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# CONFLICT EXPOSURE AND ECONOMIC WELFARE IN NIGERIA \*

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## Abstract

Several papers have attempted to estimate and document the impact of conflict on numerous education, health and socioeconomic outcomes. One lesson from this research is the heterogeneity in the effect of violent conflict across and within countries. In this paper we attempt to estimate the casual impact of conflict in Nigeria on welfare related outcomes. The 2009 insurgence of Boko Haram and the Fulani herdsmen versus farmers conflicts have led to a significant increase in violent conflict in the North Eastern and Central parts of Nigeria. However, bouts of violent conflict has existed in different communities across Nigeria since independence. We estimate the general effect of conflict exposure on welfare, across Nigeria using the three waves of the Nigeria General Household Survey (GHS) combined with ACLED conflict data. Employing a fixed effect approach, our results suggest that recent and long term exposure to conflict increased poverty incidence, poverty gap and poverty severity in Nigeria.

**JEL classification:** I10, I30, O1, D74

**Keywords:** Violence; Nigeria; Conflict; Boko Haram; Economic Welfare, Poverty

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# 1 Introduction

Nigeria was one of the fastest growing economies in Africa between 2006 and 2014. Long before the emergence of Nigeria as Africa's largest economy following its statistical rebasing of GDP in 2014, real gross domestic product (GDP) growth was eclectic. Chete et al (2016) document that during the period of 1960-70, GDP grew at 3.1% annually but grew at 6.2% annually between 1970 and 1978. In the early 1980s, they also document that growth rate was negative but increased to 4% in the period of 1998-1997. The heterogeneity in growth has continued in the 21st century with high rates of growth of 6.9%, 7.8% , 4.9%, 6.2% and 2.7% in 2009, 2010, 2011, 2014 and 2015 respectively (Source: World Bank data). Despite the significant increases in GDP growth in the 21st century, poverty has remained very high and poverty incidence has sometimes increased during periods of significant GDP growth. According to Eigbiremolen (2018), poverty rose from 42.7% in 1992 to 65.6% in 1996. Though poverty has been on a decline in Nigeria since the start of the 21 century, the percentage of people living in extreme poverty is still very high. For example, the National Bureau of Statistics (NBS) notes that 60.9% of Nigerians in 2010 were living in "absolute poverty". According to data from 2018, nearly 46.7% of Nigerians live in extreme poverty (World Poverty Clock). While these levels of poverty incidence are lower than 2010 levels, they are higher than levels in 2017 (45.6% according to data from the World Poverty Clock). Current levels of poverty place Nigeria in the top position as the country with the most people in extreme poverty in the world (World Poverty Clock).

Many factors can impede the process of economic development resulting in persistent high levels of poverty despite significant growth in GDP. Violent conflict is one of such factors. Recent literature suggests that conflict can negatively affect various

economic, health and labor related outcomes. In Nigeria, violent conflict is viewed as a critical variable impeding the development process but empirical estimates of its impact on development and welfare related outcomes are scant.

Conflict can reduce welfare for households and impose costs on individuals and the economy through several broad channels. First, conflict can lead to economic devastation resulting in economic decline. There are several cross country studies suggesting that violent conflict has a negative effect on investment, savings and economic growth (see Venieris and Gupta, 1986; Alesina and Perotti, 1996, Barro, 1991 and Mauro, 1995). Second, conflict can impose costs on households directly through a decline in an individual's health. In particular it can affect individuals mentally and can also cause physical and psychological harm. Third, conflict can lead to a decline in trust and an increase in fear and uncertainty. Fear and lack of trust can lead to a decline in social capital, an increase in transaction costs, a decline in school enrollment and education attainment. It can also lead to displacement which affects economic, social outcomes and health. Justino (2009) noted that conflict can lead to a decline in access to safety nets and a decline in social, economic and political institutions, community relations, and overall levels of security.

Other effects of conflict include a disruption of economic activities, a shrinkage in the productive base of a community and a decline in human capital whether health or education. All these effects of conflict can lead to a decrease in household income and/or wealth and consumption. A decline in income can lead to more households falling below the poverty line and others who are already poor falling more deeply into poverty. Investigating the potential welfare effects on households in Nigeria from being exposed to violent conflict over time is the primary focus of our current research.

In this paper, our question of interest is what is the impact of recent exposure to

conflict and accumulated exposure to conflict over a long period of time on household welfare. In particular we examine the impact of conflict on households' per capita income, total income, poverty incidence, poverty gap and poverty severity. Violent conflict is part of Nigeria's history. It began with civil war in the 60s, which claimed thousands of lives, and has evolved over time to new threats in different regions and communities in Nigeria. The ACLED database reports a total number of 9998 conflict events in Nigeria between 1997 and 2016. "Violence against civilians" is a substantial chunk of the violent events overtime in Nigeria. We measure exposure to conflict using deaths in a state linked with conflict. We construct two measures of conflict exposure: recent exposure to conflict and long term exposure to conflict.<sup>1</sup> To estimate the effect of conflict, we employ a fixed effects approach. This approach attenuates potential biases caused by unobserved time invariant differences across individuals that affect welfare and are also correlated to conflict exposure.

Our results suggest that recent exposure to conflict increases poverty incidence, poverty gap and poverty severity for households in Nigeria. We also find that exposure to conflict over a longer period of time increases the poverty gap and poverty severity significantly but does not appear to affect poverty incidence. We do not find a significant effect of conflict exposure on per capita income and total household income when we include appropriate controls.

Our results contribute to the literature by providing the first broad scale look at the effect of violent conflict on poverty incidence, poverty gap and poverty severity in Nigeria. While there have been other important studies that have considered the impact of conflict on education outcomes and health outcomes in Nigeria, to the best of our knowledge we are the first to consider carefully the impact of conflict more broadly on welfare in Nigeria over the period of 2009-2015. Investigating the

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<sup>1</sup>Details on these measures can be found in section 5 of the paper.

impact of violent conflict on welfare should provide insights for policy makers needed to facilitate intervention in areas with significant conflict exposure.

The rest of our paper proceeds as follows. In section two, we review the history of violence in Nigeria especially over 2010-2015. In section three we review the past literature and provide a conceptual framework. In section four we provide the empirical framework and justification of the modeling strategy. In Section five we describe the data used and present some descriptive analysis. Section six summarizes our results and provides robustness checks. We conclude in the last section.

## **2 History and Nature of Conflict in Nigeria**

Long before Nigeria became a country in 1914, conflict and wars were a significant part of the history of the area and kingdoms that would later be put together to form Nigeria. Best and Rakodi (2011) link this early history of conflict to contention over access to resources (including land, cattle, slaves and oil), and conquests that sought to spread Islam, especially the 19th century Dan Fodio jihad.

In 1960 Nigeria gained independence from the British but it did not take long for political tension to build up leading to the murders of political leaders in January 1966 by a group of military officers. One explanation for why this happened is that the regions that were artificially brought together by the British to form Nigeria, contained diverse kingdoms some of which were already at war with each others before the arrival of the British. This preexisting rivalry facilitated tribalism, corruption, lack of trust and competition for power, culminating into the Biafran civil War of 1967-1970. This war according to Heerten and Moses (2014) led to the death of one to three million people.<sup>2</sup>

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<sup>2</sup>For more details see Heerten and Moses, 2014, p169,

In the 70s and 80s as Nigeria cycled through different military administrations, bouts of political conflicts were common place in different parts of the country but these events while intense were relatively secluded to the communities within which the events occurred. Although Nigeria transitioned successfully to democratic rule in 1999, violence linked with political conflict has persisted. John et al (2007) notes that electoral violence still occurs in Nigeria even with democratic rule as politicians support and arm youths. Marc, Verjee and Mogaka (2015,p 20 ) provide data on fatalities as a result of election related deaths in Nigeria. For example they note that the 2011 election cycle led to a death toll of 800 people.

Another common kind of violent conflict that has intensified over time in Nigeria is religious and ethnic related conflict. Religious and ethno-religious conflict events became quite common place in Nigeria in the 80s and 90s especially in the Northern part of the country. Also communal conflict, and indigene/settler conflict has also increased and intensified during different times between 1980 and 2015. According to Jones and Naylor (2014) there have been numerous and often intense bouts of communal violence, particularly in the Niger Delta region, Plateau state and the north east of the country. Marc, Verjee and Mogaka, (2015) also note that local insurgencies over time have mutated into criminality and maritime piracy in the Niger Delta region. However the impact of these different kinds of conflict were relatively localized. It is important to note that the conflict in the Niger Delta region of Nigeria has existed for a much longer period of time than other recent communal conflict and is not an example of a new kind of conflict in Nigeria. According to Abdu et al (2014) violent conflict in Nigeria's Niger Delta has existed for almost 50 years. It is driven by the struggle among local communities, multinational oil companies, and the Nigerian state for control over oil revenues derived from this resource rich territory.

Unfortunately, violence has evolved over time in Nigeria from civil wars, military coups and the Niger Delta conflict to a new generation of threats. Since 2009, Boko Haram and Ansaru group have been perpetrating violence in Northern Nigeria with suicide bombing becoming common place<sup>3</sup>. Boko Haram is a militant Islamist organization, which according to the Global Terrorism Index, over took ISIS as the world's deadliest terrorist group in 2014 (see Global Terrorism Index report, 2015). Iyekekpolo, (2016) notes that diverse public location like markets, schools, religious worship places, motor parks, police stations, military barracks have been hit by suicide attacks linked to Boko Haram (Iyekekpolo, 2016:p1).

In the last 20 years another kind of conflict has emerged referred to by some as farmers-herdsmen conflict or cultivator- herder conflicts. The Fulanis are the herders who want access to land for their cattle. Deaths arising from this kind of conflicts are concentrated in North central geopolitical zones, with highest intensity of these conflicts in Benue, Taraba and Nasarawa. Plateau is another state where these conflicts have been noted but land conflict deaths are less. This growing conflict has led to the death of a significant number of people. Olayoku (2014) notes that conflicts resulting from cattle grazing accounted for 35% of all reported crises between 1991 and 2005 in Nigeria. In addition, information from the Nigerian Watch project database suggests that land conflicts accounted for 12 percent (2846) of violent deaths in Nigeria over the period 2006 to 2014 and of this, cattle grazing- cultivator conflicts accounted for 21 % (609) of violent deaths.<sup>4</sup>

While violent conflict is found in all parts of Nigeria, it is important to mention

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<sup>3</sup>See Ordu 2017 for an exploration of the trends and patterns of Boko Haram and militancy violent conflict in Nigeria and Iyekekpolo (2016) for an examination of the causes and perspective of Boko Haram.

<sup>4</sup>This number could be higher given the fact that land conflict estimates are frequently nested in the estimates of ethnic and political conflicts which according to the Nigeria Watch database account respectively for 32 % and 56% of violent deaths over the period considered.



that intensity of conflict exposure varies across regions. The three zones with the highest prevalence rates are the North east, North central and South South regions of Nigeria. According to Azad, Crawford and Kaila (2018), from 2010 to 2017, 49% of households in the North East experienced at least one event of conflict or violence against a household member. In the North central region, 25% of households experienced some type of conflict event and in the South south region One-fifth of households (22%) have been directly affected by conflict events or violence.

### **3 Literature Review on the Effects of Conflict**

#### **General Empirical Evidence for the Effect of Conflict**

There is a wide literature that has considered the effect of conflicts on various outcomes at the macro and the household level. Early cross country research focused on the links between conflict and economic performance or growth (Alesina & Perotti, 1996; Barro, 1991; Collier, 1999). The evidence from the past literature focusing on the long-term developmental effects of violent conflict is mixed. Some studies find rapid recovery on a variety of welfare outcomes, fast post conflict growth rates and social progress<sup>5</sup>. In contrast, other studies point to the long-term destructive effects of civil wars (see Abadie and Gardeazabal, 2003, ERD 2009, OECD 2009, Blattman and Miguel 2010).

Over the last 15 years, a number of studies have emerged examining the micro level effect of violent conflict on several economic, health and productivity indicators. Most of these studies have considered conflict in Latin America, Asia and a few African countries. These studies generally suggest negative impacts of conflict on

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<sup>5</sup>See Organski and Kugler (1980), Przeworski et al. (2000), Davis and Weinstein (2002), Brakman, Garretsen and Shramm (2004) Miguel and Roland (2006), Justino and Verwimp (2006), Chen Loayza and Reynal-Querol (2008), Cerra and Saxena (2008)

education, labor and health of individuals and households. Moreover some of these papers provide evidence that these negative effects can be observed decades after the conflict.<sup>6</sup>

## **Effect of Conflict - Studies on African Countries**

There is a growing literature focused on the effect of conflict in African countries. One of the first attempts at considering the effect of conflict was Akresh and de Walque (2008). They study the effects of the 1994 Rwandan genocide on schooling. Their results suggest that children who lived through the Rwandan genocide, lost nearly a half year of schooling compared to their peers who were not exposed. They were also 15% less likely to complete grades three and four. Leon (2012) also looking at the Rwandan conflict but focused on it from a different angle used the classic education production function model to identify the long- and short-term effects of the civil war on educational attainment. The study finds that exposure to violence affects adult human capital accumulation through both supply and demand side effects. Overall, the results show that the average person exposed to political violence before school-age (during in utero, early childhood, and preschool age) accumulated 0.31 fewer years of schooling upon reaching adulthood. With respect to the Côte d'Ivoire crises, Minoiu and Shemyakina(2012) used the postconflict survey data from the cross-sectional 2002 and 2008 Household Living Standards Surveys (HLSS) and the Armed Conflict Location and Event Database (ACLED)data for Côte d'Ivoire

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<sup>6</sup>See Alderman, Hoddinott and Kinsey (2006); Bundervoet, Verwimp and Akresh (2009); Shemyakina (2011), Colino (2013), Nillesen, 2016, Blattman Annan (2010), Guidolin La Ferrara (2007), Chamarbagwala and Mor'an (2011) and Uwaifo Oyelere and Wharton (2013), Rodriguez and Sanchez (2012), Almond and Currie (2011); Almond et al. (2005); Black et al.(2007); Oreopoulos et al.(2008), Royer (2009), Currie and Vogl, (2013), Camacho, (2008), Smits et al (2006), Mansour and Rees(2012) and Verwimp Van Bavel (2014), Barrera Ibáñez (2004), Kondylis (2008), Leon (2012), Valente (2014), Justino, Leone, and Salardi. (2013) for research focused on the impact of conflict using microdata.

to examine the impact of armed conflict on children's health status, measured by height-for-age. Their results suggest that children exposed to the conflict either in utero or during early childhood and who lived in conflict-affected regions had height-for-age z-scores lower than those who lived in less-affected regions. Dabalen and Saumik (2014) also examined the impact of the conflict in Côte d'Ivoire using ACLED data and the HLSS. The difference between their paper and Minoiu and Shemyakina(2012) was the focus on the impact on households' food security using dietary diversity scores. Their findings suggest that households in conflict areas of highest intensity and individuals who are the direct victims of the conflict are more food insecure with lower dietary diversity. Another paper by Dabalen and Saumik (2014b) focused on Côte d'Ivoire consider the average causal effect of the conflict on education attainment over the same time period. They note 0.2 to 0.9 fewer average years of education for war victims compared to the control group.

## **Effect of Conflict - Studies on Nigeria**

In the last 10 years studies examining the effect of conflict in Nigeria have increased. For example Nwokolo (2015) used the Nigerian demographic data and ACLED data to examine the effect of Boko Haram Insurgency(BHI) on child health. The study finds increase in terror fatalities reduces birth weight and increases low birth weight probability for cohorts exposed within six months of pregnancy. His results suggest that male and female child in utero have a higher probability of having a low birth weight due to exposure to terror fatalities.

Another more recent study on Nigeria is Ekhaton and Asfaw (2019). They considers a similar question also using the Nigerian demographic data but combined it with data from the Global Terrorism Database. In particular the study examines the effect of Boko Haram insurgency on measures of children health such as stunting,

wasting, height-for-age z-scores and weight-for-age z-scores and weight-for-height z-scores. Their results suggest negative effects of the insurgency on weight-for-age and weight-for-height z-scores and an increase in the probability of wasting.

The paper most similar to ours in terms of the microdata used is Bertoni et al.,(2017). They used the three rounds of the GHS-Panel dataset but examined the impact of civil conflict (specifically Boko Haram) on school attendance and attainment. Another difference between our paper and this paper is the fact that while we focus on Nigeria, they focus solely on the North eastern part of Nigeria. Bertoni et al (2017) make use of a panel regression estimation approach and complement the panel regression with the standard cohort difference in difference analysis. They find a one standard deviation increase in the number of fatalities in the 20 km radius of each household decreases the number of completed years of education for the cohort exposed to conflict during primary school by 0.6 years, compared to the non-exposed cohort.

Our paper complement all the aforementioned papers in that we also look at the effect of conflict in Nigeria. However, we do not focus on a region of Nigeria or a particular type of violent conflict such as recent Boko Haram terrorism. Rather we focus on any time of violent conflict in the whole country. Our rationale for doing this is the recognition that different regions in Nigeria have been plagued with significant violent conflict at different times since Nigeria's independence in 1960. Hence, we attempt to identify the average recent and long term effect of exposure to any violent conflicts on an individual's welfare over the period of 2010-2016. Our paper also differs from the other three papers given our outcome variables of interest. In particular we focus on economic welfare related outcomes while the other papers focused on health and school related outcomes. Both health and education outcomes are important and our paper complements these papers by focusing on

another important outcome- household economic welfare.

In this paper we focus on the impact of conflict on welfare outcomes such as poverty incidence and severity. Most research suggests the existence of a positive correlation between poverty and the likelihood of civil strife (Collier, 1999; White, 2005; Kondylis, 2007). Some authors have focused on linking poverty or food shocks to conflict. For example Pinstrup-Andersen and Shimokawa (2008) explain how poverty, hunger and food insecurity together with inequality of income, land and other material goods generate anger, hopelessness, a sense of unfairness and lack of social justice all of which provides a fertile ground for grievance and conflict. Abidoye and Cali (2014) examined the relationship between income shocks and conflict across states in Nigeria. They find increases in the price of consumed items induces conflict as well as oil price increases. While these papers suggest that poverty or income or price shocks can lead to conflict, our paper considers the effect of conflict on welfare related outcomes overtime, controlling for other kinds of shocks including price or income shocks.

## 4 Empirical Strategy

Isolating conflict exposure effect on development outcomes using cross sectional data poses several challenges. Hence, we investigate how violent conflict affects individuals and household welfare exploiting the panel nature of our data and estimating our model using a fixed effect estimator. This technique among other things, allows the researcher to control for all time-invariant unobservables affecting a household or an individual that could affect the outcomes of interest and are correlated to conflict.<sup>7</sup>

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<sup>7</sup>We are not the first to use this method for identifying effects of conflict. For example, Pivovarova and Swee (2015) used a two-round panel and controlled for individual unobserved heterogeneity through a difference in-differences fixed-effects model.

The general form of the estimation equation is as follows:

$$Y_{ijt} = \beta_0 + \beta_1 W_{ijt} + \mathbf{x}_{ijt}\rho + \mathbf{c}_{ijt}\beta_3 + \gamma_t + \delta_i + \epsilon_{ijt} \quad (1)$$

where our outcome variable  $Y_{ijt}$  includes different measures of welfare of a household  $i$  in state  $j$  and year  $t$ . We describe these variables in more detail in the next section.  $W_{ijt}$  is a measure of violent conflict in state  $j$  and year  $t$ . We have two main measures of violent conflict. The first measure is focused on capturing recent conflict exposure. By recent we mean exposure to conflict in the last two years. We also consider a measure for long term exposure by looking at the accumulative effect of exposure to conflict from 1997 to 2015.<sup>8</sup> In the next section we describe in detail how we construct this measure in alternative ways.  $\mathbf{x}_{ij}$  is a vector of individual and household variables regressors that affect household welfare and  $\mathbf{c}_{ij}$  represents time varying local government area council characteristics such as the population, population density, the distance to police station and rainfall.  $\delta$  are time-invariant household-specific effects that could be correlated with the observed covariates;  $\gamma_t$  are year fixed effects;  $\epsilon_{ijt}$  is the idiosyncratic error term.  $\beta_1$  is the parameter of interest to be estimated and captures the effect that exposure to conflict has on the welfare indicators we focus on.

## 5 Data and Descriptive Analysis

To estimate the effect of conflict on welfare outcomes we make use of two datasets. The socioeconomic data used in this study is the Nigeria General Household Survey (GHS). As noted on the World Bank’s Central Microdata Catalog website, the GHS is implemented in collaboration with the World Bank Living Standards Measurement

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<sup>8</sup>We use two measures of violent conflict.

Study (LSMS) team as part of the Integrated Surveys on Agriculture (ISA) program and was revised in 2010 to include a panel component (GHS-Panel). The World Bank in its description of the data also notes that the panel data survey was launched for tracking farm and rural households social economic changes over time. The survey was undertaken by the National Bureau of Statistics in partnership with the Federal Ministry of Agriculture and Rural Development(FMARD), the National Food Reserve Agency (NFRA), the Bill and Melinda Gates Foundation (BMGF) and the World Bank (WB). There are three waves currently of the panel (2010, 2012 and 2015) and the GHS-Panel is a nationally representative survey of approximately 5,000 households, which are also representative of the geopolitical zones in Nigeria at both the urban and rural level. It provides information on basic demographics, food and non-food expenditure and household income sources and community variables.

To measure conflict exposure, we turn to the Armed Conflict Location and Event Data (ACLED) by Raleigh, Hegre, and Carlson, (2009). This database focuses on a range of violent and non-violent actions by governments, rebels, militias, communal groups, political parties, rioters, protesters and civilians. It records event date, event type, location and conflict fatalities and covers period from 1997-2016 for all countries including Nigeria. A number of studies have used the data in constructing conflict measures for conflict analysis in different countries. (See Dabalen and Paul,2012; Shemyakina, 2012; Rohner, Thoenig and Zilibotti, 2012). “Violence against civilians” is a substantial chunk of the violent events overtime in Nigeria making the ACLED data appropriate for capturing exposure in Nigeria. Raleigh, Hegre, and Carlson (2009) defines “Violence against civilians” as deliberate violent acts perpetrated by an organized political group such as a rebel, militia or government force against unarmed non-combatants. It also includes inflicting significant harm (e.g. bombing, shooting, torture, rape, mutilation etc) or accosting victims (e.g. kidnapping and

disappearances)<sup>9</sup>.

Following previous empirical research using this data, we constructed two measures of conflict exposure using fatalities at the state level. We consider the effect of recent conflict exposure and the effect of long term accumulated exposure to conflict. We normalized these measures using population figures for the state for the respective years we consider. For recent exposure we consider the total number of conflict related fatalities in the state in the year of the survey plus the two years preceding it. For long term we consider the total number of conflict related fatalities in the state in the year of the survey plus all other preceding year of available data (1997 to the year of the survey). As a robustness check later on in the paper and to indirectly get at intensity of exposure, we normalize the recent and long term conflict exposure measures for each year of the survey by the land area in the state. So the conflict exposure measure captures either recent or long term conflict related fatalities per square kilometer in a state.

Figure 1 provides the kernel density distribution of the recent conflict exposure measure in 2010, 2012 and 2015. Notice that the distribution is concentrated around 0 which is expected in Nigeria and highlights that conflict in Nigeria is not distributed evenly across the landscape and many households are exposed to low levels of conflict. However, figure 1 also highlights the general increase in conflict exposure post 2010. Notice that the tail of the distribution extends more rightwards in both 2012 and 2015 compared to 2010. Figure 2 captures the variation in the intensity of long term conflict exposure across states in Nigeria.<sup>10</sup> Full details of long term conflict exposure by states can be found in Table 8 in the appendix. Notice that 4 out of the

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<sup>9</sup>See Raleigh, Hegre, and Carlson, 2009 for more details

<sup>10</sup>As displaying all 36 states will make information visibility hard, we only include the names for a few states in the figure.



5 states with the highest long term conflict exposure are in the North (Nasarawa, Borno, Plateau and Kaduna). Each of these states have passed through prolonged episodes of violent conflict since 2009. For example Borno is the base of operation of Boko Haram. Delta state is the 5th highest in long term conflict exposure and is in the south-south region of Nigeria versus the north. As noted in Section 2, the Niger Delta region of Nigeria has been plagued with conflict since the early 1990s. Conflict in this region is linked with tension between locals (Niger Delta minority ethnic groups) and foreign oil producers and the government. This tension has been attributed to locals feeling exploited because they do not feel they are reaping the benefits of oil being derived from their land.

We focus on the impact of conflict on welfare in this paper. Our dependent variables are commonly used measures of welfare. In particular we consider the impact of conflict exposure on total household income and the impact on income per adult equivalent. We follow the Atkinson (1983) approach of measuring welfare using income given some of the challenges we had with the expenditure data. We also consider other more broad measures of welfare including poverty incidence, poverty gap and poverty severity. We derive the poverty line for each year of data using information from the World Bank and convert these poverty lines to Naira (Nigeria's currency) using the relevant exchange rates for each year of data. We also convert all monetary values to real values with a base year of 2010.

The data set also includes a number of specific household and individual characteristics which we include as controls. In particular, we use a dummy variable to control for exposure to other idiosyncratic shocks such as the death or disability of an adult working, death of someone who sends remittances, illness of income earning member or job loss. In addition to the information about conflict and socioeconomic conditions captured in the GHS-panel, we also use information on rainfall and pop-

ulation density in our analysis. We obtain rainfall data from the Central Bank of Nigeria(CBN) annual statistics for 2016 while information on land surface area and population for each states were sourced from the National Population Commission.

Summary statistics for the variables we use in our analysis can be found in Table 1.

Table 1: Summary Statistics

Variable	Description	Observation	Mean	SD
Total HH income	Total income/annum in Naira	91353	1825902	5.66E+07
PCI	Per capita income/annum in Naira	91353	293530.5	1.14E+07
P0	Poverty incidence	91353	0.7242	0.4469
Povgap	Poverty gap	91353	0.5001	0.3921
Povsev	Poverty severity	91353	0.4039	0.3833
Yrsch	Years of education	77574	5.5330	5.3005
Age	Age in years	83610	23.8842	22.0044
Agesq	Age squared	83610	1054.6410	9854.5790
Expshock	1 if exposed to shock	91353	0.3667	0.4819
Conflict(Recent)	Recent conflict death/1000 pop	91353	0.0753	0.2771
Conflict(Long)	Long conflict death/1000 pop	91353	0.0002	0.0004
Conflict(Recent)	Recent conflict death/square km	90738	0.0112	0.0274
Conflict(Long)	Long conflict death/square km	90738	0.0379	0.0577
Rainfall	Rainfall in millimeters	81744	1495.6310	785.1016
Popden	Population density pop/square km	90738	335.0916	454.0677
Hhsize	Number of persons/household	91353	8.1898	3.7246
Busstop	Distance to Nearest Bus stop in Km	87384	3.9143	11.1743
Market	Distance to Nearest Market in Km	87384	2.4373	9.1521
Policestation	Distance to Police station in Km	87384	3.8636	9.6343
agricoop	Number of Agricultural cooperatives	87018	0.8042	2.3071
busassoc	Number of Business Associations	87018	1.4190	9.3967
Vigilantegrp	Number of Vigilante groups	87018	0.7991	1.7243

## 6 Results and Robustness Checks

Table 2 presents the fixed effects estimates from our parsimonious model estimated at the household level using standard control variables that potentially could affect the

probability of being poor. In Table 3 we presents estimates from our parsimonious fixed effect model estimated at the individual level versus the household level. In columns(1), (3) and (5) we use the recent conflict measure in estimation while in columns (2), (4) and (6) we use the long term conflict measure.

Both tables show regression results using three poverty measures (incidence, gap and severity) as the dependent variable. In table 2 we present all coefficient estimates from the regression primarily to illustrate that estimates of control variables have expected signs. For conciseness in Table 3, we only present the estimates of the coefficient we are interested in conflict.

The results in both tables suggest a positive correlation between increased exposure to conflict whether using a long term or a more recent measure, and poverty gap and poverty severity. In contrast we do not find evidence that long term exposure to conflict increases poverty incidence but our results suggest a correlation between recent exposure to conflict and poverty incidence. Meaning the higher the recent exposure to conflict for a household, the higher the probability that the household is poor.

We also explore other measure of welfare. In particular we investigate if exposure to conflict affects per capita income and total income. The results from our estimation is summarized in Table 4. In Panel A the results of the parsimonious regression is summarized. In column (1) and (2) the results using real per capita income as the dependent variable is summarized while in columns (3) and (4) the results using real total household income is summarized. Again we notice a statistically significant negative relationship between conflict and these outcomes regardless of the measure.<sup>11</sup>

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<sup>11</sup>We estimate the model using the natural log of income and per capita income is measured dividing income by adult equivalency versus just household size.

Despite the strengths of our estimation strategy, we recognize that our fixed effect strategy has limitations. Our estimation strategy reduces the potential of deriving estimates that are not consistent but may not fully eliminate it. As noted above, a fixed effect strategy allows us to identify effect using variation at the individual level over time thus eliminating potential bias due to time invariant unobservables. We worry about these time invariant unobservables because they could be potentially correlated with our exposure to conflict measures and our measures of welfare. However, a fixed effects strategy does not fully eliminate the potential of deriving biased estimates because there is still a possibility that our measures of welfare could be correlated to a an unobserved time varying variable and also correlated to our dependent variable. We attempt to reduce this potential source of bias by including as many controls as possible that are time varying and may be correlated with an individual's exposure to conflict and potentially affect welfare of individuals and households.

Some of the control variables we include have been shown in previous research to affect welfare. For example rainfall, population density, market access, social services, proxy for social capital, economic services proxy. The results from running the fixed effect models with these time varying controls are summarized in Table 4 panel B, Table 5 and Table 6.

Table 2: Fixed Effect Parsimonious Poverty Regressions(Household level)

Variable	Poverty Incidence		Poverty Gap		Poverty Severity	
	(1)	(2)	(3)	(4)	(5)	(6)
Yrsch	-0.0035 (0.0025)	-0.0035 (0.0024)	-0.0048** (0.0019)	-0.0048** (0.0019)	-0.0051*** (0.0019)	-0.0050*** (0.0019)
Age	-0.0009 (0.0014)	-0.0008 (0.0014)	-0.0009 (0.0012)	-0.0009 (0.0012)	-0.0006 (0.0012)	-0.0006 (0.0012)
Agesq	1.02e-06 (1.34e-06)	1.01e-06 (1.34e-06)	9.12e-07 (1.13e-06)	9.07e-07 (1.13e-06)	8.18e-07 (1.14e-06)	8.16e-07 (1.14e-06)
Expshock	0.0303** (0.0136)	0.0306** (0.0136)	0.0163 (0.0110)	0.0163 (0.0110)	0.0117 (0.0105)	0.0117 (0.0106)
Conflict(recent)	0.0483** (0.0218)		0.0598*** (0.0188)		0.0644*** (0.0197)	
Rainfall	-1.59e-05 (1.97e-05)	-1.68e-05 (1.98e-05)	-3.12e-05* (1.67e-05)	-3.14e-05* (1.67e-05)	-3.22e-05** (1.64e-05)	-3.21e-05* (1.64e-05)
Popden	0.0002 (0.0002)	0.0002 (0.0002)	0.0005*** (0.0001)	0.0005*** (0.0001)	0.0007*** (0.0002)	0.0008*** (0.0002)
Dummy 2012	-0.0089 (0.0134)	-0.0090 (0.0134)	-0.0301*** (0.0108)	-0.0309*** (0.0108)	-0.0457*** (0.0104)	-0.0468*** (0.0104)
Dummy 2015	0.195*** (0.0163)	0.196*** (0.0165)	0.193*** (0.0141)	0.192*** (0.0142)	0.172*** (0.0142)	0.170*** (0.0144)
Conflict(long)		25.87 (19.17)		50.74*** (16.88)		58.99*** (17.89)
Constant	0.557*** (0.0891)	0.560*** (0.0895)	0.298*** (0.0747)	0.292*** (0.0751)	0.164** (0.0752)	0.155** (0.0756)
Observations	10,510	10,510	10,510	10,510	10,510	10,510
R-squared	0.078	0.077	0.138	0.138	0.141	0.141
Number of Households	3,672	3,672	3,672	3,672	3,672	3,672

Note: For a description of the variables, see Table 1 Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

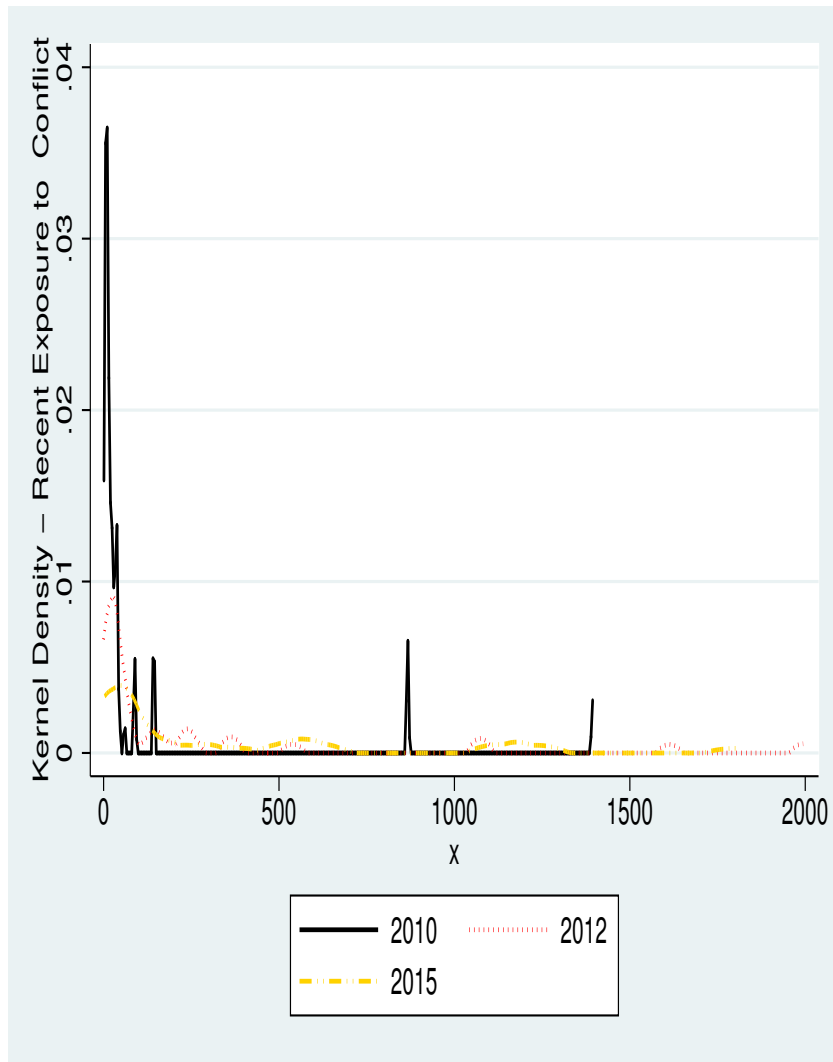


Figure 1: Kernel Density for recent conflict exposure- 2010, 2012 and 2015.

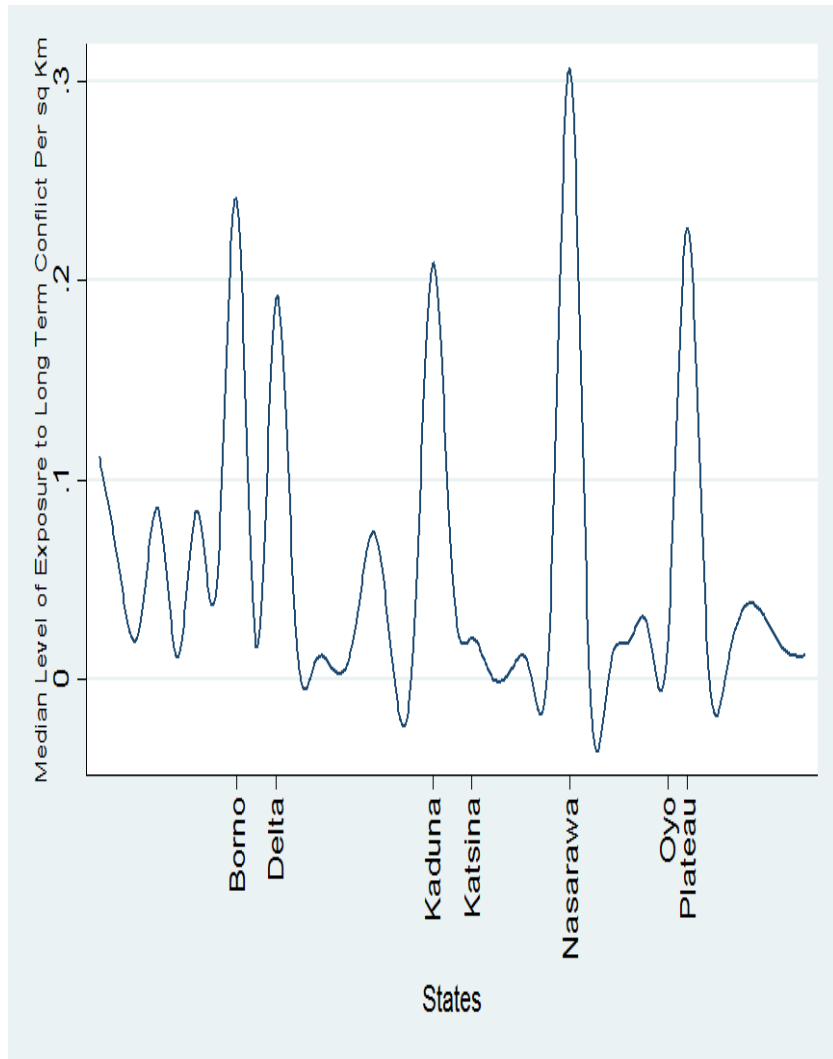


Figure 2: Long term conflict exposure per square kilometer across states in Nigeria 1997-2015.

Table 3: Fixed Effect Parsimonious Poverty Regression(Individual)

Variables	Poverty Incidence		Poverty Gap		Poverty Severity	
	(1)	(2)	(3)	(4)	(5)	(6)
Conflict(recent)	0.0228** (0.00974)		0.0387*** (0.00833)		0.0478*** (0.0087)	
Conflict(long)		5.326 (8.780)		31.28*** (7.609)		43.15*** (7.972)
Constant	0.534*** (0.0330)	0.540*** (0.0332)	0.301*** (0.0265)	0.299*** (0.0267)	0.171*** (0.0264)	0.165*** (0.0266)
Observations	52,331	52,331	52,331	52,331	52,331	52,331
R-squared	0.087	0.087	0.161	0.161	0.164	0.164
Number of observations	20,841	20,841	20,841	20,841	20,841	20,841

Note: the Control variables are the same as in table 1. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



Table 4: Fixed Effect Parsimonious and Full Log Real Income Regression

Panel A		Parsimonious			
	Per capita income		Total income		
Variables	(1)	(2)	(3)	(4)	
Conflict(recent)	-0.216*		-0.141		
	(0.114)		(0.112)		
Conflict(long)		-208.4**		-142.1	
		(105.1)		(102.8)	
Constant	10.88***	10.92***	12.35***	12.38***	
	(0.400)	(0.402)	(0.398)	(0.400)	
Observations	9,452	9,452	9,452	9,452	
R-squared	0.071	0.071	0.082	0.082	
Number of observations	3,631	3,631	3,631	3,631	
Panel B		Full Regression			
	Impact of Conflict on Income				
Conflict(recent)	-0.168		-0.137		
	(0.118)		(0.115)		
Conflict(long)		-159.5		-136.2	
		(109.1)		(106.1)	
Constant	11.51***	11.54***	12.16***	12.18***	
	(0.442)	(0.443)	(0.438)	(0.439)	
Observations	9,302	9,302	9,302	9,302	
R-squared	0.076	0.076	0.084	0.084	
Number of observations	3,625	3,625	3,625	3,625	

Note: Controls for parsimonious regressions similar to those in Table 2 and controls for full regression similar to those in Table 5. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 5: Fixed Effect Full Poverty Regression(Household level)

Variables	Poverty Incidence		Poverty Gap		Poverty Severity	
	(1)	(2)	(3)	(4)	(5)	(6)
Yrsch	-0.0027 (0.0024)	-0.0026 (0.0024)	-0.0044** (0.0019)	-0.004** (0.0019)	-0.0048** (0.0019)	-0.0048** (0.0019)
Age	-0.0011 (0.0014)	-0.0011 (0.0014)	-0.0005 (0.0012)	-0.0005 (0.0012)	-0.0004 (0.0012)	-0.0004 (0.0012)
Agesq	1.28e-06 (1.35e-06)	1.26e-06 (1.35e-06)	7.78e-07 (1.15e-06)	7.76e-07 (1.15e-06)	6.09e-07 (1.16e-06)	6.10e-07 (1.16e-06)
Expshock	0.0339** (0.0138)	0.0341** (0.0138)	0.0202* (0.0112)	0.0203* (0.0112)	0.0156 (0.0107)	0.0156 (0.0108)
Conflict(recent)	0.0388* (0.0231)		0.0483** (0.0194)		0.0529*** (0.0200)	
Rainfall	-1.76e-05 (1.98e-05)	-1.86e-05 (1.98e-05)	-3.18e-05* (1.68e-05)	-3.20e-05* (1.68e-05)	-3.37e-05** (1.65e-05)	-3.36e-05** (1.65e-05)
Popden	0.0002 (0.0002)	0.0002 (0.0002)	0.0005*** (0.0001)	0.0005*** (0.0002)	0.000722*** (0.0002)	0.0007*** (0.0002)
Dummy 2012	-0.0170 (0.0139)	-0.0171 (0.0140)	-0.0364*** (0.0113)	-0.0370*** (0.0114)	-0.0493*** (0.0110)	-0.0501*** (0.0110)
Dummy 2015	0.160*** (0.0190)	0.161*** (0.0192)	0.162*** (0.0162)	0.161*** (0.0163)	0.147*** (0.0162)	0.146*** (0.0163)
Hhsize	0.0279*** (0.0066)	0.0282*** (0.0066)	0.0185*** (0.0062)	0.0186*** (0.0062)	0.0128** (0.0061)	0.0128** (0.0061)
Busstop	-4.80e-05 (0.0008)	-5.75e-05 (0.0008)	-0.0004 (0.00057)	-0.0004 (0.0006)	-0.0003 (0.0005)	-0.0003 (0.0005)
Market	-0.0008 (0.0008)	-0.0009 (0.0008)	-0.0010* (0.0006)	-0.0010* (0.0006)	-0.0011* (0.0006)	-0.0011* (0.0006)
Agricoop	-0.0008 (0.0026)	-0.0009 (0.0026)	0.0019 (0.0021)	0.0018 (0.0021)	0.0031 (0.0021)	0.0030 (0.0021)
Busassoc	-0.0006 (0.0005)	-0.0006 (0.0005)	-0.0009*** (0.0002)	-0.0009*** (0.0002)	-0.0007*** (0.0002)	-0.0007*** (0.0002)
Vigilantegrp	0.0075** (0.0034)	0.0076** (0.0034)	0.0059** (0.0026)	0.0060** (0.0026)	0.0060** (0.0026)	0.0061** (0.0026)
Policestation	0.0009 (0.0008)	0.0009 (0.0008)	-1.13e-05 (0.0006)	-1.51e-05 (0.0006)	-0.0003 (0.0006)	-0.0003 (0.0006)
Conflict(long)		16.15 (20.36)		39.48** (17.47)		47.67*** (18.23)
Constant	0.397*** (0.0968)	0.399*** (0.0970)	0.189** (0.0826)	0.185** (0.0827)	0.0889 (0.0829)	0.0826 (0.0830)
Observations	10,354	10,354	10,354	10,354	10,354	10,354
R-squared	0.081	0.081	0.140	0.140	0.143	0.143
Number of Households	3,669	3,669	3,669	3,669	3,669	3,669

Note: For a description of the variables, see Table 1 Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6: Fixed Effect Full Poverty Regression(Individual)

Variables	Poverty Incidence		Poverty Gap		Poverty Severity	
	(1)	(2)	(3)	(4)	(5)	(6)
Conflict(recent)	0.0120 (0.0102)		0.0272*** (0.0086)		0.0366*** (0.0089)	
Conflict(long)		-5.763 (9.224)		19.61** (7.916)		31.88*** (8.212)
Constant	0.418*** (0.0387)	0.423*** (0.0388)	0.201*** (0.0315)	0.200*** (0.0316)	0.0980*** (0.0313)	0.0939*** (0.0314)
Observations	51,595	51,595	51,595	51,595	51,595	51,595
R-squared	0.089	0.089	0.163	0.163	0.165	0.165
Number of observations	20,803	20,803	20,803	20,803	20,803	20,803

Note: For a description of the variables,see Table 1 Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The results including extra controls are consistent with our earlier finding for certain measures but in some model estimated effect is no longer significant. In particular we find that after including further control, our conflict measures do not significantly impact per capital income and total income even though the coefficients have the right sign<sup>12</sup>. See Table 4 panel B. However, we find that the significant relationship between our measures of conflict and our poverty measures persist. These results are summarized in Table 5 and Table 6. In Table 5 we present the full results for the analysis for which the unit of analysis is the household. In Table 6 we present just the estimates for the most relevant variables from the regression for which the unit of analysis is the individual. Just as in earlier tables, columns (1), (3) and (5) provide estimates using the short term conflict measure while columns (2), (4) and (6) provides estimates using the long term conflict measure. These results suggest that both short term and long term exposure to conflict increases the poverty gap and severity significantly. These results are robust to analysis at the individual level versus the household level. For poverty incidence at the household level, we find a significant positive relationship with our short term measure of conflict but no significant effect when we use the long term conflict exposure measure. Our results for poverty incidence are also not robust to analysis at the individual level. Notice in Table 6 columns (1) and (2), that we find no significant effects of conflict exposure on poverty incidence.

## Robustness Check

Our results suggest that exposure to conflict (long term or recent) increases poverty gap and poverty severity. However, the evidence for the impact of conflict exposure

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<sup>12</sup>For PCI and total income we expect the negative relationship and for poverty measures we expect a positive correlation

on poverty incidence is not as strong. As an extra attempt to provide evidence that these results are not driven by our measures of conflict, we construct our measures of conflict differently. In particular instead of considering the conflict related deaths per 1000 people, we create our conflict measures using the number of conflict deaths per sq KM an individual is exposed to. Hence our recent conflict measure captures the intensity of exposure to conflict per sq Km in the last two years preceding each survey period for our short term measure. For the long term measure, we captures the number of death per sq km from 1998 to the survey period.

We rerun our fixed effect model using this alternative way of measuring conflict exposure and find similar effects. The results are summarized in Table 7. The parsimonious model is summarized in Panel A and the full model with all the controls is summarized in panel B. In particular we find evidence that exposure to conflict over short periods of time increases poverty incidence, poverty severity and the poverty gap but exposure to conflict over longer periods of time only appears to increase poverty severity and the poverty gap.

Table 7: Fixed Effect Poverty Regression(Robustness check)

Panel A		Parsimonious				
Variable	Poverty Incidence		Poverty Gap		Poverty Severity	
	(1)	(2)	(3)	(4)	(5)	(6)
Short Term Conf. (per sq km)	1.204*** (0.287)		1.049*** (0.241)		0.958*** (0.245)	
Long Term Conf. (per sq km)		0.412* (0.235)		0.717*** (0.207)		0.763*** (0.216)
Constant	0.490*** (0.0999)	0.434*** (0.0978)	0.273*** (0.0847)	0.242*** (0.0832)	0.167** (0.0848)	0.144* (0.0832)
Observations	10,510	10,510	10,510	10,510	10,510	10,510
R-squared	0.083	0.081	0.142	0.140	0.144	0.143
Number of observations	3,672	3,672	3,672	3,672	3,672	3,672
Panel B		Full Regression				
Impact of conflict on Poverty						
Short Term Conf (per sq km)	1.178*** (0.299)		0.983*** (0.246)		0.883*** (0.249)	
Long Term Conf. (per sq km)		0.371 (0.247)		0.643*** (0.211)		0.675*** (0.218)
Constant	0.483*** (0.101)	0.424*** (0.0985)	0.264*** (0.0860)	0.233*** (0.0843)	0.158* (0.0862)	0.135 (0.0845)
Observations	10,354	10,354	10,354	10,354	10,354	10,354
R-squared	0.083	0.081	0.142	0.140	0.144	0.143
Number of observations	3,669	3,669	3,669	3,669	3,669	3,669

Note: Controls for parsimonious regressions similar to those in Table 2 and controls for full regression similar to those in Table 5. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 7 Conclusions

In this paper we consider the impact of exposure to conflict on household welfare in Nigeria. Nigeria has unfortunately been plagued with several intense bouts of conflict since its independence. The spread of Boko Haram in the north eastern part of Nigeria and the Fulani herds men clashes with farmers in the middle belt region of Nigeria are just two examples of recent conflict episodes that have led to a significant number of conflict related death. Using data from ACLED to construct two measures of conflict exposure (short term and long term), we estimate the impact of exposure to conflict on per capita income, total household income, poverty incidence, poverty gap and poverty severity. We exploit the panel nature of our data in an attempt to attenuate potential bias in estimated effects. Using a fixed effect strategy and controlling for factors that affect an individual's welfare, we identify relevant effects exploiting within individual variation in conflict exposure over time.

Our results suggest that recent exposure to conflict increases poverty incidence, poverty gap and poverty severity. We also find that exposure to conflict over a longer period of time increases poverty gap and poverty severity significantly but does not appear to affect poverty incidence. We do not find a significant effect of conflict exposure on per capita income and total household income when we include appropriate controls. Our estimated effects are economically significant especially the effect of long term exposure to conflict. For example results from Table 5 suggest that a 10% increase in our long term conflict measure from the mean of 0.19 leads to an increase in poverty severity by 0.91 which is more than a 100% increase in poverty severity from the current mean. In contrast a 10% increase in our short term conflict measure from a mean of 0.08 leads to an increase in poverty severity by 0.0004 which is about a 0.1% increase in poverty severity which is a much smaller effect.

What can we take away from these results? Conflict affects welfare negatively and the effect over time can be significant. While there is some evidence that recent exposure to conflict increases poverty incidence, over a longer period of time our results do not provide evidence of rising poverty incidence linked to conflict exposure. However our results suggest that long term exposure to conflict deepens the severity of poverty hence making it more difficult for households to exit poverty in Nigeria.

It is important to mention that our current identification strategy has limitations. Even though we have included several variables to reduce the possibility of omitted variable bias coming from a variable that varies over time at the household level and is correlated with conflict and welfare, we cannot completely eliminate this potential source of bias using our current estimation strategy. We will explore alternative estimation strategies as a next step. In addition we will also reconstruct our conflict measures at a more dis-aggregated level to more precisely identify exposure to conflict. Currently conflict measures are constructed at the state level which is potentially more noisy and could lead to estimated effects being insignificant.

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## **Appendix**

Table 8: Conflict Exposure Across States in Nigeria by 2015

States	Conflict Death per square km		Conflict Death per 1000 pop	
	Recent 2013-2015	Long 1997-2015	Recent 2013-2015	Long 1997-2015
Abia	0.0006	0.1112	0.0008	0.1534
Adamawa	0.0464	0.0556	0.4541	0.5441
Akwa	0.0044	0.0230	0.0062	0.0320
Anambra	0.0158	0.0853	0.0146	0.0788
Bauchi	0.0048	0.0108	0.0413	0.0926
Bayelsa	0.0067	0.0848	0.0296	0.3749
Benue	0.0360	0.0498	0.2120	0.2931
Borno	0.2121	0.2407	3.0736	3.4881
Cross	0.0030	0.0157	0.0177	0.0938
Delta	0.0073	0.1911	0.0243	0.6414
Ebonyi	0.0012	0.0268	0.0029	0.0633
Edo	0.0031	0.0082	0.0151	0.0404
Ekiti	0.0014	0.0039	0.0027	0.0077
Enugu	0.0044	0.0218	0.0083	0.0409
Gombe	0.0622	0.0740	0.2745	0.3268
Imo	0.0006	0.0040	0.0037	0.0244
Jigawa	0.0054	0.0129	0.0057	0.0137
Kaduna	0.0459	0.2091	0.2067	0.9412
Kano	0.0117	0.0533	0.0698	0.3191
Katsina	0.0164	0.0203	0.0296	0.0368
Kebbi	0.0006	0.0014	0.0021	0.0047
Kogi	0.0021	0.0046	0.0192	0.0423
Kwara	0.0016	0.0033	0.0116	0.0239
Lagos	0.0035	0.0324	0.0413	0.3785
Nasarawa	0.1773	0.3072	0.0545	0.0944
Niger	0.0022	0.0051	0.0261	0.0595
Ogun	0.0004	0.0027	0.0065	0.0409

States	Conflict Death per square km		Conflict Death per 1000 pop	
	Recent	Long	Recent	Long
	2013-2015	1997-2015	2013-2015	1997-2015
Ondo	0.0006	0.0186	0.0023	0.0672
Osun	0.0011	0.0258	0.0039	0.0907
Oyo	0.0007	0.0186	0.0014	0.0380
Plateau	0.0434	0.2270	0.1760	0.9198
Rivers	0.0045	0.0191	0.0305	0.1299
Sokoto	0.0011	0.0040	0.0017	0.0065
Taraba	0.0185	0.0371	0.1354	0.2710
Yobe	0.0206	0.0301	0.4330	0.6326
Zamfara	0.0125	0.0141	0.2021	0.2277
FCT	0.0054	0.0114	0.0464	0.0977