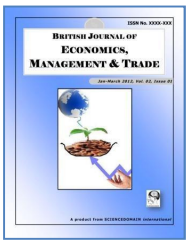

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The Effect of Unemployment on Crime in Nigeria: A Panel Data Analysis

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Authors' contributions

This work was carried out in collaboration between all authors. Author AAK did the estimations; author HIM developed the model and wrote the methodology section. Author AU conceptualized the issue and wrote the introductory part of the paper, author ATY gather all the data used for the analysis and author MAY managed the literature searches and wrote the concluding part of the paper. All authors read and approved the final manuscript.

Review Article

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ABSTRACT

The rising trend of crime in Nigeria is usually blamed on the high rate of unemployment. There is need therefore, to empirically investigate the relationship between unemployment and crime. Hence, this paper examined the impact of unemployment on different types of crime in Nigeria. The data that were used in this study consist of 36 states and Federal Capital Territory (FCT) spanning from 1996 to 2005 was used. Different estimation techniques ranging from OLS, WLS, Between estimator, Fixed effect and Random Effect were employed to estimate economics models of crime. The findings show that though employment was found to have significant impact on total crime and armed robbery, there no evidence that it causes kidnapping and vehicle theft. Prison, policing injuring or killing criminals was not found to be significant deterrent variables in the country but quick trial and prosecution of criminal's particularly armed robbery would significantly reduce rate of crime. Thus, it is recommended that police should get criminals arrested instead of killing them so that they can be tried and prosecuted if find guilty. Prisons should be restructured to serve as rehabilitation centers.

Keywords: Unemployment; crime; panel data; Nigeria.

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1. INTRODUCTION

The rising trends of levels crime and unemployment in Nigeria of recent time called for concern among policymakers, business men, investors and researchers as well as other stake holders. Generally, people easily blame the rising level of insecurity (level of crime) in the country on the mass unemployment of young people which currently stood at 37.7 and 22.4 percentages for people in the age bracket of 15 to 24 and 25 to 44 respectively. Can all kinds of crime be blamed on unemployment? Answering this question necessitate rigorous analysis to unravel the exact relationship between unemployment and different types of crimes. Therefore, this paper aims at empirically investigating the effects of unemployment on different kinds of crimes in Nigeria.

Becker [1] seminar paper formally established the foundation on the theory of economics of crime, though a number of extensions have been made since then. According to the theory, a criminal is assumed to be a rational being who indulges in crime if the benefits of such act outweigh the costs. Meaning that individuals become criminals because the expected monetary and non-monetary benefits are more than the costs associated to the crime. The costs of crime include the probability of arrest and conviction as well as the severity of punishment [1,2]. Becker [1] argues that, the economic and social environment created by public policies such as expenditures on police, the nature of punishment, opportunities for legal jobs, schooling and training programs determine the amount of crimes in a society. The types and amount of legal jobs available, the law and order, and nature of punishment, all matter in economics of crime. Thus, at the level of theory, it is expected that an increase in legal job opportunities would lead to reduction in crime, while decrease in availability of such opportunities (that is rise in unemployment) would lead to more crimes because the opportunity cost of crime decline with wide spread unemployment.

The empirical literature on crime behavior has also grown so voluminous over time since Becker's paper. Empirical papers on crime can broadly be grouped in to two, those that focus on the link between deterrent factors and crime rate [2-6] and those that focus on the availability or none availability of legal opportunities. Studies such as [7,8] examined the effect of wages on crime (impact of legal opportunities). A number of other studies examined the effect of none availability of legal opportunities such as the impact of unemployment on crime, among them are [9-15].

Despite the theoretical prediction of positive relationship between unemployment and crime, there is no consensus in the empirical literature on the nature of relationship between unemployment and crime. The link between unemployment and crime is at best inconclusive, some studies find significant positive relationship between unemployment and crime [7,14], while some find insignificant relationship and some find negative effect of unemployment on crime [10,12,16,17]. Levitt [13] find positive relation between unemployment and property crime but negative relation with violent crime. Lee [16] specifically argued that the relationship between unemployment and crime is ambiguous because it tends to be negative at a lower rate of apprehension but positive at a higher rate of apprehension. This paper therefore contributes to the literature on economics of crime by examining the effect of unemployment on different types of crimes in Nigeria.

This is not the first time that issues of crime are studied in Nigeria, a number of studies on crime in Nigeria do exist [18,19,20,21,22,23] but none of these studies examined the economic model of crime except [23]. Even Odumosu [21], who used anomie theory to analyse the indirect effect of unemployment through poverty on crime did not consider the

economic model of crime. However, [23] do not consider any deterrent variable in their model. In addition, empirical study of crime using state level data is equally scarce in Nigeria. Yakubu et al. [23] used state level data to study the impact of unemployment and population growth on crime. Their paper also studied only the behavior of total crime in Nigeria without disaggregating it to different types of crime. This paper fills this vacuum by estimating an economic model of crime with emphasis on the effect of unemployment (none availability of legal opportunities) on crime. This paper therefore specifically attempt to: (i) analyse the demographic distributions of unemployment and crime across the states in Nigeria and (ii) examine the effect of unemployment on crime using state panel data.

The paper is arranged in five sections, following this introduction is section two which presents stylize facts on crimes and unemployment in Nigeria. Section three consists of model specification, measurement of variables, data issues and estimation techniques. The results are presented and discussed in section four, while section five concludes the paper.

2. DATA AND METHODOLOGY

The use of aggregate data or national level time series data in the study of crime have been widely criticized in the literature. Many authors have argued that aggregating crime data would lead to bias result and inferences drawn from such will be misleading [13,14,24,25]. This is due to the fact that crime is an individual behavior that exhibit tremendous differences across localities, aggregating data of such activities could be misleading. The use of aggregate data will equally not allow unobserved heterogeneity to be accounted for in the model. It has also been argued in the literature that ignoring unobserved heterogeneity in estimating economic model of crime would lead to bias result [13,24,26,27]. Similarly, unemployment also varies across different local areas. These two types of variability are evident in Figs 4, 5 and 6 respectively, where crime and unemployment are shown to be different across the states in Nigeria. Using state panel data would therefore make it possible to capture this variability. Hence, this paper makes use of panel data consisting of thirty six (36) states of the federation plus the Federal Capital Territory (FCT) over the period 1996 to 2005. This also gives the opportunity of controlling for unobserved heterogeneity.

2.1 Model Specification

The basic empirical model used in this paper is specified as:

$$Crime_{st} = \alpha_1 une_{st} + \alpha_2 X_{st} + \beta_s + \delta_t + \delta_s time_t + \gamma_s time_t^2 + \varepsilon_{st} \quad \text{---------- (1)}$$

Where s and t are states and years respectively. $Crime_{st}$ is a measure of crime, une_{st} is unemployment rate, X_{st} is set of control variables which include population density, inmate population and education proxy by secondary school enrolment, β_s is state fixed effect, δ_t is year fixed effect, $time_t$ and $time_t^2$ are linear and quadratic time trends, δ_s gives the state specific coefficient on the linear trend while γ_s gives the state specific coefficient on the quadratic time trend and finally ε_{st} is the error term that is $iid(0, \sigma^2)$.

Unobservable state level covariates are extensively controlled for so as to mitigate omitted variable bias. Inclusion of β_s eliminate the effect of not including factors that vary across states but are constant over time, δ_t eliminates the effect of factors that cause year to year changes in crime rate which are common to all states and the linear as well as the quadratic

time trends eliminate variation in within – state crime rates caused by factors that are state specific over time.

Four different measures of crime were used in the regressions, these are total crime proxy by total number of criminal (major and minor) cases reported to the police; kidnapping measured by total number of reported cases of missing persons; vehicle theft measured as total number of stolen vehicles reported to the police; and armed robbery which is measured as cases of armed robbery reported to the police. Total unemployment rate by state is used to capture the unemployment rate in the model. Following Baltagi, Cornwell and Trumbull [24,26] population density is measured as state total population divided by state land area (in km^2). The total number of inmates by state is used to capture deterrent variable. In addition, other variables such as number of people prosecuted for robbery, cases of robbery awaiting trial, cases of robbery pending investigation, number of armed robbers killed by police and number of armed robbers injured by police are controlled for in armed robbery model to capture more deterrent variables as well as police effectiveness. Number of vehicles recovered is also introduced in vehicle theft model to capture police effectiveness. Data for all the variables are sourced from Nigeria's National Bureau of Statistics (NBS) data base. Thus, the final estimable equations are:

$$lnTC_{st} = \alpha + \alpha_1 lnUNE_{st} + \alpha_2 lnPD_{st} + \alpha_3 lnSSE_{st} + \alpha_4 lnIP_{st} + \beta_s + \delta_t + \delta_s time + \gamma_s time^2 + v_{st} \quad (2)$$

$$lnKIDNAP_{st} = \alpha + \alpha_1 lnUNE_{st} + \alpha_2 lnPD_{st} + \alpha_3 lnSSE_{st} + \alpha_4 lnIP_{st} + \beta_s + \delta_t + \delta_s time + \gamma_s time^2 + v_{st} \quad (3)$$

$$lnVT_{st} = \alpha + \alpha_1 lnUNE_{st} + \alpha_2 lnPD_{st} + \alpha_3 lnSSE_{st} + \alpha_4 lnIP_{st} + \alpha_5 lnVRC_{st} + \beta_s + \delta_t + \delta_s time + \gamma_s time^2 + v_{st} \quad (4)$$

$$lnAR_{st} = \alpha + \alpha_1 lnUNE_{st} + \alpha_2 lnPD_{st} + \alpha_3 lnSSE_{st} + \alpha_4 lnIP_{st} + \alpha_5 lnPPR_{st} + \alpha_6 lnCAT_{st} + \alpha_7 lnCPI_{st} + \alpha_8 lnARKP_{st} + \alpha_9 lnARIP_{st} + \beta_s + \delta_t + v_{st} \quad (5)$$

Table 1. Variables definition and their expected signs:

Variable	Definition	Expected Sign
TC	Total Crime	Dependent Variable
KIDNAP	Kidnapping	Dependent Variable
VT	Vehicle Theft	Dependent Variable
AR	Armed Robbery	Dependent Variable
UNE	Unemployment	Positive
PD	Population density	Positive
SSE	Secondary School Enrollment	Negative
IP	Inmate Population	Negative
VRC	Vehicles Recover	Negative
PPR	People Prosecuted for Robbery	Negative
CAT	Cases Awaiting Trial	Positive
CPI	Cases Pending Investigation	Positive
ARKP	Armed Robbers Killed by Police	Negative
ARIP	Armed Robbers Injured by Police	Negative

Source: compiled by authors from literature

2.2 Estimation Techniques

Several estimation techniques were used in the literature to estimate crime models, these include, the Ordinary Least Square (OLS), the Fixed and Random Effects, the Two Stage

Least Square (2SLS), Instrumental Variable (IV), the Between Estimator, the GMM and Weighted Least Square (WLS) among others. In this paper, equations 2 to 5 are estimated using OLS, WLS, between estimators, Fixed effect and Random effect respectively. GMM, IV and 2SLS could not be used due to scarcity of good instruments. All the variables are logged in all the regressions as is the usual practice in crime study. The data for all the variables are sourced from National Bureau of Statistics database.

3. PRELIMINARY ANALYSIS

Figs. 1 to 8 present some stylized facts about crime and unemployment in Nigeria. Fig. 1 displays total serious and minor crimes in the country. Serious crimes include assault, armed robbery, burglary, house and store breaking, larceny and forgery of currency, while minor crimes include false pretence/cheating, unlawful possession, receiving stolen property, arson, perjury, gambling, breach of peace and escape from custody. As shown in Fig. 1 the total of serious crimes is more than the total of minor crimes in Nigeria. This may be due to the fact that not all minor crimes are reported to the police, people prefer to resolve some of the criminal cases informally without involving the police. The trend shows that the rate of serious crimes was increasing till 2001 when it begins to fall and start rising again in 2004. Minor crime is relatively stable over the period considered except the upsurge experienced in 2002.

Ten averages of different types of serious and minor crimes are presented in Figs. 2 and 3. Among the serious crimes, assault constitutes 35 percent of the total serious crimes, larceny make up 32 percent while felonious wounding, burglary, armed robbery and murder constitute 15, 13, 3 and 2 percents respectively. Unlawful possession, cheating, breach of peace constitute 34, 32 and 22 percents of minor crimes while receive of stolen property, arson as well as escape from custody constitute 6, 5 and 1 percents respectively.

Figs. 4, 5 and 6 present total crime, armed robbery and unemployment rate across the states in Nigeria. Total crime is highest in Lagos state, followed by Anambra, Borno, Delta, Edo, Ogun, Ondo, Oyo and Rivers states. Crime is low in states like Jigawa, Gombe, Sokoto, Zamfara, Kebbi and Kwara states. Similarly, armed robbery is highest in Anambra, Delta and Lagos states. It is moderate in Abia, Bauchi, Edo, Imo, Ogun, Ondo, Oyo and Rivers states, while it low in states like Jigawa, Kebbi, Kwara, Osun, Plateau, Sokoto and Zamfara. Unemployment on the other hand is highest in Abia, Akwa Ibom, Bayelsa, Imo, Rivers and Anambra states. It is moderate in Cross River, Delta, Edo, Enugu, Kaduna, Kogi, Lagos and Abuja. Zamfara, Jigawa, Kebbi, Taraba, Oyo and Osun states have the lowest unemployment rates respectively.

Rough idea of the relationship between unemployment and total crime as well as between armed robbery and unemployment are presented in Figs. 7 and 8. Though there are a number of outliers, the relationships displayed in the two figures show positive relationship between unemployment and crime as well as armed robbery.

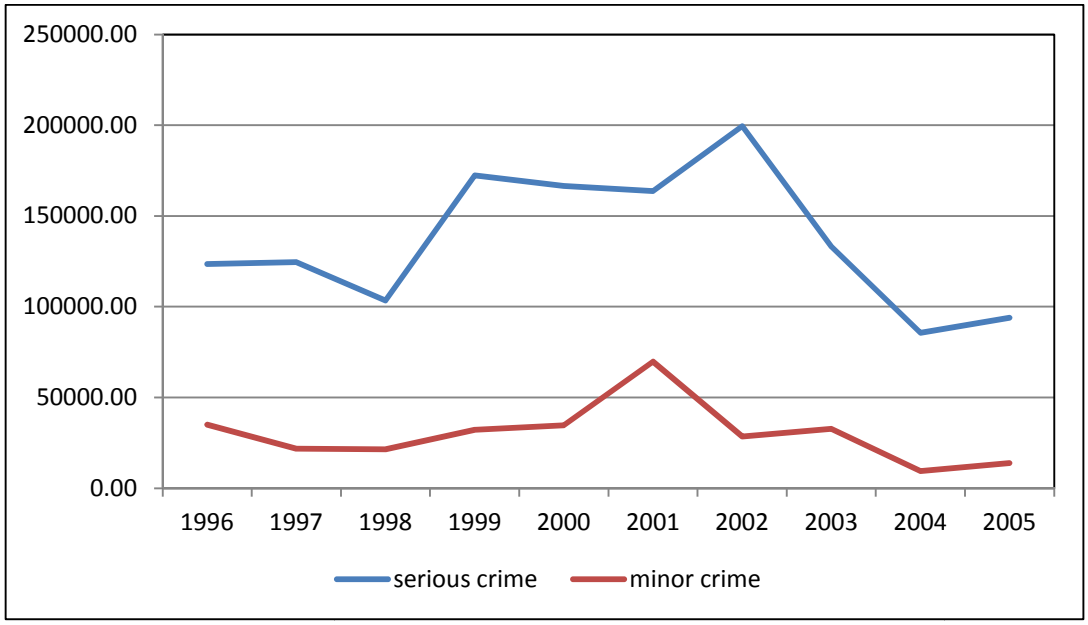

Fig. 1. Trend of total crimes in Nigeria
Source: computed by authors from NBS database

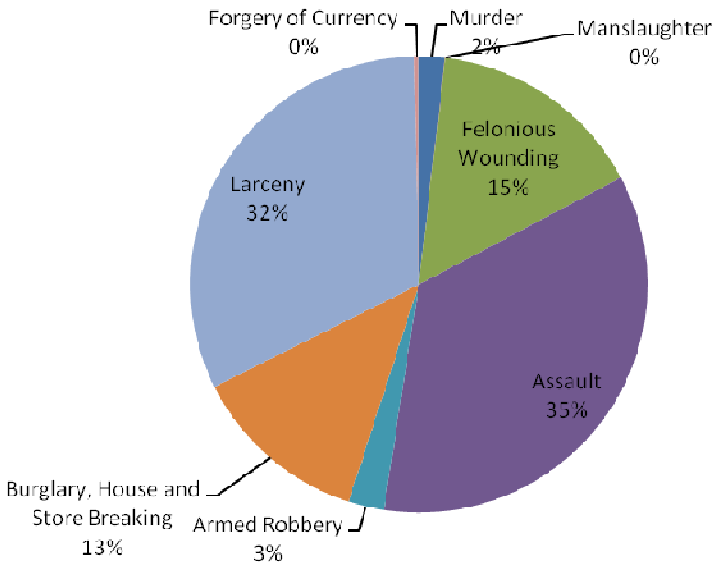

Fig. 2. Ten years average of serious crimes in Nigeria, 996 – 2005
Source: computed by authors from NBS database

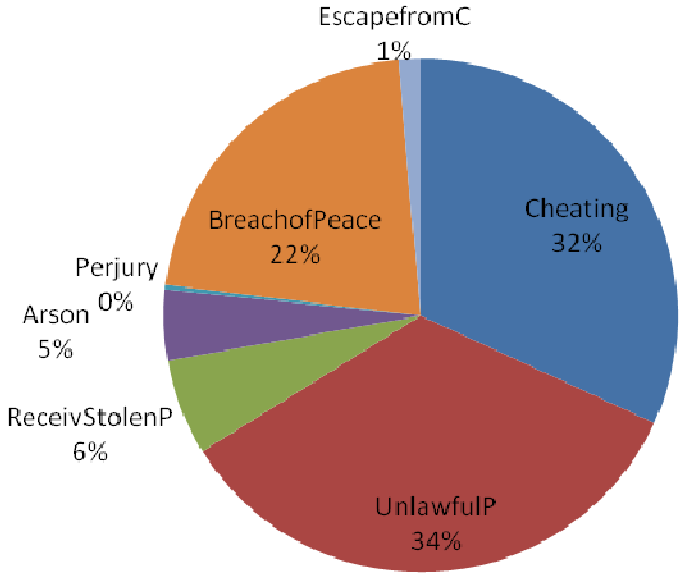

Fig. 3. Ten years average of minor crimes in Nigeria, 1996 – 2005
Source: computed by authors from NBS database

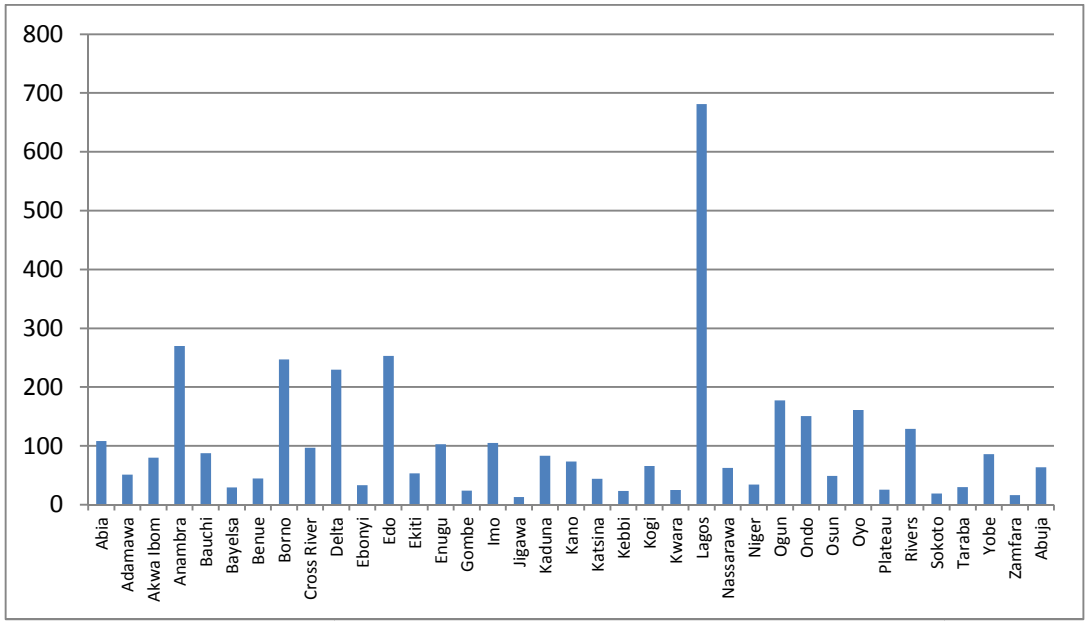

Fig. 4. Ten years average of total crime across sates, 1996 – 2005
Source: computed by authors from NBS database

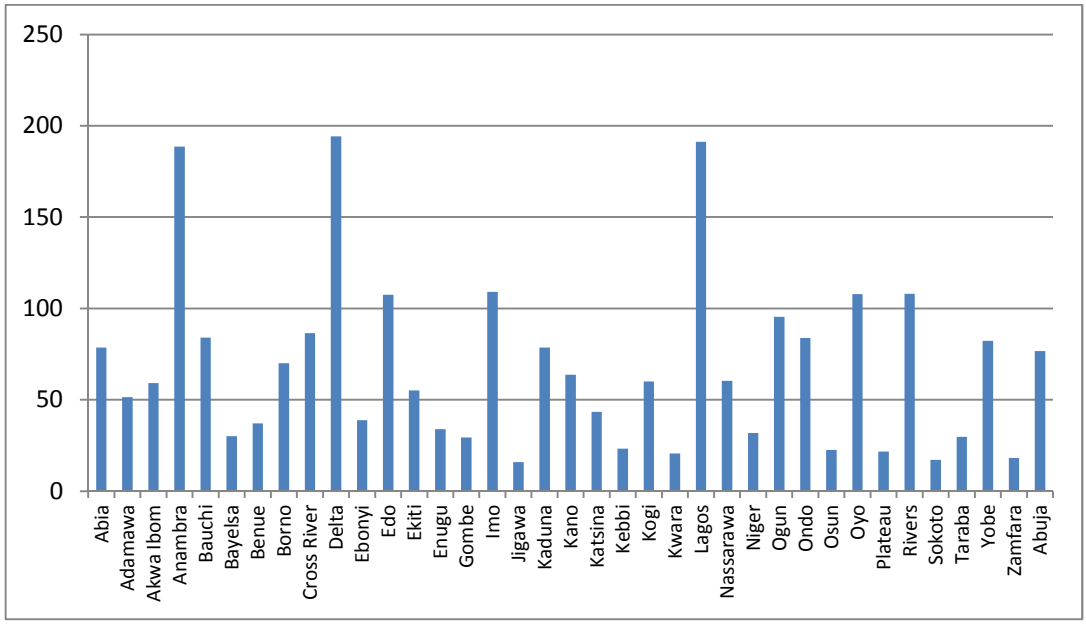

Fig. 5. Ten years average of armed robbery across sates, 1996 – 2005
Source: *computed by authors from NBS database*

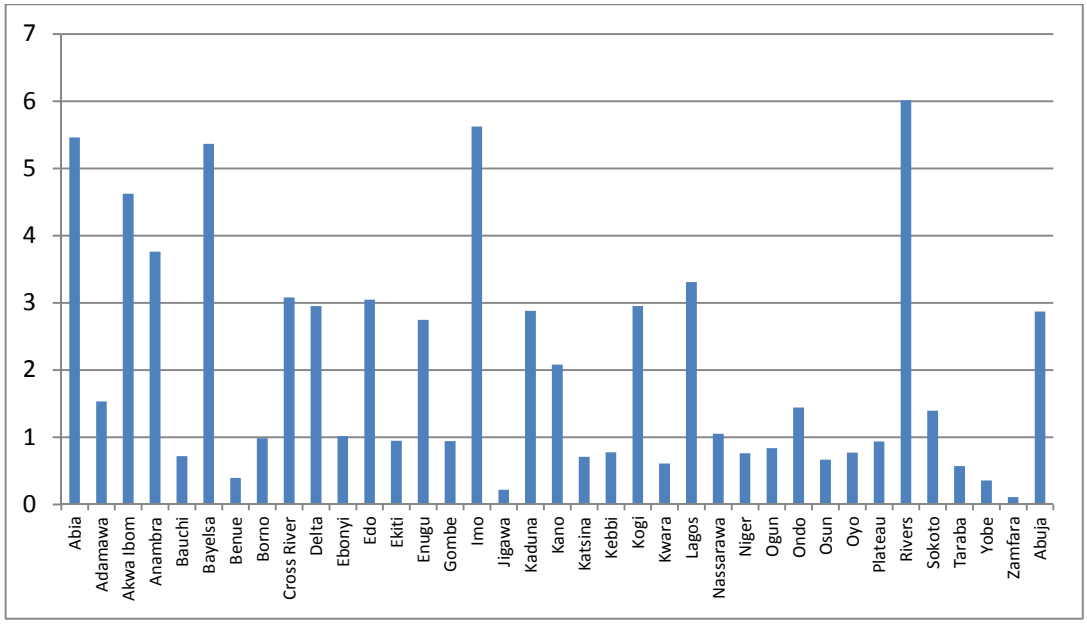

Fig. 6. Ten years average of unemployment across states in Nigeria, 1996 – 2005
Source: computed by authors from NBS database

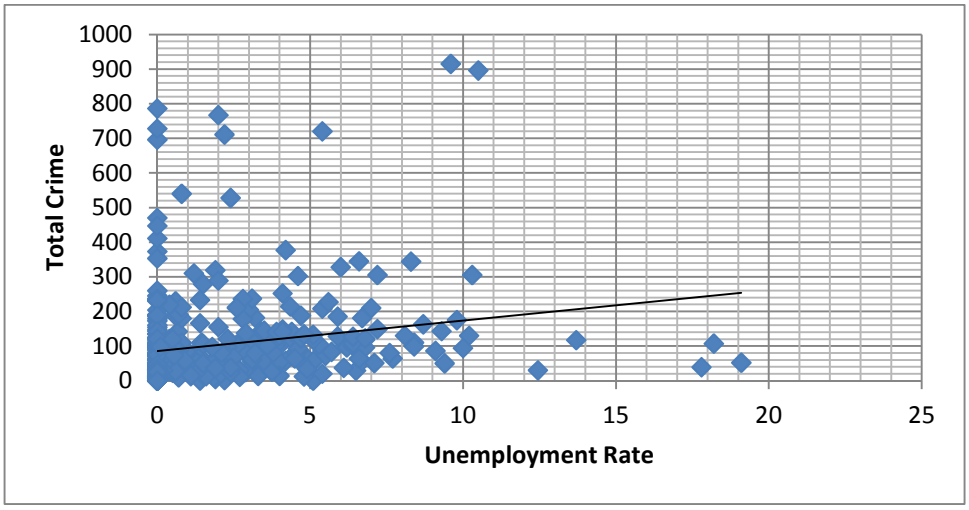

Fig. 7. Correlation between unemployment and total crime
Source: computed by authors from NBS database

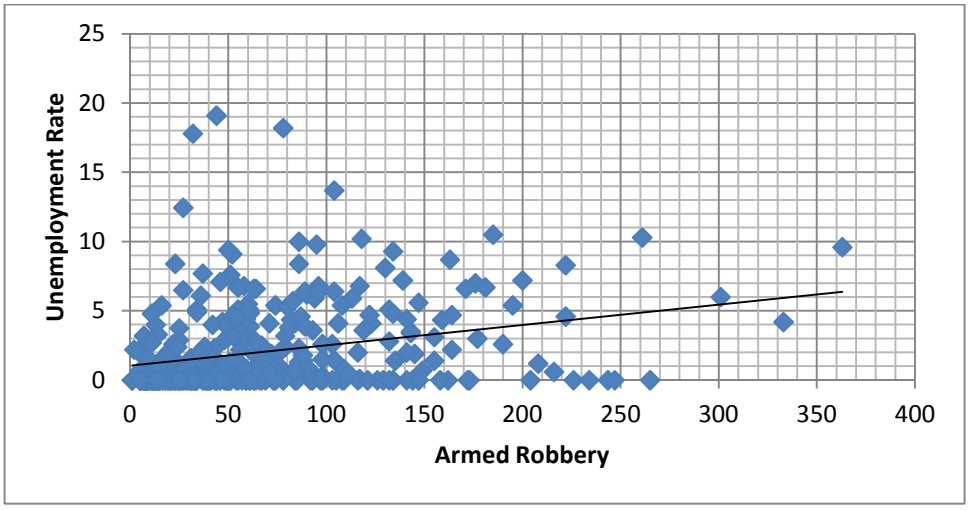

Fig. 8. Correlation between unemployment and armed robbery
Source: computed by authors from NBS database

4.1 Presentation and Discussion of Regression Results

The regression results on total crime are reported in Tables 2a and 2b, results of kidnapping are reported in Tables 3a and 3b, results of vehicle theft are in tables 4a and 4b, while Table 5 reports results of armed robbery regressions. Models with linear trends are reported in 2a, 3a and 4a, while those with quadratic trends are presented in 2b, 3b and 4b respectively. In Table 2a, unemployment rate is positive and significant in three out of five regressions. Population density is significant and negative only in the between regression. Inmate population is significant in all the regressions except random effect model but it came out positive, secondary school education is also significant and positive in three of the

regressions. Similarly in quadratic trends models reported in Table 2b unemployment and secondary school education are significant and positive in all the regression except in the Between regression. Inmate population is significant in all the regressions while population density is significant only in the between regression. In these two tables it is evident that unemployment leads to crime which conforms with expectation. In other words, total crime increases as more people become unemployed in any state. The most surprising results are coefficients of inmate population. It is expected that crime will reduce as more people are imprisoned but the results here are contrary. Inmate population leads to more crimes, this could be that prisons in Nigeria do not reform inmate. Hence, one who has been an inmate once is likely to commit another crime. Therefore, as inmate population increases, total crime increases. Secondary school education does not reduces crime in Nigeria rather leads to more crime. Though this finding contradict apriori expectation, it is not surprising since the most educated unemployed are the people with secondary education. There is no evidence that population density causes total crime in Nigeria.

In the results of kidnapping model, unemployment came out negative, significant twice in linear trends models and significant in all the regressions in quadratic trends models. This is contrary to expectation, however, it could be said that unemployment does not leads to more kidnapping in Nigeria rather more unemployment is associated with less kidnapping. This result is a reflection of characteristics of unemployment and kidnapping across the states in Nigeria. As shown in section two of this paper, states with the highest rate of unemployment records few cases of kidnapping. Population density is positive and significant in three regressions with linear trends and four regressions with quadratic trends. This implies that places with high population density are likely to witness more kidnapping. Like in the total crime regressions, prison positively and significantly affect kidnapping. Coefficient of secondary education is not consistent, it is positive and significant in the OLS, WLS, Fixed Effect and Random Effect results with linear and quadratic trends, but significant and negative in the Between regressions. While all the result show that secondary education leads to more kidnapping, the Between regression results show that 1 percent increase in secondary school education would lead to reduction in kidnapping by about 66 percent.

Table 2a. Linear trends model on total crime

Variables	OLS	WLS	Between	Fixed effect	Random effect
Constant	-5.6333***	-5.4607***	-7.3224*	-5.6692***	-5.6533
	(0.7754)	(0.7352)	(4.1185)	(0.8667)	(0.8387)
$unemployment$	0.0389**	0.0284**	0.0743	0.0369**	0.0389
	(0.0157)	(0.0140)	(0.0571)	(0.0180)	(0.0173)
$population\ density$	0.0233	0.0536	-0.5152*	0.0161	0.0233
	(0.0726)	(0.0540)	(0.2977)	(0.0651)	(0.0623)
$inmate\ population$	0.4949***	0.4626***	2.1467***	0.4465***	0.4949
	(0.0965)	(0.0789)	(0.5047)	(0.0913)	(0.0890)
$secondary\ school$	0.5607***	0.5552***	-0.1507	0.5968***	0.5607
$enrolment$	(0.0737)	(0.0669)	(0.2776)	(0.0792)	(0.0756)
R-squared	0.4064	0.4700	0.5557	0.4689	
F- stat	37.1912***	48.1806***	6.2531***	6.0965***	
Akaike criterion	840.0476	957.9453	6.5061	874.9635	840.0476
No obs	333	333	37	333	333
Hausman test					12.629**

****significant at 1%, **significant at 5%, *significant at 10%, standard error in parenthesis*

Table 2b. Quadratic trends model on total crime

Variables	OLS	WLS	Between	Fixed effect	Random effect
Constant	18802.4	21850.7	51103.4	21946.9	18802.4
	(22880.5)	(22470.3)	(277664)	(26365.8)	(26112.6)
$unemployment$	0.0370**	0.0257*	0.0787	0.0345*	0.0370**
	(0.0157)	(0.0143)	(0.0628)	(0.0182)	(0.0175)
$population\ density$	0.0208	0.0537	-0.5170*	0.0128	0.0208
	(0.0723)	(0.0539)	(0.3028)	(0.0652)	(0.0624)
$inmate\ population$	0.4962***	0.4661***	2.1502***	0.4482***	0.4962***
	(0.0963)	(0.0792)	(0.5134)	(0.0914)	(0.0624)
$secondary\ school$	0.5710***	0.5650***	-0.1511	0.6098***	0.5710***
$enrolment$	(0.0740)	(0.0677)	(0.2816)	(0.0808)	(0.0770)
R-squared	0.4073	0.4718	0.5562	0.4702	
F- stat	31.9052***	41.4661***	5.1921***	5.9645***	
Akaike	841.5165	959.8566	0.5562	876.1657	841.5165
No obs	333	333	37	333	333
Hausman test					12.8585*

***significant at 1%, **significant at 5%, *significant at 10%, standard error in parenthesis

Table 3a. Linear trends model on kidnapping

Variables	OLS	WLS	Betweeen	Fixed Effect	Random Effect
Constant	-934.905***	-548.477***	-340.626	-959.731***	-934.905
	(131.134)	(56.7405)	(490.078)	(143.716)	(87.8716)
$unemployment$	-3.2775	-1.9574**	-13.2142*	-2.6565	-3.2775
	(2.0072)	(0.9611)	(6.6601)	(1.9757)	(1.8201)
$population\ density$	25.6669***	21.0281***	-20.3966	24.8529***	25.6669
	(9.1861)	(3.8849)	(30.1323)	(8.6086)	(6.5350)
$inmate\ population$	71.4216***	29.4488***	179.532***	68.6462***	71.4216
	(12.6409)	(5.7259)	(51.4495)	(12.6048)	(9.3747)
$secondary\ school$	30.8154***	24.5357***	-65.8317**	35.174***	30.8154***
$enrolment$	(4.6877)	(4.5561)	(30.5017)	(6.0252)	(7.9123)
R-squared	0.3681	0.3382	0.4611	0.4360	
F- stat	32.2322***	28.2723***	4.2789***	5.4491***	
Akaike	4014.976	893.4524	351.9326	4048.409	4014.976
No Obs	339	339	37	339	
Hausman test					13.6339**

****significant at 1%, **significant at 5%, *significant at 10%, standard error in parenthesis*

Table 3b. Quadratic trends model on kidnapping

Variables	OLS	WLS	Betweeen	Fixed Effect	Random Effect
Constant	6.4618**	2.6805*	1.4689	6.5600**	6.4618**
	(2.7218)	(1.6115)	(3.0876)	(3.1141)	(2.7218)
$unemployment$	-3.9105**	-2.2317**	-12.6194*	-3.3511*	-3.9105**
	(1.8271)	(0.9919)	(6.8625)	(1.9554)	(1.8271)
$population\ density$	24.714***	21.0765***	-21.8233	23.8089***	24.714***
	(6.5022)	(3.8515)	(30.6755)	(8.4511)	(6.5022)
$inmate\ population$	72.029***	30.1912***	181.763***	69.2616***	72.029***
	(9.3134)	(5.8060)	(52.3365)	(12.6204)	(9.3134)
$secondary\ school\ enrolment$	34.332***	25.5997***	-65.4227**	38.9702***	34.332***
	(7.9959)	(4.5473)	(30.9148)	(6.5420)	(7.9959)
R-squared	0.3787	0.3485	0.4653	0.4468	
F- stat	28.8190***	25.2958**	3.6054***	5.5418***	
Akaike	4011.251	895.7295	353.6450	4043.858	4011.251
No Obs	339	339	37	339	339
Hausman test					14.1628**

****significant at 1%, **significant at 5%, *significant at 10%, standard error in parenthesis*

Table 4a. Linear trends model on vehicle theft

Variables	OLS	WLS	Between	Fixed effect	Random effect
Constant	-2.8950***	-2.9069***	-2.1073	-3.2413***	-2.8950***
	(0.8931)	(0.5539)	(2.3458)	(0.9396)	(0.8662)
$unemployment$	0.0013	-0.0162*	-0.0147	0.0031	0.0013
	(0.0098)	(0.0082)	(0.0306)	(0.0138)	(0.0128)
$population\ density$	0.0856**	0.0993***	0.0333	0.1034*	0.0856*
	(0.0371)	(0.0324)	(0.1173)	(0.0550)	(0.0491)
$secondary\ school\ enrolment$	0.3648***	0.3665***	0.5031**	0.3666***	0.3648***
	(0.0638)	(0.0473)	(0.2452)	(0.0789)	(0.0738)
$inmate\ population$	0.0238	0.0135	-0.3433	0.0590	0.0238
	(0.0794)	(0.0501)	(0.2394)	(0.0745)	(0.0711)
$vehicles\ recover$	0.7199***	0.7421***	0.7221***	0.7186***	0.7199***
	(0.0329)	(0.0245)	(0.0795)	(0.0375)	(0.0341)
R-squared	0.8942	0.9610	0.8936	0.9131	
F- stat	246.2838***	718.6494***	34.7873***	41.0283***	
Akaike	331.8359	610.6311	-7.2486	362.2104	331.8351
No Obs	212		37		
Hausman test					9.4715

****significant at 1%, **significant at 5%, *significant at 10%, standard error in parenthesis*

Table 4b. Quadratic trends model on vehicle theft

Variables	OLS	WLS	Between	Fixed effect	Random effect
Constant	35598.1	48753.4**	94656.6	26420.9	35598.1
	(31136.8)	(20835.1)	(165963)	(31984.3)	(31125.4)
unemployment	0.0013	-0.0147*	-0.0140	0.0030	0.0013
	(0.0096)	(0.0083)	(0.0310)	(0.0138)	(0.0128)
population density	0.0808**	0.1013***	0.0378	0.0980*	0.0808
	(0.0362)	(0.0320)	(0.1190)	(0.0554)	(0.0493)
secondary school enrolment	0.3803***	0.3886***	0.4894***	0.3806***	0.3803***
	(0.0691)	(0.0475)	(0.2493)	(0.0808)	(0.0750)
inmate population	0.0217	0.0015	-0.3266	0.0570	0.0217
	(0.0794)	(0.0500)	(0.2440)	(0.0747)	(0.0711)
vehicles recover	0.7182***	0.7468***	0.7367***	0.7164***	0.7182***
	(0.0320)	(0.0241)	(0.0844)	(0.0376)	(0.0341)
R-squared	0.8949	0.9617	0.8948	0.9134	
F- stat	215.9875***	636.6676***	29.7714***	40.0355***	
Akaike	332.4741	611.0762	-5.6760	363.3457	332.4741
No Obs	212	212	37	212	
Hausman test					9.2613

****significant at 1%, **significant at 5%, *significant at 10%, standard error in parenthesis*

Table 5. Models on armed robbery

Variables	OLS	WLS	Betweeen	Fixed Effect	Random Effect
Constant	-4.4169***	-4.9435***	-3.9736	4321.5	-3.1413
	(1.1460)	(0.7061)	(3.2462)	(5244.49)	(1.4402)
unemployment	0.0666***	0.0428***	0.1973**	0.0251	0.0335
	(0.0238)	(0.0135)	(0.0767)	(0.0196)	(0.0185)
population density	-0.0635	-0.0769	-0.2141	-849.697	0.0387
	(0.1037)	(0.0487)	(0.1578)	(1030.86)	(0.1140)
secondary school enrolment	0.5699***	0.6248***	0.5281**	0.3577**	0.4674
	(0.1240)	(0.0698)	(0.2446)	(0.1639)	(0.1249)
inmate population	0.2738**	0.2942***	0.2489	0.0688	0.2128
	(0.1187)	(0.0680)	(0.2128)	(0.2373)	(0.1345)
people prosecuted for robbery	-0.0048**	-0.0034	0.0125	-0.0062	-0.0064
	(0.0023)	(0.0029)	(0.0285)	(0.0043)	(0.0041)
cases awaiting trial	0.0057**	0.0040	-0.0227	0.0070	0.0075
	(0.0027)	(0.0036)	(0.0439)	(0.0054)	(0.0052)
cases pending investigation	0.0028*	0.0024**	0.0120	0.0026	0.0020
	(0.0017)	(0.0010)	(0.0100)	(0.0020)	(0.0017)
armed robbers killed by police	0.0022	0.0003	0.0268	0.0019	0.0018
	(0.0029)	(0.0025)	(0.0395)	(0.0040)	(0.0039)
armed robbers injured by police	-0.00356	-0.0018	-0.0386	-0.0021	-0.0023
	(0.0023)	(90.0028)	(0.0628)	(0.0044)	(0.0043)
R-squared	0.3776	0.6468	0.5808	0.7114***	
F- stat	8.8249***	26.6310***	3.0223**	6.9024***	
Akaike	386.8541	503.9561	69.2442	322.6597	393.0833
No Obs	172	172	36	172	
Hausman test					10.8428

****significant at 1%, **significant at 5%, *significant at 10%, standard error in parenthesis*

There is no evidence that unemployment leads to vehicle theft. The results show a very weak negative impact of unemployment on vehicle theft. Population density is significant and positive in all the regressions except the between estimation for linear trends models, it is not significant in the between and Random Effect regression for quadratic trends models. This could possibly be explained by the likelihood of having more vehicles in more densely populated places as well as the ease of escaping with stolen vehicle in such places. Secondary education came out again positive and significant in all the regressions. Prison is not significant in all the regressions, meaning that prison does not significantly impact vehicle theft. Number of stolen vehicles recovered which was used in the model to capture police effectiveness came out positive and significant in all the regressions. Since recovery of stolen vehicles does not involve punishment to the criminal, this may not deter those who steal vehicles; hence it is possible to have coexistence of high rate of vehicle theft with high recovery of stolen vehicles.

In the armed robbery models population density, armed robbers killed by police and armed robbers injured by police are not significant in all the regressions. Implying that population density does not lead to armed robbery. Similarly, police men killing or injuring armed robbers does not reduce the cases of armed robbery in Nigeria. However, unemployment is significant and positive in three of the regressions, meaning that more unemployment can lead to more armed robbery. Rate of prosecution is significant once and negative which is evident in the fact that prosecutions serve as deterrent to armed robbery. The more people are prosecuted for armed robbery, the lesser would arm robbery in the country. Armed robbery cases pending investigation as well as awaiting trial are positive where they are significant. Delaying investigation and trial of armed robbery cases would lead to more armed robbery cases in Nigeria.

Generally, the findings show that unemployment has positive effect on total crime and armed robbery but has negative effect on kidnapping while it has no robust effect on vehicle theft. Secondary school enrolment has positive effects on total crime as well as all the types of crime considered in this paper. Number of prison inmate also has positive effect on total crime, kidnapping and armed robbery. Population density equally has positive effect on kidnapping and vehicle theft.

4.2 Policy Implications

The findings in this paper have a number of policy implications. First, solving the problem of unemployment may not be the solution to all kinds of crimes; therefore, policymakers should look beyond unemployment in order to tackle the problem of crime. Second, police brutality against armed robbers is never a solution to armed robbery rather armed robbers should be arrested, tried and prosecuted if found guilty. Third, it seems prisons in Nigeria do not deter criminals from further committing crime. The prison services need to be restructured such that inmate are reformed and trained to became self-employed because it could be difficult for ex-convicts to secure job. Hence, they are must likely to return to criminal activities if legal opportunity is not forthcoming.

5. CONCLUDING REMARKS

This paper studied the impact of unemployment on total crime, kidnapping, vehicle theft and armed robbery. State panel data was employed and a number of unobservable characteristics were controlled for. Different estimation techniques were used to gauge the models. The results show that unemployment is an important determinant of total crime as

well as armed robbery but this is not consistent in the cases of kidnapping and vehicle theft. Findings equally show that prisons in Nigeria do not result to reduction in crime, while prosecution of armed robbers can significantly reduce armed robbery in the country. These findings on one hand concurred with previous studies that found unemployment to have a positive effect on crime [7,10.11,14,23]. This is true in the case of total crime and armed robbery. On the other, the findings contradict such previous stand, particularly in the case of vehicle theft and kidnapping to a lesser degree.

Base on these findings, the following recommendations become critical in the fight against crime in Nigeria: first, the problem of unemployment particularly at lower levels of education should be addressed. Second, cases of armed robbery and other serious crimes should be investigated and tried without delay. Third, people found guilty of armed robbery (as well as other crimes) should be prosecuted appropriately. Finally, prisons in the country should be restructured so that inmates can be rehabilitated as well as trained for self employment. This could be done by giving them intensive training of different vocational skills.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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