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## Unemployment and Violence: ARDL Endogeneity Approach

### Desempleo y violencia: Enfoque de endogeneidad ARDL

Adenuga Fabian Adekoya<sup>\*</sup>  
Nor Azam Abdul Razak<sup>\*\*</sup>

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#### Abstract

This study examines the link between unemployment and violence by controlling for income and security expenditure as an antidote to reduce violence in Nigeria. Violence claims many lives and properties in the country, which further increased the demand for public security as tax on the nation's resources. Also, the increased unemployment in Nigeria, deserving urgent attention to be reduced, as literature has pointed out, causes idleness, deception, frustration and anger. The idea of criminal motivation and strain as an inducement to violence are supported by evidence. Considering the nature of the variables in this study, we tested for endogeneity by using annual data set from 1980 to 2015 before proceeding to test for the long-run and short-run relationship. The Bound Test used to test the cointegration while the Autoregressive Distributed Lag Model (ARDL) approach was used to conduct endogeneity test. ARDL Instrumental Variable is also employed to determine long-run and short-run estimates. The results showed that unemployment causes violence while income as a variable to economic growth reduces violence at the 1% level of significance. Similarly, the deterrence variable of security

<sup>\*</sup> Department of Economics, School of Arts and Social Sciences, Michael Otedola College of Primary Education, Noforija-Epe, Lagos, Nigeria. [adenugaadekoya@gmail.com](mailto:adenugaadekoya@gmail.com)

<sup>\*\*</sup> Department of Economics, School of Economics, Finance and Banking, Universiti Utara Malaysia, Sintok 06010, Malaysia.

expenditure adversely affects violence at the 10% level of significance. Therefore, this study suggests policy to promote economic growth as the means of income-employment generation among the youth and the unemployed. Youth programs should be provided especially among the unemployed by granting credit facilities to finance their own projects and further strengthen the deterrence institutions.

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**Resumen**

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Este estudio examina el vínculo entre el desempleo y la violencia mediante el control de los ingresos y el gasto de seguridad, como un antídoto para reducir la violencia en Nigeria. La violencia se cobra muchas vidas y propiedades en el país, lo que aumenta aún más la demanda de seguridad pública, traducida como un impuesto a los recursos de la nación. Además, el aumento del desempleo en Nigeria, la cual merece una atención urgente que se reduzca ya que, la literatura señala, provoca ociosidad, engaño, frustración e ira. La idea de la motivación y la tensión delictiva como un incentivo a la violencia está respaldada por la evidencia. Teniendo en cuenta la naturaleza de las variables en este estudio, probamos la endogeneidad mediante el uso de datos anuales de 1980 a 2015, antes de proceder a la prueba de la relación de largo y corto plazo. El Bound Test se usó para probar la cointegración, mientras que el enfoque del Modelo de retardo distribuido autorregresivo (ARDL), se usó para realizar pruebas de endogeneidad. La variable instrumental de ARDL también se emplea para determinar estimaciones a largo y corto plazo. Los resultados mostraron que el desempleo causa violencia; mientras que el ingreso, como variable del crecimiento económico, reduce la violencia, al nivel de significancia del 1%. De manera similar, la variable de disuasión del gasto en seguridad afecta adversamente la violencia, al nivel de significancia del 10%. Por lo tanto, este estudio sugiere una política para promover el crecimiento económico como el medio de generación de empleo-empleo entre los jóvenes y los desempleados. El empoderamiento de la juventud debe proporcionarse especialmente entre los desempleados mediante la concesión de servicios de crédito para financiar proyectos propios y fortalecer aún más las instituciones de disuasión

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## **Introduction**

Nigeria as a developing nation has observed civil war (from 1967 to 1970) and collective violent revolts (National Human Rights Commission, 2007; Katsouris & Sayne, 2013; Dike, 2014). The uprisings that involve the use of terror tactics among others are the electoral and political violence in the Western Region (1964-65); Tiv revolts (1960, 1965); Agbekoya peasant violence (1968-69); Maitatsine Religious violence (1980-85); Odu'a Peoples' Congress and violence in the South-West; Niger-Delta upheaval by ethnic militias and cults, and the recent Boko Haram insurgency in the North-Eastern part of the country (Alemika & Ahmadu, 2014). Also, the Nigeria Watch (2016) noted that forms of violence such as for political conflict, religious violence, road accidents, criminal violence and land clashes are rampant in the country.

Several people have died due to these various types of violence. For instance, between 2006 and 2016 the number of deaths recorded due to violence stood at 106,744, which translates to the average death rate of 5.93 per 100,000 for that period. The death rate per 100,000 increased from 3.11 in 2006 to 3.52 and 4.83 in 2006 and 2009 respectively which later increased to 9.69 in 2015. Between 2006 and 2014, the average violent death rate per 100,000 for the criminal violence stood at 17.37; political violence was 9.12 while religious violence remained 6.98; oil-related violence was 3.85 as cult violence stood at 0.4 and land-issues violence was 0.11 (Nigeria Watch reports, 2014 & 2016).

In relationship to the violent incidents and death in Nigeria, three major developments crop up. Firstly, it succeeds in truncating the tranquility, creating fear and insecurity. The negative effect of the insurgency by the Boko Haram activities is that normal procedures of trade and investments especially in the North-East of the country were truncated; also it distorts the routine performance of the security agencies in the country (Eme & Ibieta, 2012). Terrorism affects trade openness, which restricts the movements of people, goods and services in the region (Shuaibu & Lawong, 2016). Also, the destruction of properties and lives force displacement and migration of citizens particularly from the North-East region towards neighboring countries. In the case of militants operating in the oil-rich Niger Delta region, there have been several violent attacks of oil installations and abductions, ruining lives and properties in places like Port-Harcourt and Warri (Nigeria Human Right Commission, 2007). Due to the militant's violent activities, the product loss value of pipeline destruction stood at 191.62 in million metric tons in 2008 was at the value of ₦14.594 billion (National Bureau of Statistics (NBS), 2011). Furthermore, the unrest and insecurity that pervaded the country cannot be left out as it has damaged infrastructures that drive the

growth and development of the economy and by extension the country's image (Dike, 2014).

Secondly, national resources and relief have been diverted away from the people displaced who are affected by the arms proliferation. The relief items caused by the insurgency worth N500m were dispersed to about 116,000 internally displaced persons in Yobe State (Gabriel, 2014). Also, government expenditure meant for developmental projects are used to purchase arms from foreign countries in order to fight the militants and insurgency in Nigeria (Shuaibu & Lawong, 2016).

Lastly, there is an increase in the cost of operation and governance (Federal Ministry of Finance of Nigeria, 2014). This is because violent crime issues are noted as threats to budget actualization by the Nigeria Government. The threat of violent crime is established as properties destruction and homicides through extra-judicial means, kidnapping, armed robbery and arson. That is, the threat increased national budget spending on security and tackling violent crime instead of other capable areas like health (reduction of infant mortality); education; housing; infrastructure; food and agriculture (Okonjo-Iweala & Osafo-Kwaako, 2007). Besides, the internal security expenditure as a percentage of total expenditure increased from 7.21% in 2010 to 9.10% in 2013, and later, increased to 10.70% in 2015. In the same period, the social services expenditure increased from 17.71% in 2010 to 26.25% in 2013, but reduced to 21.07% in 2015.

In explaining the gravity of violence, previous studies have attributed socio-economic factors as its main cause. Among these factors is unemployment which is linked positively to violence (Caruso & Schneider, 2011; Poveda, 2011). Perhaps, unemployment increases lack of opportunity, poverty and widens the income distribution; furthermore, it reduces access to skill and knowledge acquisition (Edmark, 2005). Also, the financial adversity created by unemployment causes family instability which includes separation and divorce (Fomby & Cherlin, 2007). Moreover, Ubhenin and Enabunene, (2011) and Ejumudo (2014) viewed that the root causes of violence in Nigeria are high unemployment, the infrastructure deficit, and a feeling of inequality and injustice.

Adebayo (2013) affirmed that unemployment increases crime in the country with the rising youth unemployment due to the synchronized failure of generating employment. Also, the insurgency of Boko Haram is more encouraged in the North East part of the country due to a high number in unemployment that includes Almajiris and the alienated youths by the political elites in the region (Usman, 2015).

Ikelegbe (2005) concluded that the economy provided support for arms proliferation, violent institutions and the prevalence of violent crime, and communal/ethnic conflicts. But, Oyefusi (2010) found that reducing the effect that low-level violence and oil-related criminality have on unemployment causes a positive significant result to be obtained, except when education interacts with unemployment. On the contrary to Oyefusi (2010), Oyefusi (2008) detected that unemployment is not significant to determine participation in the rebellious acts.

However, unemployment is worrisome with its present statistics because young people comprise 60% of the country's population, and most of them are unemployed and underemployed. The underemployment rate increased from 16.3% in 2010 to 16.8% and 18.7% in 2012 and 2015 respectively as the overall unemployment rate stood at 10.4% for 2015 (NBS, 2016).

Therefore, the unemployment statistics advocates two realities: firstly, reduced labor productivity from 12.45% in 2011 to 7.48% in 2014 (NBS, 2015) and secondly, the labor market policy in the country characterized reducing opportunity costs of violent crime due to high strain conditions of emotional disturbance among the unemployed which include idleness and frustration. The effect of the latter is that unemployed people are susceptible to any available anti-social behaviour and violence as they are easily recruited by criminal groups (Arowesegbe, 2009; Nwankwo & James, 2016; Adekoya, 2017).

In spite of the numerous dangers of unemployment, its statistical link to violence remains unclear in Nigeria based on available literature (Oyefusi, 2008; Oyefusi, 2010). By focusing on Nigeria, this paper would draw the attention of the policymakers to avert violence so that schooling and education can spread throughout the country and to focus on the need to improve the welfare of the citizens. Also, the citizen's right to live and their civil rights need more guarantee. Especially, that The World Bank aims to prevent violent conflict which considers development processes that interact with security and human rights to inform policies in affected countries which include Nigeria (The World Bank, 2017). Moreover, most of the studies on violence has been concentrated on the Niger-Delta part of the country (Oyefusi, 2010; Ubhenin & Enabunene, 2011; Ejumudo, 2014) and this study is novel in using aggregate data to analyze the link between unemployment and violence in Nigeria.

Thus, this study's main objective is to determine the positive relationships even if there is the existence of an endogeneity problem between unemployment and violence. In providing these estimates, we employed the data set from 1980 to 2015 from Nigeria. Based on this objective, an attempt

was made to answer a question: that is, is there a positive relationship between unemployment and violence. The remaining part of the paper is organized as follows: section 2 discusses the previous studies as section 3 considers the methodology; section 4 focuses on results and discussion while section 5 is the conclusion of the study.

## **1. Literature Review**

Violence is mainly measured by its incident and death that results from it, which is rarely different from the crime of murder or homicide. Crime is considered illegal but the act of violence which results in death may earn the same penalty as the crime that results in murder/homicides. Therefore, the use of homicide as a measurement of crime based on it being the most serious and publicly visible of all the violent acts make it more connected to violence (Poveda, 2012). These two concepts involve the use of threat either with physical or psychological force with ulterior motives to do harm (Fajnzylber, Lederman & Loayza, 2002). In a determined perspective, the use of force and threats play a prominent role in the sensitivity of violence and security (Poveda, 2012).

Over time, a criminologist in their submission concluded that socioeconomic factors, which include unemployment, are strong predictors of disruptions, violence and crime. The criminologist, however, takes on different positions in terms of their theoretical explanations on how socioeconomic factors affect violent crime matters. In the account of Merton (1938), he viewed that socioeconomic factors may not ordinarily cause people to be rebellious, but that it is the negative conditions inflicted on the disadvantaged, as a result of the poor socioeconomic condition. The negative conditions, such as stress and depression, would strain them and further induce them to behave in a deviant manner. Behaving defiantly could be by abandoning the societal goal and setting another goal for themselves, acting against the societal norms such as rebellious acts which create an unconducive atmosphere in the society. Furthermore, Merton (1938) described that a positive relationship exists between socioeconomic factors such as unemployment and rebellious acts. Therefore, rebellious acts involve violence that creates tension and led to the loss of lives and further disorganized the society, as Shaw and McKay (1942) also concluded that poor socio-economic conditions destroy existing bonds in the society. That is, when the bond is destroyed, disorderliness and disruption take place in the society. It is most likely that disorderliness and disruption are capable of creating violence in the society.

Conversely, Becker (1968) postulated that participation in a legal or illegal act is best comprehended as an attempt to satisfy basic necessities. He described this basic necessity as incentives which may motivate crime.

Incentives could either increase or decrease the motivation to commit a crime. For instance, while unemployment may increase the chances of committing crime, income and deterrence policy would reduce the chances to commit a crime. Incentive-motivated crime is determined by how more profitable the gain in illegal business is compared to legal business. Furthermore, he accounted for other factors such as criminal knowledge of the environment and presence of adequate security could possibly discourage or reduce the gain in illegal business, as criminals would not want the cost of committing a crime to outweigh the gain. Besides, Becker theoretically affirmed that a positive relationship exists between unemployment and crime related factors in the supply function of crime. In addition, previous studies on violent crime and violence measured by homicides have employed the rational theory of crime by Becker (1968) (Fajnzylber *et al*, 2002; Poveda, 2012). The idea is that crime has a negative impact on the society such as causing death and destruction, which could easily erupt into violence.

Caruso and Gavrilova (2012) considered unemployment growth along with political violence in Palestine. Political violence is measured by the number of victims and incidents and further segregating female unemployment from male unemployment. In the study findings, it was revealed that unemployment increases political violence in terms of the emergence of violence and brutality. Also, male unemployment is positively related to the increase of the emergence of violence and brutality, while female unemployment was not. In addition, value-added agriculture and value-added manufacture play a reduction role on the brutality of violence but only value-added agriculture causes a reduction effect on the emergence of violence. This study informs that viable agricultural and manufacturing policies are capable to reduce violence because these two sectors can be used to generate income-employment. That is, providing the youth with a job would neither make them idle nor frustrated.

Likewise, Caruso and Schneider (2011) examined socio-economic factors as causes of terrorism and political violence in 12 countries in Western Europe from 1994 to 2007. The data was estimated with the fixed effect estimator in a negative binomial regression panel. But the result in Caruso and Schneider (2011) are diverse, while income per capita showed a reducing effect on terrorism and political violence measured by incidents, it is found a positive relationship to the brutality of terrorism and political violence measured by a number of victims. Also, the study discovered that incentives through economic investment in real GDP attract political violence and terrorism. Their results informed that frustration and poor expectations especially among the unemployed youth concerning the future economic situations can also encourage terrorist activity which involves murder.

The result between GDP per capita and urban violence of homicides is supported by Poveda (2011). In examining a link between violence and socio-development in Colombia, Poveda (2012a) saw the need of rampant violence being reduced because of its effect and it further causing other violent acts such as homicides and political violence. The sequel, a data set of 32 Colombian departments from 1993 to 2007 was analysed with fixed effects and the Generalized Method of Moment (GMM) techniques. The outcome of the study detected that employment, GDP per capita, and a number of police officers reduced the two forms of violence studied.

Similarly, due to the rising violence that involves homicide and rape in South Africa, Seekings and Thaler (2014) found that unemployment is a direct cause of violence against strangers during the interview but it was not significant. Rather, poverty, taking of drugs and alcoholic drinks served more as incentives for the youth involved in violence.

Oyefusi (2010) used a survey method to study unemployment and civil unrest in the Niger Delta region in Nigeria. The study divided civil unrest into three sections: a peaceful protest—which is low-level violence—, oil crimes, and arms struggle. Results indicate that unemployment is not significant to peaceful protests but positive for arms-struggle. In the case of low-level violence and oil crimes, unemployment shows a negative link but when education interacts with unemployment, the result is positive and significant. The further result showed that earnings have a reducing effect on low-level violence and oil crimes, but when the income exceeds a certain limit, earnings have a marginal impact on the predicted probability of participation in violence. However, while studying the link between unemployment and rebellious acts using the survey method, Oyesfusi (2008) found that unemployment has no significant effect on the probability of the intention to engage in rebellion. The result is similar to Seekings and Thaler (2014) but different from Oyefusi (2010).

From the previous studies above, unemployment is inimical to the economy and would not promote citizen welfare but actually create stress and frustration among the unemployed ones. The added frustration would encourage them to join streets gang or accept an invitation to engage in violence. Of course, their participation is attached to the gain they would receive either by cash given to them by their recruiters or by financial gain realized after selling stolen goods and properties. That is, the financial gain serves as the compensation for their involvement in violent acts. Furthermore, a study on unemployment and violence is still required in order to provide a better understanding because of the mixed results that were obtained in the previous studies.



However, the clarity of the link between unemployment and violence looks ambiguous. This ambiguity link is due to the fact that while unemployment can increase violence, it is not unlikely that violence may indirectly increase unemployment. Also, violence may increase the demand for security, which increases the security expenditure; activities of security at times cause extrajudicial killings which fuel violence. This presupposes that there is a problem of endogeneity among these variables in this study.

On the problem of endogeneity, numerous studies on this subject matter have sought to eliminate the endogeneity problem with various methods which, if not treated, would make the regression spurious and the estimates from such analysis would remain biased (Levitt, 1997; Kelly, 2000; Raphael & Winter-Ebmer, 2001; Fajnzylber *et al* 2002; Edmark, 2005).

One of these studies is Halicioglu, Andrés and Yamamura (2012) in which authors tested unemployment and violent crime with Autoregressive Distributed Lag Model (ARDL) OLS, even though the residual was not serially correlated. We differed in terms of taking a bold step to further carry out the ARDL endogeneity test and using the Autoregressive Distributed Lag Model Instrumental Variable (ARDL IV). This study employs ARDL IV particularly to overcome the problem of serial correlation and instruments (Pesaran & Shin, 1997). The advantage of ARDL lies in its ability to generate sufficient lags for variables in the model. Therefore, unemployment and security expenditure are affirmed as weak exogenous variables in the violence model.

To the best of our knowledge, the available studies (Oyefusi 2008 & 2010; Usman, 2015) that have discussed unemployment and violent crime in Nigeria have not taken cognizance of endogeneity except for Usman (2015). Usman (2015) considered that unemployment and poverty are among factors that have contributed to insecurity and violence, due to the insurgency of Boko Haram, but also affirmed that the insurgency has resulted in increasing insecurity and violence in Nigeria, that further caused unemployment and poverty. Moreover, Usman (2015) did not provide the empirical analysis to validate this causal link in spite of the threats and danger posed by violence to the country. Therefore, this study overcomes the shortcoming in Usman (2015) by testing for endogeneity while considering the statistical relation between unemployment and violence.

## **2. Methodology**

### **2.1 Theoretical Framework**

In establishing the model to test the relationship between unemployment and violence, this study relies on Becker (1968) crime supply function as depicted

in equation 1. This is because criminal acts can generate tension because they create fear in the society especially when the acts involve the death of a person. Also, Halicioglu *et al* (2012) consider crime supply function while examining unemployment and violent crime in Japan. In regards to Becker, people involved in violence may be offered incentives to motivate them to engage in the violence. It is not uncommon that people that engage in violence are linked to poverty or areas with few opportunities and poor economic background. This is because poor areas and people with poor economic background have limited access to police (Fajnzylber *et al*, 2002), which may encourage violence in such areas.

$$VLT_t = f(PR_t, PA_t, U_t) \quad (1)$$

In equation 1,  $VLT_t$  is the total number of crime which depends on  $PR_t$ ,  $PA_t$  and  $U_t$ . The  $PR_t$  shows the probability of arrest and prosecution of the criminal, while  $PA_t$  is the punishment for committing the offense, and  $U_t$  indicates other variables that influence crime which includes unemployment. It is expected that  $PR_t$  and  $PA_t$  would reduce crime as  $U_t$ , if it is unemployment, would increase crime and violence. This model in 1 has been explored and extended by Ehrlich (1973) with the introduction of income inequality as indicated in equation 2.

$$VLT_t = f(PR_t, PA_t, Y_t, YL_t, UNE_t, V_t, Z_t) \quad (2)$$

In equation 2,  $VLT_t$  is the crime rate per person in a country,  $PR_t$  is the probability of the prosecution rate;  $PA_t$ , the penalty received for the crime;  $Y_t$ , the returns from illegal activities, as an incentive to commit a crime;  $YL_t$ , the legal existing gap in income;  $UNE_t$  is the rate of unemployment;  $V_t$ , the vector of environmental variables; while  $Z_t$  captures the psychological effect and other unquantifiable variables on the rate of crime.

Following Ehrlich (1973), we modify equation 2 by testing unemployment and then included income and public expenditure in internal security which led to equation 3. This equation 3 is also similar to the violent crime model in Halicioglu *et al* (2012).

$$VLT_t = f(UNE_t, Y_t, SE_t) \quad (3)$$

We tested equation 3, where  $VLT_t$  is the violence variable in the country which involve incidents that resulted in death,  $UNE_t$  is the probability of unemployment,  $Y_t$  is the income per capita and  $SE_t$  is the public expenditure on internal security. In this model, unemployment ( $UNE_t$ ) is expected to increase violence with a positive sign since it increases the chances of committing violence. Income ( $Y_t$ ) and the security expenditure ( $SE_t$ ) are

expected to be negative as an anti-dote to violence due to the fact that it would reduce the chances of committing violence.

## 2.2 Empirical and Model Specification

### 2.2.1 Cointegration

Following the standard model of crime and violence in literature, equation 4 is thus specified. In this model,  $VLT_t$  represents the violence variable;  $UNE_t$  represents the unemployment rate (%),  $Y_t$  denotes the log of income and  $SE_t$  stands for the security expenditure as a percentage to the total expenditure,  $\alpha_0$  is constant,  $\beta_1$ ,  $\beta_2$  and  $\beta_3$  are parameters, as  $\mu_t$  is the white noise. Considering the nature of the data, we carried out a unit root test to establish if each variable is stationary or not. We used the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP), the result would show if there is need for cointegration or not.

$$VLT_t = \alpha_0 + \beta_1 UNE_t + \beta_2 Y_t + \beta_3 SE_t + \mu_t \quad (4)$$

Based on the result of the unit root tests, we employed the proposed bound test for a long-run relationship by Pesaran, Shin and Smith (2001). This is because it is suitable to estimate co-integration among variables where the variables are having a mixture of integration order  $I(0)$  and  $I(1)$ , and where they are mutually exclusive  $I(0)$  and  $I(1)$ , but it does not consider variables with  $I(2)$ . Where all the variables are  $I(0)$ , the decision would be based on  $I(0)$ ; this implies that the F-statistic needs only to be greater than  $I(0)$  and not necessarily  $I(1)$ . The advantage of ARDL lies in its ability to generate sufficient lags for variables in the model and its superiority to sufficiently provide for the means to ascertain residual correlation. It is also capable of providing the short-run and long-run at the same time. The dynamism is based on the transformation of the variable at the period of one lag in the model using the optimal lag length. The transformation of the variables is done using the Akaike information criterion (AIC) due to the small sample size used in this study (Adekoya & Abdul Razak, 2017).

In terms of smaller sample size, Liew (2004) concluded that AIC is most suitable to determine the optimal lag length for the variable. Moreover, the bound test determines the presence of co-integration in the long-run using the F-test statistic. This is because one of the variables ( $SE_t$ ) is  $I(0)$ ; the bound test approach in this study follows Halicioglu *et al* (2012). In addition, the endogeneity test as the pre-test showed that there is no endogeneity problem even if the variables under investigation are endogenous (see the process in the next section and result in Table 2). Thus, the F-statistic tested the joint significance of the coefficients at one period of lag as shown in equation 5. The null hypothesis of no co-integration shows that  $H_0 : \beta_1 = \beta_2 = \beta_3 =$

$\beta_4 = 0$  (implies non-existence of cointegration) and the alternative is  $H_0: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$  and where at least one of the  $\beta_1$  to  $\beta_4 \neq 0$  (implies the existence of cointegration). The short-run dynamics of ARDL model in equation 6 and the ECT are presented in equation 6 and 7.

$$\Delta VLT_t = \alpha_0 + \beta_1 VLT_{t-1} + \beta_2 UNE_{t-1} + \beta_3 Y_{t-1} + \beta_4 SE_{t-1} + \sum_{i=1}^p \gamma_1 \Delta VLT_{t-1} + \sum_{i=0}^p \gamma_2 \Delta UNE_{t-1} + \sum_{i=0}^p \gamma_3 \Delta Y_{t-1} + \sum_{i=0}^p \gamma_4 \Delta SE_{t-1} + \mu_t \quad (5)$$

$$\Delta VLT_t = \alpha b_0 + \sum_{i=1}^p \gamma_1 \Delta VLT_{t-1} + \sum_{i=0}^p \gamma_2 \Delta UNE_{t-1} + \sum_{i=0}^p \gamma_3 \Delta Y_{t-1} + \sum_{i=0}^p \gamma_4 \Delta SE_{t-1} + \mu_t \quad (6)$$

$$ECT_{t-1} = \beta_1 VLT_t - (\beta_2 UNE_t + \beta_3 Y_t + \beta_4 SE_t + \alpha c_0) \quad (7)$$

## 2.2.2 Endogeneity and Bewley Model

Having used the bound test to establish the cointegration among the variable as affirmed by Granger (1987), we discovered that there is an issue of endogeneity at stake among the variables. It is observed that endogeneity exists between unemployment and crime and related matter, such as violence (Raphael & Winter-Ebmer, 2001; Edmark, 2005; Lin, 2008). Also, expenditure on internal security has the issue of endogeneity with crime (Levitt, 1997; Bourguignon, 1999). This is because the high area with violence may suggest that more security which increases security expenditure, but Halicioglu *et al* (2012) found that an increase in the number of police reduced bodily violent crime. Therefore, the model becomes insufficient (although we ran model 5 and 6 and found no serial correlation, results are available if requested but we are more concerned about the problem of simultaneity to avoid spurious regression).

To have a robust and reliable estimate, the test of exogeneity is conducted using the ARDL approach by Pesaran and Pesaran (2009), based on equations 8 to 10. In the first instance, each independent variable is regressed on its own lag value and variables in the model to obtain their residual. Then, we later ran all the variables with their lag values along with residuals obtained (equation 11). Since there are two independent variables involved, the inverse of the F-stat is used to determine if endogeneity exists or not. Where the F-value is not statistically significant, there is no endogeneity problem (Gujarati & Porter, 2009 and Seddighi, 2012).

$$UNE_t = \vartheta_A + \vartheta_1 UNE_{t-1} + \vartheta_2 Y_{t-1} + \vartheta_3 SE_{t-1} + \vartheta_4 VLT_{t-1} + \epsilon_{0t} \quad (8)$$

$$Y_t = \vartheta_B + \vartheta_5 Y_{t-1} + \vartheta_6 UNE_{t-1} + \vartheta_7 SE_{t-1} + \vartheta_8 VLT_{t-1} + \epsilon_{1t} \quad (9)$$

$$SE_t = \vartheta_B + \vartheta_9 SE_{t-1} + \vartheta_{10} UNE_{t-1} + \vartheta_{11} Y_{t-1} + \vartheta_{12} VLT_{t-1} + \epsilon_{2t} \quad (10)$$

$$VLT_t = \vartheta_C + \vartheta_{13} UNE_t + \vartheta_{14} Y_t + \vartheta_{15} SE_{t-1} + \vartheta_{16} UNE_{t-1} + \vartheta_{17} Y_{t-1} + \vartheta_{18} SE_{t-1} + \vartheta_{19} VLT_{t-1} + \vartheta_{20} RUNE_t + \vartheta_{21} RY_t + \vartheta_{22} RSE_t + \epsilon_{3t} \quad (11)$$

Furthermore, we deal with the problem of endogeneity by using the ARDL instrument variable (IV) by rewriting the Bewley equation. This approach allows the estimated short and long-run of ARDL using the lag of the dependent variable as the independent variable (Stučka, 2004). Therefore, we overcome the problem of whether the instrument should correlate with any of the variables in question. Further, when ECM (dynamic equation) is reparametrized in Bewley's equation, endogeneity bias problems are insignificant and reasonably inconsequential (Inder, 1993). Equation 5 and 6 were reparametrized to generate equation 12 and 13 (Pesaran and Shin, 1997). Thus, the estimated long run and short run model is expressed in equation 12 and 13 respectively, based on the ARDL selected model 1, 1, 0, 1 with the instruments as 1,  $VLT_{t-1}$ ,  $UNE_{t-1}$ ,  $Y_t$  and  $\Delta SE_{t-1}$ ,  $\Delta UNE_t$ ,  $\Delta SE_t$ .

$$VLT_t = \frac{\alpha_{c0}}{\varnothing(1)} + \gamma_1 UNE_t + \gamma_2 Y_t + \gamma_3 SE_t + \frac{1}{\varnothing(1)} \sum_{i=0}^{m_1-1} \gamma_4 \Delta UNE_t + \frac{1}{\varnothing(1)} \sum_{i=0}^{m_1-1} \gamma_5 \Delta SE_t + \frac{1}{\varnothing(1)} \sum_{i=0}^{m_2-1} \gamma_6 \Delta VLT_t + \frac{\eta_t}{\varnothing(1)} \quad (12)$$

$$\Delta VLT_t = \frac{\alpha_{d0}}{\varnothing(1)} + \gamma_7 Y_t + \gamma_8 UNE_{t-1} + \gamma_9 SE_{t-1} + \frac{1}{\varnothing(1)} \sum_{i=0}^{m_1-1} \gamma_{10} \Delta UNE_t + \frac{1}{\varnothing(1)} \sum_{i=0}^{m_1-1} \gamma_{11} \Delta SE_t + \frac{1}{\varnothing(1)} \sum_{i=0}^{m_2-1} \gamma_{12} \Delta VLT_{t-1} + \frac{\eta_t}{\varnothing(1)} \quad (13)$$

### 2.2.3 Data

Annual time series from 1980 to 2015 is employed in this study. The data on violence is a proxy with the ethnic violence sourced from Marshall (2016), it is the magnitude score of episode(s) of ethnic violence involving the country in each year, on the scale of 1 (lowest) to 10 (highest), non-occurrence of violence is denoted with zero (0). This data is used because violence in any form is associated with ethnic revolts in Nigeria, this lawlessness caused bloodletting ethnic squabble and secrecy in the entire political landscape (Dike, 2014). Unemployment data is sourced from NBS various publications and it is rated in percentage (%). Also, income is income per capita of the whole population and it is sourced from the World Development Indicator (2018), and the data is transformed into logarithm form. Public expenditure on internal security is obtained from the Central Bank of Nigeria from various annual reports as a ratio to total expenditure.

### 3. Results and Discussion

The results of the unit root tests conducted with Phillip-Peron and Augmented-Dickey Fuller tests using the Schwarz Information Criterion at maximum lags of 9 are shown in Table 1. Variables are integrated at first difference, that is,  $I(1)$ . The result suggests that a valid regression technique was conducted using the ARDL approach to cointegration. The result of the ARDL cointegration is significant at 1%, which connotes that variables in the model are jointly moving together as presented in Table 2. However, the result of the ARDL endogeneity test indicates that endogeneity does not exist among the variables, with F-statistics value of 0.895 that is insignificant even at 10%. The F-statistics value jointly tests the existence of endogeneity because there is more than one independent variable involved (Razmi & Blecker, 2008; Gujarati & Porter, 2009; Seddighi, 2012).

By rewriting the Bewley equation, the ARDL instrument variable (IV) provides valid estimates to overcome the issue of endogeneity (Pesaran and Shin, 1997), which indicates that the problem of serial correlation is eliminated. The result of the estimated short-run and long-run are presented in Table 2. In the long-run, we found that unemployment causes violence at the 1% level of significance. This suggests that a percentage increase in unemployment would cause more violence in Nigeria.

For instance, Usman (2015) asserted that unemployment is a source of insecurity in Nigeria, just as Ubhenin and Enabunze (2011) concluded that youth restiveness is caused by the high level of youth unemployment and that there is the need to increase the level of human security by empowering more youth. Unemployment reduces opportunities in an economy, whereas employment not only enhances or creates more opportunities, but also statistically leads to a reduction in violent activities in Colombia (Poveda, 2011 & 2012a). Likewise, Halicioglu *et al.* (2012) found that unemployment causes violence in Japan.

However, the result here is not in line with Demombynes and Özler (2005) and Seekings and Thaler (2014), because they were unable to obtain significant values. In South Africa, Demombynes and Özler (2005) observed that a positive link exists between unemployment and violent crime, in criminal catchment area, but they failed to produce a significant result. Even if unemployment has no direct effect on violence in South Africa, Seekings and Thaler (2014) affirmed it has an indirect effect on violence because unemployment increases the high chances of running out of food and more exposure to drinking alcohol as both, consequently, increase violence. In addition, this result supports the positive link obtained between youth unemployment and political violence in Caruso and Schneider (2011).

Moreover, income per capita as a link to economic growth is significant to reduce violent activities at the 5% level of significance. This means that a 1% increase in income would cause a reduction in violence in the long and short run. Similar findings are obtained by Poveda (2012a) on political violence and violence due to homicides; Poveda (2011) on the urban violence of homicide and Halicioglu (2012) on violent crime. Income per capita has a high tendency to reduce the occurrence of violent acts in a nation in both long and short run. This is possible when income per capita portrays legal income or higher gains that produce a higher opportunity cost in criminal activities (Poveda, 2012). Besides, as the income is linked to economic growth, it presupposes that the gain on economic growth may enhance more employment which could lead to a reduction in poverty as inequality does not increase (Goudie & Ladd, 1999). This idea is supported in the conclusion of Fajnzylber *et al.* (2002) that strong economic growth may be used to reduce poverty.

The security expenditure being a deterrence variable exerts a reduction effect on violent activities at the 10% level of significance. This means that a 1% increase in security expenditure is significant to minimize violence in the long-run. Halicioglu *et al.* (2012) found that the number of police is capable of reducing bodily-violent crime as expenditure on police has an adverse effect on crime. But, Halicioglu (2012) did not obtain a significant result between security expenditure and violent crime. However, the result shows that an increase in security, in terms of personnel and infrastructure, would require more expenses, especially if violence persists in the country because there would be more demand for security in order to discourage or minimize violence. That is, security requires better weapons and a higher level of intelligence in modern technologies to fight or engage the militias, cults groups and insurgency. Furthermore, violence is more associated with poor areas and the area where there is a lack of, or no presence of, security. For instance, the ethnic violence in part of Lagos that is densely populated with an inadequate number of security is linked to poverty and lack of opportunity (Brennan-Galvin, 2002).

**Table 1**  
**Result of the Unit Root Tests**

	Augmented Dickey-Fuller (ADF)		Phillip-Perron (PP)		Decisions
	Level	1ST Difference	Level	1ST Difference	
	Intercept and trend	Intercept and trend	Intercept and trend	Intercept and trend	
$VLT_t$	-2.545	-5.578***	-2.754	-5.863***	I(1)
$UNE_t$	-2.806	-6.130***	-2.730	-6.892***	I(1)
$Y_t$	-2.319	-4.117**	-2.491	-4.047**	I(1)
$SE_t$	-6.286***	-10.493***	-6.276***	-13.950***	I(0)

*Note:* the figures reported are t-ratio and showed the p-values of MacKinnon (1996) one-sided at various levels of significance. The asterisks (\*\*\*) is at 1%; (\*\*) is at 5% and (\*) is at 10%.

**Table 2**  
**Estimates of the ARDL Models using Bewley's regression form**

Dependent variable: property crime				
Critical bounds (F-test)		1% significance level		
Lower		3.65	F-stat	5.203
Upper		4.66	Conclusion (sign level)	Cointegrated (1%)
ARDL specification		1, 1, 0, 1	K	3
Test of ARDL specification significance		Adj-R-square=0.654	SB=2.545 HQ=2.341	AIC*=2.234
Endogeneity Test		Coefficient	T-stat	P-value
$C$		20.125	2.651	0.014*
$UNE_t$		0.014	0.287	0.776
$Y_t$		-2.025	-0.601	0.553
$SE_t$		-0.012	-1.307	0.204
$UNE_{t-1}$		0.184	2.651	0.014**
$Y_{t-1}$		0.309	0.090	0.928
$SE_{t-1}$		-0.020	-1.634	0.115
$VLT_{t-1}$		0.381	2.470	0.021**
$RUNE_t$		0.032	0.659	0.515
$RLGDP_t$		1.222	0.348	0.730
$RSE_t$		-0.016	-1.534	0.138
F-statistic value where df is (3, 23)			0.859	0.476



Long-run Estimates	Coefficient	T-stat
$C$	28.931	2.764
$UNE_t$	0.288	4.607***
$Y_t$	-2.454	-2.702**
$SE_t$	-0.043	-1.940*
$\Delta UNE_t$	-0.231	-2.975**
$\Delta SE_t$	0.022	1.408
$\Delta VLT_t$	-0.539	-1.625
Short-run Estimates		
$C$	18.787	2.855
$VLT_{t-1}$	-0.649	-4.635***
$UNE_{t-1}$	0.187	4.070***
$Y_t$	-1.594	-2.814***
$SE_{t-1}$	-0.028	-1.788*
$\Delta UNE_t$	0.036	0.802
$\Delta SE_t$	-0.013	-1.454
Diagnostics Tests		
<b>Normality test</b> ( $\chi^2_N$ )	$JB = 39.679$ (0.000)	
<b>Kurtosis</b>	7.072	
<b>Serial Correlation test</b> ( $\chi^2_{SC}$ )	$\chi^2 = 0.200$ (0.654)	
<b>Heterokedasticity test</b> ( $\chi^2_H$ )	$\chi^2 = 5.371$ (0.497)	

Note: the asterisk (\*) shows that the estimated coefficients are significant at 1% (\*\*\*); 5% (\*\*) and 10% (\*). Also, the diagnostic tests  $\chi^2_H$  is significant at 5%, except  $\chi^2_N$  that is not failed to be rejected at 5%, but the Kurtosis has enough excess above 3.0, which still signify that the residual error is normal (Saridakis, 2011). Variables are defined as Violent is  $VLT_t$  is the dependent variable, while Unemployment ( $UNE_t$ ), Income ( $Y_t$ ) and Security expenditure ( $SE_t$ ) are the independent variables. In the ARDL specification, the F-stat in the bounds test is based on critical upper bounds. Jointly endogeneity does not exist among the variables considered, using the F-stat of 0.859 even at the 10% level of significance.

## Conclusion

Following the argument in Becker (1968), Ehrlich (1973), Poveda (2012a) and the high level of unemployment rate in Nigeria, this paper tries to explain and analyze the link between unemployment and violence in Nigeria, by controlling for income and security expenditure, and using time series from 1980 to 2015. The time series is estimated with ARDL Instrumental Variable. We find that unemployment increases the opportunity to commit violence, which is supported by our empirical finding. Also, we find that income and security expenditure would reduce the opportunity to commit violence. The findings suffice since we were able to eliminate any trace of endogeneity problems among the variables. Therefore, we had consistent, robust, and

reliable estimates, both in the long and short run. Hence, this result provides evidence to buttress the underlying cause of various violence and means of minimizing it in Nigeria, as Nigeria Watch (2014) summarily ascribed economic issues as crucial factors that erupt violence.

The implication of this paper lies in its strength, as employment is not only able to generate a cause of violence, but also to provide an antidote for violence. The high unemployment rate in Nigeria signifies bad omen for the country, as it deemphasized the contribution of the human factor to the economy. This is because unemployment serves as a bottleneck for the labor movement from low to high productivity sectors. Likewise, its prominent existence may promote poverty and income inequality that may lead to high restiveness among the large groups of unemployed youths and households (Ubhenin & Enabuneze, 2011). Chukwuemeka and Aghara (2010) found out that when youths are gainfully employed, restiveness would become a thing of the past. The inclusion of income per capita as a link to economic growth shows that when sound policies to promote economic growth are implemented in the economy, it would act as a catalyst to reduce socio-economic factors that may impede welfare which may further cause violence. For instance, Oyefusi (2010) concluded that earning has a reducing effect on civil violence in Niger Delta of Nigeria. Also, the negative impact of security expenditure connotes that effective policing and other security personnel would discourage violence which shall encourage more investors to invest in the country, thereby leading to more income-employment generation. Also, the move to reduce violence is capable of reducing deaths and enhancing human rights.

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