

# **Education during conflict: the effect of territorial occupation by insurgents on schooling**

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November 24, 2022

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## **Abstract**

This study shows that civilians' behavior can be severely affected by territorial occupation by an insurgent group, and that these effects can persist after the government regains control and the occupation ends. I exploit the temporary occupation of territory in Nigeria by Boko Haram, an insurgent group with a strong anti-educational stance, as a quasi-experiment. Behavior is measured through school participation among children. Using individual-level panel data, I compare children exposed to the insurgency with children exposed to both the insurgency and occupation. The main results show (i) an immediate, negative effect on school participation, especially for those sharing a social identity with the insurgents, exposed to violent rule enforcement, and facing social pressure to conform, (ii) these negative effects persist in the long-run for the first and second group only. The effects cannot be explained by well-documented mechanisms linking conflict to lower school participation, demonstrating the need for accounting for occupation, and not solely violence, when considering the impact of insurgencies on civilians.

**JEL classification:** I24, D74, O10

**Keywords:** conflict, insurgency, rebel governance, education, development

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# 1 Introduction

While the effect of conflict on civilians' behavior has been studied extensively, existing work does not empirically distinguish between exposure to violence and to occupation by insurgents – even though the two concepts differ fundamentally. In the event of violence, public goods – such as safety, law, order, education or healthcare – can be provided by the public or private sector, while in the event of occupation the provision of these goods falls under control of the occupying group. Insurgents use these public goods to suppress, influence and coerce the local population, potentially changing behavior and attitudes of those they rule (Berman, 2003; Kalyvas, 2006; Mampilly, 2021; Maynard, 2019; Yakter & Harsgor, 2022). By using evidence from a quasi-experiment, I am able to disentangle the effect of exposure to territorial occupation by insurgents from the effect of exposure to violence, addressing the gap in the literature. In this paper I analyze the effect of occupation by rebels on civilians' behavior in the short and long-run, considering various sources of heterogeneity and potential mechanisms driving the effects.

The setting I focus on is the case of Boko Haram, an Islamic insurgent group active in the Lake Chad basin in north-east Nigeria. Various aspects make this a suitable setting to study the effect of occupation. First, though the insurgency affected large parts of the country, Boko Haram occupied only a limited number of areas. This enables the comparison of those exposed to the insurgency to those exposed to the insurgency and the occupation, disentangling the effect of occupation from the effect of violence. Second, the temporary nature of the group's occupation allows to me study whether potential behavioral changes in response to the group's rule were temporary or persistent, out-lasting the occupation. Third, Boko Haram imposed its anti-educational rule on individuals living in these places. This explicit anti-educational stance and the prohibition of schooling being at the core of the group's governance provides a clear outcome for measuring behavioral change: school participation.

Conceptually, the occupation – interchangeably called rule or governance – is defined as the territorial control of a rebel group and their actions towards civilians that live in that area. In this study, this specifically implies the imposition of anti-educational rules. This relates to the definition of rebel governance from Arjona et al. (2015), who defines rebel governance as “the set of actions insurgents engage in to regulate the social, political, and economic life of non-combatants during civil war” (p. 182). Within this framework, individuals confronted with occupation and governance are considered to face a choice between cooperation or resistance (Arjona et al., 2015). There are various factors that affect whether individuals are more likely to cooperate with rebels during territorial occupation: (pre-existing) positive sentiment towards, or local support for the rebels (Arjona et al., 2015; Brechenmacher, 2019) increasing the social pressure within groups to con-

form to the rules (Bursztyn & Jensen, 2017; Panagopoulos, 2014), having social identity markers in common (Stets & Burke, 2000) and experiencing violent enforcement of rule (Arjona et al., 2015; Olson, 1993). Applying this conceptual framework to the setting of this study, individuals either choose to comply with Boko Haram's anti-educational rule, or defy the group's governance and continue schooling.

Econometrically, this paper relies on panel data on children of school-going age from the Nigerian General Household Survey (NGHS). The treatment group consists of children exposed to the insurgency and Boko Haram's occupation. The control group is restricted to children that were only exposed to the insurgency. I use propensity score matching to select the appropriate control units and generate sampling weights that are used in the difference-in-differences estimation. The econometric model addresses potential spatial correlation by incorporating Conley (1999, 2008) standard errors. I show that the pre-treatment trends in school participation of the treatment and control group do not differ significantly, and address concerns regarding migration and attrition. A variety of factors that could threaten the identification strategy are discussed. For example, I show that the towns and communities that were occupied are comparable to those that remained under government control in terms of infrastructure, public good provision, population density, and so forth. To address why Boko Haram might have gained control over certain areas or areas and not others, pre-existing positive sentiment towards the group, earlier fundamentalist conflicts, and historical evidence for rejection of the secular state in the region is considered, as well as the rapid advancement and sudden halt of the group's occupation when pushed back by the Nigerian military.

Being confronted by rebel rule and territorial occupation by insurgents can lead to changes in behavior that are temporary, lasting for the duration of the occupation, or more permanent, persisting after the occupation has ended and the government regained control. The analysis includes two different outcomes to estimate these short and long-run effects. First, school participation during the occupation is not directly observable from the data, as the survey was not conducted during the two school-years that were affected by the occupation. I construct a variable that captures the difference between the total accumulated years of schooling (YoS) of a child prior to, and after, the occupation. This outcome indicates whether and for how long a child attended school during the occupation. The second outcome captures school attendance in the school-year after the occupation. An effect of the treatment on this outcome indicates whether a child is attending school after the occupation ended and whether potential initial effects persisted in the long-run.

The results indicate that the territorial occupation by Boko Haram decreased school participation in both the short and long-run. During the occupation, children in the treatment group accumulated about 11.5 months of schooling less than their counterparts. Additionally, these children are 30 percent less likely to attend school after the government

had regained control. To put this in perspective, the average adult in the region has approximately five years of schooling. The initial loss of schooling corresponds to about 20 percent of the total years of schooling of an average adult in the region. The fact that many children do not return to school suggests that they are at risk of turning this initial set-back into a permanent loss in education. Additional findings suggest that girls are especially at risk as they are less likely than boys to return to school. The results are robust with respect to different specifications of the spatially-clustered standard errors and alternative control groups.

I examine the results further. My analysis leads to several findings, that I interpret in the light of the determinants of potential compliance with insurgents' rebel governance as suggested by the literature. First, social identity theory posits that those sharing identity markers – religion – are more likely to adjust their behavior to be aligned with that of the group. This study finds evidence that this is indeed the case. Children from Muslim households are significantly more likely to have lower schooling outcomes, both in the short and long-run, in response to Boko Haram's occupation.<sup>1</sup> Second, pre-existing support for Boko Haram can cause social pressure to adhere to the group's rule. I find that while children that live in areas with relatively higher support for Boko Haram suffer larger set-backs in schooling during the occupation, they are more likely to attend school in the long-run. Third, insurgent groups often use violence to enforce rules within their territory (Arjona et al., 2015; Olson, 1993). Distinguishing school-targeted from non-school targeted violence, the results show that experiencing being exposed to anti-educational violence while facing the occupation decreases school participation in the long-run. Importantly, this result does not hold for exposure to non-targeted violence.

It is important to emphasize that I study the impact of territorial occupation within a context of insurgency, violence and conflict. A reasonable concern is that the results are driven by these matters, and not occupation per se. To address this concern I examine various well-documented mechanisms that drive lower school participation in response to conflict.<sup>2</sup> I find weak to no evidence that any of these mechanisms offer a plausible explanation for the significant and large decreases in school participation.

The baseline analysis is extended in various ways. First, I estimate the model using a non-binary treatment variable that accounts for the duration of the occupation in

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<sup>1</sup>This finding highlights the importance of considering occupation independently of violence: other studies have found that the effect of exposure to Boko Haram's violence on school attendance is not heterogeneous for children of Muslim households (Bertoni et al., 2019).

<sup>2</sup>These are economic shocks that may increase child labor (Bundervoet et al., 2009; Duryea et al., 2007; Jacoby & Skoufias, 1997; Thomas et al., 2004), worsening child health (Allison, Attisha, et al., 2019), child marriage (Mazurana et al., 2019; Mourtada et al., 2017; Walker, 2013), school supply (Akbulut-Yuksel, 2014; Glewwe & Jacoby, 1994; Jayachandran et al., 2002), and changes to labor market outcomes and education premiums (Chamarbagwala & Morán, 2011; Shemyakina, 2011).

different areas. The results indicate that the longer the duration, the stronger the effects on school participation. Second, though data is limited, I show that, aside from school participation, educational attainment is also negatively affected by the occupation.

Summarizing, this study demonstrates that school participation is severely affected by territorial occupation by an insurgent group, on top of the already negative impact of conflict. Focusing on exposure to violence alone is not sufficient to properly examine these effects. The results show that the effects of occupation can be not just large, but can also persist after the government has regained control. Second, the effect of exposure to rebel governance varies across groups and over time, and cannot be explained by well-known mechanisms found in the literature. However, this study provides a first step in the direction of better understanding the role that identity, pressure, and enforcement play with respect to how, and to what extent, various individuals are affected by occupation and subsequent rebel governance.

The paper is structured as follows. Section 2 contains background information, providing a discussion of Boko Haram and its occupation of territory, as well as evidence that the group actively forbade education and schooling in their proclaimed caliphate. Section 3 discusses a framework within which to consider occupation, rebel governance and conflict, and discusses hypotheses and mechanisms. The data, sample, treatment and control group are discussed in section 4. Section 5 describes the empirical approach, and 6 discusses the identification strategy. Section 7 contains the results, and section 8 the mechanisms behind the effects. Finally, extensions of the estimation and robustness tests are shown in section 10 and section 11 concludes.

## Literature

The results of this study demonstrate the need for accounting for occupation, and not solely violence, when considering the impact of insurgencies on the behavior of civilians. In doing so this work contributes to the growing literature on rebel governance (Arjona, 2014, 2016, 2017; Arjona et al., 2015; Barter, 2015a, 2015b; March & Revkin, 2015). However, the majority of this literature focuses on the insurgents and the strategic value of the occupation of territory and governance, whereas this paper examines the effect of occupation on the behavior of those facing the rebels. By estimating the effect of occupation in a quasi-experimental setting, I present a novel way of approaching the matter and allows to disentangle effects of violence and conflict from governance and occupation. This research thereby contributes to the work on the impact of occupation on civilians (Humphreys & Weinstein, 2006; Kalyvas, 2006; Mampilly, 2012; Rubin, 2020, among others). Importantly, this study is, to my knowledge, one of the first that provides empirical estimates of the impact of rebel occupation on civilians, additionally showing evidence

suggesting that social identity and social pressure are key in explaining why certain people change their behavior in response to occupation and others do not. By discussing these matters and the violent enforcement of a specific (anti-educational) ideology within a framework of behavioral change in response to occupation, this paper contributes to the debate concerned with ideology and attitudes during civil war as mentioned in Hirose et al. (2017). Furthermore, this paper further illustrates the usage of public goods by insurgents to suppress, influence and coerce the local population, and how this affects the behavior and attitudes of those they rule (Berman, 2003; Kalyvas, 2006; Mampilly, 2021; Maynard, 2019; Yakter & Harsgor, 2022).

By studying the relationship between insurgents' rebel governance and occupation on education during conflict, this study adds to the large literature that examines the effect of conflict on educational outcomes (Justino, 2011, for an overview) such as governments' expenditure (Lai & Thyne, 2007), educational attainment (Akresh & De Walque, 2008; Chamarbagwala & Morán, 2011; Parlow, 2011; Singh & Shemyakina, 2016; Swee, 2015; Verwimp & Van Bavel, 2014) and school drop-out rates, school attendance and enrollment (Bertoni et al., 2019; Khan & Seltzer, 2016; Shemyakina, 2011; Valente, 2014).

## 2 Institutional background

Though self-identified Islamic groups' ideologies vary, there are various ideological stances that they have in common: the use of violence aimed at those who are at odds with Islamic imperatives, the obligation to use violence when (Muslim) rulers deviate from this, the goal to found an Islamic state, and rejection of the secular state (Crisis group, 2016). The conquering of territory (as done by Boko Haram, al-Shabaab and Islamic State of Iraq and the Levant (ISIL), and others) is a clear step towards the latter.

Moreover, many organizations that represent themselves as Islamic insurgent groups strongly oppose secular ("Western") education, though there is no religious justification for the anti-educational stance (VOA, 2022). Occupation of territory by such actors often involves subsequent denial of access to education for inhabitants as part of the insurgents' governance (GCPEA, 2020), and many of such groups carry out attacks on educational targets such as schools, students and teachers (GCPEA, 2020). Examples are Ansarul Islam, active in Burkina Faso and Mali, Jama'at Nusrat ul-Islam wal-Muslimeen (JNIM) in Mali, Islamic State of Khorasan Province (ISKP) active in Afghanistan, ISIL in Iraq, the Taliban and al-Qaeda in Pakistan, al-Shabaab in Somalia, and Boko Haram in the area of the Lake Chad basin, specifically in Nigeria.

Carrying out attacks instills fear and intimidates the population, and has been shown to decrease schooling outcomes (Bertoni et al., 2019). However, control over territory is

fundamental in allowing these groups to further exert their power and (anti-educational) ideology: controlling territory and proclaiming yourself as ruler provides a group with a sense of legitimacy (Loyle et al., 2021), and is a prerequisite for rebels' exercising of local authority (Anders, 2020; Kalyvas, 2006; Kasfir, 2005). Control over territory allows insurgent groups to – in this case – exercise their anti-educational rule and prohibit schooling. The educational system is one of the main tools at rebels' disposal to gain support among or suppress the population (Mampilly, 2021), and there is evidence that Islamic insurgent groups that occupy territory almost entirely prohibit education, closing schools and prevent other means of schooling (GCPEA, 2020).<sup>3</sup> This study analyzes the effect that experiencing such occupation has on the school participation of children, by focusing on the specific case of Boko Haram and its occupation of territory in North East Nigeria.

## 2.1 Education in North East Nigeria

Nine years of (primary and junior secondary) education are free and obligatory in Nigeria, as per the Compulsory, Free Universal Basic Education Act implemented in 2004. Nevertheless, Nigeria in general has the largest percentage of out-of-school children in the world (Unicef, 2015) and the lowest educational outcomes of all sub-Saharan countries (Abdullahi & Abdullah, 2014). The situation is especially dire in the North East, a poorer and more rural region.

There are various reasons for the difficult relationship of the population of the North of Nigeria with the education system. Afzal (2020) cites four reasons for this. First, there is a lack of support in the north for the state's imposed, post-colonial, and Western system of education. Second, the education system is held accountable for poor educational outcomes in the north, as the population had not become familiar with it during colonization, contrary to the south. Third, following low educational outcomes, the system is blamed for joblessness and low educational premiums. Finally, Western education is seen to represent the Nigerian state's corruption, as many state officials are Western-educated. Against this background, Boko Haram formed as an insurgent group with clear anti-educational stance.

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<sup>3</sup>There is only one recorded exception: the case of the Islamic State. The group, after keeping schools closed for prolonged period of time, completely redesign the curriculum to fit with their ideology and allowed children to attend school. However, only specific (IS controlled) schools were allowed, and girls were strongly discouraged from attending (Arvisais & Guidère, 2020). Note that the initial closing of schools and prohibiting of education lead to severe losses in education among children.

## 2.2 The case of Boko Haram

The Boko Haram insurgency started in 2009 and is currently ongoing. Boko Haram is one of the largest militant groups in Africa (CFR, 2022), and is predominantly active around the Lake Chad basin. The Islamic insurgent group rejects all secular aspects of Nigerian society and strives to establish an Islamic state in Nigeria (Anugwom, 2018; Center for International Security and Cooperation, 2018; Omenma et al., 2020; Thurston, 2016) with Shari'a criminal courts (CFR, 2018). It asserts the right to rebel against allegedly infidel states, use force to impose a strict interpretation of Islamic law on civilians (Thurston, 2016), and specifically rejects Western education (Anugwom, 2018).<sup>4</sup>

In the years following the initial anti-government uprising that started the insurgency, the frequency, size and impact of the attacks carried about by Boko Haram drastically increased. This change has been attributed to changes in leadership of Boko Haram, as well as Boko Haram's co-operation with al-Qaeda (Center for International Security and Cooperation, 2018). As Boko Haram grew in size and carried out more attacks, it started to finance itself through robberies, kidnapping, extortion and raids of military stations. In response to the escalating situation the Nigerian government declared the state of emergency in three states in the North East - Borno, Adamawa and Yobe - in May 2013 and deployed a high number of military personnel to the area. Though the number of military personnel in the region increased significantly, Boko Haram started to carry out more military-style offensives on towns in the region, gaining control over various local government areas (LGAs). In the second and third quarter of 2014 Boko Haram captured more territory and declared its caliphate in August 2014.<sup>5</sup>

According to interviews conducted by Amnesty International (2015) with former inhabitants of the caliphate, Boko Haram ruled according to its set of beliefs and ideology. The group actively tried to wipe out all (Western) influences on day-to-day life, and convert and enforce its ideas on the local population.<sup>6</sup> To aid ruling its caliphate, Boko Haram appointed Emirs who dealt with matters in a town.<sup>7</sup> Civilians that did not follow the

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<sup>4</sup>Boko Haram, loosely translated, means "Western education is forbidden".

<sup>5</sup>Figure A.6 shows the progression of the occupation of Boko Haram based on this data from ACLED. Considering the pattern of the spread of occupation in figure A.6, it is clear that the group steered clear, or was incapable of, conquering the more central and middle regions of Borno specifically. This can be explained by the fact that the government forces were stationed in September 2014 around Maidiguri (the capital of Borno) and more south towards the northern borders of Damboa and Bama (OCHA).

<sup>6</sup>According to Amnesty International (2015) the rules affected almost every aspect of day-to-day life such as the usage, possession or sale of cigarettes, the type of clothing worn by and general appearance of men and women, the selling of products on markets, etc.

<sup>7</sup>For example, the Emir (often someone from the town that supported Boko Haram) was responsible for approving forms of travel between towns within Boko Haram's territory for civilians, as well as ensuring that Boko Haram's rules were followed. Note that leaving the caliphate was in most cases almost entirely prohibited. In various villages Boko Haram imprisoned people or placed them under constant guard. In places where civilians were allowed to move freely within the town, Boko Haram

rules risked being trialed and punished.<sup>8</sup> For those who cooperated with Boko Haram, followed the rules and supported the group, life could sometimes be mildly easier. For example, Boko Haram distributed food, often looted from other villages, among households that supported them. The rules that Boko Haram enforced were aligned with goal to implement a strict Shari'a law in its territory, and were based in its strong anti-democracy and anti (Western) education sentiment. Attending schools and other forms of education were entirely forbidden under Boko Haram's rule.

Boko Haram rapidly expanded the area under control rapidly and continued to do so into early 2015. In January of that year, Goodluck Jonathan - the Nigerian president at the time - supported the creation of an African task-force aimed at countering Boko Haram. In February 2015 the military offensive of the task-force started, and Gwoza - considered the headquarters of Boko Haram - was captured in March 2015.<sup>9</sup> This was considered the end of Boko Haram's caliphate and control over the region.

In the time period that followed, the North East saw a significant drop in violence (CFR, 2018) but suffered the long-term consequences of the conflict and occupation. While Boko Haram was expelled from the areas it controlled, the group still carried out attacks in the region. According to the Crisis group (2017), the extensive damage to the economic infrastructure in various parts of the North East, and bans or restrictions on trade as to deny Boko Haram access to supplies lead to a heightened level of food insecurity. This situation affected the entire North East, but especially Borno, Adamawa and Yobe. After the government had regained control over the region it was possible for humanitarian groups to access the previously occupied LGAs and provide educational, food, and health aid. Importantly, according to Relief web (2017), in all previously occupied states (in the sample used in this study - see section 4) there were NGOs present to provide access to education, quality emergency learning, and educational system strengthening.

Considering the evidence discussed above, it is clear that Boko Haram actively engaged in rebel governance. Moreover, the fact that Boko Haram's strong anti-educational stance was central to this governance makes it a suitable case to examine the impact of Islamic insurgents' occupation of territory on schooling.

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fighters patrolled the streets and areas between villages, ensuring no-one escaped Boko Haram territory (Amnesty International, 2015).

<sup>8</sup>In order to deal with such cases, Boko Haram installed institutions such as a courts where civilians' cases were judged (Amnesty International, 2015).

<sup>9</sup>The recapturing of the areas by the government are shown in figure A.7.

### **3 Framework and mechanisms**

The territorial control of Boko Haram, proclamation of its caliphate in these areas, and the group’s actions towards civilians under their rule are considered the occupation and subsequent rule that this paper focuses on. Conceptually, occupation (often) takes place within a general setting of conflict. This implies that aside from occupation, dynamics relating to conflict are present. Therefore this paper builds on work on rebel governance, in order to capture dynamics in occupied territory and understand how any effects might have arisen, as well as the extensive literature on conflict and its effects on education. The frameworks are applied to the case of Boko Haram, the effects of exposure to conflict and occupation disentangled, and the effect of the latter on school participation estimated. In doing so, this study examines whether those exposed to occupation adjust their behavior to adhere to the rebels’ rule, and provides an in-depth discussion of channels and mechanisms that drive these effects.

#### **3.1 Occupation and rebel governance**

Occupying territory allows rebels to exercise authority and thereby govern, or impose rules on, the population of those areas (Anders, 2020; Kalyvas, 2006; Kasfir, 2005; Loyle et al., 2021). As discussed in Arjona et al. (2015), when facing rebel governance, the population can either choose to cooperate (comply with the rules) or resist (reject the rules). In the case considered, lower schooling outcomes would imply that an individual adhered with Boko Haram’s prohibition of schooling, i.e., cooperated with Boko Haram – and vice versa, with resistance leading to higher schooling outcomes. The literature identifies various determinants that might lead to certain sub-groups of the population being more likely to cooperate or comply. These determinants will be examined as potential sources of heterogeneity of the treatment effect.

#### **3.2 Heterogeneity: social identity, social pressure to conform and enforcement of rule**

First, sharing a social identity can lead to a heightened sense of belonging or shared identity among people (Stets & Burke, 2000). Having such a shared identity can lead to higher support for those that have, for example, the same religion (Knott & Lee, 2020; Seul, 1999; Stets & Burke, 2000). As noted by Stets and Burke (2000), those who feel a sense of belonging to a certain group are “more likely than not to participate in that groups culture [...] and show attraction to the group in their behavior” (p. 4). It might be that having a religion in common indeed leads to having a more positive sentiment or

higher level of support, compared to those who do not share a religion. Based on this, I posit that inhabitants of the caliphate that have identity markers, such as religion, in common with Boko Haram might have been more likely to converge in terms of behavior and attitudes (i.e., rejection of education) than those who do not have similar identity markers.

Additionally, building upon shared identity, the extent of compliance among the local population can be due to pre-existing pro-Boko Haram sentiment among the population. Especially “those who perceive their institutions as illegitimate or ineffective may welcome change” (Arjona et al., 2015, p. 186). Given the anti-Western education sentiment in the North East (Afzal, 2020) as mentioned above, it is likely that many might have been receptive to Boko Haram’s viewpoints. Moreover, it is known that weak service provision and negligence on behalf of the government lead to increased local support for Boko Haram (Brechenmacher, 2019). Crucially, rebel control in areas with low government service provision leads to heightened social cohesion within villages (Rubin, 2020). Increased cohesion implies higher levels of social pressure to conform to ideas or rules. Moreover, individuals are more likely to engage with pro-social behavior and compliance with social rules when they are being watched or experience social pressure (Bursztyn & Jensen, 2017; Panagopoulos, 2014). This is especially the case during occupation by insurgents, when failure to conform is punished, and the negative consequences of one person failing to conform can affect the whole group (Arjona et al., 2015).

This suggests that those who live in an environment where there is stronger pro-Boko Haram sentiment and the occupation increased levels of social control and pressure to conform, will experience lower schooling outcomes. In order to obtain an instrument that measures support for Boko Haram, and consecutive heightened pressure to conform to Boko Haram’s rule, I turn to Archibong (2019). Archibong (2019) shows that areas that were traditionally ruled by a centralized authority and had a Muslim super-majority population experience lower levels of public good provision by the government. The measure of Archibong (2019) will be used as an instrument to capture positive sentiment towards Boko Haram (discussed more in-depth in section 5 and 6) and examine potential heterogeneity of the treatment effect.

Violence can be used as a tool during occupation, conflict and war. It serves a different purpose in occupied and non-occupied territory. According to Olson (1993), insurgents in control of territory (stationary bandits) often strive for “peaceful order”. Violence aimed at the civilians is often used to punish disobedience or defiance of group’s governance. This form of violence will be referred to as enforcement of rule. In areas where insurgents govern, cooperation with the occupying rebels most frequently takes place as to avoid such violence (Arjona et al., 2015). Based on this notion, I expect that those who experience such enforcement are more likely to adjust their behavior (i.e., have lower

schooling outcomes) compared to those who are not exposed to such violence.

The differential effects of civil war and conflict with respect to gender are highly context-specific (Buvinić et al., 2014), but it is known that Islamic insurgent groups often strongly oppose girls' education.<sup>10</sup> This dimension to the anti-educational rule will be examined by estimating the potential heterogeneity of the effect by gender. Moreover, the start of the occupation will have coincided with a different stage in the education of each child. A child that is just about to start primary school might opt not to attend school anymore; one that has been going to school already might be more inclined to return. This will be considered by examining the effect for different birth cohorts.

### 3.3 Education during conflict and civil war

The above focuses on the adjustment of behavior in response to direct exposure to rebel governance. It frames cooperation with Boko Haram's during occupation as compliance with its prohibition of schooling, leading to rejection of education and, in turn, lower educational outcomes. However, this study is also concerned with what happened in the long-run: did children go to school after the government regained control? Did those who might have dropped out during the occupation return to school? These questions – as well as those concerning what happened during the occupation itself – are answered in a general conflict setting.<sup>11</sup> It is therefore important to acknowledge the potential presence of mechanisms that are not specific to occupation and rebel rule, but conflict in general. Moreover, after the occupation, “regular” civil war or conflict dynamics might have become more prominent. Examining these mechanisms additionally serves as a validity test: if the results indicate that any effects can be explained by conflict, this would cast doubt upon the identification of the effect of occupation.

Turning to the literature considering the relationship between educational outcomes and conflict, the dominant narrative is that exposure to (civil) war, conflict and violence has a negative impact on educational outcomes (for an excellent overview, see Justino (2011)). The mechanisms I consider are well-documented explanations for the decrease in schooling. First, conflict and civil war can lead to a decrease in income for the household (Bundervoet et al., 2009; Jacoby & Skoufias, 1997; Thomas et al., 2004), causing children to work in order to compensate the loss in household income (Duryea et al., 2007). Second, a decrease in access to healthcare, as well as the potential exposure to danger and violence can lead to worse health among children. Children with worse health are

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<sup>10</sup>A clear example related to the case at hand is the kidnapping of schoolgirls by Boko Haram in Chibok in 2014.

<sup>11</sup>Even though Boko Haram was expelled from the areas it controlled, it still carried out attacks in the area and the conflict is considered to have been ongoing.

less likely to attend school (Allison, Attisha, et al., 2019). Moreover, child marriage is shown to increase in response to conflict, as the economic situation deteriorates, returns to education diminish, and schooling is disrupted (Mazurana et al., 2019; Mourtada et al., 2017; Walker, 2013). Additionally, when future expected payoffs of having an education are lower, the cost of attending school might not out-weigh potential benefits and children might decide to stay home (Chamarbagwala & Morán, 2011; Shemyakina, 2011).

Considering the general background of conflict and civil war, it is important to examine the role of violence.<sup>12</sup> In non-occupied territory insurgents act as roving bandits and violence in such a setting is aimed at looting and extracting resources (Olson, 1993). This different type of violence (i.e., not aimed at upholding or enforcing rules) can have an impact on educational outcomes. It might be that such violence is a mechanism driving the potential effect on educational outcomes. Various forms of violence will be examined to consider this possibility.

Finally, conflict can affect the supply of education, prohibiting those that want to go to school to do so. For example, children cannot attend school when there are no schools or teachers, i.e., when school supply is low or non-existent (Akbulut-Yuksel, 2014; Glewwe & Jacoby, 1994; Jayachandran et al., 2002). Similarly, it is important to consider whether children might have changed the type of school they attended (whether children might have switched from state to religious schools, etc.) or commute to school has increased.

## 4 Data and sample

Individual-level panel data is obtained from three waves of the Nigerian General Household survey (NGHS). Every wave covers two years, and the survey is conducted twice per wave: once during the harvest season (fall), and once during the planting season (spring). Aside from regular questions with regards to individual characteristics, respondents are asked whether they attend school, what type of school they attend, and so forth, for both the current and/or previous school-year. The survey therefore provides information on the 2009/10, 2010/2011, 2011/12, 2012/13, and 2015/16 school-years. The survey does not cover the 2013/2014 and 2014/2015 school-years, the time period during which Boko Haram controlled large swathes of territory. The last school-year observed in the data prior to the occupation is 2012/2013, and the only school-year observed after the treatment is the 2015/2016 school-year. Hence there is a gap of two full school-years between the last pre-treatment observation and the post-treatment observation (see figure 1).

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<sup>12</sup>The potential difference in type (and level) of violence that took place in occupied and non-occupied areas is a potential threat to identification. I will discuss this in section 5 and 6.

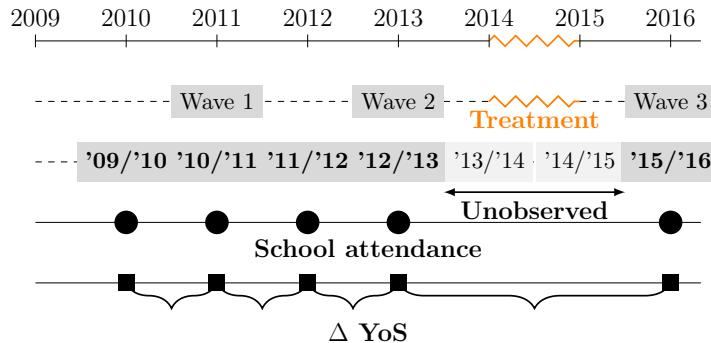


FIGURE 1. DATA STRUCTURE: INDIVIDUAL PANEL DATA FOR FIVE SCHOOL-YEARS

*Notes:* The diagram explains the data structure. The timeline shows the period considered in this study; the occupation (treatment) took place between 2014 and 2015. The three waves were carried out in 2010/2011, 2012/2013, and 2015/2016. Combined, these provide data on the school-years shown. The gap in the data covers two school-years: 2013/2014 and 2014/2015. School attendance is measured for each year; the change in years of schooling is obtained by taking the difference between the current, and previous, total number of Yos.

Only individuals born between 1998 and 2008 are included in the sample as to ensure they were of mandatory school-going age prior to the start of the treatment. The sample is further restricted to include only individuals who live in an LGA that was covered in all survey waves. Due to safety concerns, various LGAs were excluded from the survey in later years. Any individuals living in these regions are excluded from the sample, as they would not have been observed prior to the treatment. However, individuals who potentially might have dropped out of the sample are also excluded. This is an inclusion restriction that might have affected the attrition rates, which are discussed below.

The NGHS includes a community component. For this part of the survey a group of community members is surveyed on the presence of various public goods, local events, infrastructure, and so forth. These surveys were conducted in 2010, 2012 and 2016. I rely on this part of the NGHS to examine potential differences between the communities in the sample prior to and after the treatment, as well as obtain more detailed information on the school supply in the region.

Data on violent events comes from ACLED (Raleigh et al., 2010).<sup>13</sup> I focus on events categorized as violent (excluding, for example, peaceful protests) and that are initiated by Boko Haram. Since ACLED includes information on the precise location of the violent event and the NGHS on the location of the household, it is possible to construct variables that capture the individual-level exposure to violence. Similarly, data on the locations of schools is from Archibong et al. (2015), and is used to first determine the school(s)

<sup>13</sup>ACLED gathers data on violent events related to Boko Haram through media reports, and a local network of journalists, informants, regional specialists and NGO workers. Any attacks claimed or reported by Boko Haram themselves are cross-referenced with these sources. Through this network ACLED was able to obtain information on events during the height of the conflict and on those that took place in occupied territories.

in vicinity of a household, and then determine whether these were attacked by Boko Haram. I discuss this measure in section 5, and when considering the results with respect to exposure to violent enforcement of Boko Haram’s rule. All variables regarding violence are lagged by one year, as to account for last years’ events affecting the observed years’ decisions on schooling. Note that by doing so, any violence that occurred during the occupation (2014/2015) is accounted for in the analysis.

Additionally, data on the number of primary and secondary school teachers per LGA comes from the Universal Basic Education Commission (UBEC) and is available for 2010, 2011, 2012, 2013 and 2016. Data on rainfall and temperature on LGA level is obtained from the World Bank, and information on migration flows from FEWS. Finally, data on precolonial centralization and regional ethnic majorities is taken from Archibong (2019) and is used to discuss historical grievances and potential positive sentiment towards Boko Haram in various areas, as well as to measure pro-Boko Haram sentiment in various regions.

#### 4.1 Treatment

The treatment is defined as being exposed to Boko Haram’s temporary occupation that occurred between 2014 and 2015.<sup>14</sup> The areas that the group occupied are identified using two different data sources. First, data from ACLED is used to document where and when (non-)violent transfer of territory to Boko Haram occurred. Second, the data from ACLED is cross-referenced with maps of the IOM (2015). These maps depicts the areas that were fully and partially under Boko Haram control in January 2015 (see figure A.6). By cross-referencing data from both sources, it is possible to control for potential measurement errors or diverging accounts.<sup>15</sup> All LGAs that have experienced any violent event during which Boko Haram gained control over territory according to ACLED, and were deemed “inaccessible” or “under control of Boko Haram” according to the IOM,

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<sup>14</sup>As noted previously, Boko Haram lost control of the areas relatively quickly and the occupation was temporary, starting in May 2014 and lasting until Spring 2015. As can be seen in figure A.7, the task-force moved in rapidly and almost immediately recaptured the entire area. The figure is based on ACLED event-data and shows the number of events where the government retakes, or non-violent transfers of, territory. As was the case with data on Boko Haram’s occupation of territory, it has been noted that the military did not always put out verifiable statements which partially feed into the data shown (through media outlets, etc.). However, as the survey that this study relies on was able to be conducted again in September-November 2015, it is assumed that the areas were no longer under Boko Haram control.

<sup>15</sup>For example, two LGAs (Askira/Uba and Geidam) that did not experience events during which Boko Haram seized control according to ACLED, are considered to be fully controlled by Boko Haram by the IOM. Investigating this further, it turns out that these LGAs are explicitly mentioned in various news sources as having fallen under Boko Haram control and being occupied (Al Jazeera, 2014; Anadolu Agency, 2015; BBC, 2015; France24, 2014). For these reason, these will also be considered occupied in this study.

are considered to have been occupied. Individuals in the sample that live in one of these LGAs are considered to be treated.

## 4.2 Specification of control group: propensity score matching

The purpose of this study is to isolate and estimate the effect of an Islamic insurgent group's occupation on school participation. In order to correctly identify the effect, selecting the correct control group is crucial. First, inhabitants of LGAs that did not experience any events during which Boko Haram gained control over territory according to ACLED, and additionally are identified by the IOM (2015) as "fully accessible" or "under control of government forces" in the corresponding time periods are considered eligible to be included in the control group. Second, to support the identification of the effect it is required that the control group experienced the conflict and insurgency, and was additionally comparable to the treatment group in many other ways.

The control units are selected through propensity score matching, and the propensity scores will be used in the estimation as weights (see section 5). Using propensity score matching reduces dependence on the outcome model specification, as it is done without using the (value of the) outcome variable, reducing bias and leading to more robust inferences (Ho et al., 2007; Rosenbaum et al., 2010; Rubin, 2007). This is especially relevant when using propensity score matching with difference-in-differences estimation, as is the case in this study. I refer the interested reader to Stuart et al. (2014), for an excellent discussion.

I match on the two nearest neighbors, without replacement. There is no match for five treated observations, and these individuals are dropped from the sample.<sup>16</sup> Various characteristics are used to match on, including household size, religion, gender, whether the household is an agricultural household, age, and exposure to violence, and the pre-treatment averages of the outcome variables. Moreover, I include a measure for local support for Boko Haram in the propensity score matching in order to account for potential differences between the treatment and control group, and additionally address a threat to the identification of the effect. I use data from Archibong (2019) on regional ethnic majorities and pre-colonial centralization of rule, which are shown to be related to lower levels of public good provision by the government. As shown by Brechenmacher (2019), lower public good provision is correlated with higher support for Boko Haram among the population. Unfortunately, this data is not available for all units that are eligible to be included in the control group. I therefore account for the level of local support for Boko

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<sup>16</sup>The children were on average 10 years old, but did not have any schooling yet; they had zero change, on average, in their YoS but did attend school (most likely for the first year). They were slightly less likely to be Muslim, but did not differ in another way.

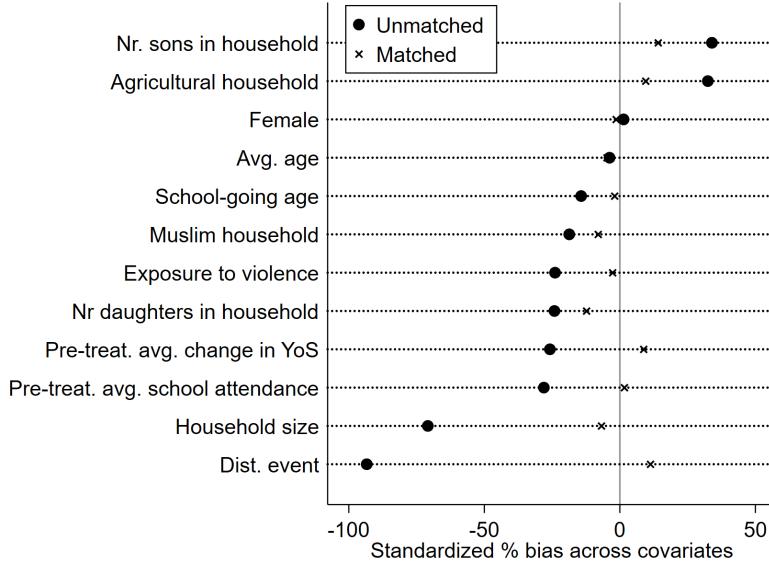


FIGURE 2. BALANCING THROUGH PROPENSITY SCORE MATCHING

*Notes:* The graph shows the results for the propensity score matching. The x-axis shows the reduction in the bias, in percent, due to the matching procedure. The circles show the unmatched scores; the crosses show the bias of the matched sample.

Haram by including the distance to closest event where Boko Haram occupied territory in the propensity score matching. There is a very strong, negative, significant correlation between the distance to one of these events and the measure of Archibong (2019). By including these ‘true confounders’ that predict both the likelihood of treatment and the outcome variable in the matching procedure I increase the precision of the estimators (Austin, 2011).

### 4.3 Descriptive statistics

There are 318 treated and 518 control observations, resulting in a final sample of 836. The treatment and control group have very similar characteristics, as shown in table 1. The only difference is that individuals in the treatment group are slightly more likely to be from a rural household. This differences will be addressed in the estimation by including controls and individual level fixed effects.

A note on the type of schools attended by the children in the sample: in the treatment group, 95.3 percent of the children attend a school run by the state or local government, and 1.16 percent a religious, and 3.49 a private school. This differs somewhat from the control group, where 87.92 percent of the children attends a federal, state or local government school, 2.68 percent a religious, and 9.40 a private school. There is no significant difference in the likelihood of a child in the treatment or control group attending a religious school.

TABLE 1—DESCRIPTIVE STATISTICS OF TREATMENT AND CONTROL GROUP

Variable	Mean control group	Mean treatment group	Diff.	T-test
Nr. sons in household	0.28	0.31	-0.02	-1.44
Agricultural household	0.07	0.09	-0.01	-0.71
Female	0.49	0.49	0	0.19
Avg. age	8.70	8.63	0.07	0.27
School-going age	0.67	0.66	0.01	0.26
Muslim household	0.73	0.66	0.06*	1.98
Nr. daughters in household	0.24	0.20	0.03*	2.17
Exp. to violence	0.76	0.78	-0.02	-0.15
Dist. event	89.70	91.73	-2.03	-0.50
Δ YoS	0.30	0.36	-0.06	-1.58
School attendance	0.44	0.49	-0.05	-1.34
<i>N</i>	518	318		

*Notes:* Means of the control variables used in the analysis, for both the treatment and control group. Difference between the means in column four, t-test in column five. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

The two main variables of interest that capture the level of cooperation with Boko Haram’s rule on education, change in the YoS and school attendance, are shown in figure A.10. Considering the left panel of the figure, two things jump out. First, the average annual increase in YoS was slightly higher for individuals in the treatment group, compared to those in the control group, before the treatment. However, this differs greatly between the two groups when considering the change in YoS throughout the years of the occupation. Note that the ‘gap’ in the data, during which Boko Haram occupied LGAs, is about two years in total, while the occupation of Boko Haram lasted approximately a year.<sup>17</sup> Throughout these two years the children in the control group witnessed an average increase of 1.65 years in YoS, while children in the treatment group increased their education with little over half a year.

Considering school attendance (right panel), it is clear that children in the treatment and control group had similar school attendance rates prior to the occupation. However, whereas attendance rates among children in the control group are higher after the occupation than before the occupation, the reverse is true for children in the treatment group: school attendance rates have decreased. This corresponds to anecdotal evidence regarding a significant decrease in school attendance rates among children of obligatory school-going age reported by NGOs such as Unicef (2017). The following section is dedicated to the estimation of these differences between the two groups with respect to both outcomes.

<sup>17</sup>These two years spanned roughly two school-years, 2013/2014 and 2014/2015.

## 5 Empirical approach

### 5.1 Difference-in-difference estimation

The objective of this study is to estimate and explain the effect of exposure to Boko Haram’s temporary occupation on the change in YoS and school attendance of children. The following model is estimated:

$$(1) \quad Y_{i,t,j} = \alpha_i + \lambda_t + \beta_{i,j,t}(D_t * occupation_{i,j}) + \sigma_{i,j,t}X_{i,j,t} + \epsilon_{i,j,t}$$

Where  $Y_{i,t}$  is a continuous variable that captures the change in the total YoS of individual  $i$ , living in LGA  $j$ , in year  $t$  or a binary variable that captures school attendance.<sup>18</sup>  $D_t$  is a dummy variable that is equal to one for 2014 onward.  $occupation$  is the treatment variable, which is equal to one for individuals living in one of the LGAs that were occupied by Boko Haram.  $\alpha_i$  captures the individual fixed effects,  $\lambda_t$  the school-year fixed effects, and  $\epsilon_{i,t}$  is the error term. Propensity scores are used as sampling weights, denoting the inverse of the probability that the observation is included in the sample.

$X_{i,t}$  is a vector of control variables. Controls included are a dummies for whether the father of the child works in agriculture, the child is of mandatory school-going age (6 – 14 y/o), it is a rural household and the household head is Muslim; the household size, the number of sons/daughters of school going age in the household, exposure to violence and individuals’ age, as well as and rainfall and temperature (on LGA level).<sup>19</sup> These covariates are similar to those used for the propensity score matching procedure. However, the pre-treatment averages were included in the matching.

It is likely that there is spatial correlation in the data. In order to address this potential dependency between observations due to geographical proximity, Conley (1999, 2008) heteroskedasticity and autocorrelation consistent standard errors are used. In the baseline model, there is a distance cut-off of 20 kilometers and a time-lag of three school-years. In section 10, I vary the cut-off value of the geographical distance between observations in the sample, as well as the time lag for the calculation of the Conley (1999, 2008) standard errors.

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<sup>18</sup>The first captures the annual change in total YoS, and is therefore one if a child attended school throughout the school-year, but equal to a maximum of two years during the treatment period due to the gap between the moments the survey was conducted. The latter variable is based on the answers respondents gave to the “Are you currently attending school?” or “Did you attend school in the previous school-year?” survey questions.

<sup>19</sup>Violence is measured as number of fatalities due to Boko Haram related events within a 5km radius of the household, similar to the measure used by Bertoni et al. (2019).

## 5.2 Heterogeneity of effect: drivers of cooperation

As mentioned in section 3, those who share social identity markers with the rebel group and/or have positive sentiment towards the group are more likely to adhere to the rules of the rebels. The first is estimated by interacting the treatment variable with a dummy for whether or not the household is Muslim. The second by using the measure of Archibong (2019) as an instrument to capture higher levels of support for Boko Haram, as well as increased social cohesion.<sup>20</sup> Due to the potential overlap between sharing social identity markers and living in an area with heightened support for Boko Haram, these two factors will be considered simultaneously.<sup>21</sup>

Additionally, enforcement of rule is an important tool rebels use in order to influence the behavior of those they govern. By using violence to ensure civilians adhere to the prohibition of schooling, Boko Haram might have intimidated the population and raised fears of punishment. It is examined whether the baseline effect is driven by those who have experienced targeted violence by considering the heterogeneity of the effect for those who have, and have not, experienced such enforcement. Enforcement is operationalized by a variable capturing attacks to the school closest to the household.<sup>22</sup>

Finally, the literature suggests that it is likely that there are differences in educational outcomes by gender and birth cohort. All the mentioned factors potentially leading to a heterogeneous effect – social identity, social pressure, school-focused violence, gender and birth cohort, captured below by  $W_{i,j,t}$  – are interacted with the treatment variable in equation 2.

$$(2) \quad Y_{i,t,j} = \alpha_i + \lambda_t + \beta_{i,j,t}(D_t * occupation_{i,j} * W_{i,t,j}) + \sigma_{i,j,t}X_{i,j,t} + \epsilon_{i,j,t}$$

Importantly, aside from providing insight into the workings of the effect of occupation by Islamic insurgents, these sources of heterogeneity serve as an additional test: if there is evidence that the treatment effect is indeed heterogeneous for these groups, the notion that the effect of occupation is correctly identified is further supported.

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<sup>20</sup>As mentioned before, the data on support for Boko Haram is sparse and the sample size is therefore smaller when considering this source of heterogeneity.

<sup>21</sup>I.e., since support for Boko Haram is likely higher among Muslims, there is a higher chance that someone that lives in an area with higher support for Boko Haram is Muslim. By estimating the role of social identity and social pressure identity simultaneously, this is controlled for.

<sup>22</sup>Intuitively, a driver of lower schooling outcomes would be the fear that schools and/or students might be the victim of attacks. Using data on the location of schools in 2012 from Archibong et al. (2015), households, and violent attacks, it is estimated whether the school closest to the household has been exposed to violent events within a 5km radius. This radius is chosen as to capture potential areas that children have to pass by or through on their way to school. The occurrence of such an event is interacted with being occupied.

### 5.3 Mechanisms

This study considers the effect of exposure to rebel governance through living in occupied areas within a context of conflict. Therefore, aside from estimating the effects as outlined above, it is important to consider what mechanisms – potentially due to the general conflict setting – might drive the effects.

The first group of mechanisms affects the demand for schooling, such as child labor (whether a child works for a household farm, did other paid work, or for a household business), child health (whether a child got sick, or visited a doctor or other healthcare professional), child marriage, and decreasing labor market prospects or potential future returns to education. Additionally, fear and intimidation due to having experienced violence might cause a decline in demand for schooling.<sup>23</sup>

The second group affects the supply of education (the number of primary and secondary schools, whether the time to get to school has increased, the type of school has changed). All these mechanisms are estimated by regressing the treatment variable together with the controls, as above, on the respective outcomes:

$$(3) \quad V_{i,t,j} = \alpha_i + \lambda_t + \beta_1 D_t * occupation_{i,j} + \beta_2 X_{i,t} + \epsilon_{i,t}$$

Where  $V_{i,t,j}$  captures dummies for child labor, child health, child marriage; or continuous variables capturing violence, school supply and payoffs of education. Note that if the effect of occupation is correctly identified, it is not expected to find evidence for any of the mechanisms above.

## 6 Identification

The previous sections elaborated on the selection of the control group, the comparability of the treatment and control group, and laid out the empirical strategy. This section focuses on the identification of the effect, and provides a discussion to what extent and under what conditions the occupation of areas can plausibly be considered to be exogenous. Additionally, various potential threats to the identification of the effect are considered.

I start with discussing the usual assumptions related to DiD estimation. First, it is important that the treatment and control group do not differ significantly with respect to

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<sup>23</sup>Though violence targeted at schools is examined as a potential determinant for cooperation with Boko Haram's anti-educational rule, exposure to 'general' violence (attacks on civilians, explosions and remote violence and battles in the vicinity (10km radius) of the household) might be able to explain shifts in behavior as well. Moreover, by examining violence as a potential mechanism it is shown whether violence, and not occupation and subsequent exposure to rebel governance, is the driver behind the effects.

the pre-treatment trends of the outcome variables. Second, I discuss attrition and the potential issue of migration. Additionally, I consider factors that might have contributed to certain areas being occupied, while others remained under government control. Such confounding factors are positive sentiment towards Boko Haram among the population that might have allowed the group to occupy certain areas more easily, area characteristics such as ruggedness of the terrain, population density, or the distance to Boko Haram's basecamp in the Sambisa Forest; and community-level variables related to local infrastructure, public good provision, and development.

## 6.1 Pre-event study

In order to reliably estimate results using a difference-in-differences set up, various assumptions should be considered. First, it is important that the trends of the outcome variables, change in YoS and school attendance, of the treatment and control group do not differ significantly prior to the intervention (in the graphs at time  $t$ ). The results are presented in figure 3. There are no significant differences prior to the treatment with respect to either variable.

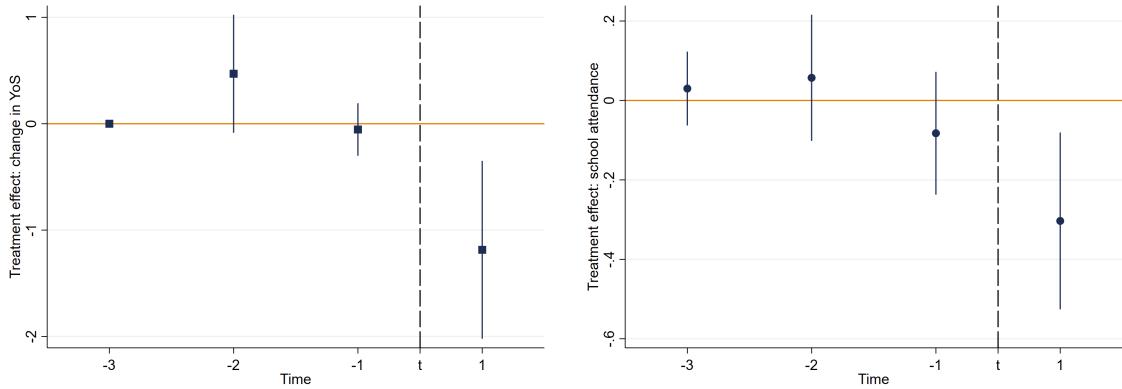


FIGURE 3. PRE-EVENT STUDY: CHANGE IN YOS AND SCHOOL ATTENDANCE

*Note:* The graph shows the conditional differences between the change in YoS and school attendance for the treatment and control group for each observed school-year. The confidence intervals are 95%. On the left panel,  $t - 3$  (2010/2011 school-year) is the base year. The gap between each observed data point is one school-year, except for the last interval, which spans two school-years.

## 6.2 Attrition and migration

Attrition is, with the treatment being living in an area occupied by an extremely violent terrorist group, an obvious concern. The attrition rate is twelve percent in the control group, and there is no attrition in the treatment group.<sup>24</sup> I explore various explanations

<sup>24</sup>About three-quarters of those that dropped out of the sample, did so prior to the last pre-treatment observation (the 2012/2013 school-year), i.e. well before the occupation was took place and the conflict

for this.

Exposure to violence can lead to attrition through migration. First, there is no evidence that those that drop out of the sample were exposed to more, or different types of, violence compared to those that remained. Second, considering migration as a potential source of attrition, I use data from FEWS, detailing the changes in the population in LGAs in north-east Nigeria in 2014 due to migration spurred on by the violence of the insurgency. The occupied LGAs witnessed a decrease of approximately 16 percent, and the non-occupied LGAs examined in this study an increase of about 3 percent. However, across the entire North East, the population of LGAs that were not occupied witnessed an average increase of approximately 12 percent. Examining the relationship between migration and violence, attacks on civilians seem to be significantly and negatively correlated with migration flows, indicating that these are the events that move civilians to leave areas. Simultaneously, there is a positive correlation between explosions/remote violence, battles, and the number of fatalities due to events, suggesting these attacks were more likely to take place in non-occupied areas. This notion would correspond to the discussion of the types of violence used by insurgents in occupied and non-occupied territory as discussed in section 3. However, since the individuals in our sample do not differ significantly with respect to their exposure to violence and there is no evidence that those who attrited did so in response to violence, this does not seem a plausible explanation for the attrition rates in the treatment and control group.

Furthermore, as mentioned above, the survey design was altered in 2015 in order to adjust to the situation in the North East. Any LGAs that are not continuously included in the survey design are excluded by default, thereby potentially omitting the respondents that might have otherwise been in the treatment group (and have attrited). Second, the higher attrition rate in the control group might be due to various households having the possibility to flee, while this was not an option for those who lived in occupied territories. For example, as discussed in section 2, Boko Haram prohibited inhabitants of occupied villages to leave the area and patrolled roads to ensure civilians could not escape. The lower attrition rate in the treatment group aligns with the findings of Schon (2016) that risk of violence along migration routes deters migration. Furthermore, many individuals do not have the option to flee conflict zones as they have no place to go (for example, no family members they can stay with), the refugee camps are not considered a feasible alternative, or fleeing itself is too dangerous (Unicef, 2015).

All the individuals that attrited are removed from the sample. Importantly, there do not

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escalated. The survey includes a question for remaining household members about the reason for an individual not being present. Though there are only 26 cases in which this was answered, in 57 percent of the cases marriage was cited as a reason, in 27 percent of the cases the individual passed away, and in 12 percent of the times the individual went to live with a family member elsewhere.

seem to be any differences with respect to age, gender, various household characteristics, or exposure to violence between these individuals and those who remained in the sample. To account for the potential differences in exposure to violence, variables capturing exposure to violence in vicinity of the household are included in every analysis.

### 6.3 LGA-level: Pro-Boko Haram sentiment and other factors

The fact that only specific areas were occupied by Boko Haram might raise concerns that, for whatever reason, it was easier to gain control over these areas than over others. One possible explanation is that there was (heightened) pro-Boko Haram sentiment among the population of certain areas. If this is the case, it is a clear threat to the identification of the effect and exogeneity of the treatment. A shortened explanation of this inherently complex matter is included here: for a full discussion of this matter, the reader is referred to Adesoji (2011), Aghedo (2017), and Archibong (2019).

Boko Haram is not the first fundamentalist Islamic group that carries out violent attacks and incites uprisings in the North East. There is evidence of longer-running grievances and anti-governmental sentiment, often linked to the North having a long tradition of being ruled by a Muslim elite and how this ended under military rule in 1976.<sup>25</sup> Considering the current-day impact hereof, Archibong (2019) shows that there is a significant negative association between the precolonial centralization of a region that also had a Muslim majority population, and access to public goods and infrastructure. As mentioned in section 3, the perception of institutions - such as the education system and schools - with respect to their effectiveness and legitimacy can determine local support for insurgents (Arjona et al., 2015). Specific to the case of this study, Brechenmacher (2019) finds that weak service provision and negligence on behalf of the government lead to increased local support for Boko Haram.

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<sup>25</sup>Many scholars refer to the Maitatsine followers and uprisings in the 1980s as drawing on similar anti-Western, anti-secular, and anti-educational sentiment and ideology as Boko Haram (Adesoji, 2011; Aghedo, 2017). This sentiment has its roots in religious and ethnic differences (between the North and South), pre-existing economic conditions, and local governance. For an excellent discussion of these matters and their relationship to current-day local development, see Archibong (2019). Summarizing, Archibong (2019) shows that centralized regions (with a clearly identifiable sovereign) had the ability to bargain with the federal (British) regime to obtain access to public goods or infrastructure in colonial times. In order to be able to bargain, a region had to be compliant – for example, through supporting direct taxation. Moreover, in the northern part of Nigeria, the ruling Muslim elite was granted a significant level of autonomy, especially with respect to matters of religion and tradition (Adesoji, 2011; Aghedo, 2017). This level of autonomy was institutionalized first in the Native Authority Proclamation of 1907, and later again in the Native Authority Law of 1954. The latter ensured that these ethnic regional leaders, in northern areas where the population was predominantly Muslim, had almost absolute power and were able to implement, for example, Shari'a law. In 1976, under military rule and after the civil war, these leaders were removed from politics. This abrupt end to the absolute power of the regional leaders faced strong opposition and contributed to local grievances and anti-governmental sentiment.

The possible presence of higher levels of support in areas that were occupied is addressed in various ways. First, I account for potential differences with respect to the level of support in the propensity score matching procedure as discussed in section 4. Second, variation in the local levels of support will be considered as a source of heterogeneity in the analysis. Additionally, for the areas for which the data is available given the sample, the level of support for Boko Haram given historical grievances and lower levels of provision of public goods by the government is compared: there is no significant difference, though the level seems somewhat higher in the treatment group (see table A.7). To address this matter and as a robustness test, I take a qualitative approach to the selection of the control units to specifically account for LGA-level differences (such as local support and historical grievances), and not solely individual-level differences addressed through propensity score matching (the results, robust to this specification, are shown in section 10).

Aside from support for Boko Haram additional factors, such as population density, ruggedness of the terrain, and the distance to the Sambisa forest - Boko Haram's initial base - are considered. I find (see table A.7) that the areas that were occupied are more rugged and more likely to be close to the Sambisa forest. The differences in these time-invariant variables are addressed by including fixed effects.

#### **6.4 Community level: development, infrastructure and provision of public goods**

Are the communities, villages or towns in the occupied and non-occupied areas comparable? The community-survey data from the NGHS, where respondents from villages are asked about the presence of various public goods and infrastructure, is used to answer this question. Table A.7 shows whether public goods are present in the average community in the treatment and control group. In terms of development and local infrastructure the communities that were occupied were similar to those that remained under government control, with the exception of treated areas having a higher number of health centers.

Remaining unobserved structural differences between occupied and non-occupied communities are addressed by including individual, as well as school-year fixed effects in every estimation. As individuals do not move, including these effects captures community-level fixed effects.

## 7 Results

As Boko Haram's occupation was temporary, it is possible to study the short and long-run effects of exposure to the group's occupation on educational outcomes. As outlined in section 5, two different dependent variables are used. First, the change in the total number of years of schooling. By estimating the effect of the occupation on this outcome, the result captures whether or not - and how long - children attended school in this time period (the short-run effect). The second dependent variable captures school attendance rates, observed after the occupation had ended. This variable indicates whether schooling behavior was affected after the occupation had ended and the government regained control (the long-run effect).

### 7.1 During the occupation: change in years of schooling

Column one of table 2 shows the results of the baseline estimation of the short-run effect, capturing changes in schooling behavior during the occupation. Children in areas that were occupied accumulated 0.96 fewer years of schooling, corresponding to about almost a year, throughout the occupation compared to children in non-occupied areas, controlling for pre-treatment differences between these groups. This set-back of 11.5 months is incurred in the time period of about two school-years between the last pre-treatment point in the data (March 2013) and the first post-treatment observation (September 2015). As noted in section 3, though the exact duration of Boko Haram's occupation of various areas differs, LGAs were occupied for eleven months on average. To put the number in perspective, the average number of YoS for adults in the sample is 4.90. This implies that the set-back of 0.96 corresponds to about 20 percent of the average educational achievement in the region.

Considering the heterogeneity of this effect provides insight into who was most likely to comply with Boko Haram's anti-educational rule. First, the results indicate that there is no significant difference between genders. However, there is a clear difference between birth cohorts. Younger children, born between 2006 and 2008, are more likely to have accumulated less YoS than children that were older at the start of the occupation. This implies that younger children, who might have just started school, were more likely to stay or be kept at home, or delayed the start of school.

Furthermore, those who share a social identity with Boko Haram – children from Muslim households – are more likely to have significantly lower schooling outcomes at the end of the occupation. Given the evidence that those who broke the Boko Haram's rules were punished (Amnesty International, 2015) and the repercussions of resistance to a group's governance can present negative externalities on the wider population (Arjona

et al., 2015), it was expected that those who experience social pressure to conform and/or live in areas with high(er) levels of support for Boko Haram adhere to the prohibition of education. The results indicate that this is the case. Children who lived in areas with positive sentiment towards Boko Haram, and (whose parents or household) might have experienced social pressure to conform, suffer significant negative setbacks compared to children who do not experience this pressure.

Interestingly, there is a relatively strong significant and positive result with respect to being exposed to the occupation and non-school focused violence. This can be due to the fact that Boko Haram targeted areas where school participation was higher, i.e., a case of reverse causality. Aside from this there are no (significant) results with respect to exposure to violence. However, note that all variables with respect to violence are lagged by one year to account for last years' violence affecting the current school years' school choices (hence the violence interacted here with the occupation variable accounts for the 2012/2013, and 2013/2014 school years). What the lack of results indicates is that there were potentially no significant differences between exposure to school-targeted violence for those living in occupied and non-occupied areas.

## 7.2 After the occupation: school attendance rates

When considering the long-term impact of Boko Haram's occupation on school attendance rates, the results indicate that children in the treatment group are 17 percent less likely to be attending school than children in the control group (see column one, table 3). This indicates that potential changes in behavior during the occupation - rejecting education, not attending school - have carried over until after the occupation. Moreover, as it was known that though Boko Haram was expelled from the occupied territories, the group was not fully defeated, fear of Boko Haram returning might have prevented children from returning to school.

When considering the heterogeneity of the effect by gender, it seems to be the case that girls specifically are more likely to drop out of school: 25 percent less likely than boys, to be precise. Interestingly, there does not seem to be a difference across birth cohorts with respect to school attendance after the occupation. This might imply that the younger children who suffered larger educational set-backs during the occupation continue their education afterwards. They might 'catch-up' on missed schooling.

Children from Muslim households - who experienced potentially the strongest negative effect during the occupation itself - show significantly lower school attendance rates afterwards. Unfortunately, if these children stay out of school, the initial set-back might become permanent and result in definite loss in educational outcomes. Interestingly –

TABLE 2—THE SHORT-RUN EFFECT: CHANGE IN YEARS OF SCHOOLING

	Baseline (1)	Gender (2)	Birth Cohort (3)	Social identity & pressure (4)	Enforcement of rule (5)
Occupation	-0.96** (0.37)	-0.90** (0.36)	-0.52 (0.41)	-0.14 (0.37)	-0.87** (0.43)
Occ.#Female		0.12 (0.24)			
Occ.#Cohort '03-'05			-0.20 (0.33)		
Occ.#Cohort '06-'08				-0.89*** (0.33)	
Occ.#Identity					-0.84** (0.38)
Occ.#Pressure					-0.36** (0.16)
School-violence					-0.001 (0.31)
Occ.#School-violence					-0.08 (0.42)
Non-school violence					0.25** (0.12)
Occ.#Non-school violence					0.004 (0.20)
Mean dependent variable	0.589	0.589	0.589	0.537	0.589
N	625	625	625	452	625
Controls	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Individual FE	✓	✓	✓	✓	✓

*Notes:* The table shows the results of the estimation of the treatment effect, being exposed to Boko Haram's occupation, on the change in YoS throughout the occupation. Being female, Muslim, ones' birth cohort, and living in an area with positive sentiment towards Boko Haram are time invariant variables and absorbed by the individual fixed effects. The three birth cohorts are defined as children being born between 1998-2002, 2003-2005 or 2006-2008. Controls as laid out in section 5. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

when controlling for whether a child is from a Muslim household and faced the occupation – children from areas with heightened social pressure are more likely to be attending school. It might be that the pressure to comply with Boko Haram's prohibition of schooling diminished in the long-run, resulting in these children returning to school.

Finally, those who have experienced the enforcement of Boko Haram's rule are much less likely to attend school after the occupation has ended. Having experienced significant pressure and intimidation to stay out of school through exposure to school-targeted violence, arguably lead to high levels of fear, keeping children out of school in the long-run. The positive and significant coefficients on variables relating to non-school focused violence can most likely be explained by reverse causality, indicating that children where school attendance rates were higher have also experienced higher levels of violence, and

TABLE 3—THE LONG-RUN EFFECT: SCHOOL ATTENDANCE AFTER THE OCCUPATION

	Baseline (1)	Gender (2)	Birth Cohort (3)	Social identity & pressure (4)	Enforcement of rule (5)
Occupation	-0.30* (0.10)	-0.18* (0.10)	-0.26*** (0.09)	-0.19** (0.10)	-0.27*** (0.08)
Occ.#Female			-0.25** (0.11)		
Occ.#Cohort '03-'05				-0.13 (0.11)	
Occ.#Cohort '06-'08				-0.06 (0.15)	
Occ.#Identity					-0.47*** (0.16)
Occ.#Pressure					0.16*** (0.06)
School-violence					0.13 (0.09)
Occ.#School-violence					-0.72*** (0.12)
Non-school violence					0.02 (0.03)
Occ.#Non-school violence					0.08*** (0.03)
Mean dependent variable	0.515	0.515	0.515	0.518	0.515
N	760	760	760	551	760
Controls	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Individual FE	✓	✓	✓	✓	✓

*Notes:* The table shows the results of the estimation of the treatment effect, being exposed to Boko Haram's occupation, on school attendance rates after the occupation had ended. Being female, Muslim, ones' birth cohort, and living in an area with positive sentiment towards Boko Haram are time invariant variables and absorbed by the individual fixed effects. The three birth cohorts are defined as children being born between 1998-2002, 2003-2005 or 2006-2008. Controls as laid out in section 5. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

were especially likely to be exposed to that during the occupation.

Summarizing, there is evidence that living in an area that is occupied by Islamic insurgents who harbor a strong anti-educational view can have a significant and negative impact on educational outcomes both during, but also after, the occupation. The fact that the heterogeneity of the effect is well-explained through a framework of occupation and rebel governance strengthens the assumption that the effect is correctly identified.

### 7.2.1 Who drops out of school?

Are the effects due to the occupation, or driven by an underlying structure in the data – i.e., are the children that drop out of school the ones that completed more years of

education prior to the occupation and were they actually ‘done’ with school? To examine this possibility I focus on the children that do not return to school in the 2015/2016 school-year that live in the previously occupied areas.

The children are of a very similar age (12-13 years old) and gender. However, the children that return to school have about 4.59 YoS, whereas the children that drop out have 2.51 YoS. This difference is significant. The stark lower number of total YoS among those that drop out might suggest that these children were less likely to attend school at all prior to the occupation, which upon closer inspection is the case (these children have lower average school attendance rates prior to the treatment). Moreover, they might have had shared somewhat more anti-educational stances to start with: the children were exposed to higher levels of local support for Boko Haram and have a higher likelihood of being from a Muslim household, two factors shown to contribute to lower school attendance during the occupation. However, they are significantly less likely to have been exposed to any type of violence.

## 8 Mechanisms

The above focuses on the adjustment of behavior in response to occupation. However, after the occupation ended individuals no longer faced rebel rule: in this time period, conflict dynamics might have become more prominent. Considering the potential presence of mechanisms that are not specific to occupation, but conflict, acts as a validity test. If the previously presented results can be well-explained through conflict mechanisms, this would cast doubt upon the identification of the effect of occupation. To this end, various mechanisms affecting the demand for and supply of education are discussed below.

### 8.1 Demand side mechanisms

#### 8.1.1 Child labor, health status, and marriage

A potential explanation for the decrease in schooling is that the conflict lead to a drop in household income, increasing the need for children to work instead of attending school (Bundervoet et al., 2009; Duryea et al., 2007; Jacoby & Skoufias, 1997; Thomas et al., 2004). The household survey provides data on whether an individual worked outside the household, for a household owned business or on the household farm. Table 4 contains the results. I find that children are less likely to work on the household farm, but there is no evidence for other differences with respect to the labor choices of children in the treatment or control group.

Moreover, I do not find results that suggest that health status might influence whether or not a child attends. This eliminates the possibility that the insurgency worsened the health of children, either through exposure to violence or lack of access to healthcare (Allison, Attisha, et al., 2019). Data from the NGHS on health status and healthcare usage is used to shed light on this matter. The survey includes questions on whether the child visited a doctor or healthcare professional, was ill, or sustained an injury in the past four weeks. The results are presented in table 4, column four and five.<sup>26</sup>

Another well-documented mechanism linking decreased educational outcomes to conflict is child marriage. Child marriage has been shown to be common during insurgencies and civil war due to increased insecurity, and is linked with lower educational attainment and school drop-out (Mazurana et al., 2019; Mourtada et al., 2017; Nguyen & Wodon, 2014; Parsons et al., 2015; Walker, 2013). It is possible that children got married during or after the occupation, leading them to drop out of school. There is no evidence of this being the case (see table 4, column six).

Finally, the household survey offers a way to gain insight into what children are up to when not attending school. When asked for a reason as to why children are not working or studying, those living in areas that were occupied by Boko Haram are 29 percent more likely to indicate that they stay at home in order to perform household and childcare tasks (column 7, table 4). Moreover, the lack of parental interest being cited as a reason for not attending school is about 13 percent higher for children in the treatment group.

TABLE 4—MECHANISMS: LABOR, HEALTH, MARRIAGE, HOUSE WORK AND INTEREST IN SCHOOLING

	Child labor			Health status		Marriage	Other	
	Household business	Household farm	Other work	Illness or injury	Doctor visit	Child is married	Household or childcare	(Parental) interest
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Occupation	0.001 (0.04)	-0.17** (0.07)	-0.003 (0.003)	0.08 (0.06)	0.09 (0.06)	-0.02 (0.01)	0.29*** (0.09)	0.13** (0.06)
Mean dependent variable	0.018	0.187	0.004	0.065	0.047	0.009	0.140	0.147
N	769	769	769	476	476	769	769	769
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Individual FE	✓	✓	✓	✓	✓	✓	✓	✓

Note: The table shows the results of the estimation of (3) for various mechanisms. All dependent variables are dummies, equal to one if the answer of the child was “yes” when asked whether s/he performed any tasks, was employed, married, visited a doctor, etc. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

### 8.1.2 (Un)employment and returns to education

Education is an investment that is more likely to be made if there is an expected likelihood of future returns. Conflict might negatively expect these expectations, resulting in

<sup>26</sup>There are no differences in the presence of hospitals, health centers or pharmacies in previously occupied communities and those that were not occupied - see table A.8.

deteriorating schooling outcomes (Chamarbagwala & Morán, 2011; Shemyakina, 2011). In order to examine this mechanism, various factors are considered: whether there are general labor market effects due to the occupation, and if the occupation had a differential effect on those that completed primary education, i.e., whether the returns to education have changed. Since especially girls seemed to not return to school in the long-run, the analysis is also run for a sub-sample of women.<sup>27</sup>

There is some evidence that the occupation had a general negative effect on the labor market (table 5). However, there seems to be an education premium: those with at least primary school education earn relatively higher wages than those without a primary school education. Interestingly, when considering these effects for women only (table 5), the results suggest that the occupation lead to women with a primary school education working fewer hours. (There is not sufficient data on women's wages to estimate the effect.) These results do not directly explain why girls are significantly more likely to stay out of school after the occupation.

TABLE 5—RETURNS TO EDUCATION

	Education premium			Education premium (women)	
	Wage (1)	Employment (2)	Hours worked (3)	Employment (4)	Hours worked (5)
Occupation	-96.742** (36.054)	-0.406** (0.187)	1.875 (27.930)	-0.126 (0.255)	55.686*** (17.512)
Occ. * P.educ.	43.203* (23.006)	0.017 (0.114)	-23.156 (22.960)	0.051 (0.160)	-66.021*** (7.409)
Mean dependent variable	36.815	0.666	40.887	0.610	38.141
N	34	507	180	253	78
Controls	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Individual FE	✓	✓	✓	✓	✓

*Notes:* The table shows the results of the estimation of (3) for the effect of occupation on (un)employment, labor market prospects, and education premiums. Wage is the average wage (in thousands of Naira) of an employed respondent, employment is a dummy equal to one when the respondent indicates to be employed, and hours worked captures the weekly number of hours worked as reported by employed respondents. P.educ. is a dummy equal to one when a respondent has completed primary education, defined as 6 or more YoS. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

### 8.1.3 Exposure to violence

Violence is a frequently cited reason for children to be kept home and not attend school (Unicef, 2015), with fear of attacks thereby decreasing the demand for education. Though the heterogeneity of the effect is examined for those experiencing non-school and school-focused violence, a potential difference in exposure to the types of violence close to the

<sup>27</sup>The sample is expanded to include individuals that are 15 or older (i.e., older than mandatory school-going age), observed at least once before and after the treatment period, and living in either the occupied or bordering areas are included in this sample.

household might play a role. In order to examine this possible mechanism, I consider three forms of violence – attacks on civilians, battles, and explosions/remote violence – taking place within a 10km radius of the household. The results are shown in 6. Though households in the occupied areas are slightly more likely to have experienced battles, there are no differences with respect to the other two types of violence between the two groups. Importantly, the fact that there have been more battles supports the notion that the areas were actually occupied, as events where Boko Haram gained control over territory are categorized as battles by ACLED.

TABLE 6—EXPOSURE TO VIOLENCE

	Attacks on civilians (1)	Battles (2)	Explosions and remote violence (3)
Occupation	-0.04 (0.25)	0.24* (0.12)	-0.20 (0.21)
Mean dependent variable	0.465	0.049	0.128
N	769	769	769
Controls	✓	✓	✓
Year FE	✓	✓	✓
Individual FE	✓	✓	✓

*Notes:* The results above show whether experiencing attacks on civilians, battles, explosions/remote violence within a 10km radius of the household were affected, or more likely, for those living in the occupied areas. Analysis includes controls, individual and school-year fixed effects. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## 8.2 Supply side mechanisms

### 8.2.1 School supply

It has been shown that physical destruction of infrastructure, such as the destruction of school buildings, leads to lower educational outcomes (Akbulut-Yuksel, 2014). Moreover, school accessibility has been found to be positively correlated to schooling (Jayachandran et al., 2002). A low(er) school supply is a logical mechanism behind the decrease in schooling outcomes in the occupied areas. The absence or destruction of schools or other educational facilities might prevent children from going to school. Moreover, school-targeted violence might have lead the destruction of buildings or teachers leaving the area.

I examine the school supply channel in various ways. First, using the community-survey data from the NGHS, I consider the presence of schools in the villages of the respondents in the sample after the occupation (see table A.8).<sup>28</sup> There does not seem to be a significant

<sup>28</sup>The community survey was conducted during the fall of 2015, after the end of Boko Haram’s occupation of various LGAs.

difference between the occupied and non-occupied areas with respect to the presence of primary and secondary schools.

Finally, there are some hints that there was a drop in the number of secondary school teachers.<sup>29</sup> However, given that the average age of the sample is nine and most children indicate they attend primary school, it is not likely that this decrease can explain the decrease in educational outcomes. In general, the presence of both primary and secondary schools seem to suggest that children technically had the option to attend school.

Moreover, I do not find evidence that indicates that children who did attend school after the occupation were more likely to change to a different type of school, faced higher commuting times, or that the education-related expenditure incurred by the household was higher. Importantly, children are not more or less likely to attend Quaranic school due to the occupation. The results are shown in table A.9. If there would have been results that suggested that any of these changes might have taken place, they could have explained why children in general were less likely to attend school.

As a final test, I examine whether the overall level of development or presence of infrastructure and public goods differed between communities in the occupied and non-occupied areas in the post-treatment period. The results are shown in table A.8. I find that there are less pharmacies and markets in the previously occupied areas, though the differences are not significant. The fact that markets are absent can be due to Boko Haram's prohibition of intermediaries, affecting trade. However, there are no other differences between the communities.

Summarizing, I find weak to no evidence that supports any of the mechanisms as a plausible explanation for the significant decrease in educational outcomes presented. This diminishes the risk of the estimated effect being driven by conflict, and increases the confidence in the correct identification of the occupation effect.

## 9 Expansion of baseline analysis

### 9.1 Non-binary treatment: duration of occupation

As an expansion of the baseline analysis and as a test of the validity of the results, I re-estimate the baseline model using a non-binary treatment variable that accounts for

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<sup>29</sup>The data from UBEC on LGAs that were previously occupied is very limited (there is only one LGA included in the data) and the results are therefore not conclusive and for this reason not shown here. If one would ignore this blatant shortcoming and consider the impact of the occupation on the number of primary and junior secondary school teachers, there seem to be more junior secondary school teachers, but significantly less primary school teachers. The absence of teachers or a high student to teacher ratio in a primary school might explain part of the drop in school attendance.

the duration of the occupation in each individual LGA. More specifically, the treatment variable takes on four different levels: zero for LGAs that were not occupied; one for LGAs that were occupied for half a year; two for LGAs that were occupied for three quarters of a year; and three for LGAs that were occupied for a year. These levels are based on the information on the spread of the occupation as shown in figure A.6. The results are shown in table A.10.

## 9.2 Educational outcomes

As mentioned above, the lack of data in addition to the availability of only one post-treatment period does not allow me to consider the (long-term) impact of the occupation on educational outcomes. However, relying on the data that is available, I find that children that are exposed to the occupation complete about 1.63 grades less (on average children are in the fifth grade). There are no age or gender differences with respect to the educational attainment of children. The results are shown in table A.11

# 10 Robustness

## 10.1 Alternative sample selection

I take an alternative approach with respect to the selection of the control units. Since the treatment is on LGA level, the control group is selected based on what LGAs are most suited. Technically, there are a few potential control groups. A first group would consist of the entire North Eastern region of Nigeria. This would clearly form the largest sample, but the differences between the individual regions are obviously larger. For example, not all the states in the North East were subject to the state of emergency. However, solely using the state of emergency as an inclusion restriction would not be sufficient: a large number of the LGAs in these states were not exposed to violence due to the insurgency.

Another option would be to consider only contested LGAs.<sup>30</sup> This sample would, however,

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<sup>30</sup>First, Boko Haram occupied vast areas in the North East in almost one swift move, but was pushed back by the military starting early 2015. However, there was some push-back to Boko Haram's territorial aspirations from mid-2014 to early 2015, prior to the task-force moving in. Using ACLED data on both government and Boko Haram's take-over of territory, certain areas are marked as "contested": where, in the same quarter, both Boko Haram and the government took over an area from the others' control (see figure A.9). This provides insight into potential government presence in various areas and where Boko Haram's territorial control was challenged. No territory was contested prior to the third quarter of 2014, or after the first quarter of 2015. The last image shows all contested areas and the areas that were occupied according to the IOM. It is noteworthy that the most southern areas that were contested (at the end of 2014 and early 2015) are not included in set of LGAs that the IOM identified as under Boko Haram control; this supports the notion of (potentially) not fully occupied areas having been excluded from the IOM definition.

be too small as only the inhabitants of four LGAs are considered to be contested. Finally, a considerable group of LGAs directly bordered the occupied areas. These areas have been exposed to the violence of the insurgency. Moreover, they were threatened with potential occupation (though none were occupied at any point in time) due to the proximity to Boko Haram’s territory. It was therefore unknown to individuals in these LGAs whether they would be “treated” or not. Therefore the control group will consist of the individuals living in a LGA, directly bordering the LGAs that were occupied by Boko Haram (see figure A.11).

Moreover, for all bordering areas (contrary to the full sample used in the analysis), the data from Archibong (2019) is available. This is used to estimate whether the level of support for Boko Haram differs across the occupied LGAs and the bordering areas. If this would be the case, the positive sentiment might be able to explain why Boko Haram managed to occupy and hold on to certain territories, and was not able to do so with respect to other LGAs that do not share historical similarities. However, the bordering LGAs do not have significantly different levels of support for Boko Haram. Furthermore, the only (significant) difference between these and the occupied LGAs are the level of ruggedness. When considering the pre-event study, there is no significant effect of the treatment prior to the occupation occurring (see figure A.12). Model 1 is estimated using this sample. The results are presented in table A.13, and are similar to the baseline results though the coefficients are smaller. This seems logical, as the difference between children living very close to the occupied areas and those living potentially further away (considering the sample used in the baseline analysis) might have been smaller to begin with.

For completion, I also show the results for other control groups. These include solely individuals living in Yobe, Adamawa and Borno (states where the state of emergency was declared), or individuals living in the entire North East. The table below contain the baseline results for the varying control groups. The results are robust to these specifications with larger sample sizes. Moreover, the coefficients get larger with each increase in sample size: this is intuitive, as more potentially less-affected children are added to the sample. Though solely the baseline effects are shown in table A.13, the heterogeneous effects are similar to those in tables 2 and 3.

## 10.2 Standard errors: varying distance cut-off and time lag

I vary the cut-off value of the geographical distance between observations in the sample, as well as the time lag for the calculation of the Conley (1999, 2008) standard errors. The results are robust to these various specifications (see table A.14).

## 11 Concluding remarks

Between one-fourth to one-third of all insurgents occupy territory at some point (Huang, 2016; Stewart, 2018) subsequently exposing civilians to their governance (Arjona, 2016; Rubin, 2020; Stewart, 2018; Wood, 2008). And while the effect of conflict on civilians' behavior has been studied extensively, existing work does not empirically distinguish between exposure to violence and to occupation by insurgents. This study addressed this matter. I examined whether those exposed to occupation adjust their behavior to adhere to the insurgents governance and rule in the short and long-run, and provided an in-depth discussion of channels and mechanisms that drive these effects.

This paper relied on evidence from the case of Boko Haram, an insurgent group with strong anti-educational stance, that temporarily occupied various areas in North East Nigeria between 2014 and 2015. The temporary occupation of territory by Boko Haram was exploited as a quasi-natural experiment where a certain part of the population was exposed to occupation and conflict, while another part was exposed to conflict but not affected by occupation. The study relied on rich and detailed individual-level panel data and estimates the effects through a difference-in-differences approach. The control units are selected through propensity score matching to ensure that the sample is balanced and the effect identified correctly. The generated weights are additionally used in all regressions. Moreover, to address concerns with respect to spatial dependency or correlation between observations, Conley (1999, 2008) are used.

This research considered what happened *during* the occupation as well as what happened *after* the occupation, thereby evaluating both the short and long-term impact of exposure to insurgents' occupation on behavior. With respect to the first, the results indicated that the occupation of Boko Haram lead to decreasing school participation for children of mandatory school-going age relative to those who were not exposed to the group's rule. To be precise, these children suffered a set-back in education of 11.5 months due to the occupation. Moreover, those who share an identity with the governing rebel group might be more likely to stay out of school. Similarly, experiencing social pressure to conform to the occupying group's rule, as well as by living in an area with heightened levels of support for the rebel group, leads to a decrease in a child's schooling. In turn, being exposed to violent enforcement of Boko Haram's ban on schooling, in addition to their occupation, lead to higher compliance with the group's rule: those children have significantly lower educational outcomes than others. Interestingly, exposure to 'general' violence, not aimed at schools and education, did not have a similar effect.

Considering the long-term impact of occupation, the evidence suggested that children are 30 percent less likely to attend school, with especially female children being at risk of

permanently dropping out of school. Those who shared an identity with Boko Haram, and during the occupation showed higher rates of compliance with the group's rule, are more likely than other children to continue to stay out of school after the occupation has ended. When controlling for this effect of shared identity, children from the treatment group that experienced social pressure to conform are more likely to be returning to school in the long-run, after having dropped out in the short-run. Furthermore, having experienced enforcement of the anti-educational rule seems to have lead to intimidation and fear: those who have been exposed to such violence during the occupation are significantly less likely to be returning to school. Importantly, well-documented mechanisms through which conflict and violence affect education did not seem to explain the negative impact on education: this strengthens the notion that the effect of the occupation is correctly identified, and the estimates are not biased by the insurgency in general. Various robustness tests were performed to further support the findings.

Decreasing schooling outcomes can suppress the human capital accumulation of an entire generation and thereby the economic development of states. I demonstrated that school participation can be severely affected by occupation of an insurgent group, on top of the already negative impact of conflict. Moreover, the results showed that the effects of occupation can be not just strong but also persistent, and might remain after the group has retreated and the government has regained control – emphasizing the role that can be played by policy and aid aimed at encouraging and enabling education in conflict settings.

Finally, I showed that the effect of occupation varies across groups and over time, and cannot be explained by well-known mechanisms found in the literature. In doing so, I presented a new approach to considering the various ways that conflict can affect behavior while providing insight into the role that identity, social pressure, and rule enforcement play with respect to how and to what extent various individuals are affected by the occupation. Clearly, to develop efficient peace-building and post-conflict development policies that target and support individuals correctly, more detailed insight into such complex and multi-layered situations is needed. This study forms a first step in that direction.

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## A Appendix

### A.1 Figures

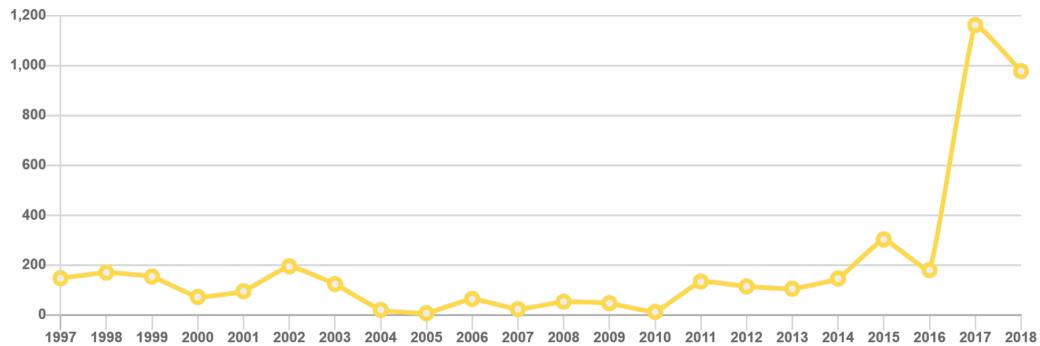


FIGURE A.4. NUMBER OF CONFLICT EVENTS WHERE TERRITORY IS CAPTURED

*Notes:* The graph shows the total number of conflict events, per year, where territory was captured by non-state actors. Source: ACLED.

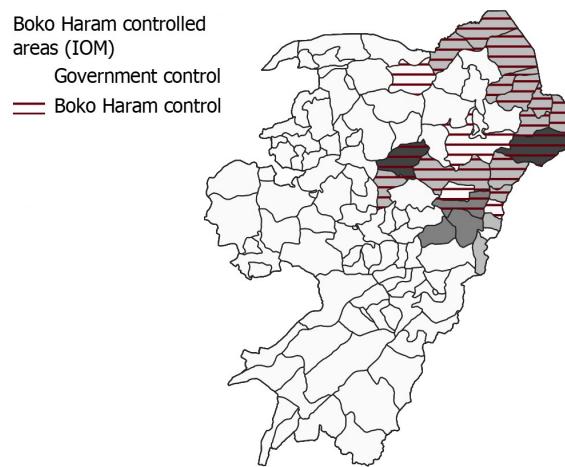


FIGURE A.5. OCCUPATION OF TERRITORY BY BOKO HARAM: ACLED AND IOM (2015)

*Notes:* Maps shows the occupation of territory by Boko Haram in Q1 of 2015, the height of the occupation, as well as the areas that were occupied by the group according to the IOM (striped red). The darker, the more events took place where Boko Haram gained control over territory as recorded by ACLED by quarter/year.

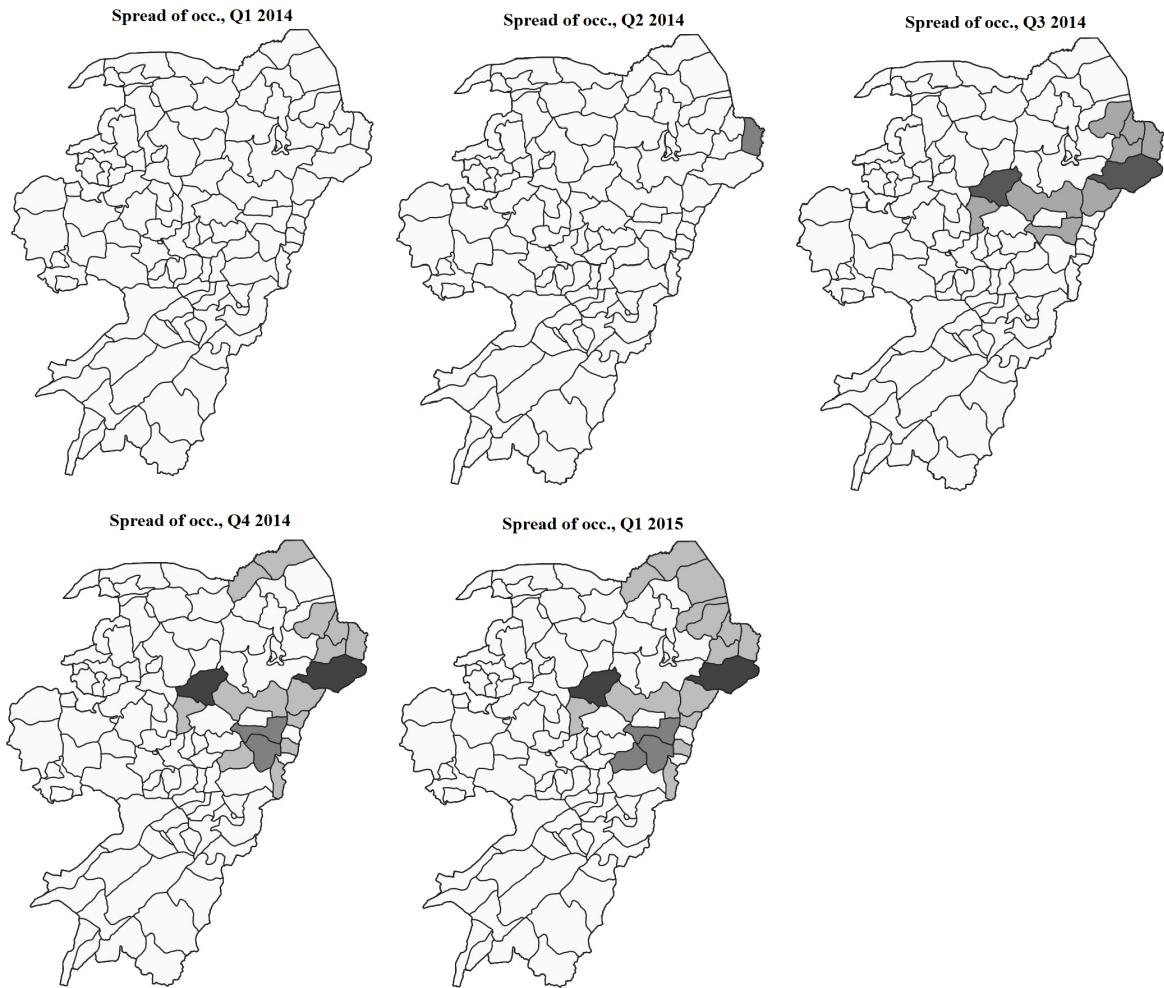


FIGURE A.6. THE PROGRESSION OF THE OCCUPATION OF TERRITORY IN NORTH-EAST NIGERIA BY BOKO HARAM.

*Notes:* Maps shows the progression of the occupation of territory by Boko Haram. The darker, the more events took place where Boko Haram gained control over territory as recorded by ACLED by quarter/year.

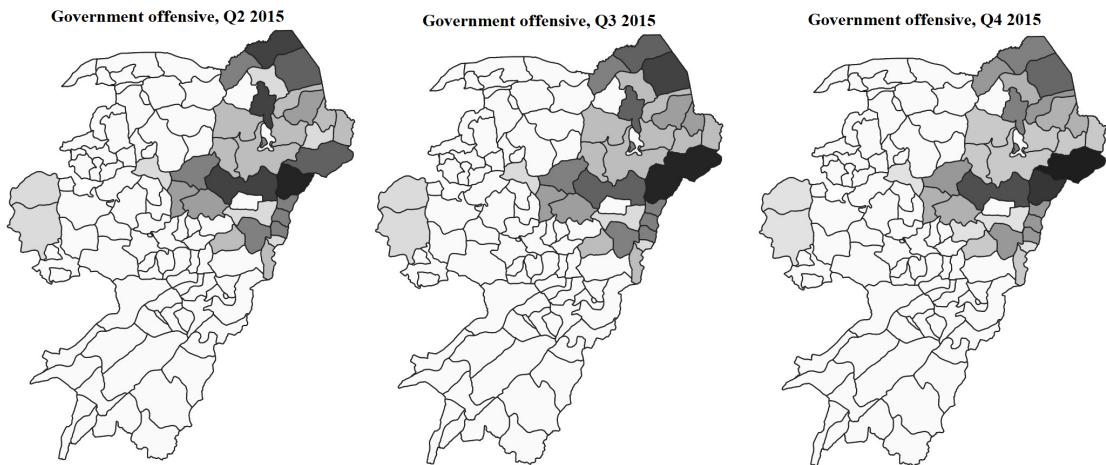


FIGURE A.7. GOVERNMENT OFFENSIVES TO RETAKE TERRITORY

*Note:* Maps shows the progression of the government offensives to retake territory from Boko Haram. The darker, the more events took place where the government regained control over territory as recorded by ACLED by quarter/year.

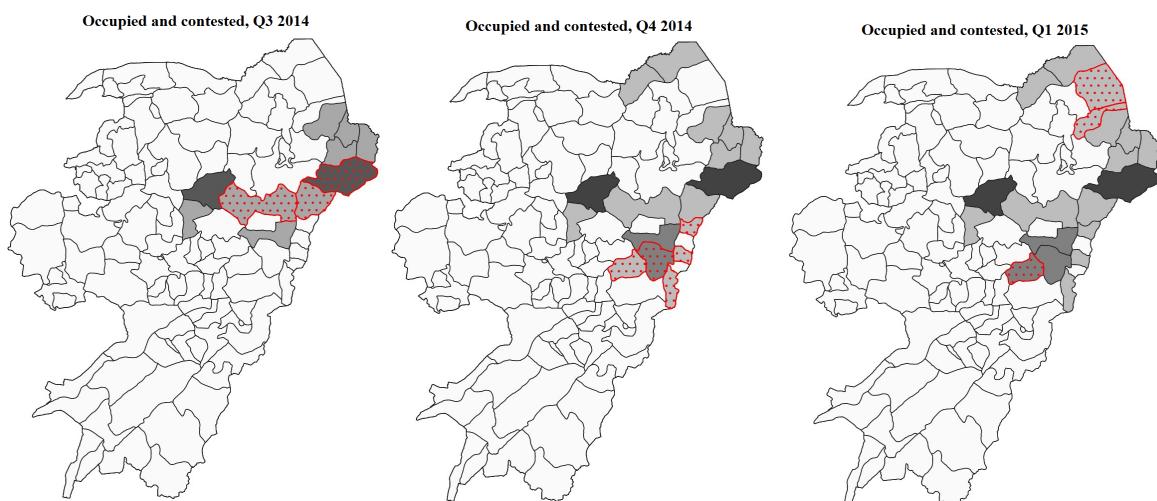


FIGURE A.8. CONTESTED AND OCCUPIED TERRITORY IN NORTH-EAST NIGERIA

*Note:* Maps show the number of events, per LGA, where the Boko Haram gained control over territory as recorded by ACLED by quarter/year. “Contested” implies that in that same quarter/year there was at least one event where the government (re-)gained control over territory. The darker the LGA, the higher the number of events that took place in that time period whereby Boko Haram gained control over territory.

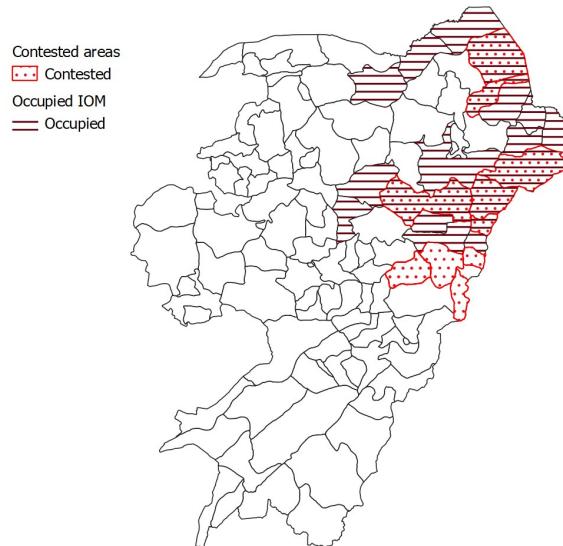


FIGURE A.9. CONTESTED AND OCCUPIED TERRITORY IN NORTH-EAST NIGERIA

*Note:* The map shows the areas that were contested based on data from ACLED (see A.8) and the areas that were occupied according to the IOM (2015).

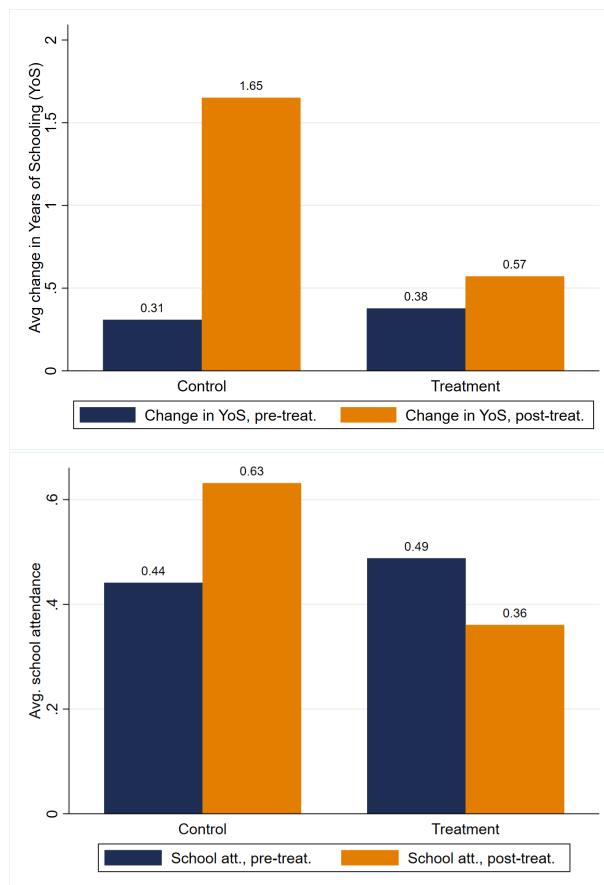


FIGURE A.10. CHANGE IN YOS AND SCHOOL ATTENDANCE

*Note:* Sample averages of the two main dependent variables of this study, change in YoS and school attendance, for the treatment and control group.

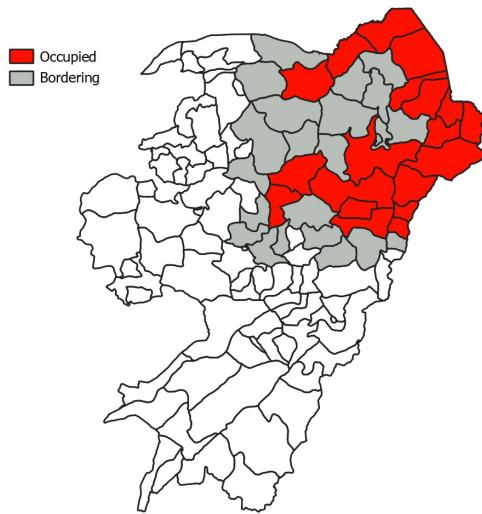


FIGURE A.11. CONTROL GROUP: BORDERING AREAS

*Note:* The maps show various bordering LGAs (in grey) that make up the control group and the treated LGAs (in red) that were occupied by Boko Haram.

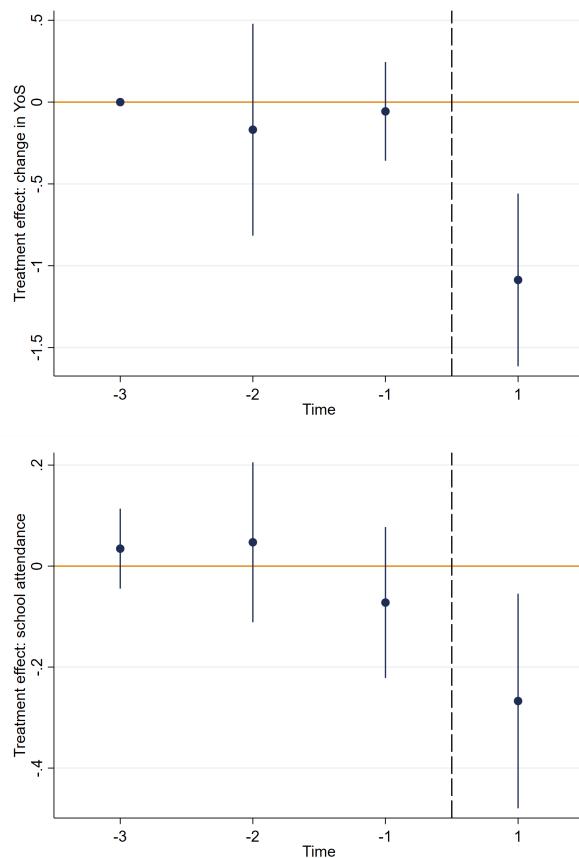


FIGURE A.12. ROBUSTNESS: CHANGE IN YoS AND SCHOOL ATTENDANCE

*Note:* The treatment effect for the change in years of schooling (YoS), and school attendance, considering the bordering and occupied areas.

## A.2 Tables

TABLE A.7—COMMUNITY LEVEL DIFFERENCES, PRE-TREATMENT

Variable	Control	Treatment	Difference	T-test
Support Boko Haram, indicator	0.24	0.50	-0.26	-0.77
Population, % of pre-insurgency tot.	103.13	85.86	17.27***	4.33
Distance to Sambisa Forest	233.07	150.50	82.57***	4.05
Ruggedness	25393.86	5698025	-5672632*	-3.04
Population density	300.25	70.06	230.19	0.97
Primary schools	0.91	1	-0.09	-1.22
Secondary schools	0.87	0.94	-0.07	-0.80
Health center	0.59	1	-0.42*	-2.18
Public hospital	0.24	0.50	-0.26	-1.31
Pharmacy	0.21	0.33	-0.12	-0.66
Post office	0.18	0.43	-0.25	-1.52
Bust stop	0.50	0.86	-0.36	-1.77
Bank	0.13	0	0.13	0.92
Market	0.56	0.88	-0.31	-1.68
<i>N</i>	121			

*Notes:* The table indicates whether, on average, a public good is present in the community (0 = not present, 1 = present) prior to the occupation. Difference between the means in column four, t-test in column five. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE A.8—COMMUNITY LEVEL DIFFERENCES, POST-TREATMENT

Variable	Control	Treatment	Difference	T-test
Primary school	0.93	1	-0.07	-0.79
Secondary school	0.58	0.50	0.08	0.43
Health center	0.65	0.75	-0.10	-0.37
Public hospital	0.04	0	0.04	0.41
Pharmacy	0.35	0	0.35	1.41
Post office	0.26	0.25	0.01	0.04
Bus stop	0.09	0.25	-0.16	-0.94
Bank	0.74	0.75	-0.01	-0.04
Market	0.22	0	0.22	1.01
<i>N</i>	62			

*Notes:* The table indicates whether, on average, a public good is present in the community (0 = not present, 1 = present) prior to the occupation. Difference between the means in column four, t-test in column five. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE A.9—MECHANISM: SCHOOLING

	Change school (1)	Quaranic school (2)	School commute (3)	School expenses (4)
Occupation	-0.04 (0.12)	0.02 (0.03)	-0.23 (0.17)	-944.22* (519.15)
Mean dependent variable	2.623	0.099	2.004	1561.669
N	407	769	407	629
Controls	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Individual FE	✓	✓	✓	✓

*Notes:* The table shows the whether having lived through Boko Haram's occupation caused children to change the type of school they attended, the likelihood of attending Quaranic school, the time spend travelling to school or the education-related expenses (in Naira) for the household. Estimation includes controls, school-year and individual fixed effects. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE A.10—RESULTS USING NON-BINARY TREATMENT VARIABLE

	Change in YoS	School attendance
Occupation, .5 year	-1.41*** (0.39)	-0.32*** (0.08)
Occupation, .75 year	-0.71* (0.42)	-0.13* (0.07)
Occupation, 1 year	-1.10*** (0.29)	-0.79*** (0.09)
Mean dependent variable	0.589	0.515
N	625	760
Controls	✓	✓
Year FE	✓	✓
Individual FE	✓	✓

*Notes:* Estimation includes controls, school-year and individual fixed effects. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE A.11—EDUCATIONAL OUTCOMES

	<b>Educational attainment</b>		
	<i>Baseline</i> (1)	<i>Gender</i> (2)	<i>Birth cohort</i> (3)
Occupation	-1.63** (0.74)	-2.20 (1.10)	-1.74* (0.10)
Occ.#Cohort '03-'05			2.40 (2.02)
Occ.#Cohort '06-'08			0.45 (1.00)
Mean dependent variable	14.13	14.13	14.13
<i>N</i>	371	371	371
Controls	✓	✓	✓
Year FE	✓	✓	✓
Individual FE	✓	✓	✓

*Notes:* Estimation includes controls, school-year and individual fixed effects. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE A.12—QUALITATIVE SAMPLE SELECTION, BORDERING LGAs: COMMUNITY DIFFERENCES

Variable	Control	Treatment	Difference	T-test
Centralization # Muslim super-majority	0.90	1.22	-0.32	-1.23
Ruggedness	10103.79	3798684	-3788580***	-3.77
Pop. density	438.7812	70.05977	368.7215	1.310628
Primary school	0.93	1	-0.07	-1.06
Secondary school	0.84	0.94	-0.10	-0.97
Health center	0.65	1	-0.35	-1.87
Public hospital	0.35	0.50	-0.15	-0.64
Pharmacy	0.22	0.33	-0.11	-0.52
Post office	0.20	0.43	-0.23	-1.17
Bus stop	0.59	0.86	-0.27	-1.26
Bank	0.16	0	0.16	1.02
Market	0.65	0.88	-0.23	-1.18
<i>N</i>	60			

*Notes:* The table indicates whether, on average, a public good is present in the community (0 = not present, 1 = present) prior to the occupation. Difference between the means in column four, t-test in column five. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE A.13—BASELINE RESULTS FOR VARYING CONTROL GROUPS

	Bordering LGAs		State of emergency		North East	
	Change in YoS	School att.	Change in YoS	School att.	Change in YoS	School att.
Occupation	-0.64*** (0.17)	-0.27*** (0.08)	-0.76*** (0.20)	-0.25*** (0.0899)	-0.82*** (0.21)	-0.26*** (0.08)
Mean dependent variable	0.704	0.603	0.678	0.541	0.770	0.598
N	1230	1536	2450	3081	5592	6979
Controls	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Individual FE	✓	✓	✓	✓	✓	✓

*Notes:* Estimation of the baseline effect using a qualitatively selected group of control units, consisting of the bordering LGAs. Estimation includes controls, school-year and individual fixed effects. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE A.14—STANDARD ERRORS: VARYING DISTANCE CUT-OFF AND TIME LAG

	Change in YoS	School att.
Occupation	-0.96** (0.372)	-0.30*** (0.101)
<i>Cut-off: 20km, lag: 3</i>		
Occupation	-0.96*** (0.365)	-0.30*** (0.100)
<i>Cut-off: 20km, lag: 2</i>		
Occupation	-0.96*** (0.356)	-0.30*** (0.099)
<i>Cut-off: 20km, lag: 1</i>		
Occupation	-0.96** (0.423)	-0.30*** (0.103)
<i>Cut-off: 40km, lag: 3</i>		
Occupation	-0.96** (0.400)	-0.30*** (0.100)
<i>Cut-off: 30km, lag: 3</i>		
Occupation	-0.96*** (0.369)	-0.30*** (0.101)
<i>Cut-off: 10km, lag: 3</i>		
Occupation	-0.96** (0.366)	-0.30*** (0.097)
<i>Cut-off: 5km, lag: 3</i>		
Mean dependent variable	0.589	0.515
N	625	760
Controls	✓	✓
Year FE	✓	✓
Individual FE	✓	✓

*Notes:* The table shows the results of the estimation of the treatment effect, being exposed to Boko Haram's occupation, on the change in YoS and school attendance. Estimation includes individual and school-year fixed effects and controls. Propensity scores used as sampling weights. Conley (1999; 2008) SEs in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .