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Education is Forbidden: The Effect of the Boko Haram Conflict on Education in North-East Nigeria

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Abstract
This paper quantifies the microeconomic impact of the Boko Haram conflict on various educational outcomes of children living in North-East Nigeria during the period 2009- 2016. Using an individual panel fixed-effects regression and exploiting both over-time and within-district variation in household-level conflict exposure, we show that conflict reduces school enrollment and increases the probability of school dropout. In addition, using a standard difference-in-difference estimation strategy, we show that conflict reduces the years of education completed. As for the mechanisms explaining the decision to abandon school, we document that conflict increases the child's probability of working in the household's non-farm enterprise, a choice likely to be motivated by the conflict -induced worsening in the quality of the school supply. Finally, we find that conflict also worsen the general health conditions of the students.

Keywords: Boko Haram, conflict , education, Nigeria

JEL Classification: D22, D24, N45, O12.

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1 Introduction

"(Western) Education is forbidden" is the translation from the Hausa language of the name of the terrorist group Boko Haram. Since 2009, Boko Haram has started a conflict against the Nigeria's Government with the objective of creating an Islamic state in the region. Faithful to its name, Boko Haram has targeted the Nigerian education system assaulting schools, students, and teachers in North-East Nigeria in the states of Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe. This paper estimates the impact of conflict on a number of educational outcomes for children of mandatory school age living in those areas.

The literature on the effects of conflict on education is now large and varied. Yet, almost all studies have to make do with the available data and use the standard difference-in-difference empirical strategy to estimate the impact of conflict on education attainment. Unfortunately, this same approach cannot be used to investigate the effect of conflict on individual time-varying choices such as enrolment or dropout while controlling for individual heterogeneity. Estimating the effect of conflict on these other variables would require longitudinal data, which are very rare in conflict-affected countries. Moreover, it would be desirable to measure conflict exposure at a very high level of detail, which implies geo-localising conflict events and linking them to household-level information on the place of residence. To the best of our knowledge, this has not been done by any of the previous studies in the literature. In this paper, we are able to overcome both these limitations by exploiting detailed longitudinal survey data collected during the conflict period and by geo-localising all conflicts events occurred at various distances from the household's location.

This paper quantifies the microeconomic impact of the Boko Haram conflict on the educational outcomes of children living in North-East Nigeria during the period 2009-2016. We use the first available longitudinal General Household Survey (GHS) dataset for Nigeria, which provides information on school outcomes for the period 2009-2016 for a panel of 5000 household. We combine this dataset with various data sources on fatalities and conflict events in North-East Nigeria. In particular, we construct time-varying household-level measures of conflict exposure that allow to exploit over-time variation across households even within the same district. We estimate the effect of conflict on a number of educational outcomes, including school enrolment, school dropout, and years of education completed. To this end, we employ both individual panel fixed-effects and difference-in-difference regression models.

We find that a one standard deviation increase in the number of fatalities in the 5 km radius of the household reduces enrollment probability by 3 percentage points, which translates into a 5% reduction of the mean. There is no differential effect by gender, religion, or place of residence of the student. Instead, we document a significantly larger

effect for students in Junior Secondary school, i.e. those who have completed primary education. We also find that conflict exposure increases school dropout probability, and significantly more for Muslims and Junior Secondary students. These results are robust to a number of checks, including the use of alternative samples, and accounting for potential migration bias. In addition, our results are confirmed when we use alternative ways of measuring conflict exposure, namely the number of conflict events, the number of conflict events caused by Boko Haram, and the number of Boko Haram attacks to schools. We also show that similar results are obtained using an alternative source of conflict data which allows to separate conflict events initiated by Boko Haram from those initiated by the Government. Finally, we show that the negative effect of conflict exposure decreases with the distance between the place of occurrence of the fatality, or the conflict event, and the household's location.

Next, we look at the effect of conflict exposure on school attainment. Using a standard difference-in-difference methodology, we find that a one standard deviation increase in the number of fatalities in the 5 km radius of the household's location leads to a reduction of 0.6 years of education completed. This translates into a 11% drop relative to the average educational attainment observed during the 6 years of the conflict (i.e. 5.2 years of education). We show that our results are not explained by the presence of differential pre-conflict trends in education levels. We also provide suggestive evidence that the results are not driven by endogeneity issues, and are robust to alternative definitions of the control group, to the inclusion of a large number of individual and household characteristics (including religion and migration information), to alternative measures of conflict exposure, and to a placebo test. Furthermore, we also find that, with respect to girls, male children suffer from a larger reduction in the number of years of education completed. This is not surprising considering that, before the conflict, boys had a higher average number of years of education compared to girls. At the same time, there is no differential effect for those living in urban areas, non-Muslims children, or those who have ever migrated.

Finally, we explore alternative possible mechanisms explaining the conflict-induced reduction in the probability of school enrolment. We document that conflict exposure increases a child's probability of working in the household non-farm enterprise, and that the effect is significantly larger for male and students in Junior Secondary school. Interestingly, when looking at the motives behind this decision we find that it is unlikely to be related to a reduction in household wealth. Instead, we find strong evidence of a conflict-induced worsening in the quality of the school supply. Also, we find the negative impact of conflict on school supply to be larger in junior secondary schools, in line with the result that conflict has a stronger negative effect on enrolment for students who have completed primary education. Taken together, these findings suggest that the decision to abandon school and to start working is possibly related to the reduction in the overall

quality of the schooling system and therefore to lower expected returns to education. Finally, we find some evidence that conflict might have also worsened the general health conditions of the students, suggesting that this may be an additional mechanism behind our main result.

The growing literature on the microeconomic effects of conflict has focused on different educational outcomes (see Justino (2012) for a review). These span from completion of primary and mandatory schooling (Justino, Leone and Salardi (2013); Shemyakina (2011); Valente (2014); Verwimp and Bavel (2013)), to primary school attendance (Di Maio and Nandi (2013)), educational attainment (Akbulut-Yuksel (2014); Akresh and de Walque (2014); Chamarbagwala and Moran (2011); Dabalen and Paul (2014); Leon (2012); Swee (2015); Singh and Shemyakina (2016)), academic achievement (Bruek, Di Maio and Miaari (2014)), school dropout (Rodriguez and Sanchez (2009)), and grade completion (Bundervoet (2012)). Not very surprisingly, the estimates on the microeconomic effects of violent conflict on education are widely heterogeneous. Yet, given the unavailability of longitudinal data, most of these studies use the same difference-in-difference estimation strategy. Even those studies adopting a different empirical strategy (see for instance, Monteiro and Rocha (2017) and Bruek, Di Maio and Miaari (2014)) use repeated cross-sectional data. There are two exceptions. Rodriguez and Sanchez (2009) use retrospective information to study the effect of armed conflict exposure on school dropout and labor decisions in Colombia. Justino, Leone and Salardi (2013) use retrospective information on three school years to estimate the effect of displacement and destruction of home on school attendance in Timor Leste. The latter is, to the best of our knowledge, the only one study that used a panel regression analysis to estimate the effect of conflict on education outcomes.

Our paper contributes to the literature on the micro-level effects of conflict exposure on child education outcomes in four ways. First, it provides the first analysis of the impact of the Boko Haram (one of the most violent terrorist group in Africa) on a number of educational outcomes in Nigeria, the largest economy in Africa. Second, this paper advances previous research by improving the quality of the conflict proxies used in the empirical analysis. Our household-level measures of conflict exposure provide a higher level of detail and precision as for the measurement of conflict exposure with respect to existing analyses. Third, thanks to the unique features of the Nigeria GHS panel, this is the first study that uses actual longitudinal information for a panel of households to estimate the effect of conflict on education. Finally, our analysis provides evidence of two novel mechanisms explaining the conflict-induced reduction in school attainment in the context of Sub-Saharan Africa, namely the worsening in the quality of school supply and in child health.

The paper proceeds as follows. Section 2 presents an overview of the Nigerian education system and of the Boko Haram conflict. Section 3 describes the data while Section 4

presents the empirical strategies implemented in the analysis. Results are presented in Section 5. Section 6 concludes.

2 Background

Education system in Nigeria The education system in Nigeria consists of primary, secondary, and tertiary education. Formal primary education typically starts at age 6 (grade 1) and runs up to age 11 (grade 6). Secondary schooling lasts 6 years and consists of 3 years of Junior Secondary schooling (ages 12-15), ending with the Basic Education Certificate Examination (BECE) which leads to 3 additional years of senior secondary school (ages 15-18). At the end of secondary school students are required to take the Senior Secondary Certificate Examination (SSCE), often a minimum requirement to access higher education. Since 1999, formal education is free and compulsory up to age 15 (Labo-Popoola, Bello and Atanda (2009)).

Nigeria accounts for the 10 percent of the world's out-of-school children, and access to education is also very low with 52 percent of children being out of school in the Sub-Saharan region (World Development Indicators - WDI). Nigerian net primary enrollment rate in 2010 was around 64 percent, well below the average rate for Sub-Saharan Africa (76 percent) and that of lower-middle-income economies (87 percent). Total primary completion rate (as a percentage of the relevant age group) in 2010 was around 76 percent, higher than the average rate for Sub-Saharan Africa (68 percent) but lower than the average for lower-middle-income economies (91 percent).

Disparities in educational achievements exist between the North and the South of the country. More than two-thirds of students in the North remain illiterate even after completing primary school, as compared to only about 18–28 percent of students in the South. Moreover, students in the North East have the lowest literacy outcomes from schooling (Favara, Appasamy and Marito (2015)).

The Boko Haram conflict Nigeria has historically been a conflict-prone country due to its heterogeneous population along ethnic, religious, and cultural lines. From the colonial proclamation of 1900 to independence in 1960, the British controlled Nigeria through indirect rule,[1] fueling the ongoing uneven development between the North and the South of the country. Nigeria underwent a successful, although not peaceful, transition from military to civilian rule in 1999, and it has held four elections since then (World Bank (2016*b*)).

Violence in Nigeria is highly regionalized and has progressively taken various forms, spanning from the high levels of religious and ethnoreligious violence in the North, to the

[1] After extending its protectorate from Southern Nigeria to the northern Fulani Islamist Sokoto Caliphate that was ruling Nigeria since 1804.

local insurgencies that mutated into criminality and maritime piracy in the Niger Delta region and the clashes between farmers and pastoralists in the Middle Belt region (Marc, Verjee and Mogaka (2015)).[2] In the West African region as a whole, the nature of violence changed over the last decade from large-scale conflicts and civil wars to a new generation of threats such as rising election-related violence, extremism, and terror attacks, drug trafficking, maritime piracy, and criminality. In addition, conflicts are increasingly being fought on the periphery of the states such as in the case of the National Movement for the Liberation of Azawad (MNLA) in Mali and Boko Haram in Nigeria.

Nearly fifteen million people have been affected by the violent radicalization of the Boko Haram members and the resulting military operations in the North-East of Nigeria since 2009[3]. An analysis of the aggregated ACLED data for the North East zone over the 2003-2016 period reveals that the year 2009 was a turning point for the violence in the region (Figure 1). The Boko Haram conflict has triggered an acute humanitarian and forced displacement crisis, with devastating social and economic impacts on the population, further deepening underdevelopment and regional inequalities. The fighting became particularly intense after 2013, and has led to the loss of at least 20,000 lives and the displacement of an estimated 2.1 million people internally and across international borders in 2015[4] (World Bank (2016*a*)). The most affected states are the northeastern states of Borno, Adamawa and Yobe[5], and the most affected groups are women, children, and the youth, which account for nearly 80 percent of the affected populations. Sexual and gender-based violence during the conflict was widespread (UNOCHA (2015)), girls and women who experience sexual violence from Boko Haram members are stigmatised by their communities and girls are often used by the terrorist group as suicide bombers.[6] At the same time, boys and men also confront a range of threats, including violence, abduction, forced recruitment by Boko Haram and vigilante groups, and detention on suspicion of militancy sympathies (World Bank (2015)).

The conflict has had a particularly high impact on the education system, disrupting access to education and social services, especially for young people. Schools were damaged and destroyed, teachers were threatened and in some cases killed, and schools were transformed into shelters for IDPs. Schools that are in operation across the Borno, Adamawa

[2]Different types of violence are dominant in different areas, and the underlying determinants of the conflicts are also different (Abidoye and Calì (2015)). While riots and civilian protests are more frequent in the South of the country, in the last decade North-East areas have seen an increase in episodes of violence against civilians. In the specific case of the North East region, violence against civilian are the more common type of conflict events.

[3]The group's violence progressively escalated after the detention and death of the movement's leader, Ustaz Mohammed Yusuf, while in custody in July 2009.

[4]About 84 percent of the forcibly displaced people have remained within the three conflict-affected states of Borno, Adamawa, and Yobe, while around 8 percent moved to Northern and Central Nigeria, and the remaining 8 percent into the neighboring countries of Cameroon, Chad and Niger.

[5]The Nigerian government declared a state of emergency in the three most northeastern states of Borno, Yobe and Adamawa in May 2013.

[6]http://www.nytimes.com/2016/04/08/world/africa/boko-haram-suicide-bombers.html

and Yobe states are overcrowded and are largely unable to meet the needs of the host population and IDPs. The estimated total impact of the conflict on the education sector of the North East is around US$ 273 million, 53 percent of which is accounted for by the State of Borno (World Bank (2016*a*)).

3 Data

3.1 Education data

Individual level data This analysis uses data from the three rounds of the Nigeria General Household Survey Panel (GHS-Panel) conducted by the National Bureau of Statistics.[7] The GHS-Panel is a randomly selected sub-sample of the GHS cross-section consisting of 5,000 households; it covers three periods: August 2010/April 2011 (first wave), September 2012/April 2013 (second wave), and August 2015/May 2016 (third wave). Among others, the GHS-Panel provides information on individuals' enrollment in five different school years. The first two panel rounds report retrospective information on individuals' enrollment in the previous year, i.e. 2009/2010 and 2011/2012, respectively. The last round of the GHS reports information on the current enrollment in the 2015/2016 school year.[8] Moreover, the dataset provides village-level GPS information so that they can be linked to geo-referenced conflict data. The final panel used in this analysis counts 3,709 observations. The latter is composed by individuals aged 6-11 in 2009, residing in the North East of the country which presents at least 2 observations throughout the 5 school years of reference. Table A.1 summarizes the variables used in the panel regression analysis.[9]

In our analysis, we will also implement a difference-in-difference estimation using the third panel wave only, i.e. the 2015/16 cross-section. In this case, the sample counts 1,815 observations, corresponding to individuals aged 6-14 (treated group) and 18-24 (control group) in 2009. Table A.2 summarizes the variables used in the difference-in-difference analysis. In our sample, 80% of households are interviewed three times. The missing households (due to attrition) potentially pose a selection bias problem. To check how this may affect our results, we compare the 166 missing households with the 638 included in our sample along a large number of observable dimensions. Results for this

[7] The GHS-Panel, which is representative at the national and geopolitical levels, is part of the Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) project which aims at improving agricultural statistics in Sub-Saharan Africa.

[8] In the 2010/11 round individuals were asked *"Were you in school during the 2009/10 school year?"* and *"Were you in school in the current academic year?"*. In the 2012/13 round individuals were asked *"Were you in school during the 2011/12 school year?"* and *" Were you in school in the current academic year?"*. In the 2015/16 round individuals are asked *"Are you presently in school?"*.

[9] As this is an unbalanced panel, we test the robustness of our main results by restricting the analysis to the sample of individuals followed throughout the 5 school years (balanced panel), resulting with a sample of 2,881 observations (590 individuals interviewed 5 times).

comparison are presented in Table A.3, which shows the mean differences in covariates for the households included in the third wave and for those that have exited the panel during the conflict period. The two groups of households appear to be similar, even if there are some differences. Household who abandoned the panel (column 1) are characterized by a household head with a lower number of years of education and who is more likely to work in agriculture with respect to those who remained in the panel in the last wave (column 2). At the same time, there is some indication that households leaving the panel were less wealthy. Our results show that those household - compared with households that remained in the panel - have a lower probability of owning assets (the difference is negative for all assets, even if it is only significant for radio), have on average a lower quality of the floor and are less likely to have an improved toilet (which are proxies for the quality of the house). Based on these results, it seems unlikely that selection bias will considerably affect the results of the analysis. In addition, the fact that those who left the panel during the conflict period were from poorer household at baseline can even be considered reassuring for our identification strategy (see next Section). As being poorer is likely to be negatively correlated with educational outcomes, any effect of conflict on education we would find is likely to be a lower bound of the true effect.

School supply Data on school supply are derived from the Universal Basic Education Commission (UBEC), which operates under the Universal Basic Education Programme framework since 1999 for the achievement of Education for All (EFA) and the education-related Millennium Development Goals (MDGs) in the country.[10] The database is an unbalanced panel at the LGA level covering the period 2009-2016. The dataset includes information on number of schools, number of students by gender and number of teachers by gender for both primary and junior secondary schools in all Northeastern States of Nigeria. Overall, for the mandatory school system of the North East of the country over the 2009-2016 period, the database counts 147 observations which include an average of 117 schools (97 primary schools and 20 junior secondary schools), and average of 1,141 teachers (of which 874 are in primary and 267 in junior secondary schools, respectively), an average of 39,500 enrolled students, and an average of 40 students per teacher. All measures display considerable variations across Northeastern LGAs.

3.2 Conflict data

Armed Conflict Location and Event Data (ACLED) Data on conflict events are drawn from the PRIO/Uppsala Armed Conflict and Location Event (ACLED) dataset, which covers conflict events through the 1997-2018 period. The ACLED dataset covers exact location, in terms of latitude and longitude, date, and additional characteristics

[10] http://ubeconline.com/

of a wide range of conflict-related events in all African states. Civil conflict episodes are defined broadly, to include all kinds of activity involving rebels, such as recruitment or the establishment of headquarters. Event data are derived from a variety of sources, mainly concentrating on reports from war zones, humanitarian agencies, and research publications. Information from local, regional, national and continental media is reviewed daily (Raleigh et al. (2010)).

In this study we map the exact LGA-level locations of the conflict events provided by the ACLED database using geo-spacial coordinates taken from the DIVA-GIS website. The ACLED LGA-level dataset counts 2,157 conflict events and 24,071 fatalities between 2009 and 2016 in the North East of the country. Figure 2 shows the total number of reported LGA-level conflict events for the period 2009-2016 while 3 shows the total number of reported LGA-level fatalities for the same period. Geographical areas marked with darker shades indicate LGA that experienced more intense conflict. The incidence of conflict have been more frequent in the Borno-state LGAs, particularly in the neighborhood of Maiduguri. Between 2009 and 2016, the average number of conflict events per LGA was 6 and the average number of fatalities was 72. In 2015, in Maiduguri alone, the number of armed conflict events escalated to more than 50 and the number of fatalities to more than 1,000. About 80% of the LGA in the North East of the country experienced at least one conflict event during the period 2009-2016.[11] Moreover, we take advantage of the information provided by the ACLED data on perpetrators and target of conflict events to generate a richer set of LGA-level conflict exposure measures which includes conflict events specifically caused by Boko Haram as well as conflict events caused by Boko Haram specifically against schools.

Integrated Conflict Early Warning System (ICEWS) We derive information on political violence at the LGA level as well from the Integrated Crisis Early Warning System (ICEWS) dataset. Prepared by the Lockheed Martin Advanced Technology Laboratories, these data have been recently made publicly available and cover the period from 1995 to 2016. The dataset records any event of interaction between socio-political actors. Each entry provides information on the date, location, source and target of each interaction.[12] We build our dataset of political violence as follows. We keep all geo-referenced events between 2009 and 2016 in North East Nigeria classified as hostile, meaning having

[11] Despite its wide coverage, we must acknowledge selection in reporting as one of the ACLED dataset limitations. As noted in Harari and La Ferrara (2013), it is possible that areas experiencing intense conflict might have a poorer media coverage, possibly leading to under-reporting of conflict. Unfortunately, we have no alternative data source of comparable scope and level of disaggregation allowing us to evaluate this concern. At the same time, it is unclear that such a reporting bias would be systematically correlated with our measure of schooling outcome.

[12] Events are assigned to specific categories using the Conflict and Mediation Event Observations (CAMEO) classification. Additionally, each one of these categories is assigned an intensity variable using a scale from -10 to 10 (from most hostile to most cooperative). Events are automatically identified and extracted from news articles, geo-referenced and time-stamped accordingly.

intensity value from -10 to -1 (inclusive). We then classify each category as violent or non-violent. As an example, events such as abductions, assassinations and acts of terrorism (e.g. suicidal bombing) are classified as violent, while events such as accusations, demonstrations and threats are classified as non-violent. We only keep events for which the target actor belongs to Nigeria.

The ICEWS dataset makes it possible to identify all violent events caused by Boko Haram from all those events where the government or related entities (such as the Nigerian police or the military) are identified as the source. The LGA-level ICEWS dataset counts an average of 20 events caused by Boko Haram between 2009 and 2016 in North-East Nigeria versus an average of 23 events caused by the government.

To track the evolution of exposure to violence for each household over time, we take advantage of the geographic coordinates available in the GHS, ACLED, and ICEWS databases to implement a proximity analysis to compute the number of conflict events and the associated number of fatalities occurred in the vicinity of each household. To do so, we firstly define progressively larger buffer distance measures around each GHS household (at 5, 10, 20, 30, and 40 km). Secondly, we compute the total number of geo-located conflict episodes and fatalities occurred within each buffer zone over the most relevant period given the estimation strategy adopted. More precisely, for the panel estimation we computed the total number of conflict episodes and fatalities during each school year. For the difference-in-difference analysis we computed the total number of conflicts events and fatalities between the beginning of the conflict (July 2009) and the end of the GHS survey (May 2016).

4 Estimation strategy

In our analysis, we combine various empirical strategies. First, we estimate a panel fixed-effects regression to address the effect of conflict exposure on enrollment and school dropout. Second, we use a difference-in-difference strategy to estimate the effect of conflict on the number of years of education completed.

4.1 Enrolment: Individual level panel regression

We estimate the impact of conflict exposure on school enrollment for children in primary education (i.e. 6 to 11 years old) as of 2009, i.e. when the Boko Haram conflict started, using the following regression model:

$$Enrollment_{ijlt} = \alpha + \beta\ Conflict\ Exposure_{j\,t-1} + W'_{jlt}\delta + \mu_i + \theta_t + \lambda_{lt} + \varepsilon_{ijlt} \qquad (1)$$

where $Enrollment_{ijlt}$ is a dummy that takes value 1 if a student i from household j living in LGA l is in school at time t and zero otherwise. $Conflict\ Exposure_{j\,t-1}$ is the household-specific measure of conflict exposure. In our main regression, we define it as the total number of fatalities occurred in the 5 km radius of the household in the previous academic year. As alternative definitions, we also use the number of conflict events, the number of conflict events caused by Boko Haram, and the number of Boko Haram attacks to schools in the 5km radius of the household. All this measures are constructed using the geo-localization information in the ACLED dataset.

The matrix W'_{jlc} groups a set of (time-varying) household characteristics, namely: father is employed in agriculture, household size, percentage of girls aged 6-11 in the household, and percentage of boys aged 6-11 in the household. μ_i indicates the individual fixed effects while θ_t the school year fixed effects. λ_{lt} represent LGA-specific time trends.

The individual fixed effects account for all time-invariant observed and unobserved individual characteristics that could influence the schooling outcome of interest. Under the assumption that there are no omitted time-varying individual-specific attributes correlated with the number of fatalities, the estimates of β gives the causal effect of conflict exposure on school enrollment. Finally, ε_{ijltw} is the error term. All regressions are estimated using robust standard errors clustered at the LGA level.

4.2 Years of education: Difference in Difference estimation

Our identification strategy to estimate the effect of conflict on the number of years of education completed exploits the variation in conflict exposure across birth cohorts and geographic areas through a difference-in-differences (DID) model.[13] By using data from the last available GHS wave (i.e. the one collected in 2015/2016), we compare the effect of exposure to conflict during the 2009-2016 period on years of education completed of two groups of individuals. In our analysis, the treatment group includes individuals who were of mandatory school age at the beginning of the conflict, i.e. children aged 6 to 14 in 2009. The control group includes individuals who were not of primary school age when the conflict started, i.e. those aged 18 to 24 in 2009, who are as comparable as possible to the treated cohorts. The final sample consists of 1815 individuals between 12 and 30 years as of 2015.

We estimate the following model:

$$\begin{aligned} Years\ of\ Education_{ijkl} = \alpha &+ \beta\ Total\ \ Conflict\ Exposure_{j} \\ &+ \gamma\ (Total\ Conflict\ Exposure_{jl} * Treated_{ik}) \\ &+ X'_{ijkl}\ \ \delta + W'_{jkl}\ \ \gamma + \theta_k + \lambda_l + \varepsilon_{ijkl} \end{aligned} \tag{2}$$

[13] Previous analysis using the same methodology include Akresh and de Walque (2014); Shemyakina (2011); Verwimp and Bavel (2013); Chamarbagwala and Moran (2011); Justino, Leone and Salardi (2013); Valente (2014); Akbulut-Yuksel (2014); Dabalen and Paul (2014); Singh and Shemyakina (2016).

where $Years\ of\ Education_{ijkl}$ is the number of years of education completed by individual i, in household j, born in year k and residing in LGA l. The effect of interest is captured by the coefficient γ in equation 2 associated to the interaction term between a household-level measure of conflict exposure during the entire conflict period and a dummy equal to one when an individual belongs to the treatment group. In our main model, $Total\ Conflict Exposure_j$ is defined as the cumulated number of ACLED reported fatalities, registered in the 5 km radius of each household over the 2009-2016 period:

$$Total\ Conflict\ Exposure_j = \sum_{2009}^{2016} fatalities(5km)_j \tag{3}$$

Note that, differently from previous analyses that use the same methodology, this conflict measure allows us to exploit variation in conflict exposure across different households that reside in the same LGA. The matrix X'_{ijkl} and W'_{jkl} groups a large set of individual and household-level socio-economic variables, respectively. We denote with θ_k the birth cohort fixed effects and with λ_l the LGA fixed effects. The latter two terms serve to account for all (time-invariant) unobservable characteristics at the birth cohort and LGA level, respectively. ε_{ijkl} is the error term. In particular, the birth cohort fixed effects control for the underlying trend in years of education due to be born in a later year versus an earlier year (education level increases on average with the passing of time at the country level). The LGA fixed effects instead control for all the observable and unobservable time-invariant local conditions. In all regressions, we use sampling weights and cluster standard errors at the LGA and birth cohort level.[14]

4.2.1 Preliminary checks

Parallel trend assumption The main identifying assumption for this strategy is that the educational outcomes of children living in conflict-affected and -unaffected LGAs would have followed the same time trend in the absence of the conflict. While this parallel trend assumption cannot be verified, one way to check for its validity is to compare the averages of the schooling outcomes of individuals who were out of mandatory school age as of 2009 (at the beginning of the Boko Haram conflict), i.e. those whose year of birth is $1985 \leq k \leq 1991$, in LGAs affected by the conflict with their counterparts in unaffected LGAs. Results are reported in Figure A.1. We report the results using two different definition for affected LGA: 1) there has been at least one fatality during the conflict period (panel a); 2) there has been at least one conflict event during the conflict period (panel b). The graphs shows that the trends for the two groups are parallel and increasing. Thus, pre-conflict data provide suggestive evidence that, in absence of the conflict, the two groups would be expected to follow the same time trend.

[14]Note when we cluster standard errors by LGA, the results (available upon request) are unchanged

Endogeneity Although we include LGA fixed effects in all our specifications to control for time-invariant province characteristics, there may be a problem of endogeneity with time-varying LGA characteristics. To test for this source of endogeneity, we analyze the correlation between pre-conflict education levels and the intensity of conflict at the LGA level. To this end, we compute for each LGA the pre-conflict average number of years of education, the average percentage of individuals who have completed primary school, and the percent of individuals who have completed mandatory education. We then separately regress these averages on the LGA-level number of fatalities. Results reported in Table A.4 columns 1-3 show no statistically significant correlations in the various specifications. Results are the same when we regress these averages on the the number of conflict events. In any case, as we discuss below, to provide further confidence in our results we will include LGA-specific time trends in all our regression specifications.

Another possible concern to our identification strategy is that we may measure the effect of something other than exposure to violent conflict. If, for example, conflict episodes were more intense in poor LGAs compared to non-poor ones, then we may be capturing the effect of poverty instead of the effect of exposure to conflict. To this end, in Table A.4 column 4 we compare poor and non-poor LGAs at the beginning of the conflict (in 2009), where poor LGA is defined as being above the median in the variable indicating the percentage of people below the poverty line. We find that there are no differences in conflict intensity between poor e non-poor LGAs.

Finally, our main results may be driven by the difference in the presence of Muslims in the LGA with the former being linked to the probability and intensity of conflict events. To test for this possibility, we regress the pre-conflict percentage of Muslims at the LGA level on conflict intensity. Reassuringly, column 5 shows that there is no statistically significant correlation between the two. This suggests that neither poverty rates nor the religious composition of the LGA are correlated with conflict intensity. Taken together, these results strengthen the confidence in our identification strategy.

5 Results

5.1 The effect of conflict exposure on enrolment

Table 1 reports the individual panel fixed-effects estimates of the impact of conflict on school enrollment using as measure for $Conflict\ Exposure_{jt-1}$ the total number of fatalities occurred in the 5 km radius of the household in the previous academic year, i.e. $Fatalities\ (5\ km)_{jt-1}$. Column 1 shows the result for a specification that includes only individual and school year fixed effects. The estimated coefficient for $Fatalities\ (5\ km)_{jt-1}$ captures the difference (in percentage points) in the individual probability of school enrolment in different years that is only due to the difference in the number of fatalities

occurred since the beginning of the conflict. The results indicate that an increase in conflict intensity has a negative and highly significant effect on school enrollment. The negative effect of conflict on enrollment is robust to the inclusion of several control variables. In column 2, we add a set of child and household characteristics such as father employed in agriculture, household size, percentage of male and female children aged 6-11 in the household. In column 3, we include a full set of LGA-specific time trends to control for the (observable and unobservable) time-varying local conditions. The magnitude and significance of the effect of conflict on enrollment increases and remains highly significant. By computing the magnitude of the effect of conflict, we find that one standard deviation increase in the number of fatalities occurring in the 5 km radius from the child's household reduces the probability of school enrollment by 3 percentage points. As the mean of the dependent variable $Enrollment_{ijlt}$ is 0.68, this implies that a one standard deviation increase in the number of fatalities reduces the probability of enrolment by 5% percent of the mean.

Table 1: Effect of the Boko Haram conflict on school enrollment

	School enrollment		
	(1)	(2)	(3)
$Fatalities\ (5\ km)_{j\,t-1}$	-0.0003**	-0.0006***	-0.0010***
	(0.0001)	(0.0002)	(0.0003)
Controls	No	Yes	Yes
Individual FE	Yes	Yes	Yes
School year FE	Yes	Yes	Yes
LGA-specific time trends	No	No	Yes
Clusters	55	55	55
Individuals	848	848	848
Observations	3709	3709	3709

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The dependent variable is a dummy that takes value 1 if individual i from household j living in LGA l is enrolled in school during the school year t and 0 otherwise. The estimation sample includes individuals whose year of birth is $1998 \leq k \leq 2003$, i.e. aged 6 to 11 as of 2009, when the Boko Haram conflict started. The controls include household size, percentage of female children aged 6-11 in the household, percentage of male children aged 6-11 in the household, father employed in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

Robustness checks Our results are robust to several checks. To begin, we re-estimate our main equation using alternative samples. These are: 1) children aged 6-9 as of 2009 (i.e. at the time of the beginning of the conflict; 2) children aged 6-14 in 2009; 3) children who are older than 6 and younger than 14 in any of the 5 school years considered. Results

reported in Table A.5 column 1-3 are similar to our baseline results, even if the magnitude slightly decreases

In addition, we also re-estimate our main regression using the balanced sample, i.e. including only children who have been interviewed 5 times. The sample reduces to 590 children but the sign, size, and significance of the effect of the number of fatalities on the decision of enrollment do not change with respect to the full sample (see A.5 column 4).

Another robustness check of our results concerns the possible effect of household migration decisions on education outcomes (Justino, Leone and Salardi (2013)).[15] The Nigeria GHS dataset provides information on whether the child has ever migrated but the available data do not allow us to establish when this migration occurred or its main reason, e.g. escaping the conflict. To assess whether the bias deriving from migration is a serious concern in our analysis, we re-run our main specification including only individuals who never migrated. The number of children reduces to 709 (3305 observation) while the magnitude and significance of the coefficient is unchanged with respect to the one obtained by using the full sample (see Table A.5 column 5).

5.1.1 The Impact of Conflict on Enrollment: Heterogeneity

Table 2 column 1 shows that there is no gender differential effect of conflict exposure on enrollment decision. In fact, while Boko Haram is often depicted in the news as been predominantly targeting girls, the conflict seems to have had the same negative effect for male children, at least for enrollment decision.[16] Our results also show that there is no significant difference on the effect of fatalities by place of residence of the child (rural/urban) (column 2). Even if the interaction term indicates that the negative effect of conflict is larger in rural areas, the coefficient is not statistically significant at conventional levels.

Next, we look at the possible role of religion. The Boko Haram conflict is sometimes described as fundamentalist Muslim terrorists fighting against the possible diffusion of a Western type of society in Nigeria. One may wonder whether this implies that the most affected individuals are non-Muslims, and in particular Christians which are the second largest religious group in North-East Nigeria. Results in column 3 indicates that this is not the case. In fact, the interaction term, while not statistically significant at conventional levels, is negative suggesting that - if anything - the negative effect would be larger for Muslim students.

Finally, we look at the possible heterogeneous effect of conflict intensity by school level. Results in column 4 show that there is a significantly larger negative effect on

[15] Note that those who exit the panel are potentially migrant households who did not return to initial location. As we discussed above, the fact that they cannot be included in the final sample is unlikely to affect our results.

[16] https://www.nytimes.com/2014/05/12/world/africa/in-town-of-missing-girls-sorrow-but-little-progress.html

enrolement for students in junior secondary with respect to those in primary education. This suggests that possible mechanisms explaining our results have to account for this school-level and student age bias in the effect of conflict. We will discuss this more in detail in Section 5.3.

Table 2: Effect of the Boko Haram conflict on school enrollment: heterogeneity

	School enrollment			
	(1)	(2)	(3)	(4)
$Fatalities\ (5\ km)_{j\,t-1}$	-0.0009**	-0.0008***	-0.0016***	0.0003
	(0.0004)	(0.0002)	(0.0005)	(0.0002)
$Fatalities\ (5\ km)_{j\,t-1} * Female$	0.0000			
	(0.0008)			
$Fatalities\ (5\ km)_{j\,t-1} * Muslim$		-0.0002		
		(0.0002)		
$Fatalities\ (5\ km)_{j\,t-1} * Urban$			0.0008	
			(0.0005)	
$Fatalities\ (5\ km)_{j\,t-1} * Junior\ Secondary$				-0.0014***
				(0.0004)
Controls	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes
School year FE	Yes	Yes	Yes	Yes
LGA-specific time trends	Yes	Yes	Yes	Yes
Clusters	55	55	55	55
Individuals	848	848	848	848
Observations	3709	3709	3709	3709

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The dependent variable is a dummy that takes value 1 if individual i from household j living in LGA l is enrolled in school during the school year t and 0 otherwise. The estimation sample includes individuals whose year of birth is $1998 \leq k \leq 2003$, i.e. aged 6 to 11 as of 2009, when the Boko Haram conflict started. The controls include household size, percentage of female children aged 6-11 in the household, percentage of male children aged 6-11 in the household, father employed in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

5.1.2 The Impact of Conflict on enrollment: Additional results

The effect of fatalities and distance from household Our identification relies on the very fine-grained measure of conflict intensity that we have constructed using geo-localised data. We explore more in detail the geographical dimension of the conflict by looking at the possible effect of the number of fatalities occurred at various distances from the household. Table 3 column 1 reports the results for our main regression. The effect of the number of fatalities is always negative but declines with the distance from the household, being significant at conventional levels only for fatalities occurred in the close proximity to the household. Column 2 reports the same regression using as measure of conflict intensity the number of conflict events. Again, the only significant effect is the

Table 3: Effect of the Boko Haram conflict on school enrollment: fatalities and conflict events at various distances from households

	School enrolment	
	(1)	(2)
$Fatalities\ (5\ km)_{j\,t-1}$	-0.0008***	
	(0.0003)	
$Fatalities\ (10-20\ km)_{j\,t-1}$	-0.0008	
	(0.0009)	
$Fatalities\ (20-30\ km)_{j\,t-1}$	-0.0001	
	(0.0001)	
$Conflict\ Events\ (5\ km)_{j\,t-1}$		-0.0261***
		(0.0076)
$Conflict\ Events\ (10-20\ km)_{j\,t-1}$		-0.0174
		(0.0118)
$Conflict\ Events\ (20-30\ km)_{j\,t-1}$		0.0019
		(0.0065)
Controls	Yes	Yes
Individual FE	Yes	Yes
School year FE	Yes	Yes
LGA-specific time trends	Yes	Yes
Clusters	55	55
Individuals	848	848
Observations	3709	3709

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The dependent variable is a dummy that takes value 1 if individual i from household j living in LGA l is enrolled in school during the school year t and 0 otherwise. The estimation sample includes individuals whose year of birth is $1998 \leq k \leq 2003$, i.e. aged 6 to 11 as of 2009, when the Boko Haram conflict started. The controls include household size, percentage of female children aged 6-11 in the household, percentage of male children aged 6-11 in the household, father employed in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

one for the conflict events who occurred closer to the household.

Alternative measures of conflict Table 4 reports the estimation of our model 1 using alternative definitions of variable $Conflict\,Exposure_{j\,t-1}$. First, we use the total number of conflict events (as defined by the ACLED dataset) occurred in the 5km radius of each household in the previous academic year. Next, we exploit the breakdown of conflict events by perpetrator and target. This allows us to identify the events initiated by Boko Haram and those which were directed to attack schools. Moreover, we use the ICEWS dataset to identify and compare the effects of conflict events initiated by Boko Haram or the Government.

A number of interesting patterns arises. All types of conflict events have a negative and highly significant effect on school enrollment. A one standard deviation increase in

Table 4: Effect of the Boko Haram conflict on school enrollment: alternative conflict measures

	School enrolment				
	(1)	(2)	(3)	(4)	(5)
Conflict events (5 *km*)$_{jt-1}$	-0.0238***				
	(0.0080)				
Conflict events by Boko Haram (5 *km*)$_{jt-1}$)		-0.0157**			
		(0.0072)			
Conflict events by Boko Haram against schools (5 *km*)$_{jt-1}$			-0.0256**		
			(0.0098)		
Violent conflict events by Boko Haram(5 *km*)$_{jt-1}$				-0.0019***	
				(0.0006)	
Violent conflict events by Government(5 *km*)$_{jt-1}$					-0.0034*
					(0.0020)
Controls	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes
School year FE	Yes	Yes	Yes	Yes	Yes
LGA-specific time trends	Yes	Yes	Yes	Yes	Yes
Clusters	55	55	55	55	55
Individuals	848	848	848	848	848
Observations	3709	3709	3709	3709	3709

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The dependent variable is a dummy that takes value 1 if individual i from household j living in LGA l is enrolled in school during the school year t and 0 otherwise. The estimation sample includes individuals whose year of birth is $1998 \leq k \leq 2003$, i.e. aged 6 to 11 as of 2009, when the Boko Haram conflict started. The controls include household size, percentage of female children aged 6-11 in the household, percentage of male children aged 6-11 in the household, father employed in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS, ACLED and ICEWS.

the total number of conflict events occurred in the 5 km radius of the household reduces the probability of enrollment by 4.8 percentage points (column 1). As shown in column 2, the effect of conflict events initiated by Boko Haram has a significant negative effect but the magnitude is smaller. This suggests that it is not only the activity of the terrorist group which may influence household's education decision but also the general level of insecurity and violence the household is experiencing. In fact, attacks to schools by Boko Harm have not a larger negative impact than other types of conflict events. This result is confirmed when we look at the results using the ICEWS dataset. Results in columns 4 and 5 indicate that the effect of conflict events initiated by Boko Haram or by the Government have both a negative effect on enrollment, even if those by the Government have a smaller impact.[17] We interpret these results also as robustness check of our previous analysis. Obtaining similar findings using a completely different data source is reassuring in terms of our main result.

Alternative outcome Table 5 reports the results for an alternative education outcome, namely student school dropout. In our analysis, we define dropout as a dummy taking value 1 if the student is enrolled in year $t-1$ and not enrolled in yeat t, and 0 otherwise.

Results indicate that exposure to conflict increases the probability of school dropout (column 1). The effect of conflict exposure is significantly stronger for Muslim students (column 2). Finally, the effects turns out to be significantly larger for students in Junior Secondary school, confirming the school-level bias of the effect of conflict on school enrollment (see Table 2 column 4).

5.2 The effect of conflict exposure on years of education completed

The results reported in Table 6 column 1 indicate that treated cohorts in conflict affected areas suffer a loss in terms of average numbers of years of education completed. More specifically, the results suggest that a one standard deviation increase in the number of fatalities in the 5 km radius of each household (which corresponds to 97 fatalities) leads to a reduction of 0.6 years of completed education. Given that the average number of years of education is about 5.4, this translates into a 11 percent drop relative to the average educational attainment.[18]

[17] A one standard deviation increase in number of conflict events by Boko Haram and by the Government reduces the probability of enrollment by 1.8% and 1.4%, respectively

[18] The magnitude of this effect is in line with that of Valente (2014) and Singh and Shemyakina (2016). Dabalen and Paul (2014) find that in Burundi a one standard deviation increase in the conflict intensity translated into a 15 percent drop in average years of education completed. For Guatemala, during the periods of highest conflict intensity Chamarbagwala and Moran (2011) find negative effects of the magnitude of 15 percent for males and 12 percent for females. For Colombia, Rodriguez and Sanchez (2009) find that armed conflict reduces the average years of schooling by 9 percent for all Colombian children.

Table 5: Effect of the Boko Haram conflict on school dropout

	School dropout		
	(1)	(2)	(3)
$Fatalities\ (5\ km)_{j\,t-1}$	0.0004*	0.0000	-0.0003
	(0.0002)	(0.0002)	(0.0002)
$Fatalities\ (5\ km)_{j\,t-1} * Muslim$		0.0005***	
		(0.0002)	
$Fatalities\ (5\ km)_{j\,t-1} *\ Junior\ Secondary$			0.0008***
			(0.0002)
Controls	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes
School year FE	Yes	Yes	Yes
LGA-specific time trends	Yes	Yes	Yes
Clusters	55	55	55
Individuals	824	824	824
Observations	2764	2764	2764

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The dependent variable is a dummy that takes value 1 if individual i from household j living in LGA l is enrolled in school during the school year t and 0 otherwise. The estimation sample includes individuals whose year of birth is $1998 \leq k \leq 2003$, i.e. aged 6 to 11 as of 2009, when the Boko Haram conflict started. The controls include household size, percentage of female children aged 6-11 in the household, percentage of male children aged 6-11 in the household, father employed in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

Table 6: Effect of the Boko Haram conflict on years of education

	Years of education		
	(1)	(2)	(3)
$Total\ Conflict\ Exposure_j * Treated_{ik}$	-0.6467**	-0.6265**	-0.6271**
	(0.2624)	(0.2602)	(0.2600)
$Total\ Conflict\ Exposure_j$	1.6399***	1.3785***	1.3846***
	(0.4621)	(0.5335)	(0.5321)
Male		1.6144***	1.6147***
		(0.2440)	(0.2440)
Male household head		-0.8831**	-0.8845**
		(0.4022)	(0.4022)
Years of education of household head		0.1117***	0.1118***
		(0.0266)	(0.0267)
Household size (as of 2010)		-0.0862*	-0.0859*
		(0.0475)	(0.0475)
Father works in agriculture (as of 2010)		-0.7858**	-0.7870**
		(0.3048)	(0.3049)
Ever migrated		-1.0359**	-1.0355**
		(0.4314)	(0.4314)
Other controls	Yes	Yes	Yes
Year of birth dummies	Yes	Yes	Yes
LGA dummies	Yes	Yes	Yes
LGA-specific time trends	No	No	Yes
Clusters	700	700	700
Observations	1815	1815	1815

Notes: Robust standard errors, clustered at the lga and cohort of birth level, are reported in parentheses. The dependent variable measures the number of years of education completed at the time of the interview. The estimation sample includes individuals whose year of birth is $1985 \leq k \leq 2003$. The treatment group includes the cohorts of individuals who were of mandatory school age (6-14) as of 2009, i.e. when the Boko Haram conflict started. The control group includes the cohorts of individuals who were not of school age (18-24) as of 2009. Other controls include: age of household head; male household head; years of education of household head; household size; number of household members aged 5-14; father works in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

Our results are robust to a number of checks. First, we include additional controls for individual and household characteristics in our main specification. These are age, gender, and religion of the individual; age, gender, education level of the household head, and if the household has ever migrated during the 2009-2016 period. In addition, we include a set of household characteristics computed using the GHS-Panel survey 2010/11 to reduce the possibility that these same characteristics are influenced by the conflict. These are: the household size, the number of household members aged 5-14, if the father works in agriculture, and if the household is located in a rural area. The number of years of education is positively correlated with being male, the household head's years of education, and negatively with the child having ever migrated, the household size, and

the household head being male and being employed in agriculture.

Second, we include to our baseline model (equation 2) LGA-specific time trends to account for any unobservable time-varying characteristic at the LGA level which may confound the effect of conflict. These are, for instance, changing local economic conditions or school supply characteristics. Results do not change (column 3). This suggests that the effect of conflict is not confounded by omitted time-varying variables at the LGA level.

Next, we use an alternative definition of the control group. In particular, we define the control group to be children aged 15-20 as of 2009 at the beginning of the conflict (i.e. in 2009). Results (available upon request) indicate that the effect of conflict remains highly significant and negative even though - as expected - the magnitude of the effect is reduced.

Finally, we implement a placebo test. We re-estimate regression 2 using placebo groups. In particular, we define our placebo treatment group to include only individuals who presumably had already completed primary schooling by 2009, i.e. those aged 18-24 at the beginning of the conflict, and compare them with a placebo control group of individuals aged 25-30 by the same date. Results (available upon request) indicate that the estimated coefficient for γ in equation 2 is never significant. These results are reassuring as for the validity of our difference-in-differences methodology because they provide indirect support to the assumption of parallel trends for the treatment and control groups in absence of the conflict. Finally, these estimates are also useful in dismissing the idea that our main findings are driven by events occurred before the beginning of the conflict.

5.2.1 Additional results

Alternative conflict measures We re-estimate equation 2 using all our alternative conflict measures. Results are reported in Table 7. Column 1 reports the results when we measure conflict intensity as the total number of conflict events in the 5 km radius around each household. The results indicate that the effect is negative but not significant. Instead, when we look at conflict events caused by Boko Haram in the 5 km radius around each household, the negative effect on the number of completed years of education is large and significant (column 2). Interestingly, the effect is even larger and highly significant when we consider conflict events by Boko Haram that targeted schools (column 3). This is in line with the idea that the Boko Haram activities had a large negative effect on household education decisions.

Heterogenous effects We begin by exploring the possible heterogeneity by gender in the effects of conflict on human capital accumulation. Results reported in Table A.6 show a negative coefficient on the triple interaction term. Within conflict affected areas, male students have lost more years of education with respect to female students. This

Table 7: Effect of the Boko Haram conflict on years of education: alternative conflict measures

	Years of education		
	(1)	(2)	(3)
$Total\ conflict\ events\ (5\ km)_j * Treated_{ik}$	-0.2128		
	(0.2765)		
$Total\ conflict\ events\ by\ BH\ (5\ km)_j * Treated_{ik}$		-0.7002**	
		(0.3367)	
$Total\ conflict\ events\ by\ BH\ against\ schools\ (5\ km)_j * Treated_{ik}$			-0.8321***
			(0.2964)
Other controls	Yes	Yes	
Year of birth dummies	Yes	Yes	Yes
LGA dummies	Yes	Yes	Yes
Clusters	700	700	700
Observations	1815	1815	1815

Notes: Robust standard errors, clustered at the lga and cohort of birth level, are reported in parentheses. The dependent variable measures the number of years of education completed at the time of the interview. The estimation sample includes individuals whose year of birth is $1985 \leq k \leq 2003$. The treatment group includes the cohorts of individuals who were of mandatory school age (6-14) as of 2009, i.e. when the Boko Haram conflict started. The control group includes the cohorts of individuals who were not of school age (18-24) as of 2009. Other controls include: age of household head; male household head; years of education of household head; household size; number of household members aged 5-14; father works in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

suggests that the conflict in the North East of the country has somewhat diminished the gender-gap in schooling.[19]

Other dimensions are instead not relevant. In particular, the size of the effect of conflict on human capital accumulation does not depend on the child being Muslim. There is no differential effect in the impact of the conflict on non-Muslims, with both groups suffering a reduction in the number of years of education due to the conflict. At the same time, the effect does not depend on whether the child has ever migrated or on the type of place of residence (rural/urban).

5.3 Mechanisms

5.3.1 Child work

One potential mechanism through which conflict exposure might affect education outcomes is by inducing children to leave school to start working. To test for this possibility, we estimate again equation 2 using as dependent variable: 1) a dummy equal to 1 if the child works outside the household and zero otherwise; 2) a dummy equal to 1 if the child works in the household farm and zero otherwise; 3) a dummy equal 1 if the child works in the household non-farm enterprise and zero otherwise. Results reported in Table 8 show that - while conflict tends to increase the probability that the child works in each of the three activities, the effect is large and highly significant only for the work in the household NFE.

Table 9 explores in more detail the possible heterogeneity in the effect of conflict on child work in households' NFE. Results indicates that the probability to work in a NFE is significantly higher for male children and for students enrolled in Junior Secondary, i.e. those who have already completed primary education. These differential effects are somehow expected. Since non-farm enterprises are largely used by Nigerian households as a defensive-type of economic activity (Bertoni, Corral, Molini and Oseni (2016))[20], we interpret this as evidence that households more exposed to conflict are adopting a coping strategy where the male child is more likely to work to support the household, the more so the older is the child.

[19] Previous research has documented that exposure to conflict can result in significant gender differentials in individual educational outcomes but evidence is mixed (Buvinic, Das Gupta, and and Shemyakina (2014) for a review). Some studies have shown that the negative effect of conflict and violence is larger for girls (Chamarbagwala and Moran (2011); Shemyakina (2011); Singh and Shemyakina (2016)) while other studies find mixed results Justino, Leone and Salardi (2013) or even positive effects for girls (Valente (2014)). Finally, some studies find larger effects for males (Akresh and de Walque (2014), Swee (2015), Kecmanovic (2012), and Dabalen and Paul (2014)).

[20] The vast majority of NFE in Nigeria are in the retail trade sector and are characterized by low technical efficiency and employment capabilities (Bertoni, Corral, Molini and Oseni (2016))

Table 8: Effect of the Boko Haram conflict on child employment status

	Work outside HH (1)	Work on HH farm (2)	Work on HH NFE (3)
$Fatalities\ (5\ km)_{j,\,t-1}$	0.0001	0.0004	0.0007***
	(0.0001)	(0.0004)	(0.0002)
Controls	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes
School year FE	Yes	Yes	Yes
LGA-specific time trends	Yes	Yes	Yes
Clusters	55	55	5
Individuals	848	848	848
Observations	3709	3709	3709

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The dependent variable is a dummy that takes value 1 if individual i from household j living in LGA l worked outside household (column 1), on household farm (column 2), on household non-farm enterprise (column 3) in the 7 days prior to the interview and 0 otherwise. The estimation sample includes individuals whose year of birth is $1998 \leq k \leq 2003$, i.e. aged 6 to 11 as of 2009, when the Boko Haram conflict started. The controls include household size, percentage of female children aged 6-11 in the household, percentage of male children aged 6-11 in the household, father employed in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

Table 9: Effect of the Boko Haram conflict on child employment status: heterogeneity

	Work in HH NFE	
	(1)	(2)
$Fatalities\ (5\ km)_{j,t-1}$	0.0010***	0.0002
	(0.0003)	(0.0002)
$Fatalities\ (5\ km)_{j,t-1} * Female$	-0.0006***	
	(0.0002)	
$Fatalities\ (5\ km)_{j,t-1} *\ Junior\ Secondary$		0.0006***
		(0.0002)
Controls	Yes	Yes
Individual FE	Yes	Yes
School year FE	Yes	Yes
LGA-specific time trends	Yes	Yes
Clusters	55	55
Individuals	848	848
Observations	3709	3709

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The dependent variable is a dummy that takes value 1 if individual i from household j living in LGA l worked on household non-farm enterprise in the 7 days prior to the interview and 0 otherwise. The estimation sample includes individuals whose year of birth is $1998 \leq k \leq 2003$, i.e. aged 6 to 11 as of 2009, when the Boko Haram conflict started. The controls include household size, percentage of female children aged 6-11 in the household, percentage of male children aged 6-11 in the household, father employed in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

Household wealth Conflict may reduce school enrollment and lead to child work for different reasons. For instance, the more a household is affected by adverse economic consequences of the conflict, the more likely that the child will start working to provide additional support (Akresh and de Walque (2014); Shemyakina (2011)). To test for the presence of this motive behind the conflict-induced increase in child work in North-East Nigeria, we estimate our main regression using as outcome variables various household wealth indexes. Results (not reported) indicate that using these alternative proxies for household wealth the effect of conflict is in general negative but it is never precisely estimated. This suggests that the direct impact of the Boko Haram conflict on household wealth is ambiguous and it is unlikely to be the main reason for an increase in child labour.

School supply Conflict may also lead to a reduction in school enrollment and to an increase in child work by reducing the (expected) benefit of schooling. For instance, the conflict-induced worsening in school supply may reduce education quality, student academic performance, and possibly returns to education (Bruek, Di Maio and Miaari (2014)). This implies that in areas where conflict impacted school supply more negatively, household may have a lower incentive to enroll the child.

To explore this possibility, we look at how conflict affects school characteristics. In practice, we estimate a set of LGA-level panel regressions in which we regress various school characteristics on the number of fatalities occurred in the previous academic year controlling for LGA and school-year fixed effects. Our data include information for an (unbalanced) panel for the period 2007-2016 (described in detail in Section 3). The school characteristics we consider are: 1) the number of schools; 2) the number of teachers; 3) the number of male teachers; 4) the number of female teachers; 5) the students-teacher ratio. We have these data for both the primary and the junior secondary schools.

The results reported in Table 10 show the effect of previous year number of fatalities on school supply. Interestingly, it seems that where the conflict has been more intense, schools infrastructure have not worsen. In fact, if anything, there is evidence of the opposite: in more conflict-affected LGAs, the Government seems to have reacted investing more in education. In particular, in LGAs experiencing higher number of fatalities the number of primary schools has significantly increased (column 1). The effect is significant also when we look at the number of conflict events, with the effect being larger if the events are caused by Boko Haram (results not reported).

Yet, while the conflict seems not to have worsened school infrastructures, there is evidence that it has negatively affected the quality of the learning environment. Table 10 shows that, while the effect of conflict on the number of teachers in primary schools is positive even if not significant (see column 3), the effect of the number of fatalities on the number of teachers in junior secondary schools is negative and highly significant

Table 10: Effect of the Boko Haram conflict on school supply

	(Log) # of primary schools	(Log) # of junior secondary schools	(Log) # of primary school teachers	(Log) # of junior secondary school teachers
	(1)	(2)	(3)	(4)
$Fatalities_{l,\,t-1}$	0.0019***	-0.0004	0.0009	-0.0043***
	(0.0002)	(0.0003)	(0.0014)	(0.0010)
LGA FE	Yes	Yes	Yes	Yes
School year FE	Yes	Yes	Yes	Yes
Clusters	55	55	55	55
Observations	111	124	147	135

Robust standard errors, clustered at the LGA level, are reported in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

(columns 4).

Taken together, these results indicate that in LGAs more exposed to conflict expenditure in education tends to increase in the following year, with the effect being significant and larger in the case of areas exposed to Boko Haram conflict events. This is in line with the evidence discussed in Humphreys and Lee (2016) indicating that many states have invested in the development of educational infrastructure and in building new schools, although progress has been uneven. At the same time, there is a conflict-induced reduction in the number of teachers, especially for the junior secondary education. While we cannot directly test why there is this differential effect by school level, we note that this exactly mirrors the heterogeneous effect of conflict exposure on school enrollment and school dropout (see Table 2 and Table 5).

5.3.2 Student health

Another possible channel through which conflict may negatively impact educational outcomes is by worsening the health conditions of the student (Glewwe and Miguel (2008); Noury and Speciale (2016)). To test for this, we estimate again model 1 using as dependent variable several proxies for child health. In particular, we look at whether or not the child in the last 12 months: 1) suffered from illness; 2) consulted a doctor; 3) bought drugs; 4) has reported sight difficulties or; 5) mobility difficulties.

Table 11 shows that, while the effect of conflict on sight and mobility difficulties is positive but not significant (see columns 4 and 5), conflict increases the probability that the child has suffered from illness, consulted a doctor, and that the household bought drugs (columns 1-3). These results suggest that the deterioration of students' health conditions is thus another possible channel contributing to explaining the negative effect of conflict on education outcomes in North-East Nigeria.

Table 11: Effect of the Boko Haram conflict on health outcomes

	Suffered from illness	Consulted doctor	Bought drugs	Has mobility difficulties	Has sight difficulties
	(1)	(2)	(3)	(4)	(5)
$Fatalities\ (5\ km)_{j,t-1}$	0.0005**	0.0005*	0.0009**	0.0001	0.0001
	(0.0003)	(0.0003)	(0.0004)	(0.0002)	(0.0001)
Controls	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes
School year FE	Yes	Yes	Yes	Yes	Yes
LGA-specific time trends	Yes	Yes	Yes	Yes	Yes
Clusters	55	55	55	55	55
Individuals	839	839	839	839	839
Observations	2146	2146	2146	2146	2146

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The dependent variable is a dummy that takes value 1 if individual i from household j living in LGA l experienced the health-related specific event in the 4 weeks prior to the interview and 0 otherwise. The estimation sample includes individuals whose year of birth is $1998 \leq k \leq 2003$, i.e. aged 6 to 11 as of 2009, when the Boko Haram conflict started. The controls include household size, percentage of female children aged 6-11 in the household, percentage of male children aged 6-11 in the household, father employed in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

6 Conclusions

In this paper, we have provided the first empirical analysis of the impact of the Boko Haram conflict on schooling in Nigeria. Combining unique data from three rounds of the Nigeria General Household Survey Panel and household-level geo-localised data on fatalities and conflict events, we have estimated the effect of conflict on various education outcomes using individual-panel fixed-effects and difference-in difference regression models.

Our results have shown that conflict exposure decreases school enrollment and increases school dropout. Interestingly, these effects are larger for students in junior secondary school. We also find that conflict reduces the completed number of years of education. Next, we have discussed two possible mechanisms explaining why conflict may induce the child to abandon school. First, we have shown that conflict exposure increases child work in household non-farm enterprise. Since this choice does not seems to be fully explained by a reduction in household income, we argue that it is likely to be motivated by a reduction in the expected benefit of education due to the conflict-induced worsening in the quality of school supply. Second, we have found some evidence that the conflict has a negative effect on the general child's health, making this another possible explanation why children are forced to abandon school.

These results have clear policy implications. To minimize the negative impact of conflict on human capital accumulation a combination of policies directed to improve the quality of the school supply - especially in secondary education - and of the health system

is needed. In particular, attracting high quality teachers is central to school improvement efforts (OECD (2011)). To this end, the Government should provide teachers with monetary and non-monetary incentives (e.g. salary incentives; faster progress in the career; security guards in schools etc.) to attract them to most vulnerable areas.

These policy interventions are urgent. In fact, the conflict-induced reduction in enrollment rate in secondary education exacerbates the already existing education attainment gap between the North and the more productive South of the country (World Bank (2016*b*)). In particular, conflict-induced more unequal access to education can be transmitted across generations and further increase the income disparities among the two regions. If not mitigated, these increasing disparities in education would create additional tension between areas of the county possibly lead to more political instability.

References

Abidoye, Babatunde Oluwakayode, and Massimiliano Calì. 2015. "Income shocks and conflict: Evidence from Nigeria." *Policy Research Working Paper*, WPS7213.

Akbulut-Yuksel, Mevlude. 2014. "Children of War: The Long-Run Effects of Large-Scale Physical Destruction and Warfare on Children." *Journal of Human Resources*, 49(3): 634–662.

Akresh, Richard, and Damien de Walque. 2014. "Conflict and the Formation of Political Beliefs in Africa." *HiCN Working Paper 47*, , (202): 1–35.

Akresh, Richard, Sonia Bhalotra, Marinella Leone, and Una Okonkwo Osili. 2012. "War and stature: Growing up during the Nigerian civil war." *American Economic Review*, 102(3): 273–277.

Bellows, John, and Edward Miguel. 2009. "War and local collective action in Sierra Leone." *Journal of Public Economics*, 93(11-12): 1144–1157.

Bertoni, Eleonora, Paul Corral, Vasco Molini and Gbemisola Oseni. 2009. "Returns to Income Diversification: Evidence from Nigeria." *World Bank Policy Research Working Paper 7894.*

Blattman, Christopher, and Edward Miguel. 2010. "Civil War." *Journal of Economic Literature*, 48(1): 3–57.

Bruek, Tilman, Michele Di Maio, and Sami H Miaari. 2014. "Learning the Hard Way : The Effect of Violent Conflict on Student Academic Achievement." *IZA Discussion Paper Series No. 8543.*

Bundervoet, Tom. 2012. "War, Health, and Educational Attainment: A Panel of Children during Burundi's Civil War." *HICN Working Paper 114*, 1–34.

Buvinic, Mayra, Monica Das Gupta, and and Olga Shemyakina 2014. "Armed conflict, gender and schooling.." *World Bank Economic Review*, 28 (2), 311-319

Case, Anne, and Christina Paxson. 2010. "Causes and consequences of early-life health." *Demography*, 47(Supplement): S65–S85.

Chamarbagwala, Rubiana, and Hilcias E. Moran. 2011. "The human capital consequences of civil war: Evidence from Guatemala." *Journal of Development Economics*, 94(1): 41–61.

Dabalen, Andrew L, and Saumik Paul. 2014. "Estimating the Effects of Conflict on Education in Cote d'Ivoire." *The Journal of Development Studies*, 50(12): 1631–1646.

Di Maio, Michele, and Tushar Nandi. 2013. "The effect of the Israeli-Palestinian conflict on child labour and school attendance in the West Bank." *Journal of Development Economics*, 100: 107-116

Favara, Marta, Irajen Appasamy, and H. Garcia Marito. 2015. "Nigeria: Skills for Competitiveness and Employability." World Bank 96420NG (June), Washington, DC.

Foley, Kelly, Giovanni Gallipoli, and David A. Green. 2014. "Ability, parental valuation of education, and the high school dropout decision." *Journal of Human Resources*, 49(4): 906–944.

Glewwe, Paul and Edward Miguel. 2008. "The impact of child health and nutrition on education in less developed countries." In *Handbook Of Development Economics.*, ed. Schultz, P. T. and J., Strauss, Volume 4. Elsevier.

Harari, Mariaflavia, and Eliana La Ferrara. 2013. "Conflict, Climate Change and Cells: A Disaggregated Analysis." *CEPR Discussion Paper No. DP9277.*

Humphreys, Sara and Crawfurd Lee 2016. "Review of the literature on basic education in Nigeria: Issues of access, quality, equity and impact." *EDORE, Lagos, igeria*

Ichino, Andrea, and Rudolf Winter-Ebmer. 2004. "The Long-Run Educational Cost of World War II." *Journal of Labor Economics*, 22(1): 57–87.

IOM (International Organization of Migration). 2015. "Displacement Tracking Matrix Round VII."

Justino, Patricia. 2012. "Violent conflict and human capital accumulation." In *Elgar Handbook Of Civil War And Fragile States.* , ed. G.K. Brown and A. Langer, Chapter 13. Edward Elgar Publisher.

Justino, P., M. Leone, and P. Salardi. 2013. "Short- and Long-Term Impact of Violence on Education: The Case of Timor Leste." *The World Bank Economic Review*, 28(2): 320–353.

Kecmanovic, M. 2012. "The Short-run Effects of the Croatian War on Education, Employment, and Earnings." *Journal of Conflict Resolution*, 57(6): 991–1010.

Khan, Sarah, and Andrew J Seltzer. 2004. "The Impact of Fundamentalist Terrorism on School Enrolment: Evidence from North-Western Pakistan, 2004-09." , (10168).

Kondylis, Florence. 2010. "Conflict displacement and labor market outcomes in post-war Bosnia and Herzegovina." *Journal of Development Economics*, 93(2): 235–248.

Labo-Popoola, S.O., A.A. Bello, and F.A. Atanda. 2009. "Universal Basic Education in Nigeria: Challenges and Way Forward." *The Social Sciences*, 4(6): 636–643.

Lai, B., and C. Thyne. 2007. "The Effect of Civil War on Education, 1980–97." *Journal of Peace Research*, 44(3): 277–292.

Leon, Gianmarco. 2012. "Civil Conflict and Human Capital Accumulation: The Long-term Effects of Political Violence in Peru." *The Journal of Human Resources*, 47(4): 991–1022.

Marc, Alexandre, Neelam Verjee, and Stephen Mogaka. 2015. "The Challenge of Stability and Security in West Africa." World Bank. License: Creative Commons Attribution CC BY 3.0 IGO., Washington, DC.

Márquez-Padilla, Fernanda, Francisco Pérez-Arce, and Carlos Rodríguez-Castelán. 2015. "The (Non-) Effect of Violence on Education: Evidence from the War on Drugs in Mexico." , (April): 46.

Merrouche, Ouarda. 2006. "Households in Conflict Network The Human Capital Cost of Landmine Contamination in Cambodia." *HICN Working Paper*, , (25).

Miguel, Edward, and Gérard Roland. 2011. "The long-run impact of bombing Vietnam." *Journal of Development Economics*, 96(1): 1–15.

Minoiu, Camelia, and Olga N. Shemyakina. 2014. "Armed conflict, household victimization, and child health in Cote d'Ivoire." *Journal of Development Economics*, 108: 237–255.

Monteiro, Joana, and Rudi Rocha. 2017. "Neighbourhood violence and school achievement: Evidence from Rio de Janeiro's drug battles." *Review of Economics and Statistics*, 99 (2): 213-228.

National Population Commission and RTI International. 2016. "2015 Nigeria Education Data Survey Education Profile." United States Agency for International Development, Washington, DC.

NPVRN (Nigeria Political Violence Research Network). 2013. "Our Bodies, Their Battleground, Boko Haram and Gender-Based Violence against Christian Women and Children in North-Eastern Nigeria since 1999." *NPVRN Working Paper No. 1.*

OECD. 2011. "Teachers Matter: Attracting, Developing and Retaining Effective Teachers. OECD, Paris

Abdul G. Noury and Speciale, Biagio. 2016. "Social constraints and women's education: Evidence from Afghanistan under radical religious rule." *Journal of Comparative Economics*, 44(4): 821–841.

Paulo, Pedro, and Orraca Romano. 2015. "Crime Exposure and Educational Outcomes in Mexico."

Pivovarova, Margarita, and Eik Leong Swee. 2015. "Quantifying the microeconomic effects of war using panel data: Evidence from Nepal." *World Development*, 66: 308–321.

Raleigh, Clionadh, Andrew Linke, Håvard Hegre, and Joakim Karlsen. 2010. "Introducing ACLED: An Armed Conflict Location and Event Dataset." *Journal of Peace Research*, 47(5): 651–660.

Rodriguez, Catherine, and Fabio Sanchez. 2009. "Armed Conflict Exposure, Human Capital Investments and Child Labor: Evidence from Colombia." *Documentos CEDE*, , (ISSN 1657-5334): 76.

Roy, Sutanuka, and Prakarsh Singh. 2016. "Gender bias in education during conflict Evidence from Assam." *WIDER Working Paper 67.*

Shemyakina, Olga. 2011. "The effect of armed conflict on accumulation of schooling: Results from Tajikistan." *Journal of Development Economics*, 95(2): 186–200.

Singh, Prakarsh, and Olga N. Shemyakina. 2016. "Gender-differential effects of terrorism on education: The case of the 1981-1993 Punjab insurgency." *Economics of Education Review*, 0: 1–26.

Swee, Eik Leong. 2015. "On war intensity and schooling attainment: The case of Bosnia and Herzegovina." *European Journal of Political Economy*, 40: 158–172.

UNOCHA. 2015. "Humanitarian Bulletin." July, Nige.

Valente, Christine. 2014. "Education and civil conflict in Nepal." *World Bank Economic Review*, 28(2): 354–383.

Verwimp, Philip, and Jan Van Bavel. 2013. "Schooling , Violent Conflict , and Gender in Burundi." *The World Bank Economic Review*, 28(2): 384–411.

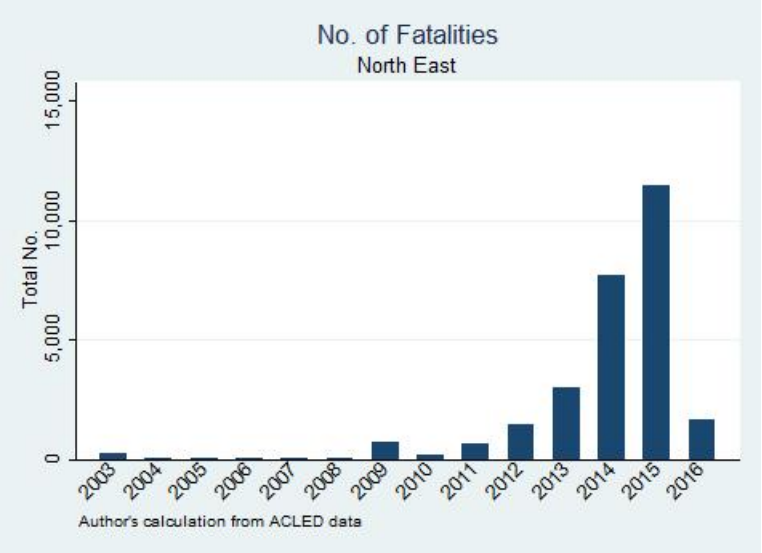
World Bank. 2015. "North-East Nigeria Recovery and Peace Building Assessment." World Bank, Washington, DC.

World Bank. 2016*a*. "Multi-Sectoral Crisis Recovery Project for North Eastern Nigeria." World Bank, Washington, DC.

World Bank. 2016*b*. "Poverty Reduction in Nigeria in the Last Decade." World Bank, Washington, DC.

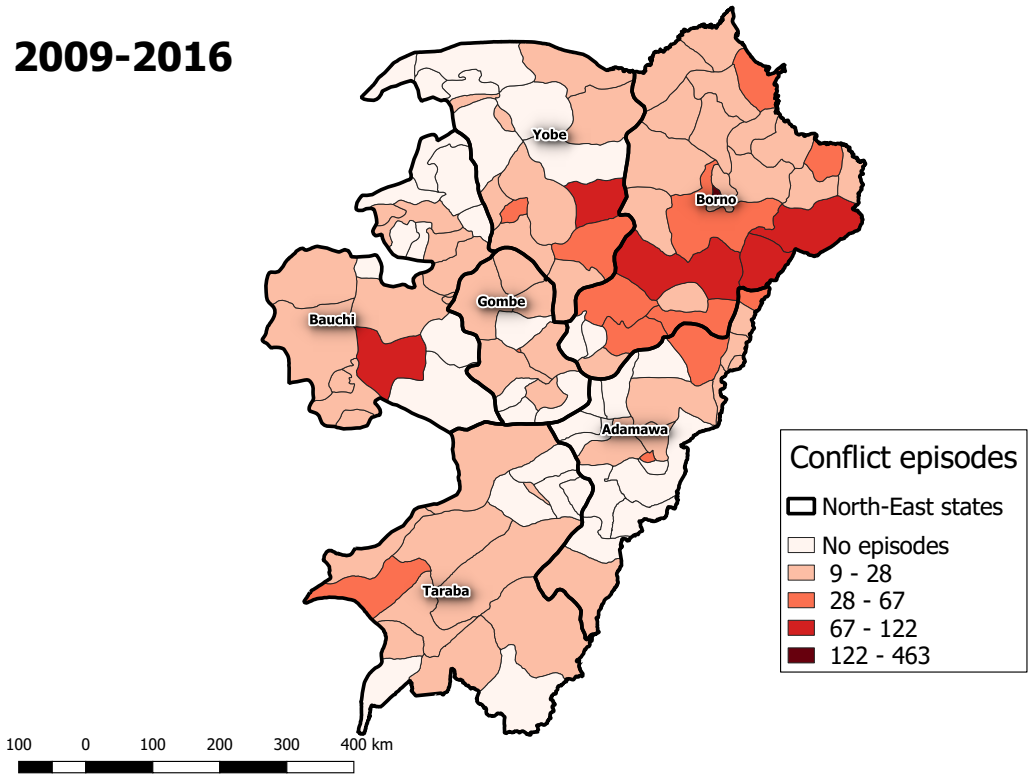
Figures

Figure 1: Total number of fatalities in each year (2003-2016)



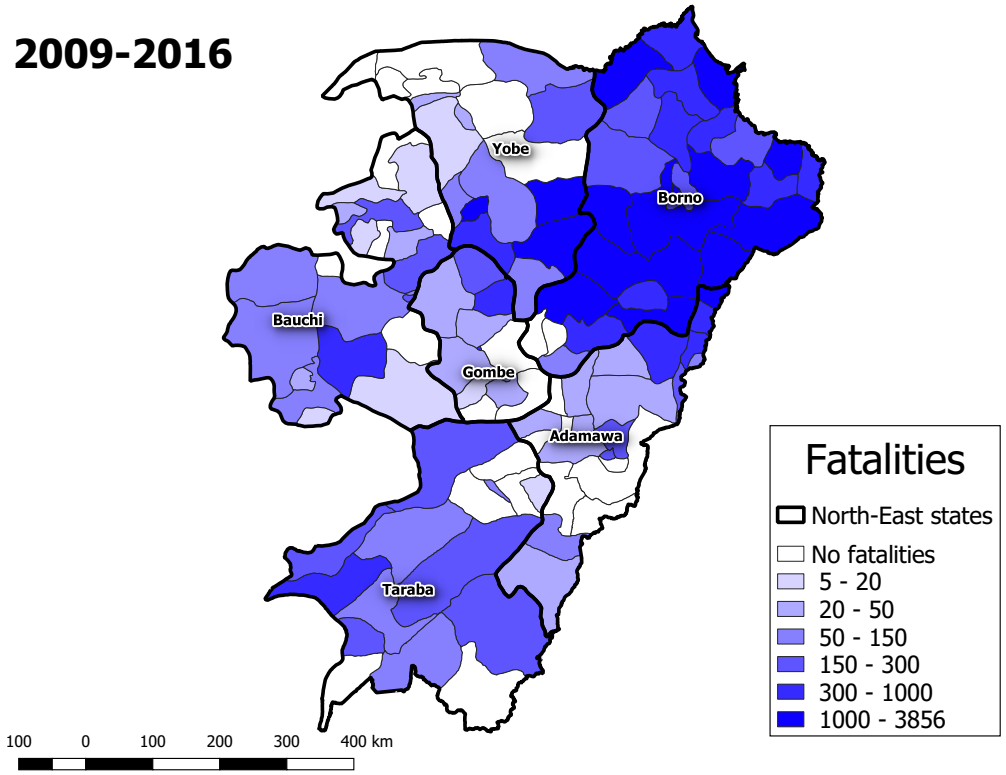
Notes. The figures plot the total number of fatalities in the North-East Nigeria as recorded in the ACLED dataset (Sources: ACLED).

Figure 2: Conflict episodes (2009-2016)



Notes. The figure plots the total number of conflict events in the North-East Nigeria as recorded in the ACLED dataset (Sources: ACLED).

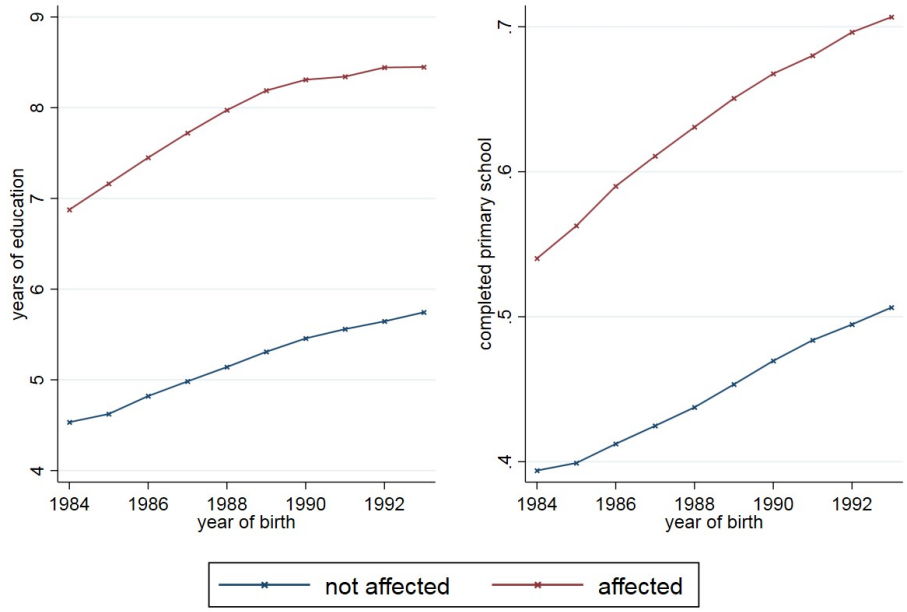
FIGURE 3: FATALITIES (2009-2016)



Notes. The figure plots the total number of fatalities in the Northern Nigeria as recorded in the ACLED dataset (Sources: ACLED).

Appendix

FIGURE A.1: PARALLEL TRENDS ASSUMPTION: PRE-CONFLICT TRENDS IN EDUCATION



Notes. The Figure reports the comparison between individuals who were not of mandatory school age when the conflict started ($1984 \leq t \leq 1994$) living in affected versus non affected LGAs. Not affected LGAs are the ones with no fatalities over the 2009-2015 period.

Table A.1: Summary statistics: panel regressions

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
Enrollment	3,709	0,69	0,46	0	1
Dropout	2,764	0,08	0,27	0	1
Child characteristics					
N. of years of education completed	3,709	3,77	3,51	0	12
Age	3,709	10,85	2,89	6	18
Muslim	3,709	0,74	0,44	0	1
Migrant	3,709	0,11	0,31	0	1
Household characteristics					
Residence is urban	3,709	0,19	0,39	0	1
Household size	3,709	10,49	4,42	2	34
N. of female members aged 6-11	3,709	1,49	1,25	0	9
N. of male members aged 6-11	3,709	1,63	1,34	0	9
Father works in agriculture	3,709	0,06	0,23	0	1
Mechanisms variables (labor)					
Worked outside household in past 7 days	3,709	0,01	0,09	0	1
Worked on family farm in past 7 days	3,709	0,25	0,43	0	1
Worked in household NFE in past 7 days	3,709	0,05	0,21	0	1
Mechanisms variables (health)					
Consulted a doctor in past 4 weeks	2,146	0,05	0,23	0	1
Suffered from illness in past 4 weeks	2,146	0,06	0,24	0	1
Bought drugs in past 4 weeks	2,146	0,08	0,27	0	1
Has mobility difficulties	2,146	0,08	0,26	0	1
Has sight difficulties	2,146	0,98	0,14	0	1
Conflict measures					
N. of fatalities in 5km radius (t-1)	3,709	5,75	30,64	0	285
N. of conflict events in 5km radius (t-1)	3,709	0,57	2,01	0	13
N. of conflict events by BH in 5km radius (t-1)	3,709	0,32	1,37	0	10
N. of conflict events against schools by BH in 5km radius (t-1)	3,709	0,02	0,24	0	4
N. of violent conflict events by BH in 5km radius (t-1)	3,709	1,63	9,40	0	100
N. of violent conflict events by GOV in 5km radius (t-1)	3,709	0,78	4,16	0	56
N. of fatalities in 10 to 20 km radius (t-1)	3,709	2,14	12,14	0	160
N. of fatalities in 20 to 30 km radius (t-1)	3,709	8,43	83,88	0	2270
N. of conflict events in 10 to 20 km radius (t-1)	3,709	0,30	1,34	0	17
N. of conflict events in 20 to 30 km radius (t-1)	3,709	0,71	2,70	0	27

Table A.2: Summary statistics: diff-in-diff regressions

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variable					
Years of education completed	1,815	5,17	4,95	0	16
Child characteristics					
Treated	1,815	0,70	0,46	0	1
Male	1,815	0,49	0,50	0	1
Muslim	1,815	0,73	0,44	0	1
Ever migrated	1,815	0,16	0,36	0	1
Household characteristcs					
Age of household head	1,815	51,40	13,35	18	89
Male household head	1,815	0,92	0,26	0	1
Years of education of household head	1,815	4,34	5,32	0	16
Household size	1,815	8,58	5,20	0	31
N. of members aged 5-14 as of 2010	1,815	3,28	2,53	0	15
Father works in agriculture as of 2010	1,815	0,21	0,41	0	1
Residence is urban as of 2010	1,815	0,12	0,33	0	1
Conflict measures					
N. of fatalities in 5km radius (2009-2016)	1,815	39,18	97,10	0	420
N. of conflict events in 5km radius (2009-2016)	1,815	5,38	13,99	0	75
N. of conflict events by BH in 5km radius (2009-2016)	1,815	2,86	6,47	0	23
N. of conflict events against schools by BH in 5km radius (2009-2016)	1,815	0,22	0,71	0	4
N. of violent conflict events by BH in 5km radius (2009-2016)	1,815	11,53	31,32	0	154
N. of violent conflict events by GOV in 5km radius (2009-2016)	1,815	7,46	22,43	0	127

Table A.3: Addressing potential selection bias: Attrition

Variable	Not interviewed in wave 3 (N=166)	Interviewed in wave 3 (N=638)	Mean difference
Household head's age	48.42	47.84	-0.58
Household head is male	0.96	0.94	-0.01
Household head's marital status	1.63	1.58	-0.05
Household head's years of education	3.79	5.15	1.36**
Place of residence is urban	0.23	0.17	-0.06
Father works in agricultural sector	0.26	0.16	-0.10***
Household head works as employee	0.17	0.18	0.01
Household head works in HH farm	0.53	0.56	0.03
Household head works in HH NFE	0.37	0.36	-0.01
Household size	6.57	8.02	1.45***
N. of members aged 5-14	2.15	2.42	0.28
N. of rooms	3.63	3.8	0.17
Improved toilet	0.04	0.2	0.16***
Floor quality	2.22	2.39	0.17**
Wealth index	-0.9	-0.76	0.14
Ownership of sewing machine	0.09	0.1	0.01
Ownership of radio	0.6	0.68	0.08**
Ownership of television	0.15	0.17	0.02
Ownership of computer	0.01	0.02	0.01
Ownership of motorcycle	0.3	0.35	0.06
Ownership of car	0.03	0.05	0.02

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Source: Nigeria GHS.

Table A.4: Pre-conflict characteristics and conflict intensity at LGA level

	Years of education	Primary school completion	Mandatory school completion	Average per capita expenditure	Percentage of poor	Percentage of Muslim
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Fatalities (LGA)	0.0750	0.0069	0.0034	-0.0046	0.0051	0.0082
	(0.0971)	(0.0085)	(0.0079)	(0.0084)	(0.0069)	(0.0104)
Panle B						
Conflict events (LGA)	0.0441	0.0035	0.0024	0.0010	0.0024	0.0075
	(0.0660)	(0.0058)	(0.0054)	(0.0057)	(0.0047)	(0.0070)
Observations	58	58	58	60	60	60

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The estimation sample includes all LGAs in the North East of Nigeria. Sources: Nigeria GHS and ACLED.

Table A.5: Effect of the Boko Haram conflict on school enrollment: robustness checks

	School enrollment				
	Children aged 6-9 as of 2009	Children aged 6-14 as of 2009	Children aged 6-14 as of any school year	Balanced panel	Excluding migrants
	(1)	(2)	(3)	(4)	(5)
$Fatalities\ (5\ km)_{j,t-1}$	-0.0008**	-0.0007***	-0.0006*	-0.0009***	-0.0009***
	(0.0003)	(0.0002)	(0.0003)	(0.0002)	(0.0002)
Controls	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes
School year FE	Yes	Yes	Yes	Yes	Yes
LGA-specific time trends	Yes	Yes	Yes	Yes	Yes
Clusters	55	56	55	52	52
Individuals	593	1193	1094	590	709
Observations	2604	5116	3541	2881	3305

Notes: Robust standard errors, clustered at the LGA level, are reported in parentheses. The dependent variable is a dummy that takes value 1 if individual i from household j living in LGA l is enrolled in school during the school year t and 0 otherwise. The controls include household size, percentage of female children aged 6-11 in the household, percentage of male children aged 6-11 in the household, father employed in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.

Table A.6: Effect of the Boko Haram conflict on years of education completed by gender

	Years of education completed
$Total\ conflict\ events\ (5\ km)_j * Treated_{ik} * Male$	-1.4291**
	(0.5583)
$Total\ conflict\ events\ (5\ km)_j * Treated_{ik}$	0.1580
	(0.3950)
$Total\ conflict\ events\ (5\ km)_j$	1.0802*
	(0.5735)
Male	1.5928***
	(0.2396)
All other controls	Yes
Year of birth dummies	Yes
LGA-specific time trends	Yes
Clusters	700
Observations	1815

Notes: Robust standard errors, clustered at the lga and cohort of birth level, are reported in parentheses. The dependent variable measures the number of years of education completed at the time of the interview. The estimation sample includes individuals whose year of birth is $1985 \leq k \leq 2003$. The treatment group includes the cohorts of individuals who were of mandatory school age (6-14) as of 2009, i.e. when the Boko Haram conflict started. The control group includes the cohorts of individuals who were not of school age (18-24) as of 2009. Other controls include: age of household head; male household head; years of education of household head; household size; number of household members aged 5-14; father works in agriculture. Sampling weights are used in all regressions. * significant at 10%, ** significant at 5%, *** significant at 1%. Sources: Nigeria GHS and ACLED.