



Impacts of violent extremism on Foreign Direct Investments in the Lake Chad Basin Countries (LCBCs)

¹Ojo Joseph IseOlorunkanmi* ;² Mathew E. Rotimi; ³Ahmed Ayodele Victor &

¹Henry C. Nweke-Love

Department of Political Science and International Relations, Landmark University, Omu-Aran

Department of Economics, Federal University, Lokoja

Department of Economics, Landmark University, Omu-Aran

Email: iseolorunkanmi.joseph@lmu.edu.ng; mathew.rotimi@fulokoja.edu.ng;

ahmed.ayodele@lmu.edu.ng; nweke-love.henry@lmu.edu.ng

ABSTRACT

The LCBCs are those countries that are situated within the Lake Chad area with distinctive characteristics such as small, open, and developing economies. The study pooled time series and cross-sectional data within the Panel Structural Vector Autoregressive (P-SVAR) model framework to examine how FDI responded to terrorism in LCBCs. Using World Bank's and World Development Indicators' (WDI) datasets, the data were sampled at the same frequency, following the Kalman filter technique. The study investigated the extent to which the inflow of FDI is determined by the level of political or institutional quality. It also used a panel VAR model in a dataset of the LCBCs spanning 2000 to 2019 to explore the extent to which violent extremism in the form of terrorism affected FDI. The findings reveal that FDI significantly responds to terrorism and that terrorism increased military expenditure. It revealed that there is a significant positive relationship between terrorism and military expenditure.

Keywords: Lake Chad, PSVAR, FDI, Violent extremism, Boko Haram

INTRODUCTION

The rise in terrorism, which has taken a global dimension, has also been aided by regional ethnic and religious composition. When nations that share borders are confronted with terrorist challenges, the homogeneity or otherwise of people occupying such a given geographical area contributes to a large extent to the success or otherwise of the global war against terrorism. The cultural, religious, and ethnic solidarity of the people around such borders provides

opportunities for the terrorists to freely through the various borders escape when faced with superior fire and smuggling in arms for the act. For the states, they suffer economic and security consequences as a result of terrorism. On the economic front, investors become sceptical about investing in a state where terrorist acts are prevalent. While a few studies related to this study have examined the relationship between FDI and conflicts (see Bray, 2010), Civil war and FDI among countries (see Murshed and Tanna, 2017) and FDI and violence in country-specific (see Bray, 2010; Umuhire and Muteteri, 2018; Omumbo, 2020; Amit, Barua, and Kafy, 2021), the dilemma remains about the narratives of FDI and extreme terrorism among group of nations having common boundaries and economic interest. This study seeks to fill this gap. Therefore, the question remains, "Does violent extremism impact FDI?"

The area regarded as Lake Chad is centrally located in Central-North Africa. The Lake Chad Basin countries (LCBCs) are countries situated around the Lake Chad Basin. They have been divided into two: the riparian countries and the conventional countries. The riparian countries are eight countries that shared the total areas of 2.434m km² in the next percentages: Nigeria (7%), Libya (0.5%), Niger (28%), CAR (9%), Chad (45%), Algeria (4%), Cameroon (2%) and Sudan (4%). The conventional LCBCs share 20% of the total area covered by Lake Chad Basin (LCB), which is approximately 427500 km². This is referred to as the Conventional Basin (Galeazzi, Medinilla, Ebiede, and Desmidt, 2017).

The LCB area has been under attack by the violent extremist group Boko Haram. Following Bak, Tarp, and Liang (2019), "violent extremism is a violent type of mobilisation that aims to elevate one group's status while excluding or dominating its 'others' based on markers, such as gender, religion, culture and ethnicity. In doing so, violent extremist organisations destroy existing political and cultural

institutions, and supplant them with alternative governance structures that work according to the principles of a totalitarian and intolerant ideology". Boko Haram, among other groups, has assumed a prominent presence in the discussion on violent extremism in Africa. Boko Haram extremist groups were reputed to be the third out of the top five perpetrators groups responsible for suicide bombing between the calculated period 1970-2016. It is responsible for 5.3% of the total global suicide bombing (Cordesman, 2017). This dreaded violent extremist group's activities have become a huge challenge to the governments of the conventional LCBCs: Nigeria, Niger, Cameroon and Chad. The Lake Chad Basin has come to assume an important geopolitical and strategic position. First for the riparian LCBC states and then for the violent extremist groups. For the LCBCs, the discovery of oil reserves at the lake's base reignited their interest in the lake, which according to Jane's Intelligent Watch (2005) has 232 billion barrels of oil reserves. The LCB area, according to US Geological Survey (2010), has about 14.7 trillion cubic feet of natural gas. With this discovery, it is expected that it will further attract investors in the form of foreign direct investments into the Lake Chad area and the other parts of the LCBCs.

For the violent extremist groups, the valuable natural resources at the Lake Chad Basin made the area more attractive for their criminal activities (Omenma, 2019). The contest over these resources has contributed to the split of the violent extremist groups striving over the economic viability and control of the area. Many factors are responsible for the emergence and proliferation of these violent groups in the region. Factors such as poverty, inequality, unemployment, inflation etc. have been explained to Granger cause terrorism in the region (Lawal, Babajide, Asaleye and IseOlorunkanmi, 2019) In exchange for the provision of security and other social services they rendered to the locals, the various splinter groups take charge of imposing taxes and other economic activities in areas under the control

of such group (Samuel, 2019). This group's activities spread across the geographical boundaries of these four countries; this has necessitated the setting up of a joint multinational effort at curbing their violent activities. The next section examines previous studies on the connection between terrorism and foreign direct investment influx to the LCBCs.

Literature review

Enders and Sandler (1996), in their study involving Spain and Greece, investigated how the net foreign direct investment (FDI) responded to terrorism. The result showed that FDI became reduced by 13.5% and 11.9% in their VAR analysis in Spain and Greece. Investors would prefer countries that are less prone to violence as they seek the safety of their investments (Esquivias and Harianto, 2020). Using an extended gravity model on a study of selected countries between 1960 and 1993, Nitsch and Schumacher (2004) found that an increase in terrorist activity negatively affects the economy by reducing its growth by 4%. Abadie and Gardeazabal (2008), revealed that there is a reduction in net foreign investment in significant proportion as a result of risk associated with terrorism. In an earlier study, Abadie and Gardeazabal (2003) opined that apart from foreign direct investment, terrorism also affects financial markets, leading to a decrease in the flow of investments. Bezic, Galovic, and Misevic (2016) in an empirical study of 29 European Union (EU) nations and the European Economic Area (EEA) Member States whose economies were categorised as no risk, medium risk, high risk, very high risk, insignificant risk and low risk of terrorist attacks between 2000 and 2013, found that the activities of terrorism impact negatively on security. It also reduces investors' confidence in such nations and reduces the inflow of FDI to the selected economies. Lutz and Lutz (2014), in their study, concluded differently. Their study examined the impact of terrorism on the activities of the international economy in sub-Saharan Africa. They found seemingly little indication that supported the claim that

terrorism has negative impacts on foreign investment. The study of Shahbaz, Javed, Dar and Sattar (2013) on the relationship between Terrorism and FDI in Pakistan revealed the confidence of investors in such economies as terrorist activities increase. In other words, their study showed a negative relationship between the activities of terrorists and foreign investors' confidence. Bandyopadhyay, Sandlery and Younasz (2014), in their study of 78 developing countries, used a theoretical model to investigate the relationship between domestic and transnational on one hand and foreign direct investment (FDI) on the other hand. Analysing how the relationships between the various estimators are affected by foreign aid flows, the study found that the two types of terrorism negatively affect foreign direct investment. In other words, terrorism, both domestic and transnational, depresses foreign direct investment. Li and Resnick (2003) examined the relationship between foreign direct investment inflows and political instability. Using a time series panel of 53 countries between 1982 and 1995, they sought to know whether democratic institutions jeopardises or promote foreign direct investment inflows to these developing countries. The study results showed that foreign direct investment inflows to developing countries are not negatively affected by political instability. Powers and Choi (2012), in a study of 123 developing countries, using a time series panel from 1980–2008, the study revealed that foreign direct investment inflow is negatively affected when terrorist attacks target transnational corporations (TNCs) in these developing countries, while there is no statistically significant effect on foreign direct investments in these countries when businesses are not the target of terrorists. Hany (2019), in a study on the MENA countries, examined the effects of the Arab Spring on the flow of foreign direct investment. The study found that a country's institutional quality is an important determining factor of the flow of foreign direct investment. This current study examines the effects of violent extremism on foreign direct investment flow in the LCBCs.

Hypothesis:

To achieve the aim of this study, the following hypotheses are proposed.

H_{0a}: Extremism terrorism does not impact FDI

H_{1a}: Extremism terrorism impacts on FDI

H_{0b}: Extremism terrorism does not affect military expenditure

H_{1b}: Extremism terrorism affects military expenditure

Scope and justification of the study

This study focuses on the Lake Chad Basin countries. The countries are Chad, Niger, Central Africa Republic (CAR), Algeria, Nigeria, Sudan, Libya, and Cameroon. The choice of pooling these countries is based on the high concentration of terrorism in the LCB zone, as reported by Samuel (2019). This choice is considered significant enough because the zone cuts across the highly populated area of Africa.

Data, Data Sources and Measurement of Variables

Data and Sources of Data

Data from 2002 to 2019 are used in this study. Data availability informs the choice of the starting and cut-off dates. Besides terrorism and military expenditure, the cut-off date is assumed to capture recent information in FDI, which is our variable of interest. This procedure is in line with earlier studies that finished their data points on the most recent period to capture the latest activities (Bezic, Galovic, and Misevic, 2016; Lutz and Lutz, 2014; Volker and Schumacher, 2004). The study sourced data from World Development Indicator (2021). Following Bandyopadhyay, Sandlery and Younasz (2014), Bezic, Galovic, and Misevic (2016) and Lutz and Lutz (2014), the study uses the terrorism index to capture the dynamics of foreign direct investment. Likewise, military expenditure is included to take into action the government's effort to combat terrorism. The need for data reliability and validity dictates the choice of the databases used to collect data for this study.

Variables and Definitions of Variables

Foreign Direct Investment (FDI)

Joshua, Adedoyin and Sarkodie (2020) define foreign direct investment (FDI) as investment from foreign resources. According to them, the FDI is presumed a panacea for economic growth. Furthermore, the FDI complements the role of the beneficiary country, mostly developing countries that usually suffer from scarce local resources.

Terrorism Index (TI)

The Global Terrorism Index (TI) is a periodically published value that offers a composite score to produce an ordinal ranking of nations on the effect of terrorism.

Military Expenditure (ME)

Military expenditures are all capital and current expenditures on the defence ministries, peacekeeping forces, armed forces, and other government agencies that are engaged in paramilitary forces and defence projects. Civil and military personnel, retirement pensions of military personnel, military operations and maintenance, military research and development, procurement, and military aid are also categorized as military expenditures.

Data Measurement

Variables selected used in this study are as follows: FDI, military expenditure and terrorism index. Consequently, FDI and military expenditure have been expressed in logarithm forms. Every variable is subjected to the stationarity test using the versions of Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS), Phillip Peron Test (PP) and

Augmented Dickey-Fuller Test (ADF). Various procedures are employed for comparison and validation of their results and to further ascertain reliability (See Levin, Lin, and Chu, 2002; Im, Pesaran and Shin, 2003). Consequently, the results reveal a mixed level of stationarity. Terrorism index and foreign direct investment are stationary at the level form while military expenditure is stationary at the first difference. As a result, the study proceeds to estimate a P-SVAR. This procedure is debatably unswerving with the literature (See Sim, Stock and Watson, 1990).

RESEARCH METHODOLOGY

Following various recent panel studies like Rotimi and Ngalawa (2017), Akande and Kwenda (2017), and Kutu and Ngalawa (2016), this study pools time series and cross-sectional data to examine how FDI responds to terrorism. The approach is based on the selected countries' distinctive characteristics, such as small open developing economies. However, this study's findings are based on a review of the dynamics of FDI and macroeconomic variables alongside insight from the SVAR framework.

Research Techniques

To capture the dynamics of terrorism in the selected domestic open economies', the study employs a three-variable $P - SVAR$ model consisting, of foreign direct investment, terrorism, and military expenditure. According to Rotimi and Ngalawa (2017), the PSVAR model is suitable for analysing the dynamics of a model. It is carried out by subjecting the model to unanticipated shocks. Furthermore, the $P - SVAR$ has been used in this study to capture the dynamic behaviour of all variables employed in the model and to offer a more effective estimation of parameters. The procedure assumes that the three variables of each country are independent of each other. The structure of $P - SVAR$ is the same as $P - VAR$ models because every variable is endogenous and inter-reliant assumed.

Furthermore, the same logic applying to the standard $P - VAR$ also applies to $P - SVAR$ except that structural restrictions are imposed $P - SVAR$. The imposition differentiates $P - SVAR$ and thus makes it a much stronger estimating tool suitable to address macroeconomic policy. The $P - SVAR$ is found suitable for this study because it captures both dynamic and static inter-reliance, thus, it treats the links across several units in an unrestricted way. In addition, according to Kutu and Ngalawa (2016) and Rotimi and Ngalawa (2017), it accounts also for cross-sectional dynamic heterogeneities. The $P - SVAR$ methodology suggests that restrictions be imposed on the contemporaneous structural parameters to derive realistic analytical structures. $\tau_{21} - \tau_{31}$ and "0" are the traditional restrictions, respectively denoting the contemporaneous and sluggish lagged association. It is believed that this method will offer more robust results that will offer better direction to how FDI responds to terrorism in the LCB region.

To examine the actual response of FDI to terrorism and establish the transmission process of terrorism on the selected variables, the generalised impulse response functions of the P-SVAR will be carried out.

Data series and conversion

Data for this study are sampled at the same frequency. Following the Kalman filter technique (see Meinhold and Singpurwalla, 1989) to construct missing data as noted in Ngalawa and Viegi (2011) that advocates interpolation and more recently, Eraker, Chiu, Foerster, Kim, and unlike Seoane (2008) who used similar technique within the Bayesian framework, this study uses a simple moving average method to construct data that are missing in FDI and military expenditure for Libya. This procedure aligns with the literature (see Camacho and Perez-Quiros, 2010).

Model Specification and Set-up of the Panel SVAR

According to Sim, Stock and Watson (1990), Vector Autoregressive (VAR) is an econometric estimating technique that explains variables using the lag of the variable. VAR considers the recent and the last values of the remaining variables. The VAR system disregards whether variables are either exogenous or endogenous. Rather, variables are mutually endogenously assumed. Hence, estimating techniques like Ordinary Least Square (OLS) could discretely solve each equation. Gujarati (2004) notes that VAR supports the analysis of data being carried out at levels. Gujarati's view disfavours data transformation. Buttressing this view, Harvey (1989) argues that data transformation findings are sometimes unreliable and unsatisfied. Sim, Stock and Watson (1990) suggested the VAR model as an appropriate estimator to define the dynamic performance of economic variables to produce reliable multivariate benchmark forecasts in their numerous variances in applied economics.

Nonetheless, the advantage of the VAR model to describe the dynamic performance of economic variables is restricted in providing essential results. To overcome the weakness associated with the variant VAR system, Canova (2005) opined the structural VAR (SVAR). He believes that the SVAR uses economic theory to sort out the contemporary relationships between economic data. The SVAR also analyses the dynamics of a model. It subjects the model to unexpected shocks since the restrictions for identification are frequently compatible with a wide spectrum of alternative theories. Hoare and Hoe (2013) opine that it is necessary to develop a generalised statement, economic specific, based on economic theory and having relevance that applies to real-life analysis. Consequently, this study adopts the Panel SVAR. The model, P-SVAR is applied and estimated in this study based on three endogenous variables, namely, foreign direct investment, military expenditure and terrorism index. The terrorism index is pertinent because it seeks to examine how FDI

responds to it and, very importantly, how the terrorism index significantly impacts FDI in the Lake Chad Basin region.

Consequently, supposing that the following structural panel equation represents the chad basin region:

$$\delta\omega_{it} = \lambda_{io} + \vartheta_1\omega_{it-1} + \vartheta_2\omega_{it-2} + \dots + \vartheta_p\omega_{it-p} + \Psi\xi_{it} \quad (1)$$

where δ is an invertible ($w \times w$) matrix defining the contemporaneous connection among all variables used in the study; ϑ_{it} is ($w \times 1$) vector of endogenous variables, such that $\omega_{it} = \omega_{1t}, \omega_{2t}, \dots, \omega_{nt}$. λ_{io} is ($w \times 1$) vector of constants symbolising country-specific intercept; ϑ_i is a ($w \times w$) matrix of coefficients of endogenous variables lagged (for every $i = 1 \dots p$); Φ is a vector of coefficients. Ψ is a ($w \times w$) matrix whose non-zero diagonal elements consider the direct effects of shocks over one endogenous variable in the system, and ξ_{it} is a vector of uncorrelated error terms (white-noise structural disturbances).

Equation (1) is the $P - SVAR$ model. Because of the feedback characterising the SVAR procedure¹, the model cannot be estimated directly (see Enders, 2004). But it is possible to estimate and recover the information in the SVAR system. According to Kutu and Ngalawa (2016) and Ngalawa and Viegi (2011), the model can be estimated by estimating an abridged form, $SVAR$ implicit in the equations. A pre-multiplication of (1) by δ^{-1} gives:

$$\omega_{it} = \delta^{-1} \lambda_{io} + \delta^{-1}\vartheta_1\omega_{it-1} + \delta^{-1}\vartheta_2\omega_{it-2} + \dots + \delta^{-1}\vartheta_p\omega_{it-p} + \delta^{-1}\Psi\xi_{it} \quad (2)$$

This can be represented as,

$$\delta^{-1}\lambda_{io} = k_i, \delta^{-1}\vartheta_1 \dots \delta^{-1}\vartheta_p = \zeta_i \dots \zeta_p, \delta^{-1}\Phi = \alpha \text{ and } \delta^{-1}\Psi\xi_{it} = \varepsilon_{it} \quad (3)$$

From equation 3, we derive (4):

$$\omega_{it} = k_i + \delta_1\omega_{it-1} + \delta_2\omega_{it-2} + \dots \dots \dots + \delta_p\omega_{it-p} + \varepsilon_{it} \quad (4)$$

¹ The SVAR system incorporates feedback. This makes it problematic to be estimated since endogenous variables affect one another in the past and the realisation time path of $\delta\omega_{it}$.

Thus, (1) differs from (4). (1) is known as a $P - SVAR$ or primitive system where the variables have simultaneous effects on one another while (2) is known as an abridged form, $P - SVAR$ or a $P - SVAR$ stated in standard form in which the variables that are found on the right-hand side are prearranged at time t and no variable has a direct contemporaneous (immediate) impact on one another in the model. Also, Enders (2004) settled that the error term (ε_{it}) is a composite of shocks in ω_{it} .

However, equation (4) can be stated in a condensed form as in (5):

$$\omega_{it} = k_i + \delta(\Gamma)\Phi_{it} + \varepsilon_{it} \quad (5)$$

where ω_{it} is ($w \times 1$) vector of variables given by

$$\omega_{it} = (FDI, TI, ME) \quad (5.1)$$

Equation 5.1 is the vector of the LCBCs, and they are, in this study, defined as endogenous variables. k_i denotes the vector of constants that symbolises the intercept terms of the countries. $\delta(\Gamma)$ and $\rho(\alpha)$ are matrices of polynomial/multinomial lags capturing the relationship between the endogenous variables as well as their lag lengths. $\varepsilon_{it} = \delta^{-1}\Psi\xi_{it}$ is a vector of random disturbances, which also could be written as $\delta\varepsilon_{it} = \Psi\xi_{it}$.

(6) and (7) are alike. Both are abridged forms of $P - SVARs$ that are derived from the primitive $P - SVAR$ system of (1) where every variable is assumed to simultaneously impact each other. It is also assumed to describe the response of the FDI in the LCBCs. However, for the information in the structural equation to be recovered, restrictions are imposed on matrices $\delta = \Psi$ in the system of equation (6).

$$\begin{bmatrix} 1 & 0 & 0 \\ \tau_{21} & 1 & \tau_{23} \\ \tau_{31} & 0 & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{it}^{FDI} \\ \varepsilon_{it}^{TI} \\ \varepsilon_{it}^{ME} \end{bmatrix} = \begin{bmatrix} x_1 & 0 & 0 \\ 0 & x_2 & 0 \\ 0 & 0 & x_3 \end{bmatrix} \begin{bmatrix} \xi_{it}^{FDI} \\ \xi_{it}^{TI} \\ \xi_{it}^{ME} \end{bmatrix} \quad (6)$$

Equation 6 presents the restricted matrixes. The first matrix is the δ -matrix of the model's non-recursive restrictions. The second, Ψ -matrix, is the diagonal matrix. ε_{it}^{FDI} , ε_{it}^{TI} and ε_{it}^{ME} are reduced-form residuals for the variables. The associated structural shocks with the

equivalent equations are represented with the following residuals: ξ_{it}^{FDI} , ξ_{it}^{TI} and ξ_{it}^{ME} .

In the short run SVAR, the study developed identification by placing restrictions on matrices in (6). It is assumed to be non-singular, and it also ensures the precise identification of the system. Nonetheless, since there are $g(g + 1)/2$ free parameters in the matrices, given its symmetric nature, numerous parameters could be estimated in (6). g is the number of variables. Therefore, since there are $2g^2$ parameters in equation (6), then, the identification order condition entails that $2g^2 - 0.5g(g + 1)$ or $0.5g(3g - 1)$ further restriction should be placed on the elements of the matrices. Following Amisano and Giannini (1997), this study argues that the $P - SVAR$ employed in this study, therefore, needs $2g^2 - 0.5g(g + 1)$ or 12 restrictions to be placed absolutely on the matrices in (6). To identify the scheme since matrix δ is supposed to be a non-singular diagonal matrix, six exclusion restrictions will be imposed on it, while six exclusion restrictions are anticipated to be imposed on matrix ρ . **But, since our non – recursive P – SVAR has imposed 22 zero restrictions on matrix δ , the system is considered to be over identified and 8 free parameters in matrices δ and 7 in matrix ρ (see (6)).**

Order and identification of variables are in line with the literature (see Rotimi and Ngalawa, 2017). However, **identifying restrictions in this study follows these economic intuitions- variables influence each other based on economic theory, and this depends on the position of the variable in the identification arrangement; terrorism affects FDI, military expenditure affects terrorism and FDI but may not be otherwise.**

Given that the non-zero coefficients (c_{kj}) in the non-singular matrices are employed to show that variable j instantaneously affects variable k . For instance, the FDI is captured in row 1, the terrorism index in row 2 and row 3 is the military expenditure. Based on the δ matrix in equation 6, FDI in row 1 may respond contemporaneously to terrorism and military expenditure because investors are conscious of

their investment environment. Row 2 presents the terrorism index equation. The FDI responds contemporaneously to terrorism and military expenditure. An environment that attracts a reasonable level of military expenditure is assumed to have minimised terrorism, hence, free for investment. Their restrictions are denoted with τ_{21} and τ_{31} ; this suggests that FDI positively improvement in terrorism and military expenditure. These transmission channels assert the belief that foreign direct investment flourishes in a safe environment devoid of economic instability and terrorism, conflicts and political impasses (see Bezic, Galovic and Misevic, 2016). Similarly, it is expected that military expenditure will positively respond to terrorism. A rise in terrorism level will demand higher military intervention, thus increasing military expenditure and vice versa. The contemporaneous response is represented as c_{32} .

Estimation and Results

Lag length test

This study selected the optimal lag length. The procedure is guided by a recognised criterium as in Rotimi and Ngalawa (2017). Using various lag selection measures like sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SIC) and Hannan – Quinn information criterion (HQ) to estimate the P-SVAR model, lag 2 is found suitable for the model. It will offer more accurate and robust dynamics without having to remarkably shorten the estimation sample, which will compromise the degrees of confidence (see Rotimi and Ngalawa, 2017; Kutu and Ngalawa, 2016). Furthermore, the selected lag length provides no room for serial correlation in the residuals (see Kose and Baimaganbetov).

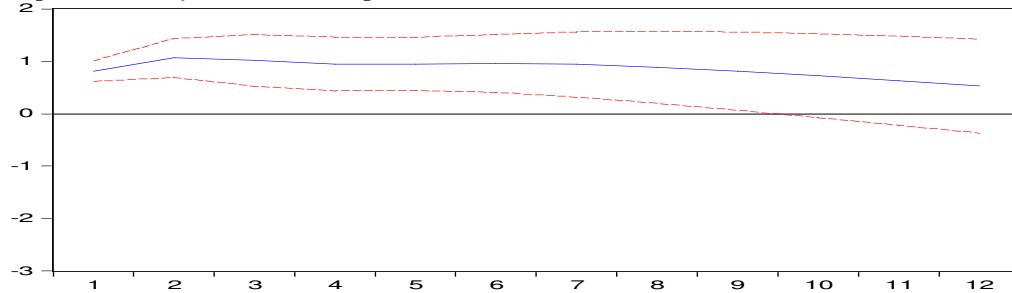
Following Ngalawa and Viegi (2011), this study checks for the joint significance of the variables to determine the robustness of the model. The results reveal that the endogenous variables are jointly significant at each lag length for all equations. The results also

reveal that disjointedly, the equations are significant also at second lag length order.

Analyses of the Impulse Response (IRS): *The responses of FDI to TI and ME and the response of ME to TI*

The study plots impulse response functions (IRF)² of the various variables employed in the study. Specifically, it displays the response of the FDI to terrorism index and military expenditure on the one hand and the response of the military expenditure to terrorism on the other hand (see Figures 1a and 1b).

Figure 1a: Response of Foreign Direct Investment to Terrorism Index

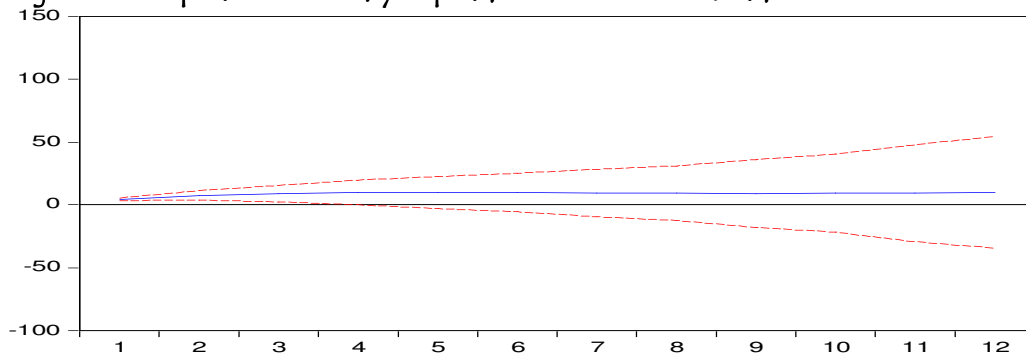


Contrary to the null hypotheses O_a and O_b , the results show that FDI significantly and statistically responds to terrorism index and military expenditure (see Figure 1a and 1b). This suggests that the duo, terrorism index and military expenditure are sacrosanct factors to determine FDI and probably its volume simultaneously. This finding aligns with Bandyopadhyay, Sandler, and Younasz (2014). The results also support Bezic, Galovic, and Misevic (2016) carried out on the European Union. This study asserts that both the terrorism index and military expenditure explain the movement in FDI within the Lake Chad Basin. As shown in Figure 1a, FDI responds negatively to the terrorism index and the response is found to be statistically significant from periods 1 to 9. This finding aligns with earlier studies that

² The IRF shows a response to structural one standard deviation innovation of one variable to the other (see Rotimi and Ngalawa, 2017).

terrorism impedes FDI. In addition, it implies that as the country witnesses rising activities of terrorism, investors would be discouraged from investing their resources in the country to avoid unforeseen losses. Also, gradual withdrawal may be observed where there are existing investments in the country. This is obvious in the case of firms and multinationals that have relocated from Nigeria and Chad region to places like South Africa. To cushion this, military expenditure is increased as shown in Figure 1a. The figure shows that FDI and terrorism index are negatively related. In the figure, FDI decreases from period 1 to 2 before it begins to significantly decline up to period 9. The decrease continues statistically insignificantly into period 12. Furthermore, while military expenditure concurrently increases with the terrorism index, it decreases with FDI on the other hand (see Figure 1b).

Figure 1b: Response of Military Expenditure to Terrorism Index



The impulse response function on military expenditure to terrorism index is presented in Figure 1b and it shows a positive association between military expenditure and terrorism. This implies that the military expenditure positively responds to structural one standard deviation innovation in terrorism. It also implies that one structural innovation introduced to terrorism will lead to a rise in total expenditure incurred in the military sector. As revealed in Figure 1b, the increase in military expenditure is statistically significant from period 1 through period 4. As it proceeds into period

5 and lastly to period 12, it continues to rise but is statistically insignificant. This probably suggests that there may be other interventions which may be different from the military intervention that is used to counter-terrorism.

Overall, the general responses of the endogenous variables to structural one standard innovation in terrorism show that foreign direct investment and military expenditure are statistically significant and stable.

Variance Decomposition Results

Table 1 Variance Decomposition of Foreign Direct Investment

Period	Foreign Direct Investment	Terrorism Index	Military Expenditure
3	99.59540	0.304924	0.099680
6	99.34809	0.400953	0.250954
9	99.10216	0.456356	0.441479
12	98.82445	0.507048	0.668498

Table 1 presents the Variance Decomposition results using the Cholesky ordering- Foreign Direct Investment, terrorism index and military expenditure. Table 1 reveals that shocks to the terrorism index and military expenditure cumulatively account for less than 0.40 per cent fluctuation in foreign direct investment in period 3. In period 6, the cumulative shocks to terrorism and military expenditure slightly rise to 0.65 per cent and later progress to 0.89 per cent in period 9 and 1.17 per cent in period 12.

Table 2: Variance Decomposition of Military Expenditure

Period	Foreign Direct Investment	Terrorism Index	Military Expenditure
3	0.220736	1.046301	98.73296
6	0.468882	2.267162	97.26396
9	0.951749	3.707945	95.34031
12	1.418472	4.872005	93.70952

The findings for the variance decomposition of military expenditure are presented in Table 2. The results show that shocks terrorism largely accounts for more than foreign direct investment for the fluctuation

in military expenditure in period 3. Specifically, it accounts for 1.04 per cent as against 0.22 per cent of foreign direct investment. In period 6, terrorism and foreign direct investment account for about 2.26 per cent and 0.46 per cent. This finding aligns with a literature that terrorism induces military expenditure. The trend continuously rises to 0.95 per cent and 3.70 per cent for foreign direct investment and terrorism, respectively and finally peaks at 1.41 per cent and 4.87 per cent.

SUMMARY AND CONCLUSION

This study examines a three-variable (lnFDI, TI and lnME), P-SVAR model to determine how FDI responds to violent extremism within the Lake Chad basin region for the period covering 2000–2019. The result reveals that foreign direct investment significantly responds to terrorism. Thus, higher rates of terrorism impede foreign direct investment. The result also reveals that terrorism increases military expenditure. Findings from this study reveal a significant positive connection between terrorism and military expenditure. On the other hand, it shows a significant negative connection between foreign direct investment and terrorism; this implies that terrorism plays a significant role in determining foreign direct investment volume variations, which may subsequently stimulate economic growth. It also suggests that terrorism prompts military expenditure. The results from the variance decomposition show that shocks to terrorism account for fluctuation in foreign direct investment. These results validate the claim in the literature that terrorism hampers foreign direct investment (see Bezic, Galovic, and Misevic, 2016; Rotimi et al, 2013). On this basis, this study recommends that the region should guide against terrorism to attract foreign direct investment, which will enhance economic growth and the general well-being of the region. This study, among other things, recommends that further study may want to extend this research by considering how violent extremism impact household expenditure and

consumption patterns which could not be considered in this study due to data paucity.

Disclosure statement: No potential conflict of interest was reported by the author(s).

Funding: There was no funding for this work

Notes on Contributors

Ojo Joseph IseOlorunkanmi obtained his B.Sc Political Science degree from Bayero University, Kano, Nigeria; his M.Sc from the University of Ibadan, Nigeria completed his PhD at the University of KwaZulu Natal, South Africa. He currently lectures at the Department of Political Science and International Relations Landmark University, Omu-Aran, Nigeria. His areas of interest include Peace and conflict studies, International Relations and Comparative Politics, Migration Studies and Political Economy.

Mathew E. Rotimi had his B.Sc degree from Bayero University, Kano, Nigeria; his M.Sc from the University of Ibadan, Nigeria and PhD from the Department of Economics, University of KwaZulu Natal, Westville Campus, South Africa. He also lectures at the Department of Economics Federal University, Lokoja, Nigeria. His areas of expertise include Energy economics

Ayodele Victor Ahmed had his B.Sc degree in Economics from Ahmadu Bello University, Zaria, Nigeria; his M.Sc and PhD degrees from Ekiti State University, Ado Ekiti, Nigeria in 2010 and 2022 respectively. He currently lectures at the Department of Economics at Landmark University, Omu Aran, Nigeria. His area of research is Industrial Economics.

Henry Nweke-Love teaches International Relations at the Department of Political Science and International Relations, Landmark University,

Nigeria. His areas of research interests include international economic relations, globalization, Politics of energy resources, migration studies and diplomatic practice

REFERENCES

- Abadie, A. & Gardeazabal, J. (2003). The economic costs of conflict: a case study of the Basque Country. *American Economic Review* 93, 113–132.
- Abadie, A. & Gardeazabal, J., (2008). Terrorism and the world economy. *European Economic*
- Akande, J. O. & Kwenda, F. (2017). Does competition cause stability in banks? SFA and GMM application to Sub-Saharan Africa commercial banks. *Journal of Economics and Behavioral Studies*, 9(4 (J)), 173–186.
- Amit, S., Barua, L. & Kafy, A. A. (2021). Countering violent extremism using social media and preventing implementable strategies for Bangladesh. *Heliyon*, 7(5), e07121.
- Bak, M., Tarp, K.N & Liang, C.S. (2019) Defining the Concept of 'Violent Extremism' Delineating the attributes and phenomenon of violent extremism Geneva Paper 24/19 Review 52, 1–27.
- Bandyopadhyay, S, Sandler, T & Younasz, J. (2014) Foreign direct investment, aid, and terrorism. *Oxford Economic Papers* (2014), 25–50 doi:10.1093/oep/gpt026
- Bezic, H., Galovic, T. & Misevic, P. (2016) The impact of terrorism on the FDI of the EU and EEA countries. *Zb. rad. Ekon. fak. Rij.* vol. 34 no. 2 333–362.
- Bezić, H., Galović, T & Mišević, P. (2016) The impact of terrorism on the FDI of the EU and EEA countries. *Zb. rad. Ekon. fak. Rij.* vol. 34 no. 2 333–362
- Bray, J. (2010). Foreign direct investment in conflict-affected contexts. *International Alert, London, UK.*

- Camacho, M. & Perez-Quiros, G. (2010). Introducing the euro-sting: Short-term indicator of euro area growth. *Journal of Applied Econometrics*, 25(4), 663–694.
- Canova, F. (2005). The transmission of US shocks to Latin America. *Journal of Applied Econometrics*, 20(2), 229–251.
- Coe, D.T. & Helpman, E. (1995) International R & D spillovers. *European Economic Review* 39 (5), 859–887.
- Cordesman, A.H. (2017) Global trends in terrorism:1970–2016. Working Draft, August 28, 2017.
- Enders, W. & Sandler, T. (1996). Terrorism and foreign direct investment in Spain and Greece. *Kyklos*, 49(3), 331–352.
- Eraker, B., Chiu, C. W. J., Foerster, A., Kim, T. B., & Seoane, H. (2008). Bayesian Mixed Frequency VARs.
- Esquivias, M. A. & Harianto, S. K. (2020). Do competition and foreign investment spur industrial efficiency? firm-level evidence from Indonesia. *Heliyon*, 6(8), e04494.
- Galeazzi, G., Medinilla, A., Ebiede, T. M. & Desmidt, S. (2017) Understanding the Lake Chad Basin Commission (LCBC) Water and security at inter-regional crossroads. Political Economy Dynamics of Regional Organisations (PEDRO). www.ecdpm.org/pedro.
- Gujarati, N. (2004). Basic Econometrics, 4th edition, International Edition, McGraw-Hill/Irwin, a business unit of The McGraw-Hill Companies, Inc.
- Hany, M. (2019). FDI response to political shocks: What can the Arab Spring tell us?. *Journal of Behavioral and Experimental Finance*.
- Harvey, C. R. (1989). Forecasts of economic growth from the bond and stock markets. *Financial Analysts Journal*, 45(5), 38–45.
- Hoare, Z., & Hoe, J. (2013). Understanding quantitative research: Part 2. *Nursing Standard*, 27(18), 48–55. <http://www.search.janes.com.lumen.cgsccarl.com>
- Im, K.S., Pesaran, M.H. & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115, pp. 53–74.

- Jane's Intelligence Watch (2005) Lake Chad Basin looks to ride wave of concern. 13 July,
- Joshua, U., Adedoyin, F. F., & Sarkodie, S. A. (2020). Examining the external-factors-led growth hypothesis for the South African economy. *Heliyon*, 6(5), e04009.
- Kutu, A. A. & Ngalawa, H. (2016). Monetary policy shocks and industrial output in BRICS countries. *SPOUDDAI-Journal of Economics and Business*, 66(3), 3-24.
- Lawal, A.I., Babajide, A. A., Asaley, A. & IseOlorunkanmi O. J. (2019) Examining the linkages between economic growth and terrorism: Evidence from Nigeria. In: The impact of global terrorism on economic and political development. Pp. 353-377.
- Levin, A., Lin, C.F. & Chu, S.J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108, pp. 1-24.
- Li, C., Murshed, S. M. & Tanna, S. (2017). The impact of civil war on foreign direct investment flows to developing countries. *The Journal of International Trade & Economic Development*, 26(4), 488-507.
- Li, Q. & Resnick, A. (2003) Reversal of Fortunes: Democratic Institutions and Foreign Direct Investment Inflows to Developing Countries. *International Organization* 57: 175-211.
- Lutz, J. B. & Lutz, M. J. (2014) "Terrorism and Its Impact on Foreign Economic Activity in Sub-Saharan Africa", *Journal of Business and Economics*, Vol. 5, No. 4, pp. 525-534.
- Meinhold, R. J. & Singpurwalla, N. D. (1989). Robustification of Kalman filter models. *Journal of the American Statistical Association*, 84(406), 479-486.
- Ngalawa, H. & Viegi, N. (2011). Dynamic effects of monetary policy shocks in Malawi. *South African Journal of Economics*, 79(3), 224-250.

- Nitsch, V., & Schumacher, D. (2004). Terrorism and international trade: an empirical investigation. *European Journal of Political Economy*, 20(2), 423-433.
- Omenma, J.T. (2019) Untold Story of Boko Haram Insurgency: The Lake Chad Oil and Gas Connection Politics and Religion, page 1 of 34, 2019.
- Omumbo, M. O. (2020). Effectiveness of Police Security Measures in Addressing Violent Extremism in Mombasa County, Kenya. *World Journal of Innovative Research (WJIR)*, 9(5), 29-37.
- Powers, M. & Choi, S. W. (2012). Does transnational terrorism reduce foreign direct investment? Business-related versus non-business-related terrorism. *Journal of Peace Research*, 49(3), 407-422.
- Rotimi, M. E. & Ngalawa, H. (2017). Oil price shocks and economic performance in Africa's oil exporting countries. *Acta Universitatis Danubius. Œconomica*, 13(5).
- Samuel, M. (2019) Economics of terrorism in Lake Chad Basin: Islamic State West Africa Province is proving its economic resilience by generating income from obliging local communities. <https://issafrica.org/iss-today/economics-of-terrorism-in-lake-chad-basin>.
- Shahbaz, M.A., Javed, A., Dar, A. & Sattar, T. (2012). Impact of terrorism on foreign direct investment in Pakistan. *Archives of Business Research*, 1(1), 6.
- Sims, C. A., Stock, J. H., & Watson, M. W. (1990). Inference in linear time series models with some unit roots. *Econometrica*, 58(1), 113-144.
- Umuhire, J. C. & Muteteri, B. (2018). The Contribution of FDI Inflows on High Technological Structure of Rwanda Manufactured Exports. *World Journal of Innovative Research*, 5(2), 262466.
- United States, Geological Survey (USGS). 2010. "Assessment of undiscovered oil and gas resources of the Chad Basin

Province, North-Central Africa." USGS Central Energy Resources Science Center.

Volker, N. & Schumacher D. (2004) "Terrorism and international trade: an empirical investigation", *European Journal of Political Economy*, Vol. 20, No. 2, pp. 423–433

World Development Indicator (2021).
<https://datacatalog.worldbank.org/dataset/world-development-indicators>