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NATURAL RESOURCE RENTS-CAPITAL FLIGHT NEXUS IN SELECTED ECOWAS COUNTRIES: EVIDENCE FROM NON-LINEAR ARDL APPROACH

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ABSTRACT

The challenge of capital flight in the ECOWAS sub-region is worrisome. Huge revenue from natural resources also contributes to the relocation of available resources necessary for the development of the region. The study identifies the revenue from natural resources as a key driver of capital flight in the region. Hence, this study analyzed the effect of natural resource rents on capital flight in ECOWAS countries accounting for the role of asymmetry. Also, the study employed the nonlinear autoregressive distributed lag (NARDL) model to account for short-run and long-run asymmetries. The results revealed the presence of asymmetry in five countries, while two countries displayed symmetric effects. It also showed that the symmetric effect of natural resource rents on capital flight is weak for Guinea and Nigeria in the short-run while the long-run effect is not more pronounced for Nigeria. In the case of asymmetric effect, natural resource rents amplified capital flight in Cape Verde and Sierra Leone. Further evidence shows that the non-linearity of natural resource rents does not encourage capital flight in Burkina Faso, Cote d'Ivoire, and Ghana. Hence, the countries should promote transparency and accountability in the management of proceeds from natural resources to enhance development in the region.

Contribution/Originality: This study uses new estimation methodology to examine the relationship between total natural resource rents and capital flight in selected ECOWAS countries. This provides insight into whether high/low rents from natural resources are associated with high/low capital flight.

1. INTRODUCTION

The issue of capital flight has taken a center stage in the academic and policy milieu of developing countries most especially in sub-Saharan African countries. Though, there is no consensus among scholars on a single definition of capital flight. Studies by Ajayi (1995) and Ndikumana and Boyce (2003) explain capital flight as the transfer of capital by the non-bank sector. On the other hand, Ali and Walters (2011) view it as the acquisition of foreign assets by African agents. Also, Ndikumana, Boyce, and Ndiaye (2014) refer to the phenomenon of capital flight as the variance between inflows recorded and uses of foreign exchange recorded. But there is a consensus on what drives capital flight, capital flight occurs when there are capital outflows from the capital-scarce economies (mostly developing countries). Other studies that considered the definition, measures, and determinants of capital flight are: Cuddington (1986); Razin and Sadka (1991); Hermes, Lensink, and Murinde (2002); Pastor (1990); FitzGerald and Cobham (2000); Ndikumana and Boyce (2003) and Ali and Walters (2011). Some studies also examined the effect of capital flight on macroeconomic instability (such as inflation, large current account deficit, exchange rate issues, and debt.). These studies include Dooley (1986); Dooley and Kletzer (1994); Salisu (2005); Ashman, Fine, and Newman (2011) among others. For this study, the definition of Boyce and Ndikumana (2012) is appropriate as it takes into consideration unadjusted 'residual' measure, total trade misinvoicing, and unrecorded remittances in measuring capital flight. Historically, the phenomenon of capital flight started as far back as 1980s during the period of trade and financial liberalization. Though, conventional Neo-classical theory has predicted outflows of capital from capital-abundant (because of low marginal product of capital) countries to capital-scarce (due to high marginal product of capital) countries, however, observed capital movements' results suggest otherwise. This has prompted recent political, monetary, development, and international economists to shed more light on this inconsistency within the framework of economic theory. An empirical study from Ndikumana and Boyce (2003) explains that the net risk-adjusted returns may be lower in the investment riskier countries hence motivating capital flight. More so, it suggests that capital flight can be motivated by high risk (such as exchange rate volatility, domestic and external debt, mismanagement of natural resource rents). For instance, issues such as business cycles, weak institutions, ineffective macroeconomic policies, poor investment environment, and exchange rate overvaluation have also been linked with the increase in capital flight from developing economies (Ndikumana & Boyce, 2003; Schneider, 2003). For more than three decades, some countries in the Economic Community of West African States (ECOWAS) have also recorded a significant increase in capital flight due to many reasons such as poor infrastructural development, mismanagement of proceeds from sales of natural resources, exchange rate instability among others. For instance, Nigeria recorded the largest scale of financial outflow totaling about $250 billion in just 25 years between 1985 and 2010 in the ECOWAS sub-region and sub-Saharan African region as a whole. Some of the reasons that account for this huge capital outflow include the adoption of the Structural Adjustment Programme (SAP), poor macroeconomic environment, corruption, among others. More so, Nigeria witnessed a significant rise in crude oil prices between 2004 and 2013 and this reflects in a continuous increase in CF, from about an average of $29 billion in the period between 2000 and 2005 to about an average of $146 billion between 2006 and 2011. Unsurprisingly, the country recorded about $20 billion capital flight within five weeks (CBN, 2015). In addition, countries in the ECOWAS region are highly endowed with different forms of natural resources such as crude oil, gas, gold, coal, among others. This raises the question of whether abundant resource accounts for huge capital flight or not in the region. Also, the essence of natural resources in the development of an economy is undermined by the evidence gathered from most natural resource-endowed countries or regions which are still facing the problems of high poverty level, low life expectancy, poor infrastructural development, poor education, and health system among others. This phenomenon is captured within the framework of the resource curse hypothesis. Many countries such as South Korea, Japan, China, Taiwan, have recorded significant progress in the areas of poverty, infrastructure, energy, and among others. Interestingly, countries endowed with natural resources such as Norway, Saudi Arabia, have explored this opportunity to increase the welfare of their people as well as building resilience against shocks to their revenue. However, the storyline changes in the case of sub-Saharan Africa (SSA) and ECOWAS, where natural resources have not played a significant role in reducing poverty, expansion of infrastructural development, improvement in education, and health system (Handley, Higgins, Sharma, Bird, & Cammack, 2009; World Bank, 2018). Consequently, many factors have been attributed to the poor development in the SSA region as well as ECOWAS sub-region which include corruption, lack of visionary leadership, mismanagement of resources, poor infrastructures, poor human capital development, among others. Some of the developmental challenges facing the ECOWAS region may be partly attributed to capital flight. For instance, some countries such as Cape Verde, Guinea, Nigeria, and Burkina Faso recorded an appreciable amount of capital flight through trade misinvoicing (See Boyce and Ndikumana (2012)). Thus, the role of natural resource rents in capital flight in ECOWAS Sub-region cannot be neglected. Also, the rents from natural resources are associated with boom and bust due to some internal factors (such as civil unrest, mismanagement, etc.) and external factors (such as exchange rate variability, political unrest in other regions or countries). These forms of ups and downs in the natural resource rents can be adequately captured under asymmetry or nonlinearity framework. The nonlinearity associated with natural resource rents through boom and bust tends to have implications for capital flight. The expansive literature on capital flight has been developed around the symmetric or linear impact of natural resource on capital flight but the nonlinearity in natural resource rents on capital flight seems to have received little attention. The idea of nonlinearity and asymmetry has been applied by some renowned researchers such as Schorderet (2001) on unemployment and output, Webber (2000) on exchange rate and import prices, Bachmeier and Griffin (2003) on gasoline prices and oil prices fluctuation, Shin, Yu, and Greenwood-Nimmo (2014) etc. Since the natural resource rents are characterized by boom and bust, it indicates that the behaviour of natural resource rents is nonlinear which may have implications for capital flight. This suggests that natural resource rents can be decomposed into partial sum processes of positive and negative changes. This idea was to verify if the nonlinearity of natural resource rents has implications for capital flight in the context of policymaking in the ECOWAS sub-region. Thus, the contribution of the study is hinged on the introduction of total resource rents non-linearity with the aim of capturing different effects of total natural resource rents on capital flight.

Following this section, the rest of the paper is structured as follows. Section 2 focuses on the literature review on capital flight. The research methodology applied in the study is presented in section 3. Section 4 focuses on empirical results and discussions. Finally, section 5 concludes the paper with policy implication.

2. LITERATURE REVIEW

There are several studies in the literature that examine the determinants of capital flight, most especially in African countries where there is massive relocation of capital through different means. Thus, it is pertinent to review the previous empirical studies as a guide to determining if there is a new paradigm shift in the outcome of our empirical study. Different methodologies have been used in the literature to quantify capital flight. The reasons for these can be attributed to: (i) lack of a universally accepted definition of capital flight and, (ii) challenges faced in the use of the term "capital outflow" between developing and developed economies- classification of outflows in the developed countries as a foreign direct investment while outflows in the developing countries are classified as capital flight. Thus, this created an avenue for using different methodological approaches to measure capital flight. Some of these approaches are the Dooley method (Dooley, 1986) Residual measure (Morgan Guaranty Trust Company, 1986; Pastor, 1990; World Bank, 1985) hot money measure (Cuddington, 1986) the mirror stock measure (Khan & Haque, 1985) and trade mis-invoicing method (Ndikumana & Boyce, 2003). Despite different definitions and measures, the study aligned with the approach of Boyce and Ndikumana (2012) that takes into consideration unadjusted 'residual' measure, total trade misinvoicing, and unrecorded remittances in measuring capital flight.

Previous studies have explored different drivers of capital flight in the literature which include exchange rate, domestic investment, inflation rate, remittances, interest rate differential, debt, institution, and governance (Adetiloye, 2012; Brada, Kutan, & Vukšić, 2013; Collier, Hoeffler, & Pattillo, 2004; Ndikumana & Boyce, 2008; Salisu, 2005). In the case of Africa, it is difficult to neglect the role of natural resources in capital flight (AfDB and GFI, 2013; Boyce & Ndikumana, 2012). For instance, Ljungberg and Friedl (2014) show evidence that natural resource endowment leads to capital flight. They used rents seeking behaviour to establish the relationship among them. Also, their study used natural resource rents as a share of GDP to proxy natural resource abundance. Further, they hypothesize that the role of institutional quality will influence the relationship in two distinct ways, namely, through capital flight directly and indirectly through natural resource rents. Ljungberg and Friedl (2014) explain that the relationship with capital flight would be negative if good institutions lessened the propensity for capital flight, while the effect on total natural resource rents would be positive if good institutions eased the process of extracting resources. Their study concludes that, in the presence of bad institutions, natural resource rents motivate the occurrence of capital flight. Also, there is evidence that resource-rich countries account for the highest share of capital flight in Africa (Boyce & Ndikumana, 2012; Mpenya, Metseyem, & Epo, 2016). In a country-specific study, Mpenya et al. (2016) examine the relationship between natural resources and capital flight in Cameroon and show that the natural resources sector, most especially, oil and timber industry, is an important channel of capital flight through trade misinvoicing. Further, Arezki, Rota-Graziosi, and Senbet (2014) explore the relationship between capital flight and natural resources and found that oil discoveries potentially promote both tax revenue mobilization and stock market development in the presence of a thin capitalization rule. Their study further reveals that multinational companies make use of financial transactions among their affiliates or tax havens to transfer part of their profit. Similarly, Kwaramba, Mahonye, and Mandishara (2015) show a positive relationship between capital flight and mineral sector output (mineral rents) implying that capital flight is derived from realized capital from the mining sector in Zimbabwe. Also, abundant natural resource exports lead to inflation and real exchange rate appreciation leading to a rise in consumption which may distort macroeconomic indicators promoting domestic firms to relocate their capital to other countries to safeguard their assets against risk (Neumayer, 2004).

A report by African Development Bank (2013) further stressed the importance of natural resources in Africa. The report reveals that agricultural and resource sectors can significantly promote growth and human capital development in the continent. As the resource sector continues to expand, the teeming population does not benefit from it due to mismanagement and embezzlement instead of using it to address the huge socio-economic challenges in the continent. The huge proceeds from natural resources exploitation tend to increase the tendency of embezzlement. Multinational and national firms collaborate to undermine the benefit that accrued to a country from its natural resources (Mpenya et al., 2016). Thus, it suggests that natural resources may serve as a key determinant of capital flight.

3. RESEARCH METHODOLOGY

3.1. The Model

The issue of capital flight from African countries has attracted so much attention in the literature. Theoretically, two main sources of capital flight have been established in the literature. Specifically, debt process (Boyce & Ndikumana, 2012) and natural resource (Kwaramba, Mahonye, & Mandishara, 2016; Mpenya et al., 2016). However, this study is preoccupied with the role of the natural resource in capital flight. According to Boyce and Ndikumana (2000) upsurge in capital flight is largely associated with boom in natural resources. More so, evidence from extant studies estimating capital flight from developing countries has showed that natural resource is a major driver. For instance, resource-rich countries experienced higher capital flight relative resource-scare countries in Africa (see (Ndikumana, Boyce, & Ndiaye, 2015; Yapatake Kossele & Njong, 2020)) and major debate on capital flight also argued that resource abundance is a major cause of capital flight (Demachi, 2013).

Furthermore, the rationale for the relationship between natural resource abundance and capital flight is founded on the essential assumption that efficient use of natural resources by resource abundance country will attract low capital flight. Hence, an observable relationship between natural resources rents and capital flight exists. However, the hypothesis we pursue in this paper is that countries with abundant natural resources will exhibit higher levels of capital flight. Thus, from the theoretical basis, this relationship is modelled in Equation 1 as follow:

$$CF_{it} = \beta_0 + \beta_1 TNRR_t + \varepsilon_t \quad (1)$$

where CF is capital flight as a percentage of GDP and TNRR is natural resource rents as a percentage of GDP.

To effectively model this relationship, we use the recently developed NARDL model of Shin et al. (2014). The NARDL model is an asymmetric expansion of the linear ARDL model of Pesaran, Shin, and Smith (2001). The advantage of this model over the ARDL is that while the ARDL is built on the underlying restrictive assumption of linearity in a long-run relationship, the NARDL model allows for asymmetry or nonlinearity in the cointegrating relationship of the dependent and independent variable (Shin et al., 2014). It is, therefore, a unified model capable of consistently combining nonlinearities in long-run relationships and the error correction mechanism. Thus, using this model makes it possible for us to carefully examine the long run and short run asymmetrical effects of natural resource rents on capital flight of the ECOWAS countries.

Our major reason for adopting this novel approach to the ARDL model is to carefully examine if capital flight responds differently to natural resource rents boom and burst. Firstly, it allows for modeling the long-run relationship (cointegration) that may exist between TNRR and CF. Secondly, it permits testing for both linear and nonlinear cointegration. Thus, it takes cognizance of the possibility of nonlinearity in the cointegrating relationship between natural resource rents and capital flight. Thirdly, it accommodates and distinguishes the potential short-run and long-run asymmetric effects from the independent variable to the dependent variable. Finally, like the ARDL model, this model allows for testing the existence of a long-run relationship among a set of variables with a different order of cointegration (zero, one, or combination of both) in the same framework even without having prior information on the order of integration of the individual series.

Since the NARDL model is a fully dynamic model developed from the linear ARDL approach, we start by presenting below the linear ECM specification without asymmetry in the short-run and long-run dynamics as defined by Pesaran et al. (2001):

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 x_{t-1} + \sum_{j=1}^{k1} \theta_j \Delta y_{t-j} + \sum_{i=0}^{k2} \delta_i \Delta x_{t-i} + \varepsilon_t \qquad (2)$$

The symbol Δ denotes variations in capital flight, α_0 is the intercept, α_1 and α_2 are the long-run coefficients and θ_j and δ_i are the short-run coefficients. $k1$ and $k2$ are the optimal lags on the first-differenced variables selected by some information criteria, such as Schwarz Information Criterion (SIC) and Akaike Information Criterion (AIC).

The ARDL approach involves establishing a long-run relationship between variables of interest by testing the null hypothesis of no cointegration $(\alpha_0 = \alpha_1 = \alpha_2 = 0)$ against the alternative of cointegration $(\alpha_0 \neq \alpha_1 \neq \alpha_2 \neq 0)$ using the proposed F-Stat by Pesaran et al. (2001) which does not require any pre-testing for unit root. Two critical value bounds (upper and lower bound) were computed for any significance level; the lower value bound assumes that all variables are I(0) while the upper value bound assumes all variables are I(1). If the proposed F-Stat is greater than (above) the upper critical bounds value, the null hypothesis of no cointegration is rejected. However, if the F-Stat is less (below) than the critical bounds value, the null hypothesis of no cointegration is not rejected implying that variables are I(0). Also, whenever F-Stat. falls within the lower and upper bounds values (i.e. lower bound < F-Stat < upper bound) the test becomes inconclusive.

Given these analyses, we, therefore, proceed to the NARDL model by Shin et al. (2014) which takes cognizance of both long run and short run asymmetries. Given that the linear ARDL assumes identical impact in the variations in the independent variable (x_t), the non-linear ARDL assumes non-identical impact in the variations of the independent variable as presented in Equation 3:

$$x_t = x_0 + x_t^+ + x_t^- \qquad (3)$$

Where X_0 is the initial value, X_t^+ and X_t^- are the partial sum processes of positive and negative changes in X_t defined in Equation 4 as;

$$x_t^+ = \sum_{j=1}^{t} \Delta x_j^+ = \sum_{j=1}^{t} \max(\Delta x_j, 0), \; X_t^- = \sum_{j=1}^{t} \Delta x_j^- = \sum_{j=1}^{t} \min(\Delta x_j, 0) \qquad (4)$$

As explained by Shin et al. (2014) we adopt a simple case in which the regressor (x_t) is decomposed into x_t^+ and x_t^- around a single threshold value of zero, thereby allowing us to distinguish between positive and negative changes in the growth rate of x_t. Shin et al. (2014) however, opined that this assumption of zero threshold value is meaningful only if the growth rates in x_t are not predominantly positive or negative.

To carefully study the impact of natural resource rents on capital flight, we use total natural resource rents as a percentage of GDP to measure natural resource abundance while capital flight as a percentage of GDP was used as a proxy for capital flight. Furthermore, expressing both variables in the regression model in percentage form will help ensure better distributional properties. Thus, y_t is capital flight as a percentage of GDP and x_t is total natural resource rents as a percentage of GDP. Accounting for asymmetry, we consider the following nonlinear ARDL (m,p) model:

$$CF_t = \sum_{j=1}^{m} \sigma_j\, CF_{t-j} + \sum_{j=0}^{p} (\mu_j{}^{+} TNRR_{t-j}^{+} + \mu_j{}^{-} TNRR_{t-j}^{-}) + \varepsilon_t \quad (5)$$

Where CF_t is capital flight as a percentage of GDP; $TNRR_t$ is total natural resource rents as a percentage of GDP; σ_j is the autoregressive parameter; $\mu_j{}^{+}$ and $\mu_j{}^{-}$ are the asymmetric distributed-lag parameters, and ε_t is an i.i.d. process with zero mean and constant variance. Equation 5 can be rewritten in the nonlinear error correction form as presented in Equation 6:

$$\Delta CF_t = \rho CF_{t-1} + \mu^{+} TNRR_{t-1}^{+} + \mu^{-} TNRR_{t-1}^{-} + \sum_{j=1}^{m-1} \theta_j\, \Delta CF_{t-j} + \sum_{j=0}^{p-1} (\vartheta_j{}^{+} TNRR_{t-j}^{+} + \vartheta_j{}^{-} TNRR_{t-j}^{-}) + \varepsilon_t \quad (6)$$

Which can otherwise be written in Equation 7 as

$$\Delta CF_t = \rho \varepsilon_{t-1} + \sum_{j=1}^{m-1} \theta_j\, \Delta CF_{t-j} + \sum_{j=0}^{p-1} (\vartheta_j{}^{+} TNRR_{t-j}^{+} + \vartheta_j{}^{-} TNRR_{t-j}^{-}) + \varepsilon_t \quad (7)$$

Where $\rho = \sum_{j=1}^{m} \sigma_{j-1}$, $\theta_j = -\sum_{i=j+1}^{m} \sigma_i$ for j = 1, …., $m-1$, $\mu^{+} = \sum_{j=0}^{p} \mu_j{}^{+}$, $\mu^{-} = \sum_{j=0}^{p} \mu_j{}^{-}$, $\vartheta_0{}^{+} = \mu_0{}^{+}$, $\vartheta_j{}^{+} = -\sum_{i=j+1}^{p} \mu_j{}^{+}$ for j = 1, …., $p-1$, $\vartheta_0{}^{-} = \mu_0{}^{-}$, $\vartheta_j{}^{-} = -\sum_{i=j+1}^{p} \mu_j{}^{-}$ for j = 1, …., $p-1$, and $\varepsilon_{t-1} = y_{t-1} - \beta^{+} x_{t-1}^{+} - \beta^{-} x_{t-1}^{-}$ is the nonlinear error correction term with $\beta^{+} = \frac{\mu^{+}}{\rho}$ and $\beta^{-} = \frac{\mu^{-}}{\rho}$ are the associated long-run parameters with respect to the positive and negative changes in the independent variable which is natural resource rents in our model. Taking account of the short and long run asymmetries in the linear ARDL model gives the standard NARDL model to be used for estimation in Equation 8:

$$\Delta CF_t = \alpha + \rho CF_{t-1} + \mu^{+} TNRR_{t-1}^{+} + \mu^{-} TNRR_{t-1}^{-} + \sum_{j=1}^{m} \theta_j\, \Delta CF_{t-j} + \sum_{j=0}^{p1} \delta_{ij}^{+} \Delta TNRR_{t-j}^{+} + \sum_{j=0}^{p2} \delta_{ij}^{-} \Delta TNRR_{t-j}^{-} + \varepsilon_t \quad (8)$$

The short-run adjustments of capital flight to positive and negative changes in total natural resource rents will be captured by δ_j^+ and δ_j^-, respectively. The same step as in the linear ARDL will be followed in the estimation of the NARDL model. First, Equation 8 will be estimated by Ordinary Least Squares (OLS). Second, the test for the presence of asymmetric long-run relationships between the capital flight and total natural resource rents will be carried out. The third step involves testing for the long run and short run symmetry. The underlying test for asymmetry is the Wald Test. The long-run symmetry can be tested by using a Wald test of the null hypothesis that $\beta^+ = \beta^-$; no long-run asymmetry (long-run symmetry), where $\beta^+ = \frac{\mu^+}{\rho}$ and $\beta^- = \frac{\mu^-}{\rho}$ while the short-run symmetry can be tested with the null hypothesis of $\delta_j^+ = \delta_j^-$; no short-run asymmetry.

The non-rejection of both null hypotheses (long and short-run) reduces the NARDL model in Equation 8 to the ordinary ECM in Equation 2. Furthermore, if the null hypothesis of long-run symmetry is not rejected the model reduces to the cointegrating NARDL model with short-run asymmetry in Equation 9.

$$\Delta CF_t = \alpha + \rho CF_{t-1} + \mu\, TNRR_{t-1} + \sum_{j=1}^{m} \theta_j\, \Delta CF_{t-j} + \sum_{j=0}^{p1} \delta_{ij}^+ \Delta TNRR_{t-j}^+ + \sum_{j=0}^{p2} \delta_{ij}^- \Delta TNRR_{t-j}^- + \varepsilon_t \quad (9)$$

Furthermore, if the null hypothesis of short-run symmetry is not rejected the model reduces to the cointegrating NARDL model with long-run asymmetry in Equation 10.

$$\Delta CF_t = \alpha + \rho CF_{t-1} + \mu^+ TNRR_{t-1}^+ + \mu^- TNRR_{t-1}^- + \sum_{j=1}^{m} \theta_j\, \Delta CF_{t-j} + \sum_{j=0}^{p} \delta_{ij} \Delta TNRR_{t-j} + \varepsilon_t \quad (10)$$

Thus, this study employed this recent methodology to analyse this relationship in seven countries in ECOWAS. The major reason for considering these countries in our sample is because it encompasses both resource-abundant and resource-scarce countries as well as countries with highest and low capital flights. This is to objectively test if asymmetry matter in the resource rent-capital flight nexus in both resource-abundant and resource-scarce countries in this region. Also, the study explores time series data on capital flight and total natural resource rents[1] in seven ECOWAS countries: Burkina Faso, Cape Verde, Cote d'Ivoire, Ghana, Guinea, Nigeria, and Sierra Leone. Our data set is obtained from World Development Indicators (2018) and Boyce and Ndikumana (2012) but was extended to 2014 using the moving average approach[2] (i.e. average of 2 years). The study covers the period between 1981 and 2014. The period coverage was based on the availability of data on the key variables.

3.2. Trend Analysis

The sub-section examines the trend analysis for the seven ECOWAS countries. Also, it systematically examines the possible relationship between the two variables that are included in the model. Figure 1 depicts a graphical illustration of capital flight[3] of seven ECOWAS countries between 1981 and 2014. Remarkably, it can be observed from the figure that Nigeria, on average has the highest amount of capital flight when compared to the

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[1]Our definition of natural resource rents is akin to that of the World Bank and this variable is proxy by total natural resource rents. In the World Bank definition, natural resources are classified under five categories: oil, natural gas, coal rents (hard and soft), forest and mineral. The aggregation of these categories yields total natural resource rents, which is measured in proportion to GDP.

[2] Simple moving average approach was adopted to compute data for period 2011-2014. This method is commonly used in time series data for computation of short-term forecasts of time series (Perry, 2010).

[3] The absolute value of capital flight was used instead of as percentage (GDP) in this case to show the volume of capital outflows in these countries. This gives appreciable idea of huge resources lost by these countries to capital flight. It further gives true picture of capital flight challenge across the countries.

other six ECOWAS countries. The higher capital flight experienced by Nigeria tells an interesting story about the country. Many reasons can be attributed to the exceptionally high capital flight in this country namely, the introduction of the Structural Adjustment Programme in 1985 which distorted macroeconomic conditions, political tension and corruption during military and democratic regimes, etc. Also, the resource boom experienced by the economy between 2004 and 2010 contributed to these high financial outflows. More so, poor financial management between 2010 and 2015 coupled with several allegations of massive corruption, poor rule of law, and impunity, further explain this massive financial outflow from the country (Page, 2018). On the contrary, Burkina Faso has the lowest value of capital flight relative to other countries. It can also be observed from the graph that countries like Sierra Leone, Ghana, and Cote d'Ivoire have a moderate level of capital flight compared to their counterparts.

Depicted in Figure 2 is total natural resource rents as a percentage of real GDP of the seven ECOWAS Countries between 1981 and 2014. Similar to Figure 1, Nigeria has the largest share of total natural resource rents in its GDP, while Cape Verde has the lowest relative to other countries. Also, following Nigeria is Guinea with an average total natural resource rent of 20.34% while other countries such as Burkina Faso, Cote d'Ivoire, Ghana, and Sierra Leone record a moderate level of average TNRR as a percentage of real GDP compared to other countries.

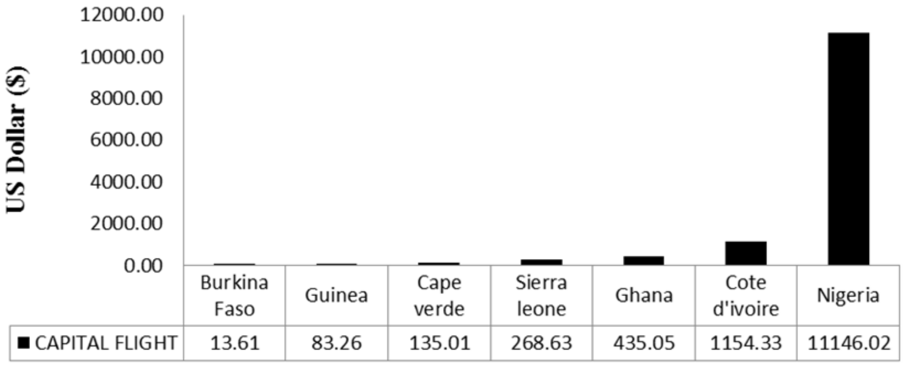


Figure-1. Average Capital Flight (1981–2014).

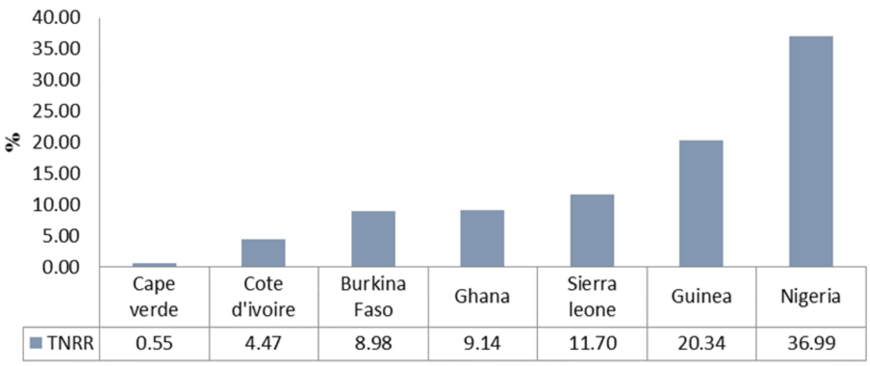
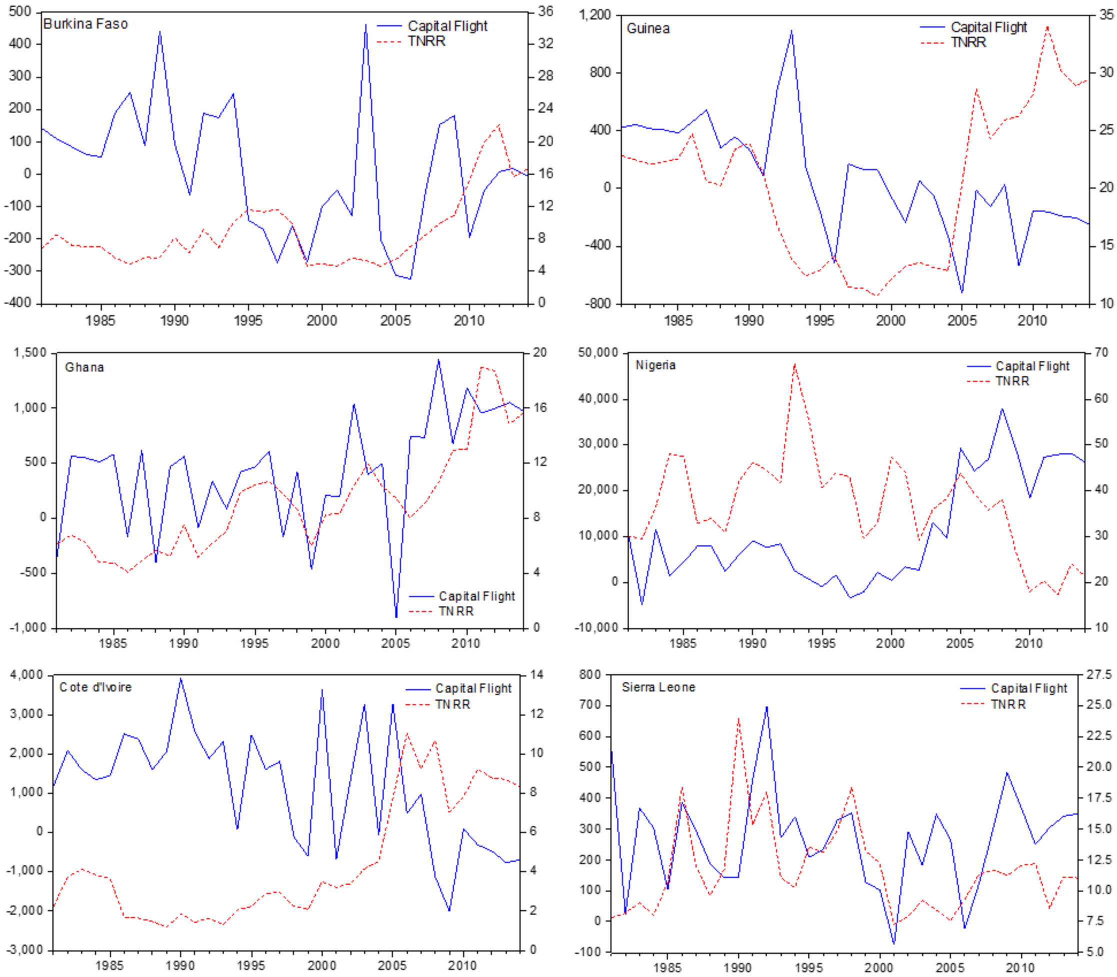


Figure-2. Average Total Natural Resource Rents as a percentage of GDP (1981–2014).

A cursory look at Figure 1 and Figure 2 show that for Nigeria, natural resource rents and capital flight are very high relative to other countries. Thus, for the periods when Nigeria has higher resource rents, it also recorded a higher level of capital flight. We also observed that countries with high capital flight are resource-rich. This may suggest that natural resources endowment may have a possible link with capital flight. The graphical assessment of capital flight and TNRR for the seven ECOWAS countries, in Figure 3 suggests that there seems to be some degree of co-movement between the two variables, signifying the possibility of a long-run relationship between the two variables. Notably, for Ghana and Sierra Leone, the graphs show that capital flight has followed the ups and downs in TNRR more closely than the other countries. Furthermore, the figure indicates that overall, there is a positive relationship between capital flight and TNRR. In addition, it shows some levels of trending (upward and downward). Also, it can be observed from Figure 3 that the graph of capital flight is highly volatile for most of the countries. For instance, in 1982, Ghana recorded a capital flight of $567.6m US dollars. However, in 1986, there was a sharp decline in this value thus, recording a negative value of $-163.8m. This may imply that the country was able to get refunds on some of the financial outflows experienced or attract more capital inflow. Also, in the following year, there was an unprecedented upsurge in the value of capital flight thus, assuming a positive value of $617m. This has been the trend capital flight in Ghana.

Further, in some countries such as Burkina Faso and Guinea, the value of capital flight has been positive in the 1980s but later took a new dimension in the early 1990s. For example, in Guinea, the value of capital flight was $159.7m and $516.8m in 1995 and 1996, respectively. However, it later declines to $168.8m in 1997 and the value of capital flight has ever since then crisscrossed between negative and positive values. A worthy of note is the sharp decrease in capital flight in the late 2000s for all the countries under consideration. This is due to the global financial crisis of the late 2000s which generated a global recession that affected both developed and underdeveloped countries. Thus, bringing about a general decline in capital flight in the ECOWAS region. Although in Cape Verde, capital flight is positive for all periods, the value has however been unstable until mid-year 2000 when it took a value of $249.2m, $234.2m, $238.7m, $247.7m in 2005, 2007, 2009 and 2010, respectively. In addition, the values of capital flight in Sierra Leone have been positive except for the years 2001 and 2006 when it took a negative value of -$74.7m and -$23.8m respectively, which represent capital flight reversal.



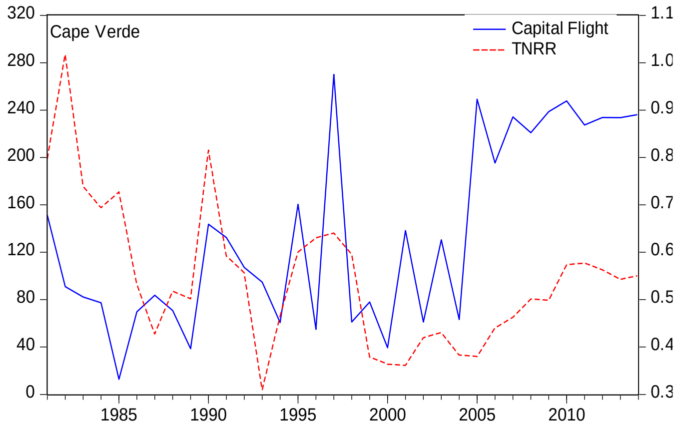


Figure-3. Co-movement between capital flight (in million dollars) and total natural resource rents (TNRR). The solid line left scale is capital flight, and the dotted line (right scale) is the total natural resource rents as a percentage of real GDP.

Though the graph for TNRR seems to suggest that there is some degree of upward and downward trends in this variable, it can also be observed that its values for all countries have been positive over time. Since, TNRR is the sum of natural resources as earlier defined (oil, natural gas, coal rents (hard and soft), forest and mineral), the trending (upward and downward movement) in TNRR might be a result of the various unavoidable short-term fluctuations of international resources price (such as oil price shock) which in one way or the other affects the rents generated from the natural resources. More importantly, some other factors such as the cost of extraction and quantity extracted influence the extent of rents generated from these natural resources. For instance, these countries are price takers in the international market, since natural resources are by and large homogeneous commodity traded globally for a price set by the international market. The quantity that an individual country can offer for sale in the international market is in most cases too small to be able to profit from influencing the world price. Another plausible reason is that the production of most natural resources is also determined by long-term capital investment projects (mines, oil wells, infrastructure, etc.) which go a long way in influencing the quantity offered for sale in the international market (Ljungberg & Friedl, 2014). Thus, the rents accruing from total natural resources are subject to large price fluctuations over time depending on the interaction of the forces of demand and supply in the international market. Succinctly, all these factors affect the rents generated from natural resources in natural resource-endowed countries.

4. EMPIRICAL RESULTS AND DISCUSSIONS

Table 1 presents the descriptive statistics for the selected ECOWAS countries. This is to verify the statistical properties of our series. It reveals that Nigeria and Cote d'Ivoire recorded higher capital flight relative to the other five countries (estimated stock of external claims that yields no recorded investment income to the creditor country-(Dooley, 1986) while Burkina Faso experienced the least outflow of investments (capital flight). The standard deviation further exposed the volatility level of capital flight in the seven countries where Nigeria recorded the highest fluctuation relative to the other countries while Cape Verde recorded the lowest fluctuation. More so, the differences between the maximal and minimal values confirmed the high volatility. The results on total natural resource rents further confirmed the relationship between capital flight and resource rents in which Nigeria that has the highest capital flight also has the highest corresponding total natural resource rents while Cape Verde with the lowest total natural resource rents has a corresponding lowest capital flight. On skewness, the series are positively skewed except for Cote d'Ivoire and Ghana (e.g. only in capital flight). The kurtosis excess was higher for Nigeria and Cape Verde under CF while it was high for Burkina Faso, Cape Verde, and Sierra Leone under TNNR. This further confirms the relatively high volatility of CF and TNRR in these countries. Jarque Bera shows that CF is normally distributed while it was not normally distributed under TNRR except for Guinea and Nigeria.

Table-1. Descriptive Statistics on capital flight (CF) and total natural resource rents (TNRR).

	Burkina Faso	Cape Verde	Cote d'Ivoire	Ghana	Guinea	Nigeria	Sierra Leone
CF (% of GDP)							
Mean	0.015	0.270	0.083	0.049	0.076	10.79	0.181
Max	0.184	0.930	0.288	0.144	0.571	27.55	0.568
Min	-0.080	0.054	-0.107	-0.085	-0.247	-9.007	-0.070
Std. Dev.	0.061	0.189	0.098	0.064	0.190	9.249	0.120
Skewness	0.625	1.468	-0.062	-0.620	0.544	-0.238	0.785
Kurtosis	3.055	5.433	1.991	2.690	2.780	2.188	4.871
Jarque Bera	2.218 *(0.330)*	20.60 *(0.000)*	1.465 *(0.481)*	2.317 *(0.314)*	1.743 *(0.418)*	1.255 *(0.534)*	8.452 *(0.015)*
Obs.	34	34	34	34	34	34	34
TNRR (% of GDP)							
Mean	8.98	0.55	4.47	9.14	20.34	36.99	11.71
Max	22.12	1.02	11.05	18.96	34.12	67.69	23.94
Min	4.68	0.31	1.18	4.09	10.67	17.30	7.28
Std. Dev.	4.44	0.15	3.08	3.84	6.64	10.84	3.70
Skewness	1.39	0.98	0.81	0.96	0.09	0.34	1.38
Kurtosis	4.30	4.16	2.20	3.41	1.86	3.49	5.03
Jarque Bera	13.35 (0.001)	7.29 *(0.026)*	4.61 *(0.099)*	5.48 *(0.065)*	1.88 *(0.391)*	0.99 *(0.610)*	16.61 *(0.000)*
Obs.	34	34	34	34	34	34	34

Further, the preliminary tests are presented in Table 2. These tests are unit root test, ARDL Bounds test, and Wald test. The unit root results reveal that the series are either stationary at level, *I(0)*, or first difference, *I(1)*. This justifies the adoption of the ARDL Bounds test to cointegration. The ARDL Bounds test shows that models for five countries have a long-run relationship while Guinea's model does not have a long-run relationship as indicated by the F-statistics. This implies that Guinea's model will be strictly short-run without the speed of adjustment or long-run impact. Also, the appropriate models for the ECOWAS countries were chosen based on the short-run and long-run asymmetries through the Wald test. The Wald test revealed that the NARDL with asymmetry is carefully chosen for five countries (Burkina Faso, Cape Verde, Cote d'Ivoire, Ghana, and Sierra Leone) while symmetric ARDL is suitable for the remaining two countries (Guinea and Nigeria). Out of the seven countries, only five countries have long run asymmetries. These show that disregarding the asymmetry in modeling the relationship between capital flight and natural resource rents may be misleading and result in false conclusions for Burkina Faso, Cape Verde, Cote d'Ivoire, Ghana, and Sierra Leone. Also, these model specifications give an insight into the significant divergence between resource-abundant countries and less resource-abundant countries.

Table 3 shows the symmetric long-run effect of TNRR on capital flight for Nigeria as captured by the coefficient of TNRR in the model. The coefficient of the lagged dependent is positive but not statistically significant. This suggests that the information about the nature of immediately capital flight is necessary when studying capital flight as indicated by the positive coefficient. On total natural resource rents, its coefficient is positive and statistically significant at lag one and four. This short-run coefficient reveals that total natural resource rents positively influence capital flight. For instance, a 100 percent increase in total natural resource rents accounts for a 0.34% increase in capital flight. This implies that the effect of natural resource rents is trivial in the case of Nigeria. Also, the long-run coefficient is negative and statistically significant. However, the impact is inconsequential. As a magnitude of 100% in total natural resource rents only account for a 0.5 percent decline in capital flight. This points to fact that total natural resource rents may not be a key source of capital flight in the case of Nigeria. This result is reinforced by findings of Boyce and Ndikumana (2012) that show that unadjusted "residual"-debt accounts for the largest share of the capital flight in the country. This, therefore, suggests that capital flight in a resource-abundant country such as Nigeria is not majorly driven by natural resource rents (i.e.

total trade misinvoicing) in the long run. Thus, there is no sufficient evidence arising from this empirical analysis in support of the natural resource rents as a key driver of capital flight due to its inconsequential effects.

In the case of Guinea, the coefficient of lagged capital flight is largely positive and statistically significant. This result implies that capital flight is incremental. Thus, the past value of capital flight is critical to the study of capital flight in Guinea in the short-run. Shifting attention to total natural resource rents, the short-run coefficient is positive and statistically significant. This simply suggests that a 100 percent increase in total natural resource rents accounts for a 1.2 percent increase in capital flight. This observed result can be attributed to export misinvoicing as it accounts for an appreciable share in the component of capital flight (Boyce & Ndikumana, 2012). This is further supported by the findings of Lensink, Hermes, and Murinde (2000); Fielding (2004); Le and Zak (2006); Davies (2008).

Considering the countries with NARDL, it is misleading to generalize the role of total resource rents on capital flight as symmetry in the ECOWAS region. Thus, the asymmetric impact of natural resource rents, in the long run, is captured by the $TNRR^{+}_{lg}$ and $TNRR^{-}_{lg}$ for positive and negative changes of the TNNR, respectively. The coefficient of lagged capital flight is negative for Cape Verde and Ghana but only statistically significant for Ghana. This suggests that capital flight follows a declining path for both countries. The coefficient of negative change of total natural resource rents is not statistically significant in four models (Burkina Faso, Ghana, and Sierra Leone). On the other hand, it was statistically significant for Cape Verde and Cote d'Ivoire models. An interesting result can be observed from Cape Verde. The result shows that a decline in total natural resource rents reduces the level of capital flight in the country. This implies that resource rents can be a plausible explanation for capital flight in Cape Verde. These findings corroborate the study by Mpenya et al. (2016) that argues that the natural sector serves as a key driver of capital flight. This is further reinforced by the partial sum of positive change which shows a positive relationship between natural resource rents and capital flight for Cape Verde. This narrative does not change for the long-run coefficients.

For Cote d'Ivoire, a natural resource has a negative relationship with capital flight as indicated by the sign of the partial sum. A similar submission was arrived at, by the study of Ndikumana and Boyce (2018). They conclude that aggregate trade misinvoicing (i.e. from natural resources) accounts for a lesser share in total capital flight from Cote d'Ivoire. A similar result is also observed in the long-run. Expectedly, natural resource rents do not serve as a conduit of capital flight in Sierra Leone in the short-run.

The short-run coefficient of the partial sum of positive change in natural resource rents shows a negative relationship. For instance, a 1 percent increase in the partial sum of positive change in natural resource rents accounts for a 0.008 percent decline in capital flight.

However, the long-run coefficient of the partial sum of positive change in natural resource rents is positive and statistically significant. This suggests that natural resource rents appear to foster capital flight from the country. As observed by Boyce and Ndikumana (2000); Boyce and Ndikumana (2012) export misinvoicing accounts for a large share in capital flight from the country. The speed of adjustment which measures the long-run convergence implies that Cote d'Ivoire, Ghana, Nigeria, and Sierra Leone's previous disequilibrium converges to a steady-state faster relative to Burkina Faso and Cape Verde.

The diagnostic tests reveal that the models are correctly specified, and their inference is valid. The ARCH LM test shows that there are no ARCH effects in all the models. This suggests no heteroscedasticity problem. Also, JB Stats. confirm the normality of the series in the model as indicated by their insignificant p-values. The Breusch-Godfrey LM tests reveal that there is no higher-order serial correlation problem as shown in their respective p-value across the seven countries while Ramsey reset test is used for testing model misspecification. Ramsey reset tests also show that all the models are correctly specified.

Table-2. Preliminary Test.

Country/Variable	Unit Root Tests: Augmented Dickey-Fuller (ADF) Level	ADF First difference	ADF I(d)	Philips Peron (PP) Level	PP First difference	PP I(d)
A. Burkina Faso						
CF	-4.078^{b**}	-	I(0)	-4.068^{b**}	-	I(0)
TNRR	-1.644^{b}	-5.476^{b***}	I(1)	-1.644^{b}	-5.479^{b***}	I(1)
B. Cape Verde						
CF	-5.966^{b***}		I(0)	-6.086^{b***}	-	I(0)
TNRR	-2.945^{b}	-5.108^{b***}	I(1)	-2.665^{a*}	-15.957^{b***}	I(1)
C. Cote d'Ivoire						
CF	-6.197^{b***}	-	I(0)	-6.170^{b***}	-	I(0)
TNRR	-1.979^{b}	-6.108^{C*}	I(1)	-1.979^{b}	-6.117^{b***}	I(1)
D. Ghana						
CF	-7.245^{b***}	-	I(0)	-7.162^{b***}	-	I(0)
TNRR	-2.708^{b}	-5.657^{a***}	I(1)	-2.802^{b}	-6.786^{b***}	I(1)
E. Guinea						
CF	-4.358^{b***}	-	I(0)	-4.122^{b***}	-	I(0)
TNRR	-1.249^{b}	-5.091^{b***}	I(1)	-1.205^{b}	-5.130^{b***}	I(1)
F. Nigeria						
CF	-4.339^{b***}		I(0)	-4.682^{b***}		I(0)
TNRR	-3.090^{b}	-6.431^{b***}	I(1)	-2.977^{b}	-12.271^{b***}	I(1)
G. Sierra Leone						
CF	-5.097^{b***}	-	I(0)	-5.102^{b***}	-	I(0)
TNRR	-3.717^{b**}	-	I(0)	-3.578^{a***}	-	I(0)

Table-2. Continue

Country	ARDL Bounds Test F-statistic	Country	Wald Tests for short and long run symmetry: Long-run W_{LR}	Short-run W_{SR}	Selected specification
Burkina Faso	4.668**	Burkina Faso	15.676 *** [0.0005]	0.117 [0.7345]	NARDL with LR asymmetry
Cape Verde	7.309***	Cape Verde	1.79E+26*** [0.0000]	0.636 [0.4393]	NARDL with LR asymmetry
Cote d'Ivoire	12.547***	Cote d'Ivoire	14.199*** [0.0009]	0.324 [0.5746]	NARDL with LR asymmetry
Ghana	4.761**	Ghana	127.252*** [0.0000]	1.066 [0.3108]	NARDL with LR asymmetry
Sierra Leone	10.648***	Guinea	1.458 [0.2396]	0.715 [0.4063]	Symmetric ARDL
Guinea	2.030	Nigeria	1.156 [0.3314]	0.198 [0.6629]	Symmetric ARDL
Nigeria	4.264*	Sierra Leone	2.93E+28*** [0.0000]	0.724 [0.4033]	NARDL with LR asymmetry

Note: ***, ** and * represents 1%, 5% and 10% level of significance, respectively. For unit root test, a = intercept, b = constant and trend and c= none. In the case of Bounds, the critical value for bounds: at 1%, 5.15, and 6.36 for lower and upper bounds, respectively; at 5%, 3.79, and 4.85 are lower and upper bounds, respectively; and at 10%, 3.17 and 4.14 are lower and upper bounds, respectively. For the Wald test, W_{SR} denotes the Wald test for the short-run symmetry testing the null hypothesis whether $\delta_j^+ = \delta_j^-$. W_{LR} corresponds to the Wald test for the long-run symmetry testing the null hypothesis whether $\beta^+ = \beta^-$;. The associated p-values are in brackets.

Table-3. Non-Linear ARDL.

	Country						**Country**	
	Burkina Faso	**Cape Verde**	**Cote d'Ivoire**	**Ghana**	**Sierra Leone**	**Variable**	**Guinea**	**Nigeria**
Variable	Non-Linear ARDL with LR asymmetry						Symmetric ARDL Short-run only	Symmetric ARDL
ΔCF_{t-1}		-0.192 (0.121)		-0.203* (0.113)		ΔCF_{t-1}	0.452*** (0.170)	0.130 (0.230)
$\Delta TNRR_t^-$	-0.0003 (0.003)	0.569** (0.0.256)	-0.023*** (0.007)	-0.003 (0.002)	0.006 (0.009)	ΔCF_{t-2}	0.031 (0.193)	
$\Delta TNRR_t^+$	-0.002 (0.002)	0.439** (0.218)	-0.0142*** (0.006)	-0.001 (0.002)	0.010 (0.006)	ΔCF_{t-3}	-0.081 (0.197)	
						ΔCF_{t-4}	0.362** (0.172)	
$\Delta TNRR^+_{t-1}$					-0.008** (0.003)	$\Delta TNRR_t$	-0.010 (0.007)	0.005** 0.002)
						TNRR(-1)	0.012*	-0.003 (0.003)
						TNRR(-2)		0.002 (0.003)
						TNRR(-3)		0.006* (0.003)
						TNRR(-4)		0.002 (0.003)
						TNRR(-5)		0.002 (0.003)
ECM(-1)	-0.579*** (0.163)	-0.640*** (0. 55)	-0.977*** (0.175)	-0.905*** (0.176)	-0.805*** (0.159)	ECM(-1)		-0.915***
$TNRR^-_{lg}$	-0.001 (0.006)	0.889*** (0.339)	-0.024*** (0.006)	-0.004 (0.003)	0.008 (0.011)			
$TNRR^+_{lg}$	-0.003 (0.004)	0.686** (0.310)	-0.015*** (0.005)	-0.001 (0.003)	0.025*** (0.008)	$TNRR_{lg}$		-0.005** (0.002)
Constant	0.030 (0.042)	-0.185 (0.171)	0.167*** (0.022)	0.069** (0.033)	-0.041 (0.092)	Constant	-0.067 (0.061)	0.306*** (0.078)
JB. Stat.	2.669(0.263)	0.134(0.935)	0.664(0.717)	0014(0.993)	0.321(0.852)	JB. Stat.	0.550(0.760)	0.468(0.791)
ARCH LM test	0.002(0.962)	0.359(0.554)	0.360(0.553)	0.712(0.406)	0.498(0.486)	ARCH LM test	0.768(0.584)	1.513(0.230)
Ramsey Reset test	0.035(0.853)	0.833(0.412)	1.523(0.139)	1.773(0.178)	2.121(0.105)	Ramsey Reset test	0.710(0.485)	6.134(0.020)
Breusch-Godfrey LM test	1.404(0.171)	1.291(0.307)	1.477(0.246)	1.598(0.222)	0.085(0.919)	Breusch-Godfrey LM test	1.907(0.172)	1.693(0.108)

Notes: This table reports the estimation results of the best-suited NARDL specifications for natural resource rents- capital flight nexus. $TNRR_{lg}$ indicates the long-run coefficient between capital flight and natural resource rents. $TNRR^+_{lg}$ and $TNRR^-_{lg}$ are the asymmetric positive and negative long-run coefficients. Standard errors are in parenthesis. JB and ARCH refer to the empirical statistics of the Jargue-Bera test for normality and the Engle (1982) test for conditional heteroscedasticity applied, while Ramsey Reset set and Breusch-Godfrey LM test refers to the empirical statistics for stability and high order autocorrelation respectively. ***, ** and * represent 1%, 5% and 10% levels, respectively. The significance of the tests indicates the presence of the problem of autocorrelation, heteroscedasticity, non-stability, and no normality.

5. CONCLUSION AND POLICY IMPLICATIONS

This study examined the impact of natural resource rents on capital flight in ECOWAS countries accounting for asymmetries in the relationship. The methodological technique applied, is the nonlinear autoregressive distributed lag (NARDL) model of Shin et al. (2014) where short-run and long-run nonlinearities are captured through positive and negative partial sum decomposition of the independent variable(s). Therefore, this approach accounts for both short-run and long-run asymmetric relationships between natural resource rents and capital flight. The countries such as Nigeria and Guinea do not have asymmetries, therefore, ARDL was used to analyze the relationship. Our findings suggested that natural resource rents do not serve as a key driver of capital flight in Nigeria. This finding complements the study of Boyce and Ndikumana (2012) as a high share of capital flight in the country is through unadjusted "residual" measure. Intuitively, this may suggest that trade misinvoicing is not more pronounced as a key determinant of capital flight in Nigeria. However, we find evidence for natural resource rents as a key determinant of capital flight for Guinea in the short-run. As shown by Boyce and Ndikumana (2012) export misinvoicing which is associated with natural resource take a larger proportion in the case of Guinea. Applying the NARDL model, our results indicated the presence of a nonlinear asymmetric relationship between natural resource rents and capital flight in the other five countries. The empirical results suggest that natural resource rents serve a key conduit for capital flight in Cape Verde in the short-run and long-run periods. A similar result was observed for Sierra Leone in the long-run. Considering the historical challenges faced by the country, it may be difficult to disentangle the role of natural resource rent in capital flight. For Cote d'Ivoire and Ghana, natural resource rents do not serve as a key determinant of capital flight in both short-run and long-run periods. Expectedly, the result is not significant for Burkina Faso as capital flight appears to be fuelled by other measures. The findings, however, have policy implications for policymakers in the process of policy prescription. Thus, countries such as Cape Verde, Guinea, and Sierra Leone that experience capital flight during the boom (i.e. resource rents boom) need to put more effort into their resource rents management as well as account for resource rents utilization. Mismanagement of natural resource rents through trade misinvoicing may stimulate relocation of capital thus affecting infrastructural development. In sum, all the countries must prevent capital flight by ensuring prudence in the management of natural resource proceeds.

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