(lnrelprices)	4.1872	0.0000	-26.531	0.0001	3.4986	0.0052	
exchdeval	0.5934	1.6782	-34.679	0.0000	-1.5376	0.4590	I(1)
D(lnexchdeval)	-9.3970	0.0000	21.568	0.0000	10.239	0.0000	
lnforgncome	-2.8547	0.2198	40.532	0.0000	0.5739	3.8920	I(1)
D(lnforgncome)	-6.7820	0.0000	2.0998	0.0072	-.0.659	0.7391	

Source: authors' calculations.

5.2. GMM estimation

Due to the explicit requirement of the study for system panel GMM estimations, the system estimation was run without pre-diagnostic tests of pooled and fixed effects panel regression. Estimation results were found to be plagued with instrument proliferation, that is, too many instruments (lowest being 19 greater than number of cross sections-11) despite the switch of exogenous variables and the application of the collapse function. The insignificance of any of the predictor also confirmed the need to discard the model. As a result, the study tested the difference panel GMM model which had 11 instruments equal to cross-section. However, lagged value of money demand is lower than that of fixed effects coefficient showing downwards bias of the model. The study therefore, discards the GMM estimation models completely.

Table 4. Coefficients of lagged non-oil exports

Variables	System GMM	Differenced Panel GMM	Fixed Effects
Instruments	19	11	N/A
lnnon-oil_export (-1)	0.6296858	0.6296858	0.6861336

Source: authors' calculations.

5.3. Panel co-integration test

Having established that the panel series are characterized by unit-roots, and are integrated of order I(I), a test for co-integration (convergence) is conducted. The results of the panel co-integration suggest strong evidence of a long-run equilibrating relation between exchange rate devaluation, relative prices, foreign income and non-oil export in African countries. This is true because the F-statistic, 10.6789 exceeds I(1) F-bound at 5 percent significance level. The absolute t-value of 5.0781 also exceeds the absolute values of I(1) t-bound. This further suggest a valid long-run equilibrating association amongst variables in the study.

Table 5. F-Bounds and t-Bounds test results

Test	Statistic	Critical Values	I(0)	I(1)
F-statistic	10.6789	5%	3.85	4.89
k	3			
Test	Statistic	Critical Values	I(0)	I(1)
t-statistic	5.0781	5%	-2.50	-3.46

Source: authors' calculations.

5.4. Panel results

In the light of the fact that the OLS results neglect or ignores the effect of heterogeneity associated with the individual countries and could cause substantial bias, the panel data estimation is carried out using the MG estimator, PMG estimators respectively of the panel ARDL equation and a system-GMM estimator. We could not conduct the Hausman test to choose between the M-G and PMG estimators because estimates from both methods had same signs. Hence, our decision was to analyse both results for non-oil export using same explanatory variables. We begin by presenting the M-G estimation of the relationship between non-oil export and exchange rate devaluation in addition to other control variables. This will help to provide a robust background for the study. Table 6 reports the results.

Table 6. Mean-Group estimates for non-oil export

Variables	Dependent Variable: lnnon_oil_export							
	Burkina Faso		Burundi		Mauritius		Eswatini	
	Coeff	t-value	Coeff	t-value	Coeff	t-value	Coeff	t-value
D(lnnon-oilexport(-1))	0.999	238.9***	0.123	8.900***	1.043	20.976***	0.023	1.956*
D(lnrelprices)	-0.02	-2.394**	-0.034	-4.109***	-0.013	-3.865**	-0.015	-2098**
D(exchdeval)	-1.034	-0.350	-1.062	-2.350**	-0.051	-4.097***	-1.356	-10.026***
D(lnforgncome)	0.049	11.095***	0.172	19.061***	0.019	7.032***	0.022	16.79***
adjustment speed	-0.201	120.56***	-0.239	10.006***	-0.312	2.036**	-0.216	120.56***
lnrelprices	-1.076	-2.009**	-0.024	-0.011	-0.055	-2.096**	-1.000	-3.221**
exchdeval	-1.032	-14.780***	-0.04I5	-13.060***	-0.008	-1.004	-0.687	-5.008***
lnforgncome	0.028	19.651***	0.013	10.248***	0.004	19.651***	0.028	19.651***
c	1.246	3.478***	0.934	13.563***	0.038	9.487***	0.372	2.435**
Variables	Mozambique		Niger		Nigeria		Rwanda	
	Coeff	t-value	Coeff	t-value	Coeff	t-value	Coeff	t-value
D(lnnon-oilexport(-1))	0.221	2.436**	1.035	3.799***	0.156	14.290***	0.268	5.006***
D(lnrelprices)	-1.034	-0.845	-0.250	-2.549**	-0.013	-2.903**	-0.005	-12.034***
D(exchdeval)	-0.087	-40.987***	-0.087	-2.089**	-1.679	-13.120***	-0.041	-9.330***
D(lnforgncome)	0.012	1.091***	0.013	1.1234	0.001	0.134	0.146	51.243***
adjustment speed	-0.310	9.860***	-0.250	70.58***	-0.235	5.435***	-0.270	20.681***

Table 6. Cont…

lnrelprices	-0.056	-12.09**	-0.026	-0.023**	-0.156	-9.556***	-1.987	-2.468**
exchdeval	-0.192	-4.098***	-1.004	-6.898***	-0.087	-7.092***	-0.034	-17.098
lnforgncome	1.169	5.870***	0.098	4.087***	1.011	10.910***	0.010	0.740
c	1.048	2.456**	0.234	3.400***	1.204	12.856***	0.387	1.348
Variables	Tanzania		S. Leone			Senegal		
	Coeff	t-value	Coeff	t-value		Coeff		t-value
D(lnnon-oilexport(-1))	1.075	5.049***	0.901	23.092***		1.573		8.099***
D(lnrelprices)	-0.134	-9.004**	-4.135	-0.203		-0.027		-3.094**
D(exchdeval)	-1.022	-0.740	-1.000	-2.997**		-1.011		-19.240
D(lnforgncome)	0.055	2.976**	0.0256	1.009		0.0287		7.001***
adjustment speed	-0.430	2.051**	-0.0135	12.436***		-0.290		12.833***
lnrelprices	-0.708	-2.458**	-0.065	-2.009**		-0.019		-2.540**
exchdeval	-1.032	-11.280	-0.076	-13.458***		-0.072		-10.620
lnforgncome	0.011	10.251***	0.0123	2.098**		0.053		3.051***
c	0.635	90.467***	1.234	5.489***		0.0374		2.354**
***(**) designates significance at 1% & 5% levels respectively								

Source: authors' calculations.

The first lag of non-oil export is positively related to current export and passes 1% significant level, a suggestion that current level of non-oil export significantly depends on its previous value. As such, the higher the value of non-oil export in the previous period, the higher its value in current and future periods. A 1% percent rise in previous non-oil export raises current/future non-oil export capacity by 0.99%. Foreign Direct Investment (FDI) FDI is significant and positive for all countries except Rwanda and Sierra Leone. An implication that inflow of foreign capital and investment resources had a stimulating impact on non-oil export in Burkina Faso, Burundi, Mauritius, Eswatini, Tanzania, Mozambique, Niger, Nigeria, and Senegal.

This finding supports the evidence by Kolawole and Okodua (2010) and is opposed to the findings by Ezike and Ogege (2012). A 1% percent increase in FDIinduces non-oil export growth by 0.044%. In accordance with theory, relative prices had a statistically significant coefficient at a 5% level of significance that is negatively signed for all countries. The same result was obtained for exchange rate devaluation.

Exchange rate devaluation is negatively signed, for all countries in deviation to extant trade theory as regards the relation between exchange rate depreciation and export. However, the negative effect was not significant. Indeed, non-oil export effects of exchange rate devaluation are significant in all countries except for Burkina Faso. This implies that devaluation in African countries is not successful. In many of these countries, the ml condition is none existent. This may imply that devaluation against the American dollar leads to increased expenditure of foreign goods, reducing income spent on locally produced goods. Accordingly, as demand for foreign goods increases, local producers in Africa are affected In the long run, local production decreases and foreign exchange earnings from exports is lowered as a consequence. In effect, devaluation of the exchange rate had no significant impact on output due largely to the export of primary products that are subjected to extreme external negative shocks and terms of trade deterioration, unlike manufactured goods . The finding corroborates the findings of Dada and Oyeranti (2012) and contradict the results of Aliyu (2011). Only twenty percent of disequilibrium in non-oil export from African countries was rightly restored annually following some short-run disturbances.

5.5. Mean-group (PMG) results

The results of the PMG are reported in Table 7. The PMG estimates are similar to those of MG. The adjusted R^2 of 0.847, implies that over 84 percent of the net systematic variations in non-oil export in Africa is explained by the independent variables. This is an indication of a good predictive ability of the model. The F-value of 161.6, with a corresponding prp-value of 0.000 is significant at the 1 percent level, thus validating actuality of a significant linear association between regressors and non-oil exports in Africa. The DW statistic of 2.21, approximated to 2, in line with

the rule of the thumb, suggests that there is autocorrelation in the model. The estimated model is, therefore, fit for policy purposes.

Table 7. Mean group (PMG) results

Dependent Variable: lnnon_oil_export			
Variable	Coefficient	t-ratios	p-value
C	3.021367	19.32318	0.0000
D(lnnon-oilexport(-1))	0.627966	34.71347	0.0000
D(lnrelprices)	-0.003808	-0.173036	0.8626
D(exchdeval)	-1.09E-05	-1.056775	0.2908
D(lnforgncome)	1.082E-05	9.326834	0.0000
adjustment speed	-0.21940	-20.6985	0.0000
lnrelprices	-0.01297	-2.4579	0.0256
exchdeval	-1.0098	-1.056775	0.2908
lnforgncome	0.95214	6.7922	0.0000
R^2	0.851976		
Adj. R^2	0.846687		
F-statistic (Prob)	161.0661 (0.00000)		
Durbin-Watson stat	2.214026		

Source: authors' calculations.

The first lag of non-oil exports has a positive sign and statistically significant at a 1 percent level. Thus, past non-oil export p tend to drive successive levels of non-oil exports, particularly in the case of manufacturing, industrial and investment sectors, where such positive effects are sustained. Relative prices and exchange rate are positively though not significant related to non-oil exports, apparently due to the weak capital flows and non-diversified export base of African countries. This finding supports the results of Olayiwola and Okodua (2015). With PMG equation, twenty two percent of disequilibrium in non-oil export from African countries was restored annually following some short-run disturbances. This is similar for the adjustment speed of the M-G estimator.

Coefficient confidence interval estimates are reported in Table 8. The results of the confidence interval indicate that the estimates fall within the 90–99% confidence level. Invariably, the results obtained fall within a high range of confidence that shows their reliability and assurance.

Table 8. Coefficient confidence interval

Variable	Coefficient	90% CI		95% CI		99% CI	
		Low	High	Low	High	Low	High
lnrelprices*lnnon_oilexport	0.1814	0.170621	0.19295	0.168	0.194	0.164	0.98440
exchdeval*lnrelprices	5.710	-3.50E-07	0.0012	-1.4E-05	0.002	-3.29	0.0002
lnforgncome*lnnon_oilexpt	0.0344	0.9021	0.1054	0.238	0.928	0.224	0.21110
exchdeval*lnclnnon_oilexpt	0.1082	0.1722	0.101	0.029	0.102	0.054	0.810

Source: authors' calculations.

Before analyzing the results of the panel ARDL model, the model selection criteria, which choose the optimal lag length of the model is presented in Table 9.

Table 9. Model selection criteria

Model	LogL	AIC*	BIC	HQ	Specification
3	3252.548733	-3.399250	-2.449526*	-3.048030	ARDL(2, 1, 1)
1	3169.946135*	-3.373210*	-2.612173	-3.091769*	ARDL(1, 1, 1)
4	3342.062128	-3.364127	-2.037030	-2.873349	ARDL(2, 2, 2)
2	3264.294746	-3.343658	-2.205247	-2.922659	ARDL(1, 2, 2)

Source: authors' calculations.

From the table it can be seen that the Akaike information criterion (AIC), BIC and HQ and the Hanan-Quinn Information criterion (HQ) all selected lag order two, respectively. Thus, the optimal lag length for the model is 1 with ARDL (1,1,1) specification.

5.6. Panel error correction results

The results of the short-run dynamics (error-correction model), which shows the response of non-oil exports to each regressors, as well as the error-correction mechanism, are presented in Table 10.

Table 10. Error correction model based on ARDL (1, 1, 1)

Variable	Coefficient	t-Statistics	p-value
c	1.652658***	5.672419***	0.0000
dlnnon_oilexport(-1)	0.056312	1.449386	0.2579
dlnrelprices	-1.733139	-17.002250***	0.0000
dlnexchdeval	-1.21E-05	-11.004976***	0.000
dlneforgncome	0.056312	0.9756	1.2475
adjustment speed	0.20857***	-3.47618***	0.0000

Source: authors' calculations.

An examination of the results shows a lagged positive effect of non-oil export on current non-oil export, implying a positive relationship between past values of non-oil export and current/future values of non-oil export in African countries. A percent increase in past non-oil export is associated with a 0.056 unit percent increase in current non-oil export. Relative prices are negatively and significantly related to non-oil export as earlier reported at a 5% level of significance. The FDI coefficient (0.0563) is insignificant. The observed relationship does not corroborates evidence from Ekperiware (2009), Kolawole and Okodua (2010) and Olayiwola and Okodua (2015).

The short-run effect of devaluation in official exchange rate on non-oil export is negative and significant. Consequently, depreciation has a short-run adverse effect on non-oil export due to high inelastic import dependence. The result supports evidence from previous findings of Arise et al. (2002), Kandil (2004) and contradicts the research findings of Akinlo and Lawal (2012), Dada and Oyeranti (2012) and Mukherjee and Pozo (2011). The error-correction coefficient is negative and

statistically significant, in line with theory. Thus, it plays the role of restoring equilibrium in the event of temporary disequilibrium from long-run stability. The coefficient of 0.208 indicates that the adjustment/restoring capacity after a short-run perturbation is approximately 21%.

5.7. Short-run interaction model

The results of the interaction model are presented in Table 11.

Table 11. Interactive model results

Variable	Coefficient	t-Statistics	p-value
c	0.201057***	3.392472	0.0007
d(lnnon_oilexport(-1))	0.039867	10.938787	0.0000
d(lnrelprices*lnnon_oilexport)	0.108809***	6.636769	0.0000
d(lnrelprices(-1)*lnnon_oilexport(-1))	0.000892	0.114964	0.9085
d(exchdeval*lnrelprices)	-0.001914**	-2.521895	0.0018
d(exchdeval*lnforgncome(-1))	-5.59E-05	-0.446097	0.6556
adjustment speed	0.206286***	-3.323651	0.0009

Source: authors' calculations.

The results of the pair of interactions show that the interaction of relative prices and non-oil export has a positive and significant effect on African economies, with a marginal effect of 0.11. The interaction between exchange rate devaluation and relative prices produces a statistically negative marginal impact of - 0.0019. This implies that when the exchange rate depreciates in the presence of high relative prices, non-oil export declines by an additional amount of 0.0019%.

5.8. Long run equation results

Results of corresponding long-run equation model are reported in Tables 12 and 13.

Table 12. Long-run model results

Variable	Coefficient	t-Statistics	p-value
lnrelprices	-0.056480***	-8.110423	0.0000
lnexchdeval	- 7.36E-07	-1.63589	0.1021
lnforgncome	1.002390***	9.63528	0.0000

Source: authors' calculations.

From the tables, quite insightful results emerge as both the coefficients of relative prices and exchange rate devaluation are positively related to non-oil exports. Foreign gross domestic product has a negative and significant effect on non-oil export in Africa in the long run. This seems to stimulate the fact that such FDI is a source of capital inflows. By implication, investment capital constitutes an integral aspect of non-oil export diversification. The result is in line with the findings of Okafor et al. (2016) and Vincent (2017).

Table 13. Interactive long-run model results

Variable	Coefficient	t-Statistics	p-value
lnrelprices*lnnon_oilexport	0.181458	27.56038	0.0000
exchdeval*lnrelativeprices	5.71E-05	1.635891	0.1621
Lngdpnon_oilexport*lnexchdeva l	-1.9894	3.7580	0.0001

Source: authors' calculations.

The results of the long-run interaction model show that the interaction of relative prices and non-oil export has a positive and significant effect on non-oil export, with a marginal impact of 0.18%. The long-run impact of the interaction between exchange rate devaluation and non-oil export, although positive, is not significant. The t-value

is greater than 2, which implies that accounting for non-oil exports in presence of official devaluation in exchange rate movement in African countries negatively and significantly impact on non-oil export.

5.9. Country specific results

The country specific estimates are shown in tables 14–25.

Table 14. Panel ARDL results – Burkina Faso

Variable	Coefficient	t-Statistics	p-value
ect	-0.020112	-33.87576	0.0001
d(lnnon_oilexport(-1))	0.063234	1.866793	0.1588
d(lnrelprices)	-0.048948	-18.96776	0.0003
d(exchdeval)	-1.1275	-619.7399	0.0000
d(forgncome)	0.08736	2.56344	0.0012
c	0.17402	4.380432	0.0220

Source: authors' calculations.

Table 15. Panel ARDL results – Burundi

Variable	Coefficient	t-Statistics	p-value
ect	0.150280	-19.58214	0.0003
d(lnnon_oilexport(-1))	0.168291	5.375926	0.0126
d(lnrelprices)	-1.588658	-1.971625	0.1432
d(exchdeval)	-0.01690	-248.2713	0.0000
d(forgncome)	0.0085	0.12470	0.93742
c	1.139791	2.504606	0.0874

Source: authors' calculations.

Results for Burkina Faso (Table 14) reveal that capital flows and exchange rates have a positive and significant impact on non-oil exports. The results also show

responsiveness to long-run equilibrium as a result of contemporaneous short-run disequilibrium.

Results for Burundi (Table 15) show that the lag of non-oil exports and exchange rate are negatively and significantly related to current non-oil export. The error correction term is appropriately signed and significant. Thus, it rightly plays the role of restoring equilibrium in the event of short-run (temporary) deviation/disequilibrium from the long-run equilibrium.

Table 16. Panel ARDL results – Mauritius

Variable	Coefficient	t-Statistics	p-value
ect	-0.047874	-31.50087	0.0001
d(lnnon_oilexport(-1))	0.158361	23.37263	0.0002
d(lnrelprices)	-0.212673	-1.150383	0.3334
d(exchdeval)	-0.002463	-0.389488	0.0000
d(forgncome)	0.09673	1.903354	0.0356
c	0.389488	3.942393	0.0291

Source: authors' calculations.

The panel ARDL on Mauritius (Table 16) reveal that lagged non-oil export has a positive and significant effect on current non-oil export, while relative prices and exchange rate depreciation exert a non-significant impact on non-oil exports of Mauritius. A 1% increase in previous non-oil export increases current non-oil export by 0.15%. The result is at variance with the A-priori sign unlike the case of Burundi. The error correction coefficient is also appropriately negative and significant, indicating the capacity for the restoration of long-run equilibrium after a temporary deviation/shock.

The ARDL result for Niger (Table 17) show that lagged non-oil export exerts a positive and non-significant impact on current non-oil export. Relative prices exert a positive and significant impact, while the exchange rate devaluation had a negative and significant effect on non-oil export. The co-integrating coefficient indicates restoration of 3% long-run equilibrium after a temporary deviation.

Table 17. Panel ARDL results – Niger

Variable	Coefficient	t-Statistics	p-value
ect	0.033008	48.63386	0.0000
d(lnnon_oilexport(-1))	0.127850	1.630699	0.6190
d(lnrelprices)	-0.022656	-20.36138	0.0003
d(exchdeval)	-1.27E-06	-33100.12	0.0000
d(forgncome)	0.000679	10.09451	0.0000
c	-0.222468	-7.043222	0.0059

Source: authors' calculations.

Table 18. Panel ARDL results – Nigeria

Variable	Coefficient	t-Statistics	p-value
ect	-0.096357	-90.29238	0.0000
d(lnnon_oilexport(-1))	0.120956	4.495380	0.0205
d(lnrelprices)	-0.036566	-2.631707	0.0782
d(exchdeval)	-0.000457	-2818.321	0.0000
d(forgncome)	1.01390	5.712403	0.0000
c	0.720230	12.15946	0.0012

Source: authors' calculations.

The panel ARDL result for Nigeria (Table 18) show that lagged non-oil export exerts a positive impact on current non-oil export, as in the case of Niger. In the same vein, relative prices and exchange rate movements have negative and significant effects, confirming the detrimental impact of the destabilizing high domestic-foreign price ratio and exchange rate depreciation on non-oil-export. The error correction term is appropriately signed and significant, indicating the capacity of the model to restore to long-run equilibrium after a temporary deviation/shock.

Table 19. Panel ARDL results – Rwanda

Variable	Coefficient	t-Statistics	p-value
ect	0.246665	30.28693	0.0001
d(lnnon_oilexport(-1))	-0.334091	-5.137654	0.0143
d(lnrelprices)	0.063290	83.23786	0.0000
d(exchdeval)	-2.66E-05	-43102.98	0.0000
d(forgncome)	0.00015	1.30945	0.7849
c	-1.840787	-4.087814	0.0265

Source: authors' calculations.

In the case of Rwanda (Table 19), the panel ARDL results show that lagged non-oil export and exchange rate export have negative and significant impacts on non-oil export, while relative prices exert a positive and significant impact. The error correction 24.6% speed of non-oil export adjustment to long-run balance.

Table 20. Panel ARDL results – Sierra Leone

Variable	Coefficient	t-Statistics	p-value
ect	-0.258128	-23.30425	0.0002
d(lnnon_oilexport(-1))	0.511281	-23.35755	0.0002
d(lnrelprices)	-1.709785	-2.570922	0.0124
d(exchdeval)	-0.000489	-2954.636	0.0000
d(forgncome)	0.09835	1.029847	0.09472
c	2.029832	2.913833	0.0618

Source: authors' calculations.

For Sierra Leone (Table 20), the panel ARDL results show that lagged non-oil export impacted positively on current exports and exchange rate devaluation have negative and significant impacts on non-oil export, whereas relative prices had a

negative and significant impact. The error correction 25.8% speed of adjustment of non-oil export to long-run stability.

Table 21. Panel ARDL results – Senegal

Variable	Coefficient	t-Statistics	p-value
ect	-0.358540	-10.86771	0.0017
d(lnnon_oilexport(-1))	0.169102	5.101058	0.0146
d(lnrelprices)	-1.047458	-0.088759	0.9349
d(exchdeval)	-0.017135	-6.403724	0.0077
d(forgncome)	0.01001	2.36081	0.0013
c	2.752179	1.360582	0.2668

Source: authors' calculations.

For Senegal (Table 21), the panel ARDL results show that lagged non-oil export has a positive and significant impact on current non-oil export, whereas the exchange rate depreciation had a negative and significant impact. Relative prices are negatively related to non-oil export, and the effect is insignificant. Evidence of a significant adjustment/restoring process to long-run equilibrium after a temporary shock/deviation is found.

Table 22. Panel ARDL results – Estwatini

Variable	Coefficient	t-Statistics	p-value
ect	-0.270057	-69.27967	0.0000
d(lnnon_oilexport(-1))	0.121965	5.856957	0.0099
d(lnrelprices)	-0.126932	-74.52458	0.0000
d(exchdeval)	-0.000609	-1825.007	0.0000
d(forgncome)	-0.0113	-1.2458	0.9236
c	1.846287	10.21803	0.0020

Source: authors' calculations.

The panel ARDL results for Eswatini (Table 22) reveal a positive and significant effect of lagged non-oil export on current non-oil export, while relative prices and exchange rate both exert negative and significant impacts. Invariably, the short-term destabilizing and volatile impact of prices, as well as exchange rate depreciation for an economy characterized by high import-dependence tend to be detrimental to non-oil export, particularly agriculture, trade, and the industrial sector, which are key to economic diversification in non-oil export. Evidence of a significant adjustment/restoring process to long-run equilibrium after a temporary shock/deviation is found.

Table 23. Panel ARDL results – Tanzania

Variable	Coefficient	t-Statistics	p-value
ect	-0.116420	-11.84455	0.0013
d(lnnon_oilexport(-1))	0.055604	1.738921	0.1804
d(lnrelprices)	-0.045229	-0.199979	0.8543
d(exchdeval)	-0.001216	-0.0009	1.5862
d(forgncome)	1.3984	15.02980	0.0000
c	0.880381	1.598899	0.2081

Source: authors' calculations.

For Tanzania (Table 23), lagged non-oil export on current non-oil export exert a positive but insignificant impact on current export, the exchange rate has a positive and significant effect. Relative prices are negatively, though not significant, related to non-oil export. Consequently, since the economy of Tanzania is heavily dependent on the production and export of a few primary products with weak elasticity of demand and synthetic substitutes, the effect of the depreciation of the domestic currency on export is non-significant. This is in line with trade theory. Evidence of a significant 11% restoring capacity of the model to long-run equilibrium after a temporary shock/deviation is found.

Table 24. Panel ARDL results – South Africa

Variable	Coefficient	t-Statistics	p-value
ect	-0.05863	-2.4659	0.0510
d(lnnon_oilexport(-1))	1.8962	13.5670	0.0000
d(lnrelprices)	0.1293	1.3890	0.54786
d(exchdeval)	-0.00975	-35.0008	0.0000
d(forgncome)	1.283745	27.47593	0.0000
c	0.32434	4.87990	0.0001

Source: authors' calculations.

The panel ARDL results of South Africa (Table 24) reveal a positive and non-significant lagged non-oil export on current non-oil export, while relative prices and exchange rate devaluation both exert a negative effect, although only the latter is significant. Thus, exchange rate depreciation/devaluation has a favourable and significant impact on the non-oil export in South Africa, unlike the evidence found in other countries. This could be because the economy is relatively more diversified in manufacturing exports than other African economies. It is also evident that the model has a significant adjustment to long-run equilibrium after a temporary shock/deviation.

Table 25. Panel ARDL results – Mozambique

Variable	Coefficient	t-Statistics	p-value
ect	-0.148400	-39.17611	0.0000
d(lnnon_oilexport(-1))	0.133660	4.581990	0.0195
d(lnrelprices)	-0.713583	-0.199851	0.8544
d(exchdeval)	-8.69E-05	-1438.744	0.0000
d(forgncome)	-0.00384	0.573861	2.94763
c	1.339140	4.425830	0.0214

Source: authors' calculations.

The panel ARDL results of Mozambique (Table 25) show a positive significant lagged non-oil export on current non-oil export, implying that previous export performance tends to positively rub off on current non-oil export, particularly when policies aimed at growing the non-oil sector are sustained. Relative prices are negatively related to non-oil export but the impact is not significant, while devaluation in official exchange rate has a negative and significant effect. Invariably, as in earlier evidence, the benefits of currency depreciation on export stimulation cannot be realized when the economy largely produces and exports low volume of primary products, in addition to high import dependence, which is characteristic of the Mozambican economy. In this case, the effect of exchange rate depreciation becomes detrimental to non-oil export capacity. The error correction term is appropriately negative in line with econometric theory and significant. Thus, there is robust evidence of the significant adjustment of only 14 percent disturbances to long-run equilibrium after a temporary shock/deviation.

5.10. Empirical findings

a. From the results of cross-sectional analysis by country, results for Burkina Faso revealed that relative prices and exchange rate devaluation had and inverse and significant impact on non-oil exports. The results for Burundi show that the lag of non-oil exports and exchange rate depreciation are positively and negatively related to current non-oil export.
b. The panel ARDL on Mauritius revealed that lagged non-oil export has a positive and significant effect on current non-oil export, while relative prices and exchange rate devaluation exerts a non-significant but negative impact on non-oil export.
c. The results of Nigeria show that lagged non-oil export exerts a positive but non-significant impact on current non-oil export while relative prices exert a positive and significant impact, while exchange rate depreciation had inverse and significant effect on non-oil export.
d. The panel ARDL result for Nigeria shows that lagged non-oil export exerts a positive impact on current non-oil export, as in the case of Niger. Exchange rate devaluation had negative and significant effect on non-oil export.

e. In the case of Rwanda, the panel ARDL results show that exchange rate depreciation had inverse and significant impact on non-oil export, while relative prices exert a positive and significant impact.
f. For Sierra Leone, the panel ARDL results show that lagged non-oil export and exchange rate have negative and significant impacts on non-oil export, whereas relative prices had negative and significant impact.
g. For Senegal, the panel ARDL results show that exchange rate devaluation had a negative and significant impact while relative prices are positively related to non-oil export, but the effect is not significant.
h. The panel ARDL results for Eswatini revealed a positive and significant effect of lagged non-oil export on current non-oil export, while relative prices and exchange rate devaluation both exert negative and significant impacts.
i. For Tanzania, lagged non-oil export on current non-oil export exerts a positive but insignificant impact on current export, the exchange rate depreciation had a negative and significant effect and relative prices are negative impacting on non-oil export, but not significant.
j. The panel ARDL results of South Africa revealed a positive and significant lagged non-oil export on current non-oil export, while relative prices and exchange rate devaluation both exert a negative effect, although only the latter is significant.
k. The panel ARDL results of Mozambique revealed to show a positive significant lagged non-oil export on current non-oil export, relative prices are positively related to non-oil export but the impact is not significant, while the depreciation of exchange rate has a negative and significant effect.

6. Conclusion

This research work focused on the static and dynamic responses of non-oil export to devaluation in official exchange rate, change in relative prices, and inflow of foreign capital from trading partners in 11 African countries. The data covered 11 African countries (Nigeria, Burkina Faso, Sierra Leone, Eswatini, Mauritius, Uganda,

Burundi, Niger, Rwanda, Tanzania and Mozambique). Based on the findings of the research, it can be argued that African governments should be aware of the fact that boosting local production and strengthening non-oil export can go a long mile to solve plethora of economic challenges African countries are bedeviled with. In the face of high import prices, devaluation of the exchange rates in Africa significantly hampers non-oil export in Africa, probably because the M-L condition is not met in these countries. Hence, rather than discourage, depreciation in the face of high import prices encourages import-dependency and strengthens foreign competition for domestic producers of on-oil exports. This calls for meaningful diversification of production base in Africa, particularly for manufactured products, with high value-added and multiplier effects. The benefits of currency depreciation on export stimulation cannot be realized when the economy is mainly produces and exports primary products and is highly dependent on imports, as is the case with all African nations covered in this study.

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