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RESEARCH PAPER

# Boomerang Effect of Remittances: Cross-Country Evidence

**Emeka Okoro Akpa[a,*], Segun Subair Awode[b]**

a. Department of Economics, Olabisi Onabanjo University, P.M.B 2002, Ago-Iwoye, Ogun State, Nigeria; Babcock University Centre for Open Distance and e-Learning (BUCODeL), Ilishan Remo, Ogun State, Nigeria

b. Department of Economic and Business Policy, Nigerian Institute of Social and Economic Research (NISER), Ibadan, Nigeria; Department of Economics, Olabisi Onabanjo University, P.M.B 2002, Ago-Iwoye, Ogun State, Nigeria

* Corresponding author, E-mail: akpae@codel.babcock.edu.ng

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## Abstract

We test the boomerang effect in remittances (the effect of remittances on imports) for the top two global remittances recipients – China and India – and the top two recipients in Africa – Egypt, and Nigeria – from 1981 to 2019. The first two countries have more domestically developed productive capacities than the last two countries, making them (China and India) potentially able to shrug off a remittance boomerang than Egypt and Nigeria. We find asymmetry in the relationship between remittances and imports in Nigeria using the nonlinear autoregressive distributed lag (NARDL) model of Shin et al. (2014). We mostly find positive asymmetric effects in the short- and long-run, thus confirming the boomerang effect in Nigeria. For Egypt, we find a short-run, OLS asymmetric positive effect of remittances on imports, confirming the boomerang effect. The short-run OLS symmetric effect of remittances on imports in China and India is negative, refuting the boomerang effect in both countries. To reduce the boomerang effect in Nigeria and Egypt, efforts must be made to improve and expand the productive capacity of the domestic economy so that most of the inward remittances will be spent on commodities produced in the domestic economy, and reduce imports.

**Keywords:** Asymmetry, Boomerang, NARDL, Remittances.
**JEL Classification:** F24, F41, C22.

## 1. Introduction

The boomerang effect describes a situation where remittances flow into countries and are spent on financing imports from abroad, leading to such inflows (remittances) flowing back abroad, thereby reducing the employment effect of remittances. This phenomenon is possible in countries with less developed productive capacity; such that those goods and services (in terms of quality) that are sought abroad are not produced locally (see Straubhaar, 1985; Nikas and King, 2005).

Migrant remittances are increasingly becoming an important source of external finance for developing countries, helping recipient households fund necessities. It has grown to represent the biggest source of foreign exchange earnings for low-and middle-income countries (Barne and Pirlea, 2019). Although remittances are categorized as private finance and should not be equated with other flows of international finance, however, total remittances to developing countries in 2019 amounted to US$554 billion, more than triple the annual amount of Official Development Assistant (ODA), and surpassing total foreign direct investment (FDI) (IFAD, 2022).

The significant growth in remittance flows over time has also made it an important subject of empirical inquiry in the literature. As such, the literature is proliferated with scientific studies examining a vast range of remittance-related issues at cross-country and country-specific levels. Some of these issues include determinants of remittances (Carling, 2008; Lin, 2011; Hines and Simpson, 2019; Adenutsi and Ahortor, 2021), channels used in remitting (Mannan and Wei, 2009; Kosse and Vermeulen, 2014; Apanisile, 2021), and more importantly, the economic outcomes of remittances in recipient countries (Fayissa and Nsiah, 2010; Irdam, 2012; Amuedo-Dorantes and Pozo, 2012; Amuedo-Dorantes and Puttitanon, 2014; Mehedintu et al., 2020). Among the latter, remittances have been shown to have positive impacts on the balance of payments than other financial flows such as ODA, FDI, or foreign loans, explained by the fact that, unlike the other financial flows, the usage of remittances is not tied to developmental projects with a high volume of imported inputs, attract no interest rate and are not even expected to be paid back (Hougaard, 2008).

However, noteworthy is the fact that apart from the positive effects of remittances on balance of payments and aggregate economic growth, remittances could also have negative economic effects in recipient countries. A significant determinant of the potential negative economic effect of remittances, especially on production, inflation, and imports, relates to how the remittance income is spent or invested. Remittance income increases the purchasing power of recipient households, and by extension, increases their effective demand. The ability of domestic supply to react to meeting the remittance-induced increased demand is important in determining whether remittances will bring about an increased employment effect or a surge in inflationary pressures, as well as the extent of the need for additional imports. The latter has implications for the current account and trade balance. An increase in the propensity to import due to increased remittances would lead to a decline in the current account balance and will cause a negative trade balance, especially in a country with a weak domestic production base. This is the boomerang effect of remittances.

In the literature, studies on remittances are replete. However, most of these studies have tilted towards the positive effects of remittances on recipient economics. As such, while the positive impacts of remittances have been well pronounced, little evidence exists on how remittances negatively affect receiving economies. We attempt to fill this important gap in the literature by examining the relationship between remittances and import spending. We aim to see whether increasing remittances income fuels more imports. We do this by focusing on the two biggest global and African recipients of remittances (China and India, Nigeria and Egypt respectively). This is compelling as it allows us to be able to compare the sign and magnitude of impacts across these countries differentiated by domestic productive capacities.

The study's contribution to the literature is in two areas. First, we employed an asymmetric approach to examining the impact of remittances on imports. This enables us to capture the import-effects of both negative and positive changes in remittances. This is motivated on the basis that if there is an unprecedented increase in remittances, there could be an upward pressure in imports, especially by countries that have been identified to have very small domestic manufacturing capacity – Nigeria and Egypt. An unprecedented downward pressure in remittances could make domestic demand more appealing than imports, thus there could be a decline in the demand for imports. Being able to separate the positive and negative changes in remittances will make these effects (unprecedented upward or downward shifts in remittances) more obvious.

Secondly, the study controlled for structural breaks which could have otherwise rendered the results biased. We built a non-linear autoregressive distributed lag (NARDL) model for Nigeria while a short-run asymmetric OLS model was developed for Egypt, China, and India because we could only find long-run relationships and asymmetry in Nigeria alone.

Our results show a negative link between remittances and imports in China and India but a positive relationship was found in Nigeria and Egypt. Impliedly, while an increase in remittances brings about a decline in imports in China and India, it leads to an increase in imports in Nigeria and Egypt. This result is explained because while both China and India have relatively larger domestic economies to avert a remittance boomerang, the same cannot be said of Nigeria and Egypt. Remittance-receiving households in China and India are more likely to find a domestically produced array of goods and services on which they can spend their remittance income, and thus have a lesser propensity to import than their African counterparts. This means that while the remittance boomerang holds in Nigeria and Egypt, it does not exist in China and India, explainable by differences in economic complexities and domestic productive structures. Nigeria and Egypt, therefore, have a lot to learn from China and India in avoiding the boomerang effect

of remittances. Apart from filling important literature gaps, this study is important for the design and implementation of policy actions in Nigeria and Egypt, and the African continent generally.

## 2. Literature Review

As earlier noted, remittance has been a significant subject of empirical inquiry in the literature owing to its increasing importance. As such, the literature on remittances continues to grow as scholars continue to ask important questions to provide new evidence regarding the dynamics of remittances across countries and regions. However, despite the burgeoning literature on remittances, studies have largely focused on the positive effects of remittances. Although some attempts have also been made to unravel possible negative effects of remittances, especially by examining the Dutch Disease effect of remittances through its impact on exchange rate, current account balance, balance of payments, and trade balance, extant studies in this regard have mostly employed panel data analytical approaches involving several countries. One of the limitations of panel data studies is the inability to generate results and implications at specific country levels. To avoid the generalization problem that is characteristic of panel data studies, we contribute to this effort by examining the imports linkage with remittances at country-levels for four countries. The countries were selected based on the need to make a comparison between top remittance-receiving countries in Africa and the highest recipients of remittances in the world.

The remittances literature identified two general channels through which remittances could affect the trade balance of recipients' economies. These are the exchange rate and the savings channels. The savings channel is when recipients in financial institutions save a larger share of remittances. Through the financial intermediation role of these institutions, the saved funds may be channeled to productive sectors, which will help in the local production of goods that may substitute manufactured imports and promote exports (Schiantarelli, 2005; Kandil and Mirzaie, 2011). However, if domestic capacity gaps exist and the additional consumption demand created by the increase in remittances cannot be met by domestic production, this results in inflationary pressures and an increase in imports. This is the boomerang effect of remittances.

On the exchange rate channel, an increase in the volume of remittances inflows increases the inflow of foreign exchange, which may result in exchange rate appreciation for the recipient economy. The appreciation in exchange rate may make the country's exports more expensive and unaffordable and thus, reduce trade competitiveness with attendant consequences for trade balance and economic growth. This is the Dutch Disease phenomenon (Amuedo-Dorantes and Pozo, 2004). In addition, exchange rate appreciation makes imports cheaper and affordable due to increased purchasing power, and this may lead to an increase in

imports especially if the domestic economy cannot respond to meet the additional demand induced by increased remittance income. Again, this is the boomerang effect of remittances.

Strubhaar (1985) is one of the studies that have explored the subject matter by estimating the contribution of remittances to economic activities, including imports, in five Mediterranean and Iberian remittance-receiving countries between 1960 and 1981. The study could not confirm that a boomerang effect of remittances existed in these countries as only six percent of total remittances inflows was spent directly on the importation of foreign goods while the rest stayed within the domestic economy. The result is in contrast with that of Hernández and Toledo (2020) who examined the economic impact of international remittances on different import categories of eight Latin American countries between 1991 and 2004. Using the panel vector autoregressive technique, the study found that remittances increase imports of; capital, consumption, and intermediate goods. Bashier (2018) found similar results studying the impact of remittances on the import demand function of Jordan. Using the autoregressive distributed lagged model, the study concluded that remittance has a positive relationship with imports in the long run. The result is the same as that of Saad (2015) who found that an increase in remittances causes a corresponding increase in consumption, imports, investment, and income in Palestine.

Some studies reported no significant link between remittances and imports. For instance, Iliescu (2019) examined the existence of common trends in the relationship between imports and remittances in 11 Central and Eastern European countries. Using the Engle-Granger two-step procedure, the study found no long-run common trend between any two countries. In addition, Sanusi and Oderinde (2020) examined the link between remittances inflows and import spending in Nigeria through the lenses of the COVID-19 pandemic, using annual secondary data from 1980 to 2019. Using the vector autoregressive technique, the study found that remittance inflows do not significantly influence import spending in Nigeria.

Some studies confirm the Dutch disease effect of remittances. These include Amuedo-Dorantes and Pozo (2004) who assessed the impact of workers' remittance on the real exchange rate of 13 Latin American and Caribbean countries. Using the panel unit root test, the study revealed the existence of Dutch disease such that remittances appreciate the real exchange rate and therefore, reduce the international competitiveness of these countries. Similarly, Lartey (2018) analyzed the effect of remittances on the current account of emerging and developing economies and, how exchange rate flexibility influences the relationship. The study showed a positive effect of remittances on the current account and a possibility of the Dutch disease problem. The result is similar to that of Mousa et al., (2018) who used correlation and regression techniques and found

a significant positive relationship between remittances inflows and current account deficit in Jordan. Ito (2019) also explored the Dutch disease effect of remittances in Georgia using the vector error correction model to analyze quarterly data covering 2000 to 2016 and found that remittances lead to the appreciation of real effective exchange rates in the long run. Furthermore, Farzanegan and Hassan (2020) investigated the link between remittances and trade balances in a sample of 11 MENA countries, controlling for the role of capital formation in the recipient economy. The study used both the panel OLS and two stages of least square fixed-effect methods to analyze data on the selected countries over the 1980-2013 period. The results showed that remittance inflow increases trade balance, with the final effect depending on the level of capital formation in the domestic economy. Conversely, Amin and Murshed (2017) examined the relationship between remittances and exchange rates using the auto-regressive distribution lag and found a negative correlation between remittances and the real exchange rate, which does not translate into the Dutch disease problem.

It is obvious from the foregoing that there is no clear-cut empirical evidence as to the exact relationship between remittances and import spending, especially from the countries under study. Indications from extant studies are that the remittances-imports relation could depend on domestic productivity. If remittance-receiving households could easily find domestically produced goods and services they could spend their remittance incomes on, they would be less likely to import. We fill this important gap in the literature by examining the relationship between remittances and import spending by focusing on the two largest remittance-receiving countries in Africa (Nigeria and Egypt) and in the world (China and India). Nigeria, Egypt, China, and India received about $23.8 billion, $26.8 billion, $68.4 billion, and $82.7 billion respectively according to KNOMAD/World Bank (2020). This selection is compelling and important in stressing the point that the study is trying to make, considering that China and India are more industrialized than Nigeria and Egypt. It then enables us to make comparisons based on domestic productive structure as our empirical analyses are done at country-specific levels.

## 3. Theoretical Framework, Methodology and Data Description

### 3.1 Theoretical Framework

This study empirically examines the effect of remittances on imports (boomerang effect) in Egypt, Nigeria, China, and India. The "boomerang theory" or boomerang effect, that is, the relationship between remittances inflow and imports may have been mentioned first by Straubhaar (1985), but not ascertained for Portugal, Spain, Italy, Greece, and Turkey. Not ascertaining this effect may have been because of several reasons: (1) a highly developed domestic manufacturing base, which largely, caters to consumption (2) a low propensity to import.

This study is motivated based on the countries sampled are high recipients of remittances, but vary in both levels of development of domestic manufacturing bases and propensities to import. Thus, the boomerang effect may be more prevalent in some than in others. Across the world, China and India belong to the top ten countries with the share of global manufacturing output; China accounts for 28.4% of global output while India accounts for 16.6% (see Richter, 2020). While Egypt and Nigeria are among the top three manufacturers in Africa, they do not account for much of the global manufacturing output (OECD, 2021). Given the large manufacturing base of China and India, we posit that the boomerang effect may not be present in these countries, but may be present in Egypt and Nigeria.

## 4. Methodology

This paper contributes to the literature in two ways. The paper employs the NARDL model developed by Shin et al. (2014), which is an expansion of the linear type developed by Pesaran et al. (2001) to examine the relationship between remittances and imports. While the NARDL model was most suited for Nigeria, a short-run asymmetric OLS model was developed for China, India, and Egypt given that no long-run relationship was established nor a long-run asymmetry in the countries except Nigeria. Additionally, the paper controls for structural breaks. Not controlling for structural breaks could bias the regression results. The variables selected for this study are in line with Aziz and Bahban's (2012) import demand function for developing countries. Before specifying the NARDL model, we will specify a linear ARDL model relating remittances (and other control variables) to imports, this is presented in Equation (1):

$$\Delta IMP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta IMP_{t-i} + \sum_{i=0}^{q} \beta_i \Delta REM_{t-i} + \sum_{i=0}^{r} \delta_i \Delta EXR_{t-i} + \sum_{i=0}^{s} \chi_i \Delta FR_{t-i} + \sum_{i=0}^{t} \phi_i \Delta RGDP_{t-i} + \varphi_1 IMP_{t-1} + \varphi_2 REM_{t-1} + \varphi_3 EXR_{t-1} + \varphi_4 FR_{t-1} + \varphi_5 RGDP_{t-1} + \varepsilon_t \quad (1)$$

where $-\frac{\alpha_0}{\varphi_1}, -\frac{\varphi_2}{\varphi_1}, -\frac{\varphi_3}{\varphi_1}, -\frac{\varphi_4}{\varphi_1}$ and $-\frac{\varphi_5}{\varphi_1}$ are the long-run coefficients for the intercept and slope respectively, while $\alpha_i, \beta_i, \delta_i, \chi_i$ and $\phi_i$ are the optimal lags on the first-differenced variables selected by the Schwarz Information Criterion (SIC). In Pesaran et al. (2001), the long-run relationship between imports and remittances is achieved by imposing zero restrictions on the long-run estimated coefficients of the one-period lagged level of IMP and other independent variables. Hence, the null hypothesis of no long-run relationship is stated such that $H_0$: $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0$ This hypothesis of a long-run relationship is tested using the Wald (F-statistic) test. Two critical bounds values are computed for any significance: the lower value which assumes that all the variables are I(0) and the upper value which

assumes that all the variables are I(1). If the calculated F-statistics is greater than the upper bound, there is a long-run relationship (that is, cointegration), if it is less than the lower bounds, there is no long-run relationship; the relationship is inconclusive if the value of the F-statistic lies between the upper and lower bounds (Fasanya et al., 2021).

Equilibrium between imports and remittances may be difficult to capture given lags and the adjustment process. To capture the speed of adjustment in the long run between imports and remittances, an error correction model will be specified thus:

$$\Delta IMP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta IMP_{t-i} + \sum_{i=0}^{q} \beta_i \Delta REM_{t-i} + \sum_{i=0}^{r} \delta_i \Delta EXR_{t-i} + \sum_{i=0}^{s} \chi_i \Delta FR_{t-i} + \sum_{i=0}^{t} \phi_i \Delta RGDP_{t-i} + ecm_{t-1} + \nu_t \quad (2)$$

To account for structural breaks in the model, rather than create time dummies that may lead to parameter proliferation, the break date for each series was filtered from the series itself. We adopt the three-step method of (Salisu and Obiora, 2021): *first*, we use the ADF method for determining the break dates for each series. *Secondly*, we construct a dummy variable for each of the break periods and regress each of the variables against the dummy. Step two is illustrated with Equation (3):

$$y_t = \vartheta + \sum_{j=1}^{N} \iota_j D_{jt} + \mu_t \quad (3)$$

where $y$ is the series to be break-adjusted; $D_j$ is 1 for each and zero otherwise. *Thirdly*, the break-adjusted series is determined by estimating $y_t^d = y_t - \sum_{j=1}^{N} \hat{\iota}_j D_{jt}$. Using the break-adjusted series, the ARDL model is thereafter estimated.

The potential role of asymmetries in the short- and long-run of the series is considered by Shin et al. (2014). In this study, the decomposition of remittances (REM) into positive and negative changes was used. This decomposition is necessary because imports could respond differently to positive and negative changes in remittance, which is compelling for robustness purposes as this helps us to compare the results from both dimensions against each other. The decomposition of remittances into its positive ($REM_t^+$) and negative ($REM_t^-$) partial sums to show increases and decreases is shown thus:

$$REM_t^+ = \sum_{j=1}^{t} \Delta REM_j^+ = \sum_{j=1}^{t} max(\Delta REM_j, 0) \quad (4)$$

$$REM_t^- = \sum_{j=1}^{t} \Delta REM_j^- = \sum_{j=1}^{t} min(\Delta REM_j, 0) \quad (5)$$

Following Shin et al. (2014), a linear ARDL can be modified to accommodate asymmetries, thus becoming a non-linear ARDL (NARDL) model, specified thus:

$$\begin{aligned}\Delta IMP_t &= \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta IMP_{t-i} + \left( \sum_{i=0}^{q} \beta_i^+ \Delta REM_{t-i}^+ + \beta_i^- \Delta REM_{t-i}^- \right) \\ &+ \sum_{i=0}^{r} \delta_i \Delta EXR_{t-i} + \sum_{i=0}^{s} \chi_i \Delta FR_{t-i} + \sum_{i=0}^{t} \phi_i \Delta RGDP_{t-i} \\ &+ \varphi_1 IMP_{t-1} + \varphi_2^+ REM_{t-1}^+ + \varphi_2^- REM_{t-1}^- + \varphi_3 EXR_{t-1} + \varphi_4 FR_{t-1} + \varphi_5 RGDP_{t-1} + \varepsilon_t\end{aligned} \quad (6)$$

To include an error correction term, Equation (6) can be rewritten thus:

$$\begin{aligned}\Delta IMP_t &= \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta IMP_{t-i} + \left( \sum_{i=0}^{q} \beta_i^+ \Delta REM_{t-i}^+ + \beta_i^- \Delta REM_{t-i}^- \right) \\ &+ \sum_{i=0}^{r} \delta_i \Delta EXR_{t-i} + \sum_{i=0}^{s} \chi_i \Delta FR_{t-i} + \sum_{i=0}^{t} \phi_i \Delta RGDP_{t-i} + \lambda ecm_{t-1} + \mu_t\end{aligned} \quad (7)$$

In Equation (7), $ecm_{t-1}$=$IMP_{t-1} - \zeta^+ REM_{t-1}^+ - \zeta^- REM_{t-1}^-$and it is the non-linear error correction; $\lambda$is the parameter measuring the speed of adjustment; the long-run parameters are represented by:

$\zeta^+ = -\frac{\varphi_2^+}{\varphi_1}$ and $\zeta^- = -\frac{\varphi_2^-}{\varphi_1}$;

the short-run adjustment parameters are $\beta_i^+$ and $\beta_i^-$.

Long-run in the NARDL is tested the same way the long run is tested in the linear ARDL– through Bounds testing using the *F* statistic. In the NARDL, the null hypothesis of no cointegration is tested so that $H_0$: $\varphi_1 = \varphi_2^+ = \varphi_2^- = 0$is tested against the alternative hypothesis of $H_1$:$\varphi_1 \neq \varphi_2^+ \neq \varphi_2^- \neq 0$. To be sure that there is indeed the presence of long-run and short-run asymmetry, the Wald test will be used; the test will be the null of no asymmetry, that is $H_0$: $\varphi_2^+ = \varphi_2^- = 0$against the alternative of asymmetry, that is $H_1$: $\varphi_2^+ \neq \varphi_2^- \neq 0$. The additive symmetry in the short-run can also be tested with no asymmetry that is $H_0$: $\sum_{i=0}^{l} \beta_i^+ = \sum_{i=0}^{l} \beta_i^- = 0$against the alternative of asymmetry, that is $H_1$: $\sum_{i=0}^{l} \beta_i^+ \neq \sum_{i=0}^{l} \beta_i^- \neq 0$ .

## 5. Data Description

This study tests the boomerang effect in remittances in the two biggest global and African recipients of remittances by examining the effect of remittances (REM) on imports (IMP); control variables employed in the analysis include exchange rate (EXR), foreign reserve (FR) and real gross domestic product (RGDP).

Yearly data was used for the analysis and they spanned 1981 to 2019. This period was chosen not just for the availability of data, but because remittances and imports showed considerable movement in the period under review (World Bank

Group, 2022; Ortiz-Ospina and Beltekian, 2018). All data is sourced from the World Bank's World Development Indicators (WDI), apart from the data on Chinese imports, which is obtained from the IMF Database. The data on the exchange rate is measured in terms of the period average of local currency unit to the US dollar, FR is composed of gold reserves, foreign exchange held by monetary authorities, reserves, and special drawing rights with the IMF, IMP is the monetary value of goods and services received from other countries expressed in millions of US dollars, remittances represent transfers from migrants outside their home countries. All the series are expressed in millions of US dollars and transformed into the natural logarithmic form for estimation, while the data on remittances was adjusted for 2010 US prices using the US data on annual consumer price index (CPI) sourced from FRED Stlouis. The data described so far, for the study can be visualized in Figure 1.

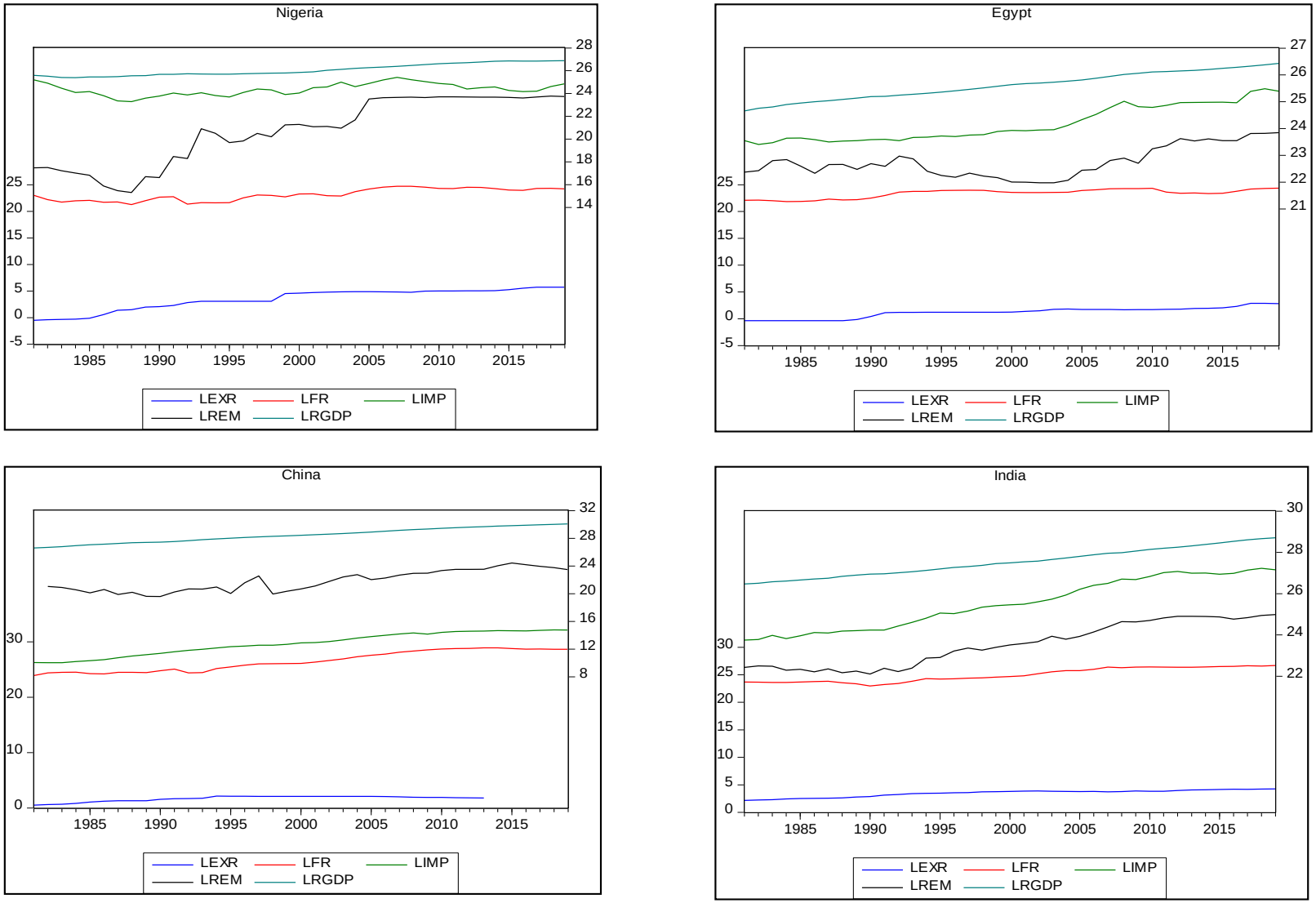


**Figure 1.** Trends in Remittances, Imports, and Other Selected Variables

**Source:** Research finding, 2022.

## 6. Results and Discussion

In terms of the average values for remittances, Egypt has more than Nigeria and China, while India has the most. Average imports for the period were least for China and most for India, which may point to the superior domestic ability to meet most needs by China over the other economies in the study. The standard deviation indicates that all the variables have varying degrees of variation. It is noteworthy that apart from the exchange rate for China and India, all other variables for all the countries under review are positively skewed. The kurtosis shows the variables are either platykurtic or leptokurtic. The series for the four countries considered in the study are either normally distributed or not, as observed in their J-B statistics.

In Figure 1, the possible co-movement in the variables for each of the countries sampled is shown. It is observed that imports and remittances, including other variables considered for this study (foreign reserve, real gross domestic product, and exchange rate) maintain a relationship.

**Table 1.** Descriptive Statistics

| | | | **Nigeria** | | |
|---|---|---|---|---|---|
| | EXR | FR | IMP | REM | RGDP |
| Mean | 94.14346 | 1.90E+10 | 4.43E+10 | 7.76E+09 | 2.40E+11 |
| Median | 101.6973 | 1.00E+10 | 3.94E+10 | 1.44E+09 | 1.68E+11 |
| Maximum | 306.9210 | 5.46E+10 | 1.10E+11 | 2.11E+10 | 4.77E+11 |
| Minimum | 0.617708 | 1.72E+09 | 1.30E+10 | 4470565. | 1.07E+11 |
| Std. Dev. | 92.82186 | 1.73E+10 | 2.37E+10 | 9.19E+09 | 1.29E+11 |
| Skewness | 0.810180 | 0.659910 | 0.934100 | 0.478208 | 0.702564 |
| Kurtosis | 2.854578 | 1.959501 | 3.179934 | 1.264606 | 1.930168 |
| Jarque-Bera | 4.300915 | 4.589918 | 5.724146 | 6.380274 | 5.068256 |
| Probability | 0.116431 | 0.100766 | 0.057150 | 0.041166 | 0.079331 |
| Observations | 39 | 39 | 39 | 39 | 39 |
| | | | **Egypt** | | |
| | EXR | FR | IMP | REM | RGDP |
| Mean | 4.920049 | 1.84E+10 | 3.98E+10 | 9.02E+09 | 1.49E+11 |
| Median | 3.472050 | 1.77E+10 | 2.45E+10 | 6.92E+09 | 1.36E+11 |
| Maximum | 17.78253 | 3.80E+10 | 1.17E+11 | 2.28E+10 | 3.02E+11 |
| Minimum | 0.700001 | 3.12E+09 | 1.47E+10 | 3.51E+09 | 5.13E+10 |
| Std. Dev. | 4.342747 | 1.10E+10 | 2.91E+10 | 5.81E+09 | 7.31E+10 |
| Skewness | 1.740505 | 0.160103 | 1.144731 | 1.165573 | 0.487979 |
| Kurtosis | 5.931610 | 1.995767 | 3.244744 | 3.035088 | 2.000385 |
| Jarque-Bera | 33.65662 | 1.805402 | 8.614993 | 8.832643 | 3.171551 |
| Probability | 0.000000 | 0.405473 | 0.013467 | 0.012079 | 0.204789 |
| Observations | 39 | 39 | 39 | 39 | 39 |
| | | | **China** | | |
| | EXR | FR | IMP | REM | RGDP |
| Mean | 6.249471 | 7.72E+11 | 628025.5 | 4.24E+09 | 2.58E+12 |
| Median | 6.800843 | 2.02E+11 | 288063.2 | 1.33E+09 | 1.84E+12 |
| Maximum | 8.618743 | 3.63E+12 | 2219076. | 1.67E+10 | 7.75E+12 |

| | | | | | |
|---|---|---|---|---|---|
| Minimum | 1.892542 | 3.27E+10 | 22844.41 | 3.27E+08 | 3.90E+11 |
| Std. Dev. | 2.208626 | 1.12E+12 | 716583.0 | 5.15E+09 | 2.17E+12 |
| Skewness | -0.662544 | 1.443587 | 1.083221 | 1.358294 | 1.001537 |
| Kurtosis | 2.058991 | 3.583225 | 2.722632 | 3.574198 | 2.820524 |
| Jarque-Bera | 3.521805 | 11.56790 | 6.360538 | 10.27941 | 5.392692 |
| Probability | 0.171890 | 0.003077 | 0.041574 | 0.005859 | 0.067452 |
| Observations | 32 | 32 | 32 | 32 | 32 |
| | | | **India** | | |
| | EXR | FR | IMP | REM | RGDP |
| Mean | 37.95440 | 1.37E+11 | 2.26E+11 | 2.72E+10 | 1.13E+12 |
| Median | 43.05543 | 5.20E+10 | 1.14E+11 | 1.63E+10 | 8.73E+11 |
| Maximum | 70.42034 | 3.95E+11 | 6.67E+11 | 7.11E+10 | 2.94E+12 |
| Minimum | 8.658523 | 9.41E+09 | 2.06E+10 | 3.98E+09 | 3.13E+11 |
| Std. Dev. | 18.71469 | 1.34E+11 | 2.21E+11 | 2.44E+10 | 7.72E+11 |
| Skewness | -0.078503 | 0.567883 | 0.713453 | 0.636147 | 0.902108 |
| Kurtosis | 1.946083 | 1.630250 | 1.900572 | 1.735002 | 2.666979 |
| Jarque-Bera | 1.845013 | 5.145045 | 5.272801 | 5.230793 | 5.469913 |
| Probability | 0.397521 | 0.076343 | 0.071619 | 0.073139 | 0.064897 |
| Observations | 39 | 39 | 39 | 39 | 39 |

**Source:** Research finding, 2022

Finally, two types of unit root tests were chosen for this study – the conventional Augmented Dickey-Fuller (ADF) test (without structural breaks) and the Perron-Vogesland test (with structural break). Table 3 reports the results of the unit root tests, which adopted both methods highlighted above. The results of the unit root test are mixed. The unit root tests show the presence of unit root in the level forms of all the variables except exchange rate for Egypt and China and real income for Egypt only. The other variables which still have unit root at level became stationary after their first differencing. The ARDL method proposed by Pesaran and Shin (1999) can be used to model series that have mixed order of stationarity or are all stationary after their first differencing.

**Table 2.** Correlation Matrix

| **Nigeria** | | | | | |
|---|---|---|---|---|---|
| Correlation | exr | fr | imp | rem | rgdp |
| exr | 1.000000 | | | | |
| fr | 0.133932 | 1.000000 | | | |
| imp | -0.366812 | 0.427438 | 1.000000 | | |
| rem | 0.169283 | 0.532924 | 0.478613 | 1.000000 | |
| rgdp | 1.000000 | 0.133932 | -0.366812 | 0.169283 | 1.000000 |
| **Egypt** | | | | | |
| Correlation | exr | fr | imp | rem | rgdp |
| exr | 1.000000 | | | | |
| fr | -0.128734 | 1.000000 | | | |
| imp | 0.243289 | 0.321093 | 1.000000 | | |
| rem | 0.371746 | -0.192707 | -0.379769 | 1.000000 | |
| rgdp | 0.819426 | -0.331967 | 0.229241 | 0.335369 | 1.000000 |
| **China** | | | | | |
| Correlation | exr | fr | imp | rem | rgdp |
| exr | 1.000000 | | | | |
| fr | -0.491581 | 1.000000 | | | |
| imp | 0.340567 | -0.066343 | 1.000000 | | |
| rem | -0.161259 | 0.202296 | -0.193482 | 1.000000 | |
| rgdp | 0.412907 | -0.435451 | 0.343985 | -0.244471 | 1.000000 |
| **India** | | | | | |
| Correlation | exr | fr | imp | rem | rgdp |
| exr | 1.000000 | | | | |
| fr | 0.029646 | 1.000000 | | | |
| imp | 0.054022 | 0.367815 | 1.000000 | | |
| rem | 0.395723 | 0.684917 | 0.105624 | 1.000000 | |
| rgdp | 0.395532 | 0.800862 | 0.173827 | 0.733710 | 1.000000 |

**Source:** Research finding, 2022.

Tables 2 shows that in most parts, the series are highly correlated without any form of adjustments. Using the variables like that in estimation will create the problem of multicollinearity. Hence, to combine the series in estimation, each was adjusted for structural break. Table 3 shows the break date for each series using the Perron-Vogesland break test[1]. However, for Nigeria, given that both the non-break adjusted series for real GDP and exchange rate maintain a very high correlation, real GDP was dropped in the final estimation for Nigeria.

[1]. Only the break date corresponding to the point of stationarity of each series is used for the break-adjusted series.

**Table 3.** Unit Root Test

| **Nigeria** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Augmented Dickey-Fuller (ADF)** | | | | **ADF Unit Root with Structural Break (Perron-Vogesland test)** | | |
| | **LEVEL** | | | | **LEVEL** | | |
| | Constant | Constant and Trend | None | | Constant | Constant and Trend | Break Date |
| *lexr* | -2.090901 | -1.252519 | 1.823013 | *lexr* | -3.542354 | -3.073599 | 1985 |
| *lfr* | -1.011745 | -3.264475* | 0.378935 | *lfr* | -3.782815 | -4.015369 | 2003 |
| *limp* | -1.936263 | -2.921933 | -0.243131 | *limp* | -3.655393 | -3.686813 | 2011 |
| *lrem* | -0.78334 | -2.069715 | 1.295426 | *lrem* | -3.131496 | -3.440434 | 1990 |
| *lrgdp* | 0.026217 | -1.512152 | 2.583220 | *lrgdp* | -2.680489 | -5.262900*** | 2001 |
| | **FIRST DIFFERENCE** | | | | **FIRST DIFFERENCE** | | |
| *lexr* | -5.205054*** | -5.608917*** | -4.215595*** | *lexr* | -7.745874*** | -7.512841*** | 1999 |
| *lfr* | -5.589166*** | -5.466655*** | -5.589554*** | *lfr* | -6.554084*** | -6.472704 | 1992 |
| *limp* | -4.838271*** | -4.900563*** | -4.917255*** | *limp* | -5.750528*** | -5.873951 | 2007 |
| *lrem* | -6.347409*** | -6.257220*** | -6.082964*** | *lrem* | -7.072005*** | -7.911522 | 1988 |
| *lrgdp* | -3.856836*** | -3.764123** | -2.201079** | *lrgdp* | -4.326525* | -5.105410** | 2000 |
| **Egypt** | | | | | | | |
| | **Augmented Dickey-Fuller (ADF)** | | | | **ADF Unit Root with Structural Break (Perron-Vogesland test)** | | |
| | **LEVEL** | | | | **LEVEL** | | |
| | Constant | Constant and Trend | None | | Constant | Constant and Trend | Break Date |
| *lexr* | -1.190915 | -2.986355 | 0.315226 | *lexr* | -7.315812*** | -3.870386 | 2016/1989 |
| *lfr* | -1.706263 | -2.316298 | 0.880738 | *lfr* | -3.569837 | -3.918507 | 1989/2010 |
| *limp* | 0.671160 | -2.081310 | 2.595386 | *limp* | -2.472062 | -3.854354 | 2003/2004 |
| *lrem* | -0.375376 | -1.161150 | 1.124578 | *lrem* | -2.780784 | -3.421867 | 2009/1993 |
| *lrgdp* | -0.426726 | -5.009215*** | 3.996609 | *lrgdp* | -3.165897 | -5.741153*** | 2003/2010 |
| | **FIRST DIFFERENCE** | | | | **FIRST DIFFERENCE** | | |
| *lexr* | -3.487582** | -3.422167* | -3.095336*** | *lexr* | -4.645531** | -4.845596* | 1991 |
| *lfr* | -3.652496*** | -3.615072** | -3.535416*** | *lfr* | -6.049553*** | -5.771788*** | 2001 |
| *limp* | -5.072799*** | -5.030915*** | -4.355964*** | *limp* | -5.256323*** | -6.367355*** | 2008 |
| *lrem* | -6.084862*** | -6.193591*** | -5.970504*** | *lrem* | -6.753258*** | -7.021106*** | 2003 |
| *lrgdp* | -3.903350*** | -3.775175** | -1.709767* | *lrgdp* | -4.687747** | -4.654007* | 1991 |

| **China** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Augmented Dickey-Fuller (ADF)** | | | | **ADF Unit Root with Structural Break (Perron-Vogesland test)** | | |

| | LEVEL | | | | LEVEL | | |
|---|---|---|---|---|---|---|---|
| | Constant | Constant and Trend | None | | Constant | Constant and Trend | Break Date |
| *lexr* | -3.568986** | -0.881535 | 1.232463 | *lexr* | -3.915172 | -5.837496*** | 1994 |
| *lfr* | -0.816566 | -2.412149 | 3.199330 | *lfr* | -3.824833 | -4.616386* | 1992/1998 |
| *limp* | -2.094021 | 0.631396 | 6.744791 | *limp* | -3.958815 | -1.511907 | 1986/2012 |
| *lrem* | -1.150890 | -3.773490** | 0.513957 | *lrem* | -3.562301 | -4.341396 | 2001/2002 |
| *lrgdp* | -1.863666 | -2.562281 | 1.838052 | *lrgdp* | -3.792758 | -4.383500 | 1991/2016 |
| | **FIRST DIFFERENCE** | | | | **FIRST DIFFERENCE** | | |
| *lexr* | -3.933170*** | -5.634475*** | -3.674370*** | *lexr* | -8.473475*** | -8.279546 | 1994 |
| *lfr* | -2.499841 | -2.460334 | -1.995219** | *lfr* | -5.657533*** | -6.489612*** | 1992 |
| *limp* | -4.107489*** | -4.863551*** | -0.946957 | *limp* | -5.759937*** | -5.548957*** | 2008 |
| *lrem* | -6.196187*** | -6.129460*** | -6.043298*** | *lrem* | -7.804575*** | -7.500662*** | 1998 |
| *lrgdp* | -3.703081*** | -4.231030** | -1.041162 | *lrgdp* | -4.649753** | -4.630013* | 2002 |

**India**

| | **Augmented Dickey-Fuller (ADF)** | | | | **Unit Root with Structural Break (Perron-Vogesland test)** | | |
|---|---|---|---|---|---|---|---|
| | **LEVEL** | | | | **LEVEL** | | |
| | Constant | Constant and Trend | None | | Constant | Constant and Trend | Break Date |
| *lexr* | -2.768412* | -1.233852 | 2.120729 | *lexr* | -4.269461* | -4.033274 | 1988/1990 |
| *lfr* | 0.058539 | -1.954571 | 2.703554 | *lfr* | -2.920637 | -3.101958 | 1990/2001 |
| *limp* | -0.578727 | -1.298180 | 5.346183 | *limp* | -2.666499 | -2.544341 | 1991/2014 |
| *lrem* | 0.023263 | -2.284614 | 2.754420 | *lrem* | -2.802869 | -2.774838 | 1993/1995 |
| *lrgdp* | 1.744200 | -2.021819 | 20.22311 | *lrgdp* | -0.427838 | -4.148921 | 2003/1990 |
| | **FIRST DIFFERENCE** | | | | **FIRST DIFFERENCE** | | |
| *lexr* | -4.313499*** | -4.775011*** | -3.151391*** | *lexr* | -5.539725*** | -5.422587*** | 1994 |
| *lfr* | -4.256382*** | -4.214008** | -3.722370*** | *lfr* | -5.816912*** | -6.666987*** | 1990 |
| *limp* | -5.147560*** | -5.091608*** | -3.370768*** | *limp* | -5.857450*** | -6.151499*** | 2011 |
| *lrem* | -6.435873*** | -6.431472*** | -1.771448* | *lrem* | -8.481638*** | -8.696516*** | 1994 |
| *lrgdp* | -5.641198*** | -5.883628*** | -0.863569 | *lrgdp* | -6.441992*** | -6.257355*** | 1991 |

**Source:** Research finding, 2022.

**Note:** ***, ** and * imply significance at 1%, 5% and 10% respectively. All variables are in their natural logarithm form.

**Table 4.** Summary of Unit Root Test Results

| Variable | ADF Test Without Break *I(d)* | ADF Test with Break *I(d)* | ADF Test Without Break *I(d)* | ADF Test with Break *I(d)* | ADF Test Without Break *I(d)* | ADF Test with Break *I(d)* | ADF Test Without Break *I(d)* | ADF Test with Break *I(d)* |
|---|---|---|---|---|---|---|---|---|
| | **Nigeria** | | **Egypt** | | **China** | | **India** | |
| lexr | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(1) | I(1) |
| lfr | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) |
| limp | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) |
| lrem | I(1) | I(1) | I(1) | I(1) | I(0) | I(1) | I(1) | I(1) |
| lrgdp | I(1) | I(0) | I(0) | I(0) | I(1) | I(1) | I(1) | I(1) |

**Source:** Research finding, 2022.

**Table 5**. Bounds Test of cointegration

| | Nigeria | | | | Egypt | | | | China | | | | India | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Symmetry | | Asymmetry | | Symmetry | | Asymmetry | | Symmetry | | Asymmetry | | Symmetry | | Asymmetry | |
| **F-stat.** | 3.1197 | | 4.6232 | | 3.8977 | | 2.5930 | | 1.3699 | | 2.4465 | | 2.4167 | | 1.6203 | |
| **Critical Values** | | | | | | | | | | | | | | | | |
| **Significance** | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) |
| **10%** | 2.72 | 3.77 | 2.45 | 3.52 | 3.47 | 4.45 | 1.81 | 2.93 | 3.03 | 4.06 | 2.75 | 3.79 | 3.03 | 4.06 | 3.03 | 4.06 |
| **5%** | 3.23 | 4.35 | 2.86 | 4.01 | 4.01 | 5.07 | 2.14 | 3.34 | 3.47 | 4.57 | 3.12 | 4.25 | 3.47 | 4.57 | 3.47 | 4.57 |
| **2.5%** | 3.69 | 4.89 | 3.25 | 4.49 | 4.52 | 5.62 | 2.44 | 3.71 | 3.89 | 5.07 | 3.49 | 4.67 | 3.89 | 5.07 | 3.89 | 5.07 |
| **1%** | 4.29 | 5.61 | 3.74 | 5.06 | 5.17 | 6.36 | 2.82 | 4.21 | 4.4 | 5.72 | 3.93 | 5.23 | 4.4 | 5.72 | 4.4 | 5.72 |
| **Is there cointegration?** | No | | Yes | | No | | No | | No | | No | | No | | No | |

**Source:** Research finding, 2022.

**Note:** Cointegration is arrived at, at the 5% level of significance. We compare the F-stat of the Bounds test to the 5% significance level.

Given the objective of this study, we proceed first by determining if there is a long-run relationship among the series of interest in both the symmetric and asymmetric models. Results from the Bounds test for both the symmetric and asymmetric cointegration tests are presented in Table 5. From the results, it is found that only in Nigeria is long-run cointegration found, but only in the asymmetric model. Given that the other countries did not present long-run association between remittances and imports, a short-run model is estimated for them. After estimating the long-run and short-run models for Nigeria (for the model with asymmetry for which cointegration is found), and short-run models only for China, India, and Egypt, the presence of asymmetry is tested using the Wald test. The null hypothesis of the Wald test states that including the partial sums of the positive and negative changes in remittances is not significant. The result in Table 8 shows that there is no asymmetry for China and India (in their short-run models). Hence, we estimate the OLS model for China and India using the symmetric data of remittances without dividing the data into the positive and negative partial sums. For Egypt, asymmetry is found in remittances in the short-run. Hence, we estimate the OLS model for Egypt with the partial sums of remittances. For Nigeria, asymmetry is confirmed both in the short – and long-run. The implication of this is that imports in Egypt and Nigeria respond to unprecedented increases (decreases) in remittances.

In the short-run OLS result presented in Table 6, the asymmetric model for Egypt shows that the positive and negative partial sums of remittances present a similar result as the symmetric model – rising remittances, whether positive or negative have a positive effect on imports. While the signs are similar for both positive and negative changes in remittances, their magnitudes are different. For every percentage positive rise in remittances, imports rise by about 0.53%, while for every percentage negative rise in remittances, imports rise about 0.21%, thus, the effect of the positive rise, in terms of the magnitude of the parameters of both positive and negative changes is different; both effects are statistically significant at the 1% level.

For China, remittances exert a negative effect on imports. That is, for every percentage change in remittances, imports declined by about 0.02%; this result is not statistically significant and does not confirm the boomerang effect in China. For India, the result shows that remittances exert a negative effect on imports. That is, for every percentage change in remittances, imports fall by about 0.09%; this result is shown to be statistically significant at 5% level, thus confirming that the boomerang effect is not present in India.

The short- and long-run NARDL estimation for Nigeria is presented in Table7. The short-run asymmetric effect is interesting – while positive changes in remittances lead to rising imports, negative changes result in falling imports. More

specifically, for every percentage positive rise in remittances, imports rise by about 0.005%, while for every percentage fall in remittances, imports also fall by about 0.05%. These effects are not statistically significant.

The long-run asymmetric model presents both positive and negative changes in remittances as having the same effect on imports. In specific terms, for every percentage rise in positive remittances, imports rise by about 0.1%; this relationship is statistically significant. On the other hand, a rise in negative remittances leads to about 0.04% rise in imports, a relationship that is not statistically significant.

Overall, we can find that while the increase in remittances in China and India leads to declines in imports, in Nigeria and Egypt, it leads to a rise in imports. The result for China and India is in consonance with the findings of Strubhaar (1985). Compared to Nigeria and Egypt, China and India have considerably larger domestic economies to prevent remittances boomerang as seen in their substantially larger manufacturing bases. Households receiving remittances in these countries will most likely find available to them, domestically produced goods and services on which they can spend their remittances, rather than spend them on imported products. The result for Nigeria may be at variance to Oderinde (2020) because the study failed to account for the inherent structural breaks in the data for imports and remittances, which this current study does. Furthermore, the boomerang effect found in Nigeria and Egypt may be due to the low absorptive capacity of their domestic economies – compared to India and China. It is most likely that the boomerang effect is present in Nigeria because households receiving remittances do not find domestically produced goods and services on which they can spend their received remittances, thus confirming that countries with low productive capacity are susceptible to the boomerang that comes with rising remittances than countries with a large domestic productive capacity.

**Table 6.** OLS Results

| Variables | Egypt | China | India |
|---|---|---|---|
| Model | Asymmetric | Symmetry | Symmetry |
| Constant | 7.1898 (0.7917)*** | 0.1076 (0.0477)** | 0.1767 (0.0120)*** |
| Δrem | - | -0.0225 (0.0156) | -0.0881 (0.0103)*** |
| $\Delta rem^+$ | 0.5260 (0.0611)*** | - | - |
| $\Delta rem^-$ | 0.2100 (0.0241)*** | - | - |
| $\Delta exr^l$ | 0.2227 (0.0182)*** | 0.1051 (0.0514)* | -0.5508 (0.1504)*** |
| Δfr | -0.0947 (0.0182)*** | 0.0424 (0.0837) | 0.0816 (0.0458)* |
| $\Delta lrgdp^l$ | -0.2824 (0.0317)*** | -0.0741 (0.0116)*** | -0.1041 (0.0207)*** |
| @trend | -0.0317 (0.0008)*** | -0.0067 (0.0033)* | -0.0049 (0.0009)*** |
| F-stat. | 33.2657*** | 22.7202*** | 71.1712*** |
| Adj. $R^2$ | 0.8938 | 0.8578 | 0.9335 |
| J-B stat. | 1.5915 | 0.1076 | 1.2364 |
| Ramsey test | 1.5971 | 2.1482 | 3.2143 |

**Source:** Research finding, 2022

**Note:** ***, ** and * imply significance at 1%, 5% and 10% respectively. All variables are in their natural logarithm form. $^l$lexr was used at level for both Egypt and China. lrgdp was used at level for Egypt.

**Table 7.** NARDL Result for Nigeria

| **Variables** | **Model** |
|---|---|
| **Short-run results** | Asymmetric |
| Constant | 20.5440 (7.1182)*** |
| Δlimp (-1) | -0.3602 (0.1133)*** |
| Δexr | -0.5321 (0.2076)** |
| $\Delta rem^+$ | 0.0051 (0.0287) |
| $\Delta rem^-$ | -0.0477 (0.0335) |
| Δfr | 0.0673 (0.0556) |
| Δlrgdp | |
| $ecm_{t-1}$ | -0.3602 (0.0706)*** |
| **Long-run results** | |
| Constant | 51.2736 (6.3792)*** |
| exr | -1.1621 (0.2435)*** |
| $rem^+$ | 0.0977 (0.0327)*** |
| $rem^-$ | 0.0405 (0.0413) |
| fr | 0.1126 (0.0766) |
| F-stat | 23.5622*** |
| Adj $R^2$ | 0.7530 |
| J-B stat. | 1.4559 |
| Ramsey test | 0.6279 |
| Breusch-Godfrey LM test | 0.7658 |
| Breusch-Pagan-Godfrey Hetereoscedasticity test | 0.7638 |
| Lag selection (SIC) | 1,0,0,0,0 |

**Source:** Research finding, 2022.

**Note:** ***, ** and * imply significance at 1%, 5% and 10% respectively. All variables are in their natural logarithm form.

**Table 8**. Asymmetry Wald Test Result

| | Wald Statistic | Is there Asymmetry |
|---|---|---|
| Nigeria | 5.0161*** Short-run | Yes |
| | 6.7366** Long-run | Yes |
| Egypt | 5.7001*** Short-run | Yes |
| China | 0.1289 | No |
| India | 1.3525 | No |

**Source:** Research finding, 2022.

Apart from estimating the relationship between remittances and imports, this paper also explained other determinants of imports. The exchange rate in Egypt and China are found to be positively related to imports. That is, with depreciating exchange rates, import demand in Egypt and China rises; while this relationship is significant for Egypt, it is not significant for China. This relationship is strange because depreciating domestic currency vis-à-vis the US dollars should be negatively related to imports, but should help boost exports. However, given that this value is significant for Egypt, it may be related to its low level of industrialization and tradeable sectors compared to China. In effect, depreciating domestic currency, against the US dollars in Egypt may not reduce import demand. In India, the exchange rate is negatively and significantly related to imports, that is, appreciating the exchange rate (fall in Indian rupees relative to the US$) in India leads to fall in imports. This is understandable given that India has a large tradeable sector that can take advantage of falling domestic currency to ramp up exports and reduce imports.

Apart from Egypt, foreign reserves are found to be positively related to imports in China, India, and Nigeria. This means that higher foreign reserves in these countries lead to more import demand. This is not unusual given that high foreign reserve for any country is indicative of the potential to meet import obligations. Interestingly, and quite curiously, real gross domestic product is negatively related to imports in all the countries. This implies that the larger the domestic economy, the fewer imports are demanded. This may not be unconnected with the fact that domestic equivalent to previously demanded foreign goods becomes available, the more an economy's domestic economy expands, thus leading to a fall in demand for imports.

## 7. Conclusion and Policy Implication

This study has tested for and compared the boomerang effect in remittances (that is, the effect of remittances on imports) in the two leading global remittances recipients – China and India and Africa's two leading recipients- Egypt and Nigeria. We employed the NARDL estimation method for Nigeria and found asymmetric remittances effect on imports in Nigeria in both the short- and long-run, with positive change in remittances exerting a more significant positive effect

on imports in the long run than negative remittances change. In Egypt, we found no long-run relationship among the variables in consideration, thus we settled for a short-run asymmetric OLS analysis and found strong evidence of boomerang effect. For China and India, we neither found a long-run relationship among the variables nor an asymmetric effect; so, we estimated a short-run OLS model. The result did not present evidence of boomerang effect in both countries. Overall, the study concludes that the boomerang effect is present in Nigeria and Egypt, with the possibility of weakening the international competitiveness of both countries (Amuedo-Dorantes and Pozo, 2004). The boomerang effect is not present in China and India. The results for Nigeria and Egypt are similar to Hernández and Toledo (2020) and Bashier (2018); confirming that less developed economies may not have the level of absorptive domestic capacity that economies like China and India have for inward remittances.

The findings in this study are important for policymakers to consider, as the full benefit of the inflows that come in the form of remittances from migrants abroad may be lost by way of importation in the African countries of Nigeria and Egypt. Hence, policies that aim at enhancing the productive capacity of these economies must be pursued to avoid the boomerang in remittances. With better productive capacities in manufacturing, incentives for increased domestic consumption demand will most likely yield the desirable outcome of reducing imports, leading to industrial transformation and improving the overall economy of the countries where boomerang in remittances have been found.

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