The Impact of Fragility on Growth and Poverty in Nigeria: A Disaggregate State-level Analysis

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Bringing Rigour and Evidence to Economic Policy Making in Africa

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List of abbreviations and acronyms

ACLED   Armed Conflict Location and Event Data
AfDB   African Development Bank
CBN   Central Bank of Nigeria
FCT   Federal Capital Territory
FDI   Foreign Direct Investment
GDP   Gross Domestic Product
IMF   International Monetary Fund
NBS   National Bureau of Statistics
NHDR   National Human Development Report
IDPs   Internally Displaced Persons
OPHI   Oxford Poverty and Human Development Initiative
OECD   Organisation for Economic Co-operation and Development
RSSDA   Rivers State Sustainable Development Agency
SGDP   State Gross Domestic Product
SNA   System of National Accounts
SSA   Sub-Saharan Africa
UN   United Nations

Abstract

This paper empirically investigated the fragility-growth nexus, as well as the fragility-poverty nexus, in a sample of 36 states and Federal Capital Territory (FCT) in Nigeria. We further considered the macroeconomic and socio-political relationship in fragile and non-fragile states of Nigeria. Using data covering the period between 2011 and 2015, both the static approach (Ordinary Least Squares, Fixed Effect, and Random Effect) and dynamic approach (Difference and System Generalized Method of Moments) were explored to provide answers to some key questions in the study. The results showed that neoclassical approach and socio-political approach complement each other. We further observed that, economic growth and poverty need urgent attention in both fragile and non-fragile states, but special attention should be directed towards fragile states to move them above fragility trap for them to be more resilient. There is still high-level poverty coupled with declined growth in both regions.

1. Introduction

One of the most debated and seemingly elusive issues in international development economics is the question of why some countries are richer than others. Therefore, myriads of understandings on the factors responsible for the overall weak development performance of Africa in the last half century have been put forth by different scholars and organizations. Although there appears to be a stain of optimistic growth for the continent, especially in the 2000s, this outset of an "Africa Rising" narrative pales when a much longer historical perspective serves as the basis for consideration. In a bid to figure out the supposed difference of Africa, several explanations have been advanced, ranging from the relics of colonial history, difficult geography (the notion of "landlocked" is flagship), ethnic fractionalization, civil unrests, to government repression, among other factors.

It is needless to say that an assortment of factors is responsible for the observed outcome. Fragility, which we operationalize as the inability of a state to steer the economy towards respectable growth and ensure equitable as well as societally inclusive allocation of the proceeds of growth, then aptly captures several dimensions of these explanations. Fragile countries are often characterized by social exclusion which can trigger conflicts. Conflicts also undermine the capacity of the state to deliver public services, weakening institutions and slowing economic performance and limiting poverty reduction (Ncube et al., 2014). In addition, fragility is defined as the consequence of an exposure to a conflict (Ncube et al., 2014). Gelbard et al. (2015) explained that economies of fragile countries are weak and vulnerable to shocks, there are large internal disparities in income and wealth and in access to services, prices and exchange rates are often volatile or subject to controls, fiscal balances are in deficit, and high debt often encumbers economic prospects.

Given the multidimensional views of fragility, different countries are faced with different forms of fragility such as fragility from political instability (Gelbard et al., 2015), fragility from conflicts (Ncube et al., 2014), fragility from macroeconomic instability (Alemayehu, 2017), among others. While the preponderance of empirical inquiries focuses on notions about national level dimensions of fragility, this orientation may obscure some critical aspects of the core issues particularly in countries with decentralized political systems such as Nigeria. There are three tiers of government – federal, state, and local – and each has constitutionally assigned

roles and responsibilities. Beyond this, different sub-national units (the 36 states in Nigeria in this case) also have marked variations with respect to natural resource endowment, economic size, infrastructure adequacy, political history, among other key distinguishing characteristics. Therefore, with this socio-political structure as a backdrop, it becomes pragmatic to imagine differentials in both the manifestations and severity of diverse aspects of fragility. In other words, there is bound to be mutual coincidence of both "pockets of fragility" and "aisles of soundness" within Nigeria. This study is specifically aimed at an in-depth understanding of both the underlining dynamics and the eventual outcomes observable in these "pockets of fragility" (or fragility clusters). It is hence pertinent to note that, in the context of Nigeria, fragility can be inferred from the enormous challenges facing the federating units (states) that make up the country. In the recent years, many states in Nigeria have been experiencing serious conflicts such as ethnic clashes and Boko Haram terrorism in the north eastern part of the country, prevalence of Fulani herdsmen killings, kidnapping, Niger/Delta militancy, and armed robbery in the southern part.

In particular, since 2009, the northern part of the country has witnessed overwhelming and prolonged crises which, via killings and destruction of properties, has decimated the social infrastructure of the region. It is needless to say that it would take many years to rebuild such depleted capital. To put into perspective the gravity of the conundrum, between 1997 and 2016, the northern part of Nigeria recorded 94,339 fatalities of which more than 80% was between 2009 and 2016. One of the major reasons for this can be attributed to the Boko Haram insurgency in the region. On the other hand, the southern part of the country recorded 18,732 fatalities between 1997 and 2016 of which 36.4% was between 2009 and 2016. A cursory comparative of the foregoing statistics already places the northern part in a far more fragile matrix than its southern counterpart. This insurgency is, not only a menace to the country, but it also has spill over effects on the neighbouring countries such as Chad and Cameroon. This state of affairs is precarious especially in a region that is faced with poor macroeconomic and socio-political indicators including poor growth and extreme poverty. Thus, it is imperative to understand the relationship between macroeconomic factors and fragility (measured by conflict) as well as unzip the connection between fragility and socio-political factor. All of these analyses are better appreciated and more policy-relevant at a disaggregated scale (state-level approach) in a federal system like Nigeria.

However, this dominant paradigm presupposes that fragile states perform poorly without an explicit attempt to investigate these connections at country-level. In this study, our interest focuses on a number of pertinent questions at the state-level in Nigeria, namely, what precise relationship exists between growth and fragility? Are there dynamic aspects to the linkages between fragility and poverty? Do fragile states differ from their non-fragile counterparts on the basis of the foregoing? What are the plausible implications of the foregoing for policy?

Thus, the broad objective is to examine the association between fragility and state-level economics, as well as socio-political performance in Nigeria. Consequently, the specific objectives of the study are as follows:

i.   To examine the relationship between growth and fragility at state-level.

ii. To analyse the linkages between fragility and poverty at state-level.

iii. To investigate the existence or otherwise of variations in the relationships in (i) and (ii) in fragile states vis-a-vis non-fragile states.

To achieve the research objectives above, we deploy a panel data set covering 36 states and Federal Capital Territory (FCT) in Nigeria between 2011 and 2015. In order to deal with specific research questions, four economic approaches have been proposed, namely, pooled Ordinary Least Squares (OLS), Fixed Effect (FE) or Random Effect (FE) and Generalized Method of Moments (GMM). The respective reasons for their adoption are detailed in the methodology section.

The outline of the rest of this study is as follows. Section 2 focuses on literature review dealing with conceptualization and empirical review. Section 3 offers details on methodological issues. Section 4 focuses on results presentation and discussion. Section 5 provides the conclusion and policy implications of the study.

2. Literature review

Conceptualization of fragility

Fragility is a multidimensional phenomenon which has been a topical issue for intensive debate among scholars. Recent research has shown how attention has been shifted to the multiple dimensions of fragility and the extent to which weaknesses along these dimensions interact and strengthen one another. The World Bank and other institutions like African Development Bank (AfDB), International Monetary Fund (IMF), Fund for Peace, etc., have tried to identify countries as fragile on the basis of a variety of indicators that combine measures of economic performance, social indicators, governance, political stability, and institutional quality.

According to Ncube et al. (2014), fragility is defined as the consequence of an exposure to a conflict. Besley and Persson (2014) and Maier (2010) explain that fragile countries suffer from significant limitations along several dimensions such as forming a weak "development cluster" typically characterized by low income, violence, and constrained state capacity. Also, Gelbard et al. (2015) highlighted the following:

- At a social level, ethnic, linguistic, or religious divides may undermine the development of a national conscience and an awareness of shared interests, while education, health, and social security systems are poorly organized, underfinanced, and unevenly accessible.

- Controls on executive power are also ineffective, as the legislative branch of government, the press, or civil society struggle to hold the government accountable.

- The economies of fragile countries are weak and vulnerable to shocks, there are large internal disparities in income and wealth and in access to services, prices and exchange rates are often volatile or subject to controls, fiscal balances are in deficit, and high debt often encumbers economic prospects.

- In a post-conflict or near-conflict environment, rebels may threaten violence, and extortionists and militia groups may impose their own "law."

Further, a number of studies have highlighted the extent to which weaknesses in these aspects can mutually reinforce and keep countries in a "fragility trap". According to Andrimihaja et al. (2011), there are linkages among weak enforcement of contracts and property rights, violence and insecurity, and corruption and government capture by vested interests. For Pritchett and de Veijer (2010), lack of institutional and technical capacity can lead to what is known as "isomorphic mimicry", whereby fragile states could be some sort of organized institutions that bear surface resemblance to a well-functioning state but in reality are dysfunctional and inherently weak. Finally, fragility also weakens a country's resilience to shocks such as natural disaster, economic downturn, violence, etc. The deleterious influence of such hazards, when they occur, are more lasting in fragile states than non-fragile states. OECD (2009) views fragility as a situation where states lack political will and/or capacity to provide basic functions needed for poverty reduction, development and to safeguard the security and human rights of their populations.

Empirical review

A large number of empirical studies have examined the impact of political conflict on economic variables using both panel and cross-sectional data. Among those who used a cross section of countries are Venieris and Gupta (1986), Barro (1991), Mauro (1995), Alesina and Perotti (1996), Abadie and Gardeazabal (2003) and Hausken and Ncube (2012). Findings from the studies of Venieris and Gupta (1986) and Alesina and Perotti (1996) show that political instability has a negative effect on investment and savings. The uncertainty in the politico-economic environment discourages investors due to a very high risk on the returns from investment. Since investment is crucial for growth, any factors that influence investment have a spillover effect on the growth, and uncertainty in politico-economic environment has been identified as one of those factors. More so, countries with high corruption, poor judicial system, and political instability tend to experience lower investment thereby recording lower economic growth (Barro, 1991; Mauro, 1995). In addition, election as a critical factor in a democratic setting may promote political violence, especially in the absence of fairness among the political contenders. Specifically, most African countries' experience depict a situation where the incumbent and challengers direct their resources into election manoeuvring, which in turn distract the incumbent from providing public goods and increase[decrease?] production necessary for the economic growth (Hausken & Ncube, 2012). More so, election outcomes in most African countries have been challenged thereby casting some doubt on the credibility of electoral processes and political representativeness.

Apart from political aspect, some studies have also examined the economic effects of conflict both from macro and micro perspectives. From micro-level approach, studies tried to identify the effects of violent conflict on society in a meticulous way which was until recently thought to be impossible. For example, the study on the effects of the Holocaust on development in Russia by Acemoglu et al. (2011)

provided evidence that the lasting impact of the Holocaust may be attributable to a permanent change it induced in the social structure across different regions of Russia. During the period, many cities that experienced the Holocaust were found to record lowest growth, worst economic and political outcomes, and therefore resulted in a large negative effect on the size of the middle class after the war. Also, Akresh et al. (2012) studied the Nigerian civil war in the 1960s and their result shows that several generations of Nigerian women, many of whom are alive today, carry the scars of their exposure to this war. They further explain that adult stature is more sensitive to the environment in adolescence than it is at younger ages. Besley and Mueller (2012) studied the economic cost of conflict in contemporary Northern Ireland. Some of the recent publications from multilateral development banks (African Development Bank's African Development Report 2009, World Bank's World Development Report 2011, and European Union's Report on Development 2009) have highlighted the issue of conflict and fragility. Their reports reveal that civil conflict cost the average developing country at least 30 years of GDP growth, and countries in protracted crisis fall over 20 percentage points behind in solving the problem of poverty. According to World Bank (2011) people in fragile and conflict-affected situations are more than twice as likely to be undernourished as those in other developing countries, more than three times as likely to be unable to send their children to school, twice as likely to see their children die before the age of five, and more than twice as likely to lack clean water.

From macro-level, using terrorist conflict in the Basque as a case study, Abadie and Gardeazbal (2003) examined the economic effects of conflicts and their findings suggest that, after the outbreak of terrorism conflict, GDP per capita in the Basque significantly declined by ten percentage points compared to their synthetic control region. Further, their findings show that in the late 1990s, after 30 years of terrorist and political conflict, this region, which was one of the richest regions in Spain, ranking third in GDP per capita (out of the 17 regions), had significantly dropped to the sixth position. In the context of developing countries, Chauvet et al. (2011) estimated the cost of a failing state for 105 countries between 1974 and 2001. They estimated three distinct costs of a failing state, which include: the costs of poor policy and governance to citizens of such states, the costs of civil war to these citizens, and the cost of both these types of failure to neighbours. Furthermore, their results show that the total cost of failing states is around US$276 billion per year and exceeds spending on global aid programmes. It also doubles what would be generated if OECD raises aid to the UN target level of 0.7% of GDP. Little attention has been devoted to understanding fragility in individual SSA countries. Given the global linkages among the countries in the world, states do not operate in isolation and will be affected by events in neighbouring countries. The porosity of national borders contributes to spill over of conflicts from one country to another particularly through refugee flows. More importantly, there is high risk when ethnic group span across borders of neighbouring countries during ethnic conflicts. Also, proximity, easy movement of mercenaries from one conflict zone to another, and proliferation of small arms and light weapons that aid widespread conflict due to porous borders in Africa, are also culpable in this milieu.

External shocks can trigger fragility if institutions are weak and when there are marked social divisions compounded with minimal public participation in political process. For example, in the Mano River region of West Africa, the Horn of Africa, the Sahel region and the Great Lakes region, the outbreak of the national conflicts created regional security issues. Ncube et al. (2014) examined the economic cost of fragility in Africa and their result shows that fragile states lose an opportunity to double their initial GDP per capita after a period of 20 years. Also, their synthetic counterfactual model shows that, in 20 years of fragility, the cumulative economic cost of fragility in Liberia, Sierra Leone, and Burundi amounted to US$31.8 billion, US$16.0 billion, and US$12.8 billion, respectively. Their simulation result suggests that, if Central Africa Republic, Liberia, and Sierra Leone had growth rates equivalent to those of the synthetic country in the model in 2010, it will take 34.5, 19.2, and 20.8 years, respectively, to recover the level of GDP per capita if these countries had not been exposed to fragility.

To obtain deeper understanding of the issues related to fragility in Africa, many recent studies have contributed extensively to the literature on this area. These include Alemayahu (2017); Ngepah and Ngepah (2017); Edwards and Chacha (2017); Nkurunziza (2017); Baliki et al. (2017); Chuku and Onye (2017); and Fowowe and Folarin (2017). A unique macroeconomic management has been identified as one of the keyways of dealing with the delicate nature of fragile states in Africa. This promotes macroeconomic stability which mostly relies on political and economic governance coupled with financial development of its nature. Thus, better governance, inclusive and democratic politics and viable macroeconomic policy will create conducive economic environment for macroeconomic stability in the fragile states in Africa. In addition, long-run debt accumulation, short-run natural resource exports, aid, financial sector depth and strong human capital base are important factors that can ensure macroeconomic stability (David et al., 2011 cited in Alemayahu, 2017). Similarly, countries with greater fragility tend to suffer higher macroeconomic volatility and crisis as well as display weaker growth. However, the state fragility conditions were rather identified to be of first-order importance in explaining the macroeconomic performance in fragile states but not necessarily macroeconomic policies (Chuku & Onye, 2017). This suggests that fragility experienced by many states in Africa can be attributed to poor macroeconomic management, and fragile states conditions can account for poor macroeconomic performance. This relationship may thus imply bidirectional causal effects between fragility and macroeconomic performance.

In the context of inclusive growth in African countries, the effects of fragility and financial inequality were examined. Inclusive growth was captured by income growth and income distribution, and the effects of fragility was found to be negatively related to inclusive growth while financial inclusion positively affects inclusive growth (Fowowe & Folarin, 2017). This implies that the inability of a fragile country or region to integrate its population into its financial system can make growth less inclusive. Similarly, an economy characterized by extreme inequality tends to promote political fragility. This implies that one of the channels through which many factors continue

to promote fragility as well as low economic growth rate is extreme inequality. Also, countries with lower levels of economic growth tend to experience fragility (Ngepah & Ngepah, 2017). Examining the relationship between fragility and poverty reveal that countries can be endangered through vicious circle of fragility trap and high levels of deprivation. Thus, the high level of fragility in sub-Saharan Africa shows that higher levels of deprivation, poor growth performance as well as inequality are interrelated. This shows that countries with vicious circle of deprivation coupled with poor economic growth tends to be fragile and may have weaker institutions.

From the above, there is no doubt that fragility is a serious challenge which many countries in the world are still battling with, especially countries in the African region. Many factors have been identified in the literature which includes political instability, poor macroeconomic management, and corruption, among others. However, most of these studies are multi-country analysis. Moreover, these studies in the literature on fragility in Africa are necessary but may not be sufficient because of the diversity of countries in Africa which may render blanket generalizations ineffectual. To fully understand fragility in countries in Africa, there is need for country-specific studies to identify the factors driving fragility. This gap is precisely what we want to bridge using recent experiences of conflicts in Nigeria. In the recent years, many sub-national units (i.e., states) in Nigeria have witnessed some form of insecurity. This includes but is not confined to ethnic clashes, Boko Haram insurgency, Fulani herdsmen killings, kidnapping, and armed robbery. Thus, to understand fragility using conflict markers in Nigeria, it is imperative to focus on the cross-sectional units (i.e., the 36 states and Federal Capital Territory (FCT) for analytical purposes. This approach will provide finer grained insights which will draw facts, show their implications, and suggest possible ways forward.

3. Methodology

Empirical framework

One of the challenges facing many states in Nigeria today is the issue of conflicts in different forms. Since 2009, many lives have been lost to Boko Haram insurgents and many economic activities and properties in the northern eastern region have been totally destabilized while some have been destroyed. This has made the region record the highest number of refugees since the country returned to democracy in 1999. Moreover, this challenge has made the region the most fragile region in Nigeria as at present. In addition, other regions such as eastern, western and southern are not isolated from conflicts. The most recent of the challenges which these regions are battling with is the issue of kidnapping, Fulani herdsmen killing (which has destabilized the agricultural system of many states in the country), Niger/Delta militia group, cultism, armed robbery, and other ethnic clashes.

Summing up all these challenges in the different regions of Nigeria put the whole country at high risk of fragility. Examining the issues around conflict, two approaches have been identified in the literature. These are "the neoclassical" and "the political economy" approaches.[1] The neoclassical approach relies on the issue of rational choice presumptions and methodological individualism in their model (Cramer, 2006 cited in Alemayehu, 2017). This approach focused on cross-country data and quantification of factors behind conflict and state fragility (see Collier, 2009, ; Collier and Hoeffler, 2004a; Collier & Hoeffler, 2004b; Fearon & Laitin, 2003).

On the other hand, the political-economy approach posits that conflict reveals the relations of social, political, and economic expressions and thus conflict studies need analytical tools to aid the understanding of these associations. Economists, though, rely on the neoclassical approach because of the quantitative advantage, but it neglects the social and political aspects which made Cramer (1999; 2006) describe it as reductionist. In the real sense, the analysis of conflict needs to consider social, economic, and political features of the society. Cramer further argues that political economy approach presupposes economic relations, behaviours and performance which are naturally embedded in the social and the political context. From this view, scarcity, poverty and economic, and environmental crises are themselves to be understood as socio-political events (see Cramer, 1999, 2001, 2006; DIFID, 2010; Stewart, 2010; Alemayehu, 2011 cited in Alemayehu, 2017).

Some aspects of neoclassical and political-economy approach will be considered for the econometric methodology to circumvent some of the issues raised by Alemayehu (2017) in relying solely on one of the approaches. Thus, the study will take into account economic and socio-political factors for robust analytical framework. Given the above, the two approaches will be employed and modified in line with the objectives of the study. First, the study will examine the extent to which conflict affects growth trajectories across states (neoclassical approach) on the one hand, and poverty (socio-political approach) on the other hand. Hence, this study will more meaningfully identify and gauge the extent to which conflict had contributed to growth differentials (or otherwise) and variations in socio-political development across states in Nigeria.

Analytical framework and econometric method

For national economic managers and policy makers, the central goals at macro-level are to ensure macroeconomic stability and sustained growth. These key objectives are also desirable at regional and state levels even in the presence of fragility within the country. Conflict intensity tends to destabilized both economic and socio-political factors in a region or state and at country level. These destabilizing factors generated by conflicts are seen to be distinctive for fragile societies. Therefore, the environment of fragility and legacy of conflict suggest the presence of deficiency in the absence of institutions which are responsible for macroeconomic management (Alemayehu, 2017). In the presence of conflicts, fragile states witness unstable growth and high level of poverty. The macroeconomic management institutions that work towards stable growth and low poverty will be inefficient and collapse during the period of conflict. Given the economic and socio-political destabilization caused by conflict in a country, it will be interesting to quantify and evaluate the extent to which conflict has contributed to economic and socio-political instability especially at the state-level as previously argued. Thus, conflict is implicated as a key factor precipitating economic and socio-political outcomes in fragile regions and states in Nigeria. These conflict spots have earlier been termed "pockets of fragility" in this research.

In the presence of conflict, the overall economic activities are affected as economic agents may be discouraged from all productive activities as a result of the risk associated with conflict. From socio-political angle, conflicts cause social displacement of people, leaving them without jobs due to exposure to conflict and this in turn results in poverty. However, it is equally plausible to imagine the flipside of the linkage between conflict and socio-political factor (i.e., poverty). High level of poverty among people may lead to agitation which may lead to conflict. All these factors are intertwined and it will be interesting to better understand this relationship. Thus, from neoclassical approach, we rely on augmented Solow growth model with human capital, while we rely on simple poverty model for socio-political approach.

As discussed by Bourguignon (2004), poverty rate is explained by growth elasticity (which captured income effect) and inequality elasticity (which captured distributional effect). To this end, we specify the functional forms for both approaches as follows:

Neoclassical approach

$$Y_{it} = f(K, L, AH) \tag{1}$$

Socio-political approach

$$Pov_{it} = f(Income, Gini) \tag{2}$$

As established in the foregoing, state fragility reduces economic activities vis-a-vis increase poverty, thus functional forms can be rewritten as:

Neoclassical approach

$$Y_{it} = f(K, L, AH, Fra) \tag{3}$$

Socio-political approach

$$Pov_{it} = f(Income, Gini, Fra) \tag{4}$$

Equations 3 and 4 were specified in baseline models as follows:

Neoclassical approach

$$Y_{it} = \beta_0 + \beta_1 cap_{it} + \beta_2 lab_{it} + \beta_3 fra_{it} + \beta_4 sch_{it} + \beta_5 lif_{it} + \beta_6 debt_{it} + \beta_7 M2_{it} + \varepsilon_{it} \tag{5}$$

Socio-political approach

$$Pov_{it} = \alpha_0 + \alpha_1 Y_{it} + \alpha_2 Gini_{it} + \alpha_3 lif_{it} + \alpha_4 sch_{it} + \alpha_5 fra_{it} + \varepsilon_{it} \tag{6}$$

The logs of the variables of the models are taken in order to normalize them, and thus the log-linearization of equations 1 and 2 is presented as:

Neoclassical approach

$$\log(Y)_{it} = \beta_0 + \beta_1 \log(cap)_{it} + \beta_2 \log(lab)_{it} + \beta_3 \log(fra)_{it} + \beta_4 \log(sch)_{it} + \tag{7}$$
$$\beta_5 \log(lif)_{it} + \beta_6 debt_{it} + \beta_7 M2_{it} + \varepsilon_{it}$$

Socio-political approach

$$\log(Pov)_{it} = \alpha_0 + \alpha_1 \log(Y)_{it} + \alpha_2 \log(Gini)_{it} + \alpha_3 \log(lif)_{it} + \alpha \qquad (8)$$

$$\alpha_4 \log(sch)_{it} + \alpha_5 \log(fra)_{it} + \varepsilon_{it}$$

Where:

Y = GDP per capita at State i in Nigeria
Fra = measured by conflict intensity at State i in Nigeria
$Debt$ = measuring fiscal sustainability at State i in Nigeria
Cap = consumption of fixed capital at State i in Nigeria
Lab = labour force at State i in Nigeria
Sch = secondary school enrolment at State i in Nigeria
Lif = life expectancy at State i in Nigeria
Pov = measured by multidimensional poverty index at State i in Nigeria
$Gini$ = measured by Gini coefficient at State i in Nigeria
$M2$ = money supply as a percentage of GDP (a proxy for financial depth/the
           sector's development) at State i in Nigeria.

The study will go further to group the states into fragile and non-fragile using Boko Haram insurgency for better comparison and to elicit appropriate policy implications. The reason for using insurgency as criterion is as a result of the unimaginable devastation caused to an area in terms of total collapse of economic or productive activities, loss of human lives and property, and high level of poverty. Added to this is the physical displacements of several millions of people who then struggle to get by in life under their assumed status as Internally Displaced Persons (IDPs). For example, on average, the number of deaths recorded in Boko Haram affected regions is 273 compare to 16 deaths recorded in non-Boko Haram affected regions in 2011. The deaths further increases to 1,200 in Boko Haram affected regions compared to 80 in non-Boko Haram affected regions in 2015. In addition, the school enrolment, on average, in affected regions is 121,422 compared to 114,072 in non-affected regions in 2011, while it declines to 114,072 (affected regions) but increases to 122,697 (non-affected regions). On human development index, it declines from 0.41 to 0.31 in affected regions compared to non-affected regions where it declines from 0.51 to 0.47 between 2011 and 2015. Given the performance of these indicators in both regions after the emergent of insurgency activities, the Boko Haram insurgency criterion is a strong yardstick for splitting the sample in the context of Nigeria. This comparative treatment will guard against overall generalization of the outcomes arising from equations 1 and 2. Exploring the relationships of interest further along the lines of fragile and non-fragile states within Nigeria will provide robust information about these relationships and better policy prescriptions. Thus, we re-specify equations 1 and 2 in the context of fragile

and non-fragile states considering both macroeconomic factors and socio-political factors as follows:

Fragile states

Neoclassical approach

$$\log(Y)^f_{it} = \beta_0 + \beta_1 \log(cap)^f_{it} + \beta_2 \log(lab)^f_{it} + \beta_3 \log(sch)^f_{it} + \beta_4 \log(lif)^f_{it} + \qquad (9)$$

$$\beta_5 debt^f_{it} + \beta_6 M2^f_{it} + \varepsilon_{it}$$

Socio-political factors

$$\log(Pov)^f_{it} = \alpha_0 + \alpha_1 \log(Y)^f_{it} + \alpha_2 \log(Gini)^f_{it} + \alpha_3 \log(lif)^f_{it} + \alpha_4 \log(sch)^f_{it} + \varepsilon_{it} \qquad (10)$$

Non-fragile states

Macroeconomic factors

$$\log(Y)_{it} = \beta_0 + \beta_1 \log(cap)_{it} + \beta_2 \log(lab)_{it} + \beta_3 \log(sch)_{it} + \beta_4 \log(lif)_{it} + \qquad (11)$$

$$\beta_5 debt_{it} + \beta_6 M2_{it} + \varepsilon_{it}$$

Socio-political factors

$$\log(Pov)_{it} = \alpha_0 + \alpha_1 \log(Y)_{it} + \alpha_2 \log(Gini)_{it} + \alpha_3 \log(lif)_{it} + \alpha_4 \log(sch)_{it} + \varepsilon_{it} \qquad (12)$$

The data structure for this study consists of both cross-sectional (states) and time dimensions which can be pooled together in panel form (i.e., panel data). This data structure presents us with a variety of techniques of modelling that can be employed. This study will, therefore, employ Ordinary Least Squares (OLS) with pooled data then proceed with employing either Fixed Effects (FE) or Random Effects (RE) estimation methods given Hausman test result. The study will finally consider Generalized Method of Moments (GMM). The three econometric approaches assist to evaluate the robustness of the findings across different techniques. First, the models in equations 3-8 will be estimated by OLS regression in panel form, but there are obviously two problems with this estimation technique which include endogeneity problems which may be due to reverse causality issue or the effect of some of the omitted variables (e.g., geographical characteristics, culture, and so on); and the possibility of measurement error of our variables of interest. If these are neglected, these two problems will yield OLS estimates that do not correspond to the causal

effect of explanatory variables on the dependent variable. Thus, upward or downward biases are possible.

The next procedure is, therefore, to employ either fixed effect or random effect panel data model. These help to address the issues that cause changes within a sample. Therefore, the fixed or random effects model controls for all time-invariant differences among the cross sections (i.e., states) for unbiased estimated coefficients. Despite that, unlike the pooled OLS, the fixed or random effects techniques can resolve individual effects as well as time effects and can account for heteroscedasticity; there is the need for certain assumptions to be fulfilled, especially strict exogeneity assumption.

In order to handle the potential endogeneity, unobserved heterogeneity, and country fixed effects problems, this study will go further to consider Generalized Method of Moments (GMM) approach to panel regression analysis proposed by Arellano and Bond (1991) but later modified by Blundell and Bond (1998) to examine the relationship among the variables. The reason for choosing GMM is due to its dynamic and robustness advantages over static panel models such as pooled regression, fixed effect and random effect. First, GMM estimation technique is suitable for panel data set with "small T and large N". However, if T is large, dynamic panel approaches like GMM will no longer be unbiased and fixed effects estimator will be preferable; and if N is small, the cluster-robust standard errors and the Arellano-Bond autocorrelation test may be unreliable (see Roodman, 2009). Second, GMM estimation technique uses the set of equations in first differences coupled with suitable lagged levels of variables as instrument, and additional set of equations in levels with lagged first differences as instrument are also included in the equations. System GMM deals with issues related to endogeneity that are common to measurement error and omitted variable bias and reverse causality.

The compact form of the equations above can be transformed into static panel form as follows:

Neoclassical approach

$$\log(Y)_{it} = \beta_0 + \beta_1 \log(cap)_{it} + \beta_2 \log(lab)_{it} + \beta_3 \log(fra)_{it} + \beta_4 \log(sch)_{it} + \beta_5 \log(lif)_{it} + \tag{i}$$

$$\beta_6 debt_{it} + \beta_7 M2_{it} + \lambda_i + \varepsilon_{it}$$

Socio-political approach

$$\log(Pov)_{it} = \alpha_0 + \alpha_1 \log(Y)_{it} + \alpha_2 \log(Gini)_{it} + \alpha_3 \log(lif)_{it} + \alpha_4 \log(sch)_{it} + \tag{ii}$$

$$\alpha_5 \log(fra)_{it} + \lambda_i + \varepsilon_{it}$$

Capturing equations 1 and 2 in dynamic form gives:

$$\log(Y)_{it} = \beta_0 \log(Y)_{it-1} + \beta_1 \log(cap)_{it} + \beta_2 \log(lab)_{it} + \beta_3 \log(fra)_{it} + \beta_4 \log(sch)_{it} + \qquad (1^*)$$

$$\beta_5 \log(lif)_{it} + \beta_6 debt_{it} + \beta_7 M2_{it} + \mu_{it}$$

$$\log(Pov)_{it} = \alpha_0 \log(Pov)_{it-1} + \alpha_1 \log(Y)_{it} + \alpha_2 \log(Gini)_{it} + \alpha_3 \log(lif)_{it} + \qquad (2^*)$$

$$\alpha_4 \log(sch)_{it} + \alpha_5 \log(fra)_{it} + \mu_{it}$$

$$\mu_{it} = \varepsilon_i + v_{it} \qquad (a)$$

Where, $\varepsilon_i \sim$ IID $(0, \sigma_\mu^2)$ and $v_{it} \sim$ IID $(0, \sigma_v^2)$ $\qquad$ (b)

Therefore, the component ε_i represents individual (country-specific) fixed effects that are invariant and v_{it} represents country-specific shocks and varies over time. The latter shocks are heteroscedastic and are correlated over time within individuals but not among them. Then, we assume that:

$$E\left(\varepsilon_i\right) = E\left(\pi_{it}\right) = E\left(\varepsilon_i, \pi_{it}\right) = 0 \qquad (d)$$

$$E\left(v_{it,} v_{js}\right) = 0 \text{ for each } i,j,t,s \text{ with } i \neq j \qquad (e)$$

$$\Delta \log(Y)_{it} = \beta_0 \Delta \log(Y)_{it-1} + \beta_1 \Delta \log(cap)_{it} + \beta_2 \Delta \log(lab)_{it} + \beta_3 \Delta \log(fra)_{it} + \beta_4 \Delta \log(sch)_{it} + \qquad (1'')$$

$$\beta_5 \Delta \log(lif)_{it} + \beta_6 \Delta debt_{it} + \beta_7 \Delta M2_{it} + \mu_{it}$$

$$\Delta \log(Pov)_{it} = \alpha_0 \Delta \log(Pov)_{it-1} + \alpha_1 \Delta \log(Y)_{it} + \alpha_2 \Delta \log(Gini)_{it} + \alpha_3 \Delta \log(lif)_{it} + \qquad (2'')$$

$$\alpha_4 \Delta \log(sch)_{it} + \alpha_5 \Delta \log(fra)_{it} + \mu_{it}$$

This implies that, strictly exogenous variables are not influenced by their current or past errors and the pre-determined ones, including the lagged dependent variable, are possibly correlated with the past errors v_{it} thus may correlate with the individual fixed effects ε_i. Equations 1" and 2" have accounted for the elimination of individual fixed effects through first differencing transformation. Also, the characterization of first difference GMM with weak instruments has been taken into consideration in

equations 1" and 2'' to increase the efficiency of the models through the inclusion of more instruments and, therefore, the variables are instrumented with their available lags level.

Data issues

Table 1 provides the definition and sources of the data used in the study. GDP per capita and poverty were used as macroeconomic factor and socio-political factor, respectively. These variables have the potential of revealing the extent of macroeconomic and socio-political instabilities. Besides, most economic activities and opportunities at any level of the society are captured adequately by these variables. The estimation would be based on annual data for the period 2011 to 2015 using a panel sample of 36 states and Federal Capital Territory (FCT) in Nigeria for which all the required data are available. GDP per capita was derived using the proportion of methodological approach output of 2008/2009 National Human Development Report (NHDR) and it is assumed that summation of all states GDP per capita must be equal to the country's GDP per capita. Though, there may be some shortcomings with this approach as partial variation of their GDP per capita may be captured. However, National Bureau of Statistics relied on this in some of their reports, and to the best of our knowledge, the national statistical body has not documented GDP at states level in the country as at now (see Appendix D for the methodological approach). This approach was further applied on the consumption of fixed capital and labour force. In addition, we used conflict intensity to capture fragility.[2] This is because the variable composition accounted for different conflicts across the states in Nigeria, which give clear picture of how conflicts intensity, given the number of deaths, can make a state or region fragile as in the case of northern part of Nigeria. The components of conflict intensity help us to identify states affected by Boko Haram terrorism through the number of deaths from their acts. In line with Armed Conflict Location and Event Data (ACLED) Project definition, armed conflict comprehensively includes political violence, civil and communal conflicts, violence against civilians, rioting and protesting, and militia interactions (see Raleigh et al., 2014). Human development index and under five infant mortality are available for some years and 1-2 years moving average was used to cover the few missing years. Also, Foreign Direct Investment (FDI) which represented capital was dropped due to unavailability of data in some Boko Haram states which is the key to the study, and also Lagos State accounted for over 96% of the total FDI for the states with data. Life expectancy, which account for health indicator of human capital, was adequately captured in the model for each state. Thus, secondary school enrolment and life expectancy are proxy for human capital development. The Gini coefficient captured inequality. Control variables in the models in the foregoing subsection include: debt, M2, life expectancy, and school enrolment. Finally, natural growth rate was determined to calculate the missing data points (a year or two years) for some variables.

Table 1:   Variable definition and data sources

Variables of interest	Definition	Source
Log of Y	It measures the income per person in the total population. That is GDP per capita	United Nations Development Programme (2008) Nigeria Human Development Report and CBN, 2016
Fra	The natural log of conflict intensity	Fund for Peace, 2016
Debt	Domestic debt (% of Gross Domestic Product)	Debt Management Office Database
Lif	Log of life expectancy	Demographic Health Survey, National Bureau of Statistics (various years)
Schenrol	Secondary school enrolment	Universal Basic Education Commission Database
Pov	Multidimensional Poverty Index	Oxford Poverty and Human Development Initiative (OPHI) briefings (various years)
Lab	The natural log of labour force	National Bureau of Statistics (NBS), 2016
Cap	The natural log of consumption of fixed capital	National Bureau of Statistics (NBS), 2016
Gini	The natural log of Gini coefficient	Aigbokhan (2017)
M2	Money supply as a percentage of GDP	CBN, 2016[

4. Empirical results and discussion

This section presents the empirical results and gives detailed discussion of the findings from the study. Table 2 presents the descriptive statistics of the variables in the estimated models. From the table, all series have positive average values (i.e., mean values), which suggest that all the series exhibit upward trends. Among the series, LAB and SCH exhibit high volatility captured by their standard deviation while GINI exhibits the lowest fluctuations over the years. This implies that there are wide dispersions in the LAB and SCH. The high fluctuations in LAB and SCH, instinctively, have implications for growth of the economy across the states and the country as a whole. In addition, GINI, M2 and MPII are relatively stable among the variables. Finally, fragility is relatively unstable, which reveals the extent of conflict intensity across states in Nigeria. This suggests that death rate arising from political violence, civil and communal conflicts, violence against civilians, rioting and protesting, and militia interactions are frequent among the states, e.g., Boko Haram in the northern parts, and communal clashes and political agitation in the southern and western parts of the country, etc.

Table 3 presents the results when estimating Equation 1 with both static panel approach (i.e., Pooled Ordinary Least Squares and Fixed Effect or Random Effect) and dynamic approach (Difference GMM by Arellano and Bond, 1991; and System GMM by Arellano and Bover, 1995) to verify if the dynamic aspect is relevant to our results for the whole sample (i.e., 36 states and Federal Capital Territory. Specifically, we use the panels of five years, and a cursory look at columns (4) and (5) shows that the lagged terms that captured the dynamic aspect of the model are not significant. Thus, we focus on the static model. From the result in column (1), the coefficient of capital is negative and statistically insignificant. This suggests that capital serves as a direct drag on growth in Nigeria contrary to theoretical proposition. This further shows the existing dearth of capital stock critical to drive growth in the states and country as a whole. The result also points to the fact that insufficient capital stock in the states is not enough to boost necessary investment drive that can expand productivity. Intuitively, the result sheds light on the low saving behaviour among the citizens in the states. A plausible reason is the low average income per person in the population which make it almost unrealistic to gather saving as the larger part of the income is expended on basic needs (see Oyinlola & Adedeji, 2019).

Further, the coefficient of labour is positive and statistically significant. This implies that labour contribute to a larger extent, as indicated by the large coefficient, to the

high productivity among the states in the country. There is no doubt about the large number of labour force in the states and the existence of its efficiency in the growth process. This further shows the reason why large portion of the states' resources go to payment of workers' salaries. On the debt, which captures the extent of fiscal sustainability, the coefficient is positive and statistically significant. Generally, this result may imply that the accumulation of debt among the states has been beneficial to economic prosperity of the states in the country. Interestingly, this may suggest that state governments accumulate debt for developmental projects which is necessary for growth. In real sense, the debt accumulation depends on the judicious utilization of the loans for the investment with high returns.

Focusing on the human capital development in Nigeria, two indicators were used, namely: school enrolment and life expectancy. The coefficient of school enrolment is negative and statistically significant. This implies that development of human capital with respect to education serves as a direct drag on the growth of the country. This reveals the challenge facing the educational system among that states. A plausible reason for this could be lack of access to quality education in terms of skills and knowledge that is necessary for growth. This is not too surprising as education sector is subjected to incessant strikes and poor incentives for teachers to give their best to the students. This however signals a danger for the growth of the states unless the states and federal government take proactive measures in making education accessible to their citizens for meaningful growth in the country. In contrast, the coefficient of the health component of human capital, as measured by life expectancy, is positive and statistically significant. Thus, the result appears to suggest that as people live longer, they tend to contribute to the production process. Thus, sustainable and quality healthcare services should continue to be the priority of the states' government and federal government as whole. The coefficient of money supply, which measures financial depth, is negative and statistically insignificant. This shows that the financial sector has not played significant role in spurring economic activities of the states in the country. The plausible reason could be inability of the financial sector to provide loans for businesses at low interest rate. This clearly demonstrates the inefficiency of the financial sector in providing required funds to businesses for economic activities to expand thereby spurring growth in the country.

Shifting attention to the role of fragility on the growth of the states, the result shows negative and statistically significant coefficient of fragility. In addition, a critical look at fragility coefficient gives an insight to multiplier effect of fragility on growth. This result reveals that, as states become more fragile, overall economic activities are disrupted thereby reducing growth rate in the economy. This result further gives insight to how fragile the state components of Nigerian federation are. This disaggregated approach shows the fundamental challenges such as political violence, civil and communal conflicts, violence against civilians, rioting and protesting and militia interactions, as well as terrorism, facing the Nigerian states. The ethnic and religious divergences in the country have not served as a source of strength for the country's development rather for bigotry, nepotism, marginalization as well as communal crisis over the

years. Incessant killings due to terrorism, communal crisis, religious ideological crisis, as well as militia interaction continue to re-occur over time without significant progress in addressing these challenges. Thus, this will largely affect the growth of the state. Focusing on aggregate level, many challenges facing the country may be obscured; however, analysing the components (i.e., states) of Nigeria shed more light to how fragility has significantly hindered the growth of economic activities of many states in the country. This result further corroborates the report of Fund for Peace (2014) where Nigeria was ranked 17th with highest alert. This demonstrates that, as the components that make up a country, states in the case of Nigeria, become more resilient or less fragile (i.e., escape fragility trap), the country and its components experience significant improvement in its output level. On the flipside, as country becomes more fragile, its output level deteriorates significantly over time.

Considering the second model (i.e., socio-political approach) which focuses basically on poverty measured by multidimensional poverty index in Table 4, we explore different methodological approaches as experimented under growth results in Table 3. This is another approach to the understanding of the impact of fragility on the economy. A cursory look at columns (4) and (5) indicates that the lagged terms that captured the dynamic aspect of the model are not significant. Thus, we focus on the static model. The coefficient of income is negative and statistically significant. This implies that, as income per person in the population grows, the poverty level declines. Though, many states are making efforts (such as State Employability Support project by Lagos State government; establishment of Rivers State Sustainable Development Agency (RSSDA) in Rivers State; Kaduna Start-up Entrepreneurship programme by Kaduna State government; Skill Acquisition Programme by Kano State government, among others) to create job opportunity to boost individuals' income in the states. Expectedly, the result is in line with theoretical prediction. On Gini coefficient, which measures the inequality, the coefficient is negative and statistically significant in the model. The result appears to suggest that as inequality increases, poverty falls across the state; however, this is counterintuitive. Focusing on human capital, the coefficient of school enrolment is positive and statistically insignificant. In contrast, the coefficient of life expectancy is negative and statistically significant. This suggests that as people live long to participate in the production process, then there will be more rewards to meet their needs thereby reducing poverty. This result gives insight to how this aspect of human capital development has contributed to reduce poverty level. A plausible reason may be associated with extension of retirement age to 70 for sectors such as education, electricity, etc.

A not too surprising result is the positive and statistically significant coefficient of fragility in the model. This supports the notion that fragility does, not only affect economic activities, but also creates social problems. This suggests that, as states become more fragile, social problems such as poverty increases. This is because many people will lose their means of survival. This is evident in most parts of the country. In the presence of conflicts arising from communal crisis, ethnic crisis, religious crisis, and political violence and militia, economic activities are disrupted and drivers of

growth in terms of infrastructures are destroyed thereby making it difficult for people to meet up with their basic needs. This is evident in the northern part of the country where many infrastructures and economic activities are destroyed thus aggravating poverty challenge of the region.

The subsequent discussion focuses on the comparative analysis of economic performance in fragile states and non-fragile states using Boko Haram terrorism attack criterion due to the timeframe of the study. Seventeen states fall under fragile states while 20 states fall under non-fragile states category. Table 5 presents the results for economic growth model across the Boko Haram affected states and non-Boko Haram states. Different estimation techniques were adopted as previously demonstrated. In columns (4) and (5) of non-fragile state model, the result indicates that the lagged terms that captured the dynamic aspect of the model are not significant, thus focusing on the static model for better comparison. Comparing the capital in both categories, the result shows a negative and statistical insignificance of its coefficients. This result supports our previous findings in the full sample that capital serves as a direct drag on growth in both categories contrary to theoretical proposition. This reinforces our previous findings that there is existing dearth of capital stock necessary to drive growth in the states and the country as a whole.

On the contrary, the coefficient of labour is positive and statistically significant for both categories, but its contribution to growth is higher for non-fragile states. As explained above, most of the states have large labour force that participates in the production process thereby boosting productivity and its growth. We expect the labour force to perform better in a peaceful environment compared to those under the challenge of terrorism. Interestingly, the coefficient of debt is positive and statistically significant for both. The coefficient is higher for the fragile states relative to non-fragile states. A plausible reason is the judicious utilization of loans for development projects by those states in the region. Overall, the coefficient is relatively small for both categories, which point to the fact that terrorism in the fragile category and large recurrent expenditure in the non-fragile category may be major factors why its impact is low on growth. In addition, many states borrowed only to finance their recurrent expenditure at the expense of capital expenditure and repayment. Thus, efficient utilization of loans by both categories is necessary to rebuild the fragile region and promote economic growth while non-fragile region should focus on building important infrastructure that can boost economic activities.

Focusing on the education aspect of human capital, the result shows negative impacts of school enrolment on economic growth in both categories. Judging by the coefficients, the decline in the growth rate is relatively high for the fragile states. This shows that as school enrolment increases, the economic growth declines. For the fragile category, the plausible reason may be associated with instability in the regions as well as poor education system. On the other hand, the plausible reason for the non-fragile category may be associated with no or little skills possessed by larger portion of the labour force in the states. Thus, the fragile states are most commonly affected by poor human capital development due to lack of an enabling environment for its development. This education indicator of human capital also requires urgent attention

in both regions but more is required in the fragile states. In addition, the coefficient of life expectancy is positive for both categories, though it is not statistically significant. In general, the two categories face the challenge of human capacity development, and thus the government should make this as a priority to boost their productivity. On money supply, the result shows negative coefficient for fragile states while otherwise for non-fragile states. Though, they are not statistically significant. The implication of this is that the financial sector may find it difficult to play its catalytic role in spurring growth in the region facing terrorism attacks. Thus, stabilizing the region should be the key to the national government for the financial sector to efficiently perform its intermediating role in the growth process.

The next discussion is on the results presented in Table 6. The results presented follow the same pattern with respect to estimation procedures. This exercise is to give an insight to pockets of fragility in Nigeria. For better understanding of fragility in the Nigerian context, it is important to examine socio-political dimension in both categories. The result indicates that the lagged terms that captured the dynamic aspect of the model are not statistically significant for the same estimation techniques; therefore, we focus on the static model for better comparison. The coefficient of income is negative and statistically significant. This implies that, as income per person in the population grows, the poverty level declines. Surprisingly, the poverty reduction is relatively high in the fragile region (in terms of their coefficients). Expectedly, the result is in line with theoretical prediction. A plausible reason may be attributed to migration of people to non-fragile states. Many indigenes of non-fragile states reside in affected states; instability in the environment may force people to relocate to their state of origin. On Gini coefficient, the result shows positive relationship between inequality and poverty for non-fragile states while otherwise for fragile states. As expected, as the gap between poor and rich get wider, the level of poverty continues to increase. Focusing on human capital, the pattern is not significantly different from the findings in the full sample. The coefficient of school enrolment is positive and statistically insignificant for both categories. In contrast, the coefficient of life expectancy is negative and statistically significant for both. However, the coefficient is higher in the fragile states. This suggests that, as people live long to participate in the production process, there will be more rewards to meet their needs thereby reducing poverty.

In sum, the findings show that neoclassical approach and socio-political approach complement each other. We further observed that economic growth and poverty need urgent attention in both fragile and non-fragile states, but special attention should be directed towards fragile states to move them above fragility trap for them to be more resilient. There is still high level poverty coupled with declined growth. We finally examine the validity of the statistical inferences of the estimated coefficients in tables 3-6 by checking diagnostic tests of the overall model specifications. First, the test for performance of the model shows that the models are statistically significant at 1% level of significance as indicated by p-value of the F-stat. The R-squared further reinforce the significance of the model as most of the regressors explained more than 60% variation in the dependent variable. Finally, Hausman test shows rejection or acceptance of the null hypothesis given the model under consideration in tables 3-6.

5. Conclusion and policy implications

The study examined, specifically, the role of fragility on growth and poverty vis-a-vis the macroeconomic and socio-political natures of both fragile and non-fragile states using a panel of five years (2011-2015) for 36 states and Federal Capital Territory (FCT) in Nigeria. We explored, empirically, the hypotheses that fragility should retard growth and deepen poverty as well as that fragile states should be more prone to macroeconomic and socio-political challenges or instability than non-fragile states. In addition, we further explored both static and dynamic approaches in panel data analysis for robustness of findings.

The findings from results show that the initial levels of growth and poverty do not influence the models as indicated by the statistical insignificance of their coefficients, justifying the reliance on static approach. Further, the results largely show an indication of fragility reducing growth while promoting poverty in states in Nigeria. This shows that fragile states have the tendency of recording unstable or declined growth over time. This suggests that the pockets of fragility in terms of political violence, civil and communal conflicts, violence against civilians, rioting and protesting, and militia interactions among these states may weaken their growth potential. In addition, fragile states are exposed to high level of poverty as more job opportunities for the citizens vanish while presenting them with less hope for survival.

More so, the study goes further to categorize these states into fragile and non-fragile using Boko Haram criterion for best understanding of pockets of fragility in the Nigerian states. The comparative results show a negative and statistical insignificance of the coefficients for both categories. This result corroborates the findings in the full sample that capital serves as a direct drag on growth in both categories contrary to theoretical proposition. In contrast, we found the coefficient of labour to be positive and statistically significant for both categories, but its contribution to growth is higher for non-fragile states. In addition, the coefficient of debt was found to be positive and statistically significant for both categories. The coefficient is higher for the fragile states relative to non-fragile states. On human capital development, school enrolment was found to have a direct drag on the growth while otherwise for life expectancy in both categories. On money supply, the result shows negative coefficient for fragile states while otherwise for non-fragile states, though they are not statistically significant. Thus, we can conclude that both fragile and non-fragile states need urgent attention in almost the same areas such as human capital development, financial sector development, debt management, among others.

Focusing on the poverty models, the coefficient of income was found to be negative and statistically significant for both fragile and non-fragile states. This implies that, as income per person in the population grows, the poverty level declines. However, the poverty reduction is relatively high in the fragile states. The reason for this may be attributed to migration of people to non-fragile states. Many indigenes of non-fragile states reside in those affected states; instability in the environment may force people to relocate to their state of origin. Further, the result shows positive relationship between inequality and poverty for non-fragile states while otherwise for fragile states. As expected, as the gap between the poor and the rich get wider, the level of poverty continues to increase. Focusing on human capital, the pattern is not significantly different from the findings in the full sample. The coefficient of school enrolment is positive and statistically insignificant for both categories. In contrast, the coefficient of life expectancy was found to be negative and statistically significant for both. However, the coefficient is higher in the fragile states.

These findings provoke some policy debates for policy makers at both national and state levels in Nigeria. Generally, the issues of political violence, civil and communal conflicts, violence against civilians, rioting and protesting, and militia interactions embedded in fragility in many parts of the country, need urgent attention. Therefore, existing interventions such as the Presidential Committee on the North-East set up by the Nigerian Government to deal with the root causes of the Boko Haram insurgency is a welcome development. Nonetheless, the efforts of the committee require additional support in key areas, particularly in terms of funding. Thus, the government can work efficiently with information collated to address the grievances of its citizens.

In addition, the issues of debt accumulation and human capital development require urgent attention. By this, borrowing should be directed towards productive investment that can promote growth coupled with diversification of the revenue base in both categories. These fiscal receipts should be maximized to guard against unnecessary borrowings to finance recurrent expenditure. Also, in the presence of fragility, poverty will be a common phenomenon as the results clearly showed. Conflicts cannot promote the wellbeing of citizens, but promote misery and poverty vis-a-vis poor human development. Thus, restructuring in terms of decentralization of government, reconciliation, and empowerment of the youth, may be a way out for the country.

Finally, special attention should be given to Boko Haram affected areas in terms of strategic and reliable security infrastructure and poverty alleviation programmes. The root cause of these challenges may be associated with high level of poverty, youth unemployment, poor infrastructural development, and poor educational and health systems. This gives opportunity for terrorists to brainwash and find willing recruits. Therefore, there is a need for proactive, aggressive, and dynamic approaches in the areas of human capital development, infrastructural development (including security infrastructures), efficient use of loans for productive investment, and revenue base diversification among states whether fragile or not. This need is, however, more pressing in the former.

Notes

1. For more discussion on these approaches see Alemayehu (2017).

2. Number of fatalities in a conflict as reported in Armed Conflict Location and Event Data (ACLED) Project definition, armed conflict comprehensively measured to include death resulting from political violence on civil and communal conflicts, violence against civilians, terrorism rioting and protesting and militia interactions (see Raleigh et al., 2014). Ncube et al. (2014) defined fragility as the consequence of an exposure to a conflict.

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Appendixes

Appendix A: List of states (36 states for the full sample)

Abia, Adamawa, Akwa lbom, Anambra, Bauchi, Bayelsa, Benue, Borno, Cross River, Delta, Ebonyi, Edo, Ekiti, Enugu, Gombe, Imo, Jigawa, Kaduna, Kano, Katsina, Kebbi, Kogi, Kwara, Lagos, Nassarawa, Niger, Ogun, Ondo, Osun, Oyo, Plateau, Rivers, Sokoto, Taraba, Yobe, Zamfara, FCT (Abuja).

Appendix B: List of Boko Haram states (17 states for the sub-sample)

Adamawa, Bauchi, Borno, Gombe, Jigawa, Kaduna, Kano, Katsina, Kogi, Nassarawa, Niger, Plateau, Sokoto, Taraba, Yobe, Zamfara, FCT (Abuja).

Appendix C: List of non-Boko Haram states (20 states for the sub-sample)

Abia, Akwa lbom, Anambra, Bayelsa, Benue, Cross River, Delta, Ebonyi, Edo, Ekiti, Enugu, Imo, Kebbi, Kwara, Lagos, Ogun, Ondo, Osun, Oyo, Rivers.

Appendix D: The mathematics of SDGP

The guidelines of the United Nations System of National Accounts 1993 (SNA'93) provides computational guide for the construction of State Gross Domestic Product (SGDP) to ensure that the sub-national GDPs add-up to the national GDP. Nigeria as one of the developing countries, its estimation of SGDP is approached from production side. In algebraic form, the matrix of outputs (value-added) of industrial groups is represented by a 33 x 37 matrix. In Table A1, q1,1 represents output of crop production in Abia State; q3,3 captures the output of forestry in Akwa Ibom; q37,33 represents the output of broadcasting in FCT; while $\sum_{j=1}^{37} q_{j1}$, for example, gives the total output of crop production for all states.

Table A1: Matrix of output of each industry by state

State	Crop Production	Livestock	Forestry	Fishery	......	Broadcasting	Total
Abia	$\alpha_{11}\delta_1$	$\alpha_{12}\delta_2$	$\alpha_{13}\delta_3$	$\alpha_{14}\delta_4$	......	$\alpha_{1,33}\delta_{33}$	$\sum_{i=1}^{33}\alpha_{1i}\delta_i$
Adamawa	$\alpha_{21}\delta_1$	$\alpha_{22}\delta_2$	$\alpha_{23}\delta_3$	$\alpha_{24}\delta_4$	......	$\alpha_{2,33}\delta_{33}$	$\sum_{i=1}^{33}\alpha_{2i}\delta_i$
Akwa Ibom	$\alpha_{31}\delta_1$	$\alpha_{32}\delta_2$	$\alpha_{33}\delta_3$	$\alpha_{34}\delta_4$	......	$\alpha_{3,33}\delta_{33}$	$\sum_{i=1}^{33}\alpha_{3i}\delta_i$
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
FCT	$\alpha_{37,1}\delta_1$	$\alpha_{37,2}\delta_2$	$\alpha_{37,3}\delta_3$	$\alpha_{37,4}\delta_4$	......	$\alpha_{37,33}\delta_{33}$	$\sum_{i=1}^{33}\alpha_{37,i}\delta_i$
Total	$\sum_{j=1}^{37}\alpha_{j1}\delta_1$	$\sum_{j=1}^{37}\alpha_{j2}\delta_2$	$\sum_{j=1}^{37}\alpha_{j3}\delta_3$	$\sum_{j=1}^{37}\alpha_{j4}\delta_4$		$\sum_{j=1}^{37}\alpha_{j33}\delta_{33}$	$\sum_{i=1}^{33}\sum_{j=1}^{37}\alpha_{ij}\delta_i$

Source: 2008/2009 National Human Development Report (NHDR).

Index of industrial output

From Table A1, an index representing the indicator for the output of each industry was derived for each state. Assuming α captures indicator for crop production thus,

$$\alpha_{11} \approx \frac{q_{1,1}}{\sum_{j=1}^{37} q_{j1}}$$

Where, α_{11} represents the index of crop production in Abia State; $q_{1,1}$ is the output of crop production in Abia state; and $\sum_{j=1}^{37} q_{j1}$ is the total output of crop for all the states.

The same procedure was followed to derive s for all the industries in the states by applying relevant indicators.

Derivation of GDP for state by industry

Assume that δ represent GDP for the nation, then:

δ_1 = GDP for crop production

δ_2 = GDP for livestock production

.

.

.

δ_{33} = GDP for broadcasting

Thus, GDP for all industries Q= $Q = \sum_{i=1}^{33} \delta_i$

The derivation of the GDP for the state for each industry follows the application of the matrix in Table A1 to the National GDP for each industry. This gives rise to Table A2:

Table A2: Derivation of GDP for State by Industry

State	Crop Production	Livestock	Forestry	Fishery	......	Broadcasting	Total
Abia	$\alpha_{11}\delta_1$	$\alpha_{12}\delta_2$	$\alpha_{13}\delta_3$	$\alpha_{14}\delta_4$	....	$\alpha_{1,33}\delta_{33}$	$\sum_{i=1}^{33}\alpha_{1i}\delta_i$
Adamawa	$\alpha_{21}\delta_1$	$\alpha_{22}\delta_2$	$\alpha_{23}\delta_3$	$\alpha_{24}\delta_4$	....	$\alpha_{2,33}\delta_{33}$	$\sum_{i=1}^{33}\alpha_{2i}\delta_i$
Akwa Ibom	$\alpha_{31}\delta_1$	$\alpha_{32}\delta_2$	$\alpha_{33}\delta_3$	$\alpha_{34}\delta_4$	....	$\alpha_{3,33}\delta_{33}$	$\sum_{i=1}^{33}\alpha_{3i}\delta_i$
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
FCT	$\alpha_{37,1}\delta_1$	$\alpha_{37,2}\delta_2$	$\alpha_{37,3}\delta_3$	$\alpha_{37,4}\delta_4$	....	$\alpha_{37,33}\delta_{33}$	$\sum_{i=1}^{33}\alpha_{37,i}\delta_i$
Total	$\sum_{j=1}^{37}\alpha_{j1}\delta_1$	$\sum_{j=1}^{37}\alpha_{j2}\delta_2$	$\sum_{j=1}^{37}\alpha_{j3}\delta_3$	$\sum_{j=1}^{37}\alpha_{j4}\delta_4$		$\sum_{j=1}^{37}\alpha_{j33}\delta_{33}$	$\sum_{i=1}^{33}\sum_{j=1}^{37}\alpha_{ij}\delta$

Source: 2008/2009 National Human Development Report (NHDR).

Where,

$$\sum_{j=1}^{37} \alpha_{j1} \delta_1 = \delta_1 = total \text{ GDP for crop}\,;$$

$$\sum_{j=1}^{33} \alpha_{j1} \delta_1 = total \text{ GDP for all industries for Abia State}\,; \text{and}$$

$$\sum_{i=1}^{33} \sum_{j=1}^{37} \alpha_{ij} \delta_i = National \text{ GDP for all industries}\,.$$

Missing data points

Step 1: Determine the natural log of the available data points

$$X = \ln(X)$$

Step 2: Regress the natural log on time

$$\ln(X) = \phi_0 + \phi_1 T$$

Step 3: Determine the missing data point by natural grow rate

$$X_{mis\sin g} = \left(\frac{X_{available}}{(1 \pm \phi_1)} \right)$$

Appendix E: The regression results

Table 2: Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
cap	185	103.7	92.73	14.32	557.6
lab	185	1.932e+06	1.701e+06	315,289	9.646e+06
sch	185	118,632	66,038	24,042	363,811
gdppc	185	351.8	216.9	101.6	1,823
debt	185	3.173	3.444	0.0199	27.35
fra	185	352.6	1,479	0	14,805
lif	185	53.69	3.258	42.57	58.80
gini	185	0.338	0.0864	0.157	0.924
m2	185	19.51	0.408	18.93	20.08
mpii	185	0.447	0.278	0.0260	0.919

Table 3: State growth model for all states

VARIABLES	POLS	FEM	Diff. GMM	Sys. GMM
lcap	-0.0522	-0.352	2.947***	0.488***
	(0.299)	(0.256)	(0.336)	(0.182)
llab	0.785**	0.668	-2.054***	0.0307
	(0.303)	(0.714)	(0.268)	(0.183)
debt	0.0124***	-0.00247	-1.42e-05	0.00266
	(0.00280)	(0.00308)	(0.000274)	(0.00315)
lfra	-0.0488***	0.0118	-0.000248	0.0534*
	(0.00991)	(0.0129)	(0.00551)	(0.0315)
lsch	-0.286***	0.0430	0.00114	-0.154
	(0.0440)	(0.0451)	(0.00756)	(0.124)
llif	0.641*	0.385	-0.0158	1.090***
	(0.341)	(0.642)	(0.0830)	(0.396)
m2	-0.0106	0.0189	-0.129***	-0.0308**
	(0.0274)	(0.0197)	(0.0146)	(0.0150)
L.lgdppc			-0.00415	0.303
			(0.0146)	(0.252)
Constant	-1.699	-2.235		0
	(1.790)	(4.170)		(0)
Observations	185	185	111	148
R-squared	0.789	0.029		
F-test	94.55	0.591		
Prob > F	0	0.762		
Hausman Test		79.94(0.00)		
Number of crossid		37	37	37
Wald-chi2				
Prob > chi2				
Hansen_test			2.998	6.652
Hansen Prob			0.558	0.466
AR(1)_test			1.035	-1.267
AR(1)_P-value			0.301	0.205
AR(2)_test			1.029	-0.524
AR(2)_P-value			0.304	0.600
No. of Instruments			12	16

Notes: Standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 4: State poverty model for all states

VARIABLES	POLS	FEM	Diff. GMM	Sys. GMM
lgdppc	-0.713***	0.0157	1.073	0.182
	(0.0504)	(0.0344)	(1.023)	(0.736)
lgini	-0.388***	-0.0200	0.0585	0.308
	(0.121)	(0.0422)	(0.150)	(0.617)
lsch	0.0626	-0.00783	-0.0764	-0.00764
	(0.0504)	(0.0184)	(0.120)	(0.121)
llif	-2.929***	-0.0461	-0.691	1.124
	(0.459)	(0.272)	(0.741)	(4.558)
lfra	0.0304**	0.000821	-0.104	-0.0544
	(0.0125)	(0.00476)	(0.0828)	(0.136)
L.mpii			-1.463	1.323
			(4.903)	(1.160)
Constant	6.726***	0.516		-2.232
	(0.797)	(0.469)		(9.155)
Observations	185	185	111	148
R-squared	0.700	0.004		
F-test	83.56	0.117		
Prob > F	0	0.988		
Hausman Test		69.5(0.00)		
Number of crossid		37	37	37
Wald-chi2				
Prob > chi2				
Hansen_test			15.10	12.84
Hansen Prob			0.00449	0.0457
AR(1)_test			-0.866	-0.192
AR(1)_P-value			0.387	0.847
AR(2)_test			-0.821	-0.188
AR(2)_P-value			0.412	0.851
No. of Instruments			10	13

Notes: Standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5: State growth model for fragile and non-fragile states

VARIABLES	Non-Fragile				Fragile			
	POLS	FEM	Diff. GMM	Sys. GMM	POLS	REM	Diff. GMM	Sys. GMM
lcap	-0.630	-0.507	2.845***	3.001***	-0.205	0.0196	2.771***	1.841***
	(0.391)	(0.442)	(0.0306)	(0.670)	(0.399)	(0.0479)	(6.33e-05)	(0.240)
llab	1.244***	0.702	-1.984***	-2.296***	0.874**	0.419***	-2.445***	-1.779***
	(0.396)	(1.304)	(0.0245)	(0.670)	(0.407)	(0.112)	(3.42e-05)	(0.239)
debt	0.00729**	-0.00399	-4.95e-05	0.00453**	0.0166***	-0.000357	-7.14e-08	0.000714
	(0.00333)	(0.00483)	(5.80e-05)	(0.00204)	(0.00500)	(0.000946)	(8.08e-08)	(0.000620)
lsch	-0.215***	0.161	0.00126	-0.191**	-0.239***	-0.00686	-1.89e-06**	-0.0284***
	(0.0661)	(0.122)	(0.000816)	(0.0926)	(0.0582)	(0.00795)	(7.50e-07)	(0.00758)
llif	0.0177	0.525	-0.0504	-0.576	0.116	0.208*	2.57e-06	-0.00866
	(0.585)	(1.595)	(0.0400)	(0.592)	(0.461)	(0.118)	(2.17e-05)	(0.0653)
m2	0.0143	0.0338	-0.125***	-0.132***	-0.0187		-0.126***	-0.0790***
	(0.0371)	(0.0356)	(0.00134)	(0.0242)	(0.0380)		(3.35e-06)	(0.0103)
L.lgdppc			0.00146	-0.0567			1.000***	0.902***
			(0.00372)	(0.0638)			(1.52e-05)	(0.0166)
Constant	-3.191	-3.136		15.62***	-1.283	-0.550		9.393***
	(2.409)	(7.886)		(3.635)	(2.370)	(0.658)		(1.278)

Table 5 Continued

VARIABLES	Non-Fragile				Fragile			
	POLS	FEM	Diff. GMM	Sys. GMM	POLS	REM	Diff. GMM	Sys. GMM
Observations	100	100	60	80	85	85	51	68
R-squared	0.662	0.059			0.660			
F-test	30.37	0.768			25.23			
Prob > F	0	0.597			0			
Hausman Test		13.98(0.02)				0.98(0.0986)		
Number of crossid		20	20	20		17	17	17
Wald-chi2						67.28		
Prob > chi2						0		
Hansen_test			10.55	5.324			2.858	13.28
Hansen Prob			0.0610	0.722			0.582	0.102
AR(1)_test			2.978	-1.275			0.508	-1.268
AR(1)_P-value			0.00290	0.202			0.611	0.205
AR(2)_test			2.807	0.872			0.831	-1.355
AR(2)_P-value			0.00500	0.383			0.406	0.175
No. of Instruments			12	16			11	16

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 6: State poverty model for fragile and non-fragile states

VARIABLES	Non-Fragile				Fragile			
	POLS	FEM	Diff. GMM	Sys. GMM	POLS	FEM	Diff. GMM	Sys. GMM
lgdppc	-0.505***	0.0138	0.436*	0.160	-0.667***	0.195	0.384	-0.350
	(0.0817)	(0.0356)	(0.249)	(0.227)	(0.0806)	(0.320)	(0.371)	(0.594)
lgini	0.109	-0.0581	-0.119	0.556	-0.426***	-0.0165	-0.0592*	0.0988
	(0.204)	(0.0735)	(0.176)	(0.767)	(0.140)	(0.0558)	(0.0328)	(0.189)
lsch	0.0299	-0.0164	0.00114	-0.0492	0.0626	-0.00569	0.0261	0.0266
	(0.0746)	(0.0379)	(0.0579)	(0.0692)	(0.0632)	(0.0206)	(0.0569)	(0.101)
llif	-2.022**	0.257	0.147	1.205	-2.357***	-0.220	-0.629**	-0.892
	(0.822)	(0.520)	(0.944)	(0.892)	(0.548)	(0.331)	(0.291)	(0.838)
L.mpii			-1.070	1.119***			-16.76***	0.443
			(1.862)	(0.362)			(3.967)	(0.846)
Constant	5.005***	-0.165		-2.037	5.710***	0.615		2.642
	(1.377)	(0.877)		(1.524)	(1.018)	(0.806)		(2.277)

Table 6 Continued

VARIABLES	Non-Fragile				Fragile			
	POLS	FEM	Diff. GMM	Sys. GMM	POLS	FEM	Diff. GMM	Sys. GMM
Observations	100	100	60	80	85	85	51	68
R-squared	0.330	0.019			0.574	0.012		
F-test	11.69	0.359			27	0.197		
Prob > F	9.21e-08	0.837			0	0.939		
Hausman Test		43.02(0.00)				28.31(0.00)		
Number of crossid		20	20	20		17	17	17
Wald-chi2								
Prob > chi2								
Hansen_test			11.11	11.37			7.812	11.47
Hansen Prob			0.0493	0.123			0.0987	0.0750
AR(1)_test			-0.179	0.411			-1.090	0.214
AR(1)_P-value			0.858	0.681			0.276	0.831
AR(2)_test			-1.226	0.487			-2.613	0.943
AR(2)_P-value			0.220	0.627			0.00899	0.346
No. of Instruments			10	13			9	12

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

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