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Estimating the Effects of Conflict on Education in Côte d'Ivoire

Andrew L. Dabalen and Saumik Paul

The World Bank and Nottingham University Malaysia campus

Abstract

This paper evaluates the effect of armed conflict on years of schooling in Côte d'Ivoire. We combine differences in conflict intensity across departments and differences across age cohorts to identify an individual's indirect exposure to conflict. The difference-in-difference outcomes indicate that the average years of education for a school-going age cohort is 0.94 years fewer compared to an older cohort in conflict-affected regions. We further use a set of victimization indicators to identify the direct effect of conflict. Overall, the findings across different models suggest a drop in average years of education by a range of 0.2 to 0.9 fewer years. The estimated effect is larger for males and individuals between 19 and 22 years of age.

Keywords: War, Human capital, Education, Propensity score matching, evaluation, Africa

JEL Classification: I20, J13, C40, H43, O15

Corresponding author: Saumik Paul, email: paulsaumik@gmail.com

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I. Introduction

Conflict affects education in several ways. It destroys infrastructure (Abdi, 1998), displaces and most tragically results in the deaths of students and teachers (Buckland, 2005), causes problems in harmonizing school calendars across conflict-affected regions (UNICEF, 2005) while schools remain closed for an indefinite period of time (Bruck, 1997), and has a damaging and pernicious socio-psychological impact on students (Sany, 2010). A cross-country analysis by Lai and Thyne (2007) shows that countries experiencing civil conflict suffer a decline in school enrolment by 1.6 to 3.2 percentage points. Evidence is growing at the subnational level that the outcomes are similar. Merrouche (2006) documents that an exposure to landmines in Cambodia resulted in an average loss of 0.4 years of education. In a similar study, the mid-1990s genocide in Rwanda lowered the average level of educational attainment by 0.5 years (Akresh and de Walque, 2008). From the perspective of gender, Shemyakina (2006) finds that conflict makes no significant impact on male education rates in Tajikistan. However, females were 12.3 percentage points less likely to complete the mandatory secondary schooling compared to those who completed their education before the conflict broke out. A recent study, using household survey data between 2000 and 2008 from twenty-five conflict affected countries, finds that conflict leaves a legacy of fewer average years of education, decreased literacy rates and a smaller share of the population with formal schooling (UNESCO, 2010).

In this paper we estimate the effect of conflict on education in Côte d’Ivoire. In particular, we measure the effect of Ivoirian conflict, which reached its peak between 2002 and 2004, on years of schooling for individuals who were exposed to it in their school-going age. We combine the year of birth and the department of birth to determine an individual’s exposure to conflict. The civil conflict in Côte d’Ivoire broke out in September 2002 as a result of growing ethnic tensions and a failed attempted military coup. It divided the country into two: the rebel-held North and the government-controlled South and caused more than 3,000 deaths (World Bank, 2010). The conflict internally displaced more than 700,000 people and as many as 500,000 children were out of school between 2002 and 2004 (UNICEF, 2004). According to the Ministry of Education of Côte d’Ivoire (2004), education in the North was affected more severely than education in the South. As per this report, almost 50 percent of the school-going aged children

were out of school and only 20 percent of government-paid teachers stayed in their posts in the North since 2002. Moreover, the start of the 2005 school year was delayed in the North, and approximately 72,000 children were unable to write their examinations in the North (UNICEF, 2005).

A recent study by UNESCO (2010) uses 2006 Multiple Indicator Cluster Survey (MICS) to conduct a quantitative study on the relationship between education and conflict in Côte d' Ivoire. This study finds an increase in the uneducated proportion of male cohorts in conflict-affected areas. Looking separately at the educational attainments for males and females, it concludes that for both genders the average educational attainment has dropped since the conflict broke out. To our knowledge this is the only quantitative study so far that examined the impact of conflict on education in Côte d' Ivoire. However, this study does not draw any causal inference on the potential impact of conflict on education. In addition, the MICS survey was undertaken in 2006 just after conflict had reached its peak, and as a result it might not have demonstrated the full impact of conflict.

Our study aims to bridge this knowledge gap. We calculate the effect of civil conflict on years of schooling in Côte d' Ivoire using the Households Living Standards Survey (HLSS) data collected in 2008 and the data on local incidences of conflict taken from the Armed Conflict Location and Event Database (ACLED). Our baseline empirical strategy to identify the indirect effect of conflict on years of schooling for the school-going age-cohort combines year and department of birth to determine an individual's exposure to conflict. Thus the identification strategy relies on the fact that older cohorts who escaped conflict during their school-going age have no correlation with the variation in conflict intensity across departments. We find statistically significant support to this assumption, which strengthens our identification strategy. We also use a set of victimization indicators to measure the direct effect of conflict. The difference-in-difference regression outcomes indicate that the average years of education for individuals aged 10 to 22 is 0.94 years fewer compared to the individuals aged 23 to 32 in conflict-affected regions. This implies that the average Ivorian born between 1986 and 1998 would have spent 1.2 more years in school even if all the tensions and all the inequality in access and all the government policies had been the same, but somehow or other physical violence had remained suppressed in certain departments where the events of violence were significantly higher. Our identification of

exogenous shock due to conflict is measured combining both years and regions of birth, not just the year of birth.

As a robustness check, we use the same set of victimization indicators to measure the potential effect of conflict and estimate a counterfactual comparison group based on propensity scores matching. This, we expect, is likely to minimize the selection bias and confounding in the estimated effect of conflict. The estimated effect of conflict identified by all the victimization categories indicates 0.2 to 0.9 fewer average years of education for conflict victims compared to the matched control group. The outcomes of double-robust models satisfactorily show less chances of misspecification in the estimated models. The outcomes are robust when we use a number of sensitivity analyses including alternative matching methods, and estimating the North and the South subsamples separately. In addition, we estimate the direct effect of conflict exposure across gender and age-specific groups. The outcomes are robust and show the largest impact on boys and individuals in the age group 19 to 22.

The paper is structured as follows. In section II, we provide a brief outline of the nexus between education, politics and conflict in Côte d' Ivoire. Section III describes the data and provides some descriptive evidence. We discuss the empirical models, identification strategies and the empirical findings in section 4. This is followed by the outcomes of sensitivity analysis in section 5. We provide our concluding remarks at the end.

II. The Political Economy of Conflict and Education

To evaluate the impact of conflict on education in Côte d' Ivoire, it is important to understand the Ivoirian education system and how it was linked to the consequences of armed conflict. First we provide a brief account of the conflict and education nexus in Côte d' Ivoire for the period until the conflict broke out. We then discuss it for the period 2002 to 2006, during and after the conflict peak.

2.1 The period until 2002

Since its independence in 1960, the education system has been central to Ivoirian identity and politics. Côte d' Ivoire follows the centralized French education system, where the government

plays a key role in curriculum development, coordination and allocation of resources and the organization of national examinations through the ministries of Education, Vocational Education and Higher Education. Prior to the civil conflict the education system was already struggling with a student-teacher ratio close to 40 (UNAIDS, 1998) while the net enrollment rate in primary education recorded around 60 percent (Côte d'Ivoire Ministry of Education, 2003). In 2000, following the Education for All (EFA) initiative - a worldwide plan to meet the learning outcomes of all children, youth, and adults by 2015 - a number of educational reforms were initiated by the newly elected President Laurent Gbagbo. The proposed agenda addressed areas that needed much attention including improvement of the status of teachers, enactment of the free public schooling through tenth grade and a nationwide preschool system. Perhaps because of this the net national enrollment rate in primary education slightly improved to 64.2 percent in 2001 (Côte d'Ivoire Ministry of Education, 2003).

While economic disparity between the North and the South and polarization of ethnicity and identity based on national origin were arguably the main causes of Ivoirian civil conflict, unequal access to education and uneven allocation of educational infrastructures between the North and the South also played a crucial role (Sany, 2010). Despite the improvement in country-wide net enrollment rates in the early 2000s, the enrollment rate in the Northern regions of Korhogo and Odiene were below 40 percent. Overall, there was a marked disparity in enrollment rates between the North (less than or equal to 50 percent) and the South (close to 80 percent).

2.2 The period from 2002 to 2004

The first phase of armed conflict started in September, 2002 but lasted for only a few months. The national army (FANCI) was joined by the Young Patriots, a youth militia that supported then President Gbagbo. On the other side, the rebel groups - the *Movement for Justice and Peace* (MJP), the *Movement of the Ivory Coast of the Great West* (MPIGO) and supporters of Alassane Ouatarra (current President) - joined forces under the banner of the *Forces Nouvelles* (FN) led by Guillaume Soro. The momentum of educational reform initiated in 2000 was soon arrested by the outbreak of civil conflict. As the conflict broke out, education moved to the bottom of the

national priority list (Sany, 2010). A UNICEF estimation in 2005 accounted for as many as 700,000 children being out of school between 2002 and 2004. This figure included students from primary school to university level. In November 2004, riots against the French force in Abidjan destroyed infrastructure including numerous school buildings there (UNICEF, 2005). In 2004, the Côte d'Ivoire Ministry of Education documented more than 50 percent of the students in the North did not have any access to school.

As argued by Sany (2010) education was used by both parties as a tactic of conflict. Due to conflict the organizational and institutional challenges in delivering the basic educational facilities were less in the government-held South compared to the rebel held-North. The Government side used this as a strategy to portray the inability of non-governmental forces in providing basic education and necessary infrastructure. Perhaps it paved a way for the government to legitimize its position, but it forced the non-governmental opposition to come up with an alternative strategy. An UNOCHA (2004) report found that there were more than 300,000 children in the North attending NGO-run primary and secondary schools from 2002 to 2004. The success of the NGOs in delivering education in the North indicates that the disparity in the provision of educational facility had more to do with the agendas of the political parties in conflict than to the fear of violence and lack of security (Sany, 2010). Validation of previous examination results in the rebel-held North and harmonization of the school calendars between the North and the South – later became part of the peace agreements signed by the parties in conflict.

In addition, during the conflict both sides actively sought to include university students on their side. The higher education institutes filled with active students' organizations and teachers' associations became the center stage of political movements. Many prominent political leaders including the former President Laurent Gbagbo and former Prime Minister Guillaume Soro emerged from the students' movements, reinforcing the Ivoirian sentiment that the education system has produced political leaders rather than business leaders (Sany, 2010).

III. Data and Descriptive Evidence

[Figure 3.1 is about here]

In this study we use two main data sources. The data on local incidences of conflict is taken from the Armed Conflict Location and Event Database (ACLED). The Armed Conflict Location and Event Databaseⁱ (ACLED) (Raleigh, Hegre, and Carlson, 2009) compiles exact locations, dates, and additional characteristics of individual battle events in states affected by civil conflict. The conflict data for Côte d'Ivoire is available for the period from 1997 to 2010. The ACLED database on Côte d'Ivoire reports a total number of 965 conflict events between 1998 and 2008. It tracks rebel activity and distinguishes between territorial transfers of military control from governments to rebel groups and vice versa. The conflict events are disaggregated into six categories: (i) Battle - government regains territory, (ii) Battle - no change of territory, (iii) Battles - rebels overtake territory, (iv) Non-violent activity by a conflict actor, (v) riots/protests, and (vi) Violence against civilians. In Figure 3.1, we show the total number of reported conflicts per year for the period starting from 2001 to 2006. The conflict intensity reached its peak between 2002 and 2004 with a total of 459 conflict events.

For empirical purposes, we disaggregate the conflict events into 50 departments, which are nested into 19 regions in Côte d' Ivoire. To decipher the causes and consequences of conflict at the local level, many studies have used smaller geographical regions or artificial geographic grid-cells (without pertaining to any meaningful sub-national border) as the unit of analysis. Some researchers prefer to follow the grid-cell approach because the unit of analysis does not change spatially (Buhaug and Rod, 2006). In comparison, when the unit of analysis is the sub-national regions, they are likely to vary in terms of area. In this study we map the exact locations of the conflict event provided by the ACLED database into 50 departments using spatial coordinates taken from the DIVA-GISⁱⁱ website.

[Figure 3.2 is about here]

Figure 3.2 plots the total number of conflict events at the department level for the period 2002 to 2004. On the left hand panel of Figure 3.2, we show the conflict prevalence map taken from the ACLED websiteⁱⁱⁱ. On the right hand panel, we plot the intensity of conflict across departments. The geographical areas marked with darker shades indicate departments that experienced more intense conflict. The incidences of civil conflict have been more frequent in the departments in the western and southern parts of the country and in the neighborhood of Abidjan. Between 2001 and 2006, the average number of conflict events per department recorded was 8.6. In 2003, in Abidjan alone the number of armed conflict events escalated to more than 150. Furthermore the conflict events occurred at a large number near the Line of Control administered by UN and French troops. About three-quarters (37 out of 50) of the departments experienced at least one conflict event during the period from 2002 to 2006.

[Figure 3.3 is about here]

We use the 2008 round of Households Living Standards Survey (HLSS) data, also known as *Enquête sur le Niveau de Vie de Menage* (ENV). These surveys were undertaken by the National Institute of Statistics in Côte d'Ivoire. The ENV-2008, jointly administered by the National Institute of Statistics - Côte d'Ivoire and UNICEF, was specifically designed to document the consequences of the civil conflict. A new section on the ‘impact of the conflict’ was added, which included a range of questions that are commonly used to evaluate the welfare impact of conflict on individuals and households. For example, household respondents were asked: “How did your income change over the years of crisis?” and “Has the current crisis affected your life?” In addition, the survey included a set of questions on the physical impact and casualty of the conflict, such as “Have you registered a death or illness linked to the crisis?”, “Have you been displaced during the conflict?” and “Have you suffered any violence linked to the crisis?”

In Figure 3.3 we provide a pictorial view of the conflict victimization based on household responses. We plot the average responses at the department level; darker shades imply a higher average rate of victimization experience for the inhabitants in a department. It is evident that the

civil conflict had an adverse effect on the livelihood of the entire population in Côte d' Ivoire. However the impact was more prevalent in the Middle and the Northwest of the country. Overall, between 30 to 50 percent of the respondents experienced declines in their income. The incidence of conflict victimization was more prominent in the departments located near the UN-peace keeping line and to the West where the civil conflict was more intense. Nearly 30 percent of the respondents had to hide during the conflict in the Northwestern departments. The conflict in the mid-West of the country is also marked by high levels of internal displacement. The adverse effect of the conflict on jobs and land is prevalent throughout the country. However, the people in the mid-West reported to have experienced loss of livestock and non-land assets.

Next, we turn to the education system in Côte d' Ivoire. The *Certificat d'étude primaires élémentaires* (CEPE) is awarded after completing six years of primary education, which is followed by seven years of secondary schooling. In the final year of secondary school students earn a baccalaureate degree. Universities, technical and vocational trainings are part of the higher education system in Côte d' Ivoire (Sany, 2010). As is evident from the ENV-2008 data, in the sub-population consisting of individuals aged 12 and above, about 35 percent earned a CEPE whereas only 10 percent completed the baccalaureate degree. However, almost 40 percent from the same group of people did not complete the CEPE. The average years of education stands a little above 7 years, which is one additional year of education after six years of primary education (CEPE). Based on this anecdotal evidence, it could be the case that the age-cohort of primary school goers are likely to be one of the potential victims of conflict. In this study, we use years of education as the main outcome variable to evaluate the effects of conflict on education in Côte d' Ivoire.

In Table 3.1 we provide descriptive evidence of basic indicators on conflict affected individuals. The first two columns compare the average outcomes for a young cohort (10 to 22 years old) between the low conflict and the high conflict departments, the last two columns show the same for an older cohort (22 to 32 years old). We define high conflict as departments experiencing at least one conflict event in the period 2002-2006, if there is no evidence of reported event of conflict we call it a low conflict area. As is evident from table 3.1, the average years of education are lower for the young cohort, though the education attainment gap is insignificant between high and low conflict areas. Other educational variables do not show any

significantly different outcomes for conflict affected individuals. We use log of per capita household consumption expenditure as an indicator of household welfare. We consider ten expenditure categories including food, education, health, transport, clothing, and transport among others to construct this indicator. The gap in the average welfare level is negligible between the high and the low conflict areas. While average years of education is higher for the old cohort, a higher percentage of households are female headed in the conflict affected areas. Among the ethnic groups, the Akans are more likely to be found in high conflict areas whereas members of the Voltaic group are more concentrated in the low conflict areas. Overall, these preliminary summary statistics are suggestive of a lower educational attainment for children in the conflict affected regions, in the next section we use both the direct and indirect exposure to conflict to evaluate its effect on educational.

IV. Empirical Outcomes

4.1. Indirect exposure to conflict: Identification using department and year of birth

According to the ENV-2008 survey data, for more than 90 percent of the individuals who earned the CEPE (completed six years of primary education), it took between 6 to 10 years. This suggests the majority of the students in the primary school are in the 6 to 16 age group with the plausible assumption that primary education normally starts at the age of six. To identify the potential victims of conflict, we construct a young cohort including all primary school goers who were exposed to the conflict between 2002 and 2006. Based on this, the individuals aged between 10 and 22 years constitute the young cohort in the ENV-2008 survey. Using ENV-2008, we compare average years of education for individuals in the young cohort against an older cohort, aged between 23 and 32. The individuals in the old cohort are likely to be over the age of primary school goers between 2002 and 2006. We use the year of birth and the department of birth to identify an individual's exposure to conflict. To begin with, a straight forward difference-in-difference of average years of education is calculated based on year and department of birth.

[Table 4.1.1 is about here]

Table 4.1.1 reports average years of education for both age-cohorts and a conflict prevalence dummy, which takes the value of one if a department (of birth) experienced at least one conflict event, zero otherwise. The conflict prevalence of a department reflects the total number of conflict events between 2002 and 2006. On average, the young cohort shows a shorter school attainment compared to the old cohort. In departments where violence broke out, the gap in average years of schooling between the old and young cohorts stands at 2.71 years whereas in departments which are not direct victims of violence the same gap stands at 1.52 years. In other words, the gap in average years of education between older and younger cohort is twice as big in the conflict zones compared to the departments with no conflict event. However, for both age-cohorts, the average years of schooling in conflict-affected departments is higher compared to the rest. Two possible explanations can be offered. First, the conflict zones (departments that experienced conflict) traditionally had higher average years of education and this could be due to better educational facilities or better job prospects. Second, due to the pernicious effect of conflict throughout the country, the gap in average years of education between conflict and non-conflict zones became smaller for the young age-cohort. Overall, the difference-in-difference outcome suggests that an individual aged between 10 and 22 experienced an average drop of 1.2 years of schooling if s/he resided in a conflict affected department.

To check for the evidence of common support we consider two older cohorts, aged between 33 to 42 years in 2008, we call them old_1. Our difference-in-difference strategy is unaffected by common support problem if we find similar trends of education attainment between the older cohorts who escaped the conflict in their school-going age. Apparently, the statistical evidence provides no threat to the difference-in-difference identification strategy as we find insignificant differences in years of schooling between old and old_1 in both no-conflict and conflict departments. In addition, the identification strategy relies on the fact that older cohorts who escaped conflict during their school-going age have no correlation with the variation in conflict intensity across departments. We find statistically significant support to this assumption, which strengthens our identification strategy¹.

¹ These results are available from the authors upon request.

We generalize this identification strategy with a regression framework, shown as equation 1 (Duflo, 2001; Merrouche, 2011; Shemyakina, 2011). This estimates the average years of education as a function of birth fixed effects and household / individual specific controls. If exposure to conflict (i.e. residing in the departments that had at least one conflict event) is detrimental to years of schooling, then the estimated coefficient of average years of education will be negatively correlated with the intensity of conflict for the young age-cohort which is exposed to conflict.

$$(1) \quad y_{ijk} = C_1 + Depart_{1j} + Birth_{1k} + (War_j \times Treat_i)\beta_1 + (X_i)\delta_1 + \varepsilon_{ijk}$$

where y_{ijk} measures years of education for an individual i born in department j in year k . C_1 is a constant, $Depart_{1j}$ is a dummy variable indicating department of birth fixed effect, $Birth_{1k}$ is a dummy variable that measures cohort of birth fixed effect, $Treat_i$ is a dummy variable indicating whether the individual belongs to the young cohort, War_j is a variable measuring intensity of conflict and X_i is a vector of household specific controls.

Table 4.1.2 presents estimates of equation (1). The first two columns show the baseline regression outcomes when the conflict intensity variable is a dummy, takes a value of one if a department had at least one conflict event, zero otherwise. The baseline regression model without household controls yields a coefficient of -0.94. This suggests average years of education for individuals aged 10 to 22 is 0.94 years fewer compared to the individuals aged 23 to 32 in departments that had at least one conflict event. The coefficient drops to -0.5 when we include household level control variables (as shown in column 2). If there is significant variation in the conflict count across departments, the dummy conflict indicator may not adequately explain the variation in average years of education across departments. As a robustness check, the next two columns report the estimated coefficients of years of education when the conflict intensity variable is measured as the actual number of conflict events. The outcome suggests that an increase in the conflict intensity by one additional event of conflict lowers the average years

of education for the young age-cohort (aged 10 to 22 years) by 0.01 years compared to old age-cohort (aged 23 to 32).

[Table 4.1.2 is about here]

For difference-in-difference to be a valid strategy, the assumption of common trends before the conflict periods needs to be verified. In order to check this, we compare educational outcomes of individuals aged 23 to 32 against individuals aged 33 to 42 years old. Presumably, individuals in both age cohorts were in school-going age before the conflict took place. The last two columns of table 4.1.2 show the estimated coefficients. The statistically insignificant difference-in-difference coefficient suggests that it is less likely that the localization of conflict is endogenous with years of education. Overall, the outcomes in table 4.1.2 suggest that indirect exposure to conflict has a detrimental effect on years of education.

Finally, we do a robustness check to find to what extent the omitted variable bias problems undermine our estimated coefficients. As evident from Table 4.2.1, after controlling for observable factors at the household level, the magnitude of the effect of conflict on years of schooling is halved. This motivated us to examine the household fixed effects further. As evident from descriptive statistics shown in Table 3.1, the presence of the ethnic group Akan is significantly higher in high conflict departments while, for the Voltaic ethnic group, it shows exactly the opposite picture. These are controlled for in our regression using fixed effects, which is likely to explain the drop in coefficients to some extent. However, differences across households in unobserved characteristics, such as conflict-led displacement, depletion in the supply of academic staff for the same reason and child soldiering (Blattman and Annan, 2010), could also undermine the estimated coefficients further. We use a statistic developed by Altonji, Elder, and Taber (2005) using selection on observables to estimate the potential bias from unobservables. We use their suggested ratio $R = \frac{\beta_{Full}}{\beta_{Restricted} - \beta_{Full}}$, which in our case, indicates how much stronger the selection on unobservables, relative to selection on observables, needs to be to explain away the estimated effect of conflict on educational attainment. For estimates in

Table 4.1.2, the average value of R is around two. This implies that, on average, the selection on unobservables has to be at least twice as strong compared to the selection on observables to explain away the estimated regression coefficients. This conceivably means that our model outcomes are unlikely to be affected by the omitted variable bias.

4.2 Direct exposure to conflict: Identification using victimization indicators

The estimated coefficients of the effect of conflict on education show an expected sign. However, it can be plagued by a number of issues. First, using department of birth as an identification strategy may not reveal the heterogeneous impact of conflict victimization on education for children from different socio-economic groups. In other words, there exists a possibility of selection into victimization across individuals which could be largely hidden by the total number of conflict events in a department. Second, the proximity to a conflict zone dummy variable may fail to identify the true impact of conflict on education because the intensity of conflict measured as the count of conflict events varies significantly across departments. Third, due to a large number of internally displaced people, it is often hard to track their movements between 2004 and 2008. It is also possible that the household control variables for the comparison group might have changed over time, especially if they migrate. As a result, we use an alternative identification strategy to measure the direct exposure to conflict.

To measure impact of direct exposure, we use 11 victimization indicators as potential identifiers of true conflict victims. The victimization indicators are dummy variables, which take the value of one for a household or individual being a victim, zero otherwise. It is possible that the self-reported victimization indicators may produce subjective bias related to a particular ethnic group or other identities. The simplest way to detect the extent of this bias is to estimate each victimization indicator as a function of the observable characteristics. The estimated outcome does not conform to any subjective bias generated by any particular variable².

We first estimate the standard linear OLS regression outcomes of years of education as a function of the victimization dummy and household and individual controls on a sample restricted to individuals aged between 10 and 22 (who are likely to have been in primary school

² For reasons of space we do not show the outcome in the paper; it is available from the authors if requested.

during the conflict). In Table 4.2.1 we report the estimated coefficients for the eleven victimization categories (columns M1 through M11). The coefficients of all the victimization dummy variables are negative. The coefficients are statistically significant for victimized individuals or households when they registered deaths or injuries due to conflict , income dropped, lost job, lost livestock and experienced violence due to conflict. Overall, the estimated conflict outcomes on education are in line with previous findings, despite the fact that the impact of conflict is now identified by a set of victimization indicators based on the subjective evaluation of conflict impact by the survey respondents.

[Table 4.2.1 is about here]

V. Sensitivity analysis

5.1. Propensity score matching outcomes

The identification strategies used so far assume that the conflict victims (as identified above) and control groups are exchangeable, such that they have identical distributions of variables. This can be confirmed by data using a randomized controlled trial. However, drawing causal inference using survey data requires a more careful analysis because selection biases and confounding invalidates the exchangeability assumption. In such cases the estimated effects are likely to be biased. Since a direct comparison of two groups of individuals may not overcome the problem of identification, we go one step further and employ propensity score matching (Rosenbaum and Rubin, 1983). This means pairing individuals who are identical based on all observable characteristics (including department of birth, other households characteristics and the relevant socio-economic factors) that the rich ENV-2008 survey data offers, except variables that measure conflict victimization. We discuss it more formally in the online appendix.

There exists a range of possibilities for matching algorithms. But, the performance of different matching estimators depends largely on the data structure (Zhao, 2000). For our purpose, we use the straightforward nearest neighbor matching as a baseline strategy. This

method first categorized both the treatment and the control group records according to the estimated propensity score and then searches backward and forward for the closest control units for a particular treatment value. Overall, most of our empirical models do not encounter any common support problem (discussed in detail in the online appendix). Table 5.1 summarizes the estimated effect of conflict on educational outcomes for each of the 11 models. The propensity score matching method yields a negative impact of conflict on years of education in the sample restricted to individuals aged between 10 and 22. The average treatment effect on the treated (ATT) indicates that irrespective of the type of conflict victimization, conflict victims in comparison with the matched control group indicate a lower average years of education. The mean difference is statistically significant particularly when the conflict victims reported being affected by the conflict, registered deaths due to the conflict, their income dropped, and they lost jobs.

[Table 5.1 is about here]

As a further robustness check we use the concept of double-robust estimators (Robins, 2000; Bang and Robins, 2005). The double-robust estimation method requires a model for estimating the propensity scores and the outcome model (OLS in our case) in the same estimator (discussed in detail in the online appendix). Overall, the findings show mixed outcomes, and there exists a trade-off in the estimation model choice between the OLS and propensity scores matching. We also employ additional matching criteria such as the *nearest neighbor matching without replacement*, the *caliper matching*, and the *kernel matching*. The findings (shown in the online appendix) reveal that the estimated effect of conflict on education is negative throughout and this outcome is independent of any matching criterion.

5.2. Alternative measures of educational outcomes

In the previous analysis we used only total years of education as an educational outcome variable. As a sensitivity analysis, we propose to look at another potential outcome variable that measures

the percentage of population that completed CEPE (six years of primary education). This is justified by the fact that the average years of education based on the ENV-2008 data is recorded as being little over 7 years and almost 40 percent of the population fail to complete the CEPE. Thus, percent completed CEPE can be a good indicator of the status of education in Côte d'Ivoire. We estimate nonparametric kernel-weighted local polynomial regressions of percent ever completing six years of primary education against age using Epanechnikov kernel. We ran the regressions separately for the conflict victims and the rest of the sample as identified by the victimization indicators. The internally displaced individuals do not show a different trend in the successful completion of CEPE. However, for households that suffered loss of ownership, we find a drop in the rate of successful completion of six years of primary education.

5.3. Effect of direct exposure to conflict on sub-samples: The North versus the South

We compare empirical outcomes from sub-samples: the North and the South. We designate the departments using the United Nations peace-keeping line (also known as the fault line). Out of a total of 50 departments, the North has 16 and the rest of the departments are classified as being in the South. We find that for both the old and the young cohort, the average years of education is lower in the North (The tables are shown in online appendix III). The difference-in-difference outcome implies individuals in the young-age cohort have on average 0.72 more years of education compared to the old cohort in the North. This is somewhat in contradiction with the anecdotal evidence that the North was hit harder due to conflict. To obtain a generalized picture, we run OLS regression outcomes. The impact of conflict on the average years of education by regions (the North and the South) is identified by the victimization indicators with the same set of control variables. Overall, the findings do not suggest any clear evidence in support of the North being the worst conflict-affected region in terms of education outcomes.

5.4. Effect of direct exposure to conflict on sub-samples: Gender and age-specific groups

Table 5.4 reports outcomes of direct exposure to conflict on years of education for females, males and other subgroups comprising of individuals aged 10 to 14, 15 to 18, 19 to 22 years old. On average, male respondents who are direct victims of conflict have few years of education. Female respondents report

negative outcomes but the magnitude of the effect of conflict is lower and less significant statistically. When compared across different age groups, individuals in the age group 19-22 who are directly exposed to conflict show a larger drop in years of education, in some cases about 2 years. Individuals in this age group, whose family members experienced a job loss or a drop in income due to conflict experienced the largest drop in years of education. This could be because they joined the labor force to help support their families. Overall, the finding that direct exposure to conflict affects years of education, negatively, is robust.

VI. Conclusion

The relationship between education and conflict in Côte d’ Ivoire is complex. While anecdotal evidence from various reports and studies suggest that education has been a clear victim of conflict, the education system in the North has been a victim of Ivoirian politics since the early 1990s and the North-South divide following the civil conflict only exacerbated that ongoing crisis. This makes the task of finding a causal inference of the conflict on education particularly challenging. In this paper we estimate the effect of civil conflict on years of education for individuals who were exposed to conflict between 2002 and 2006 in their school-going age. We use the Households Living Standards Survey (HLSS) data collected in 2008 (ENV-2008) and the data on local incidences of conflict taken from the Armed Conflict Location and Event Database (ACLED) for the empirical analysis.

We employed empirical strategies to identify both direct and indirect exposure to conflict for individuals in their school going age. We use the year of birth and the department of birth to determine an individual’s indirect exposure to conflict. The difference-in-difference outcomes indicate that the average years of education for individuals aged 10 to 22 is 0.94 years fewer compared to the individuals aged 23 to 32 in conflict-affected regions against other regions. The validity of the finding is tested by a number of factors such as common support before the break-out of conflict, heterogeneous selection into victimization both across and within a region and varying intensity of conflict across regions. The direct impacts include destruction of infrastructure, displacement and most tragically deaths of students and teachers, problems in harmonization of school calendars across the conflict-affected regions and closure of schools for an indefinite period. Other effects such as loss of jobs and farm, decrease in income and

experiencing violence could also affect the education of children in the same household. To realize the full potential impact of conflict, we used a set of victimization indicators to identify the direct impact of the conflict. The fixed effect OLS models conform to the negative impact of conflict on education outcomes.

We use a number of tests to check the validity of the estimated outcomes. We used propensity scores matching to minimize the selection bias and confounding in the estimated effect. The average effect of conflict as identified by the victimization categories reports a 0.2 to 0.9 fewer average years of education for the conflict victims in comparison to the matched control group. The moderately satisfactory outcomes of double-robust models lower chances of misspecification in the estimated models. The outcomes are also robust when we use alternative matching methods, using different educational outcome variables and estimating the North and the South subsamples separately. We also looked at subsamples by gender and different age-groups. For individuals in the age group 19-22, the estimated outcomes show the largest impact of conflict on years of education; males on average have less years of education compared to females when directly exposed to conflict.

Understanding the mechanism through which conflict affects education is critical in order to disentangle the pernicious effects of conflict on education. The education and conflict nexus in Côte d'Ivoire provides a complex picture and in this paper we attempted to explore the channels through which conflict could possibly affect education. Nevertheless, some caveats apply. The role of third parties, such as NGOs in promoting primary and secondary education in the North is difficult to incorporate in the estimated effect. It is also possible that the existence of internally displaced populations and the timing of the survey could downplay the estimated measured effect of conflict. Nevertheless, the empirical evidence derived from our study on Côte d'Ivoire provides robust support to the existing studies on how conflict has a detrimental impact on education.

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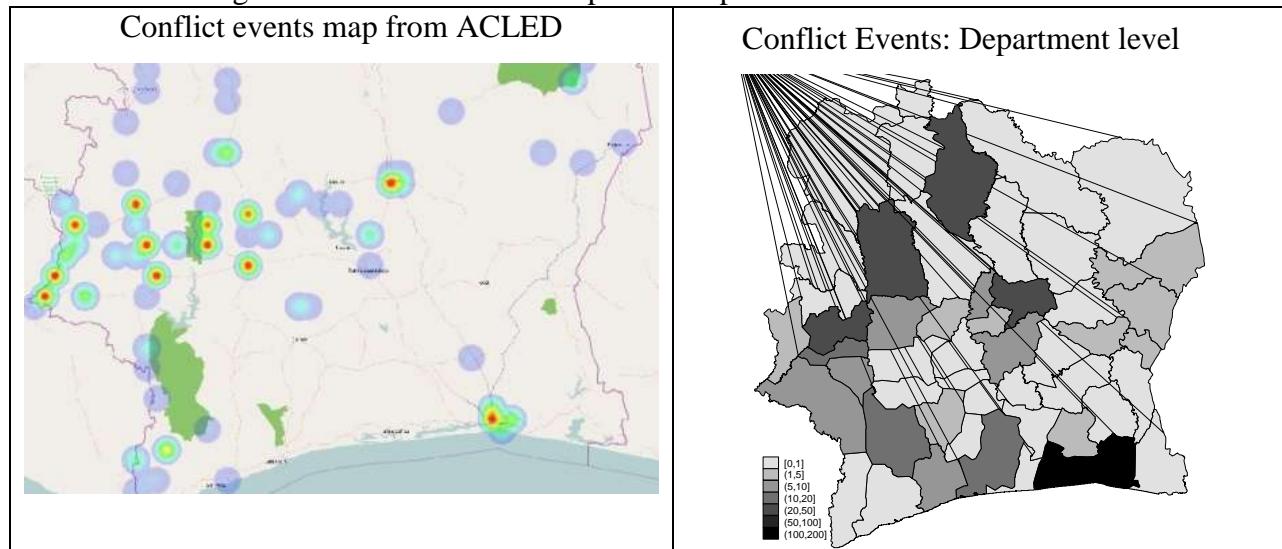
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Figure 3.1 Incidence of Conflict in Cote d'Ivoire: 2001 to 2006



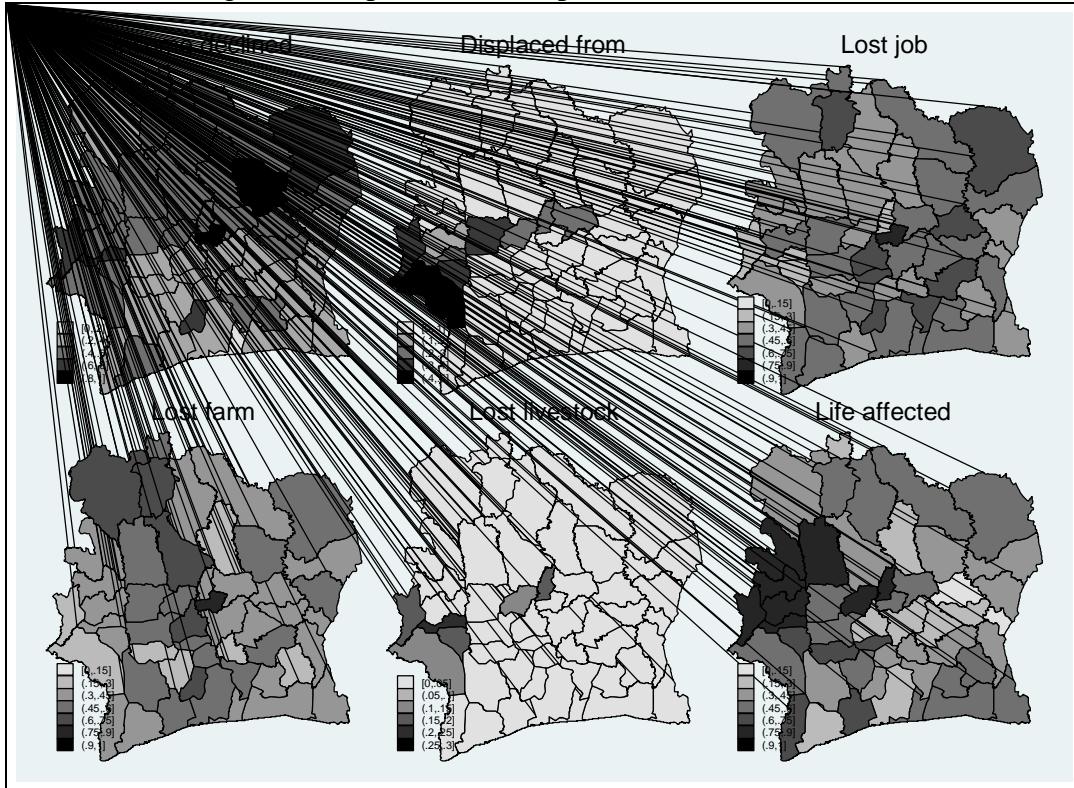
Source: Authors' calculation based on the ACLED database

Figure 3.2 Conflict events map at the department level: 2001 to 2006



Source: ACLED and authors' own calculations

Figure 3.3 A pictorial description of war victimization



Source: ACLED and authors' own calculations based on the 2008 round of *Enquête sur le Niveau de Vie de Ménage* (ENV).

Table 3.1 Descriptive evidence

	Young cohort (Age 10 to 22)		Old cohort (Age 23 to 32)	
	Low conflict	High conflict	Low conflict	High conflict
Average years of education	6.30	6.46	7.75	9.17
Completed primary education	0.33	0.32	0.30	0.28
Registered in school	0.73	0.72	0.09	0.12
Log of per capita consumption expenditure	11.34	11.53	11.55	11.83
Female	0.40	0.45	0.39	0.43
Household head is female	0.16	0.21	0.16	0.19
Number of children below 5 years old	0.85	0.82	0.87	0.76
Number of children 5 to 9 years old	1.00	0.94	0.68	0.63
Number of children 10 to 14 years old	1.15	1.15	0.46	0.47
Average years of education (excluding children)	4.08	4.41	4.72	5.83
Ethnic group: Akan	0.25	0.36	0.26	0.37
Ethnic group: Krou	0.17	0.15	0.20	0.17
Ethnic group: Mande North	0.13	0.14	0.10	0.13
Ethnic group: Mande South	0.08	0.09	0.09	0.08
Ethnic group: Voltaic	0.19	0.10	0.16	0.10
Religion: Muslim	0.34	0.32	0.31	0.31
Religion: Christian	0.44	0.48	0.49	0.52

Source: Authors' own calculations based on the 2008 round of *Enquete sur le Niveau de Vie de Menage* (ENV). High conflict areas include departments that experienced at least one event of conflict during the period from 2002 and 2006. Low conflict areas include department that did not experience any events related to conflict in the same period.

Table 4.1.1 Means of Years of Education by Cohort and Conflict Prevalence

	Years of education		
	No Conflict	Conflict	Difference
Old Cohort (Aged 23 to 32 in 2008)	7.84 (0.14)	9.18 (0.08)	-1.34 (0.18)
Young cohort (Aged 10 to 22 in 2008)	6.32 (0.06)	6.46 (0.04)	-0.14 (0.07)
Difference	1.52 (0.13)	2.71 (0.08)	-1.20 (0.16)

Note: Standard errors are in parenthesis, all estimated coefficients are statistically significant at 1 percent

Table 4.1.2 Effect of conflict on Education using 2008 household survey data
 (Dependent variable = Years of Education)

	Conflict intensity = dummy (=1 if there was at least one conflict event)	Conflict intensity = actual number of conflict events	Conflict intensity = dummy (=1 if there was at least one conflict event)	Conflict intensity = actual number of conflict events
Conflict intensity × Cohort dummy (ages 10 to 22 = 1; ages 23 to 32 = 0)	-0.940***	-0.499***	-0.011***	-0.008***
Conflict intensity × Cohort dummy (ages 23-32 = 1; ages 33 to 42 = 0)			-0.123	-0.001
Control variables				
Birth fixed effects (department)	Yes	Yes	Yes	Yes
Birth fixed effects (Age Cohort)	Yes	Yes	Yes	Yes
Household controls	No	Yes	No	Yes
Constant	8.355***	4.677***	8.477***	4.651***
Observations	16,345	16,017	16,345	16,017
R squared	0.235	0.423	0.241	0.426
				0.342
				0.342

Notes: The household level controls include log per capita consumption expenditure, gender, gender of household head, average years of education in the household, ethnic groups (Akan, Krou, Mande North, Mande South, Voltaic (comparison group) and religious groups (Muslims and Christians); *** implies significant at 1%, ** implies significant at 5% and * implies significant at 10%. Estimation with robust standard errors.

Table 4.2.1 OLS Regression outcomes on Average Years of Education for individuals aged 10 to 22

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Registered deaths		-0.128**									
Registered injury			-0.115*								
Displaced				-0.033							
Income dropped					-0.220***						
Lost ownership						-0.125					
Lost job							-1.602***				
Lost farm								-0.516			
Lost livestock									-0.682***		
Lost assets										-0.200	
Affected by the war											-0.058
Experienced violence											-0.240***
Control variables											
Birth fixed effects (department)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth fixed effects (Age Cohort)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	6.152***	6.076***	6.185***	6.213***	6.181***	6.115***	6.192***	6.168***	6.190***	6.235***	6.172***
Observations	10,552	10,331	10,492	10,625	10,625	10,625	10,625	10,625	10,625	10,625	10,625
R squared	0.455	0.457	0.456	0.457	0.456	0.457	0.456	0.456	0.456	0.456	0.456

Notes: The household level controls include log per capita consumption expenditure, gender, gender of household head, average years of education in the household, ethnic groups (Akan, Krou, Mande North, Mande South, Voltaic (comparison group) and religious groups (Muslims and Christians); *** implies significant at 1%, ** implies significant at 5% and * implies significant at 10%. Estimation with robust standard errors.

Table 5.1 Estimated effects of conflict on years of education using propensity score matching
 (Matching method: nearest neighbor)

Model		Observations	Treatment	Controls	ATT
M1	Registered deaths	10496	6.368	6.561	-0.193*
M2	Registered injury	10249	6.490	6.590	-0.100
M3	Displaced	10888	6.425	6.564	-0.139
M4	Income dropped	10625	6.409	6.686	-0.277**
M5	Lost ownership	10070	6.217	6.530	-0.313
M6	Lost job	6541	5.182	6.364	-1.182*
M7	Lost farm	4870	5.392	5.804	-0.412
M8	Lost livestock	5335	5.589	5.900	-0.311
M9	Lost assets	7305	6.811	7.232	-0.421
M10	Affected by the war	10625	6.535	6.761	-0.226**
M11	Experienced violence	10167	6.468	6.625	-0.158

*** implies significant at 1%, ** implies significant at 5% and * implies significant at 10%.

(ATT: the average treatment effect on the treated)

Table 5.4 OLS Regression outcomes on Average Years of Education for individuals by gender and age groups

	All	Girls	Boys	Aged 10-14	Aged 15-18	Aged 19-22
Registered deaths	-0.128**	-0.012	-0.232***	-0.103	-0.040	-0.212
Registered injury	-0.115*	-0.044	-0.172**	-0.155**	-0.044	-0.053
Displaced	-0.033	-0.044	-0.031	-0.085	-0.138	0.203
Income dropped	-0.220***	-0.170*	-0.248***	0.039	-0.100	-0.504***
Lost ownership	-0.125	-0.034	-0.161	-0.202	0.111	-0.225
Lost job	-1.602***	-1.347***	-1.766***	-0.672*	-1.491**	-2.056***
Lost farm	-0.516	-0.750**	-0.439	-0.192	-0.479	-0.582
Lost livestock	-0.682***	-0.441	-0.831**	0.036	-0.594	-1.039*
Lost assets	-0.200	-0.488	0.034	-0.027	0.012	-0.419
Affected by the conflict	-0.058	0.030	-0.134**	-0.007	-0.003	-0.160
Experienced violence	-0.240***	-0.081	-0.357***	-0.008	-0.155	-0.409*

Notes: The household level controls include log per capita consumption expenditure, gender of household head, average years of education in the household, ethnic groups (Akan, Krou, Mande North, Mande South, Voltaic (comparison group) and religious groups (Muslims and Christians); *** implies significant at 1%, ** implies significant at 5% and * implies significant at 10%. Estimation with robust standard errors.

ⁱFor more information go to the ACLED website at <http://www.prio.no/CSCW/Datasets/Armed-Conflict/Armed-Conflict-Location-and-Event-Data/>

ⁱⁱDIVA-GIS website for Côte d’ Ivoire <http://www.diva-gis.org/datadown>

ⁱⁱⁱThe following website <http://www.acleddata.com/index.php/dynamic-maps> provides conflict maps for a number of countries.

Online Appendix

I. Propensity Score Matching

Let us denote the binary victimization indicator W_i equals to one if individual i is a war victim and zero otherwise. We are particularly interested in estimating the average treatment effect on the treated (ATT). This can be written as below:

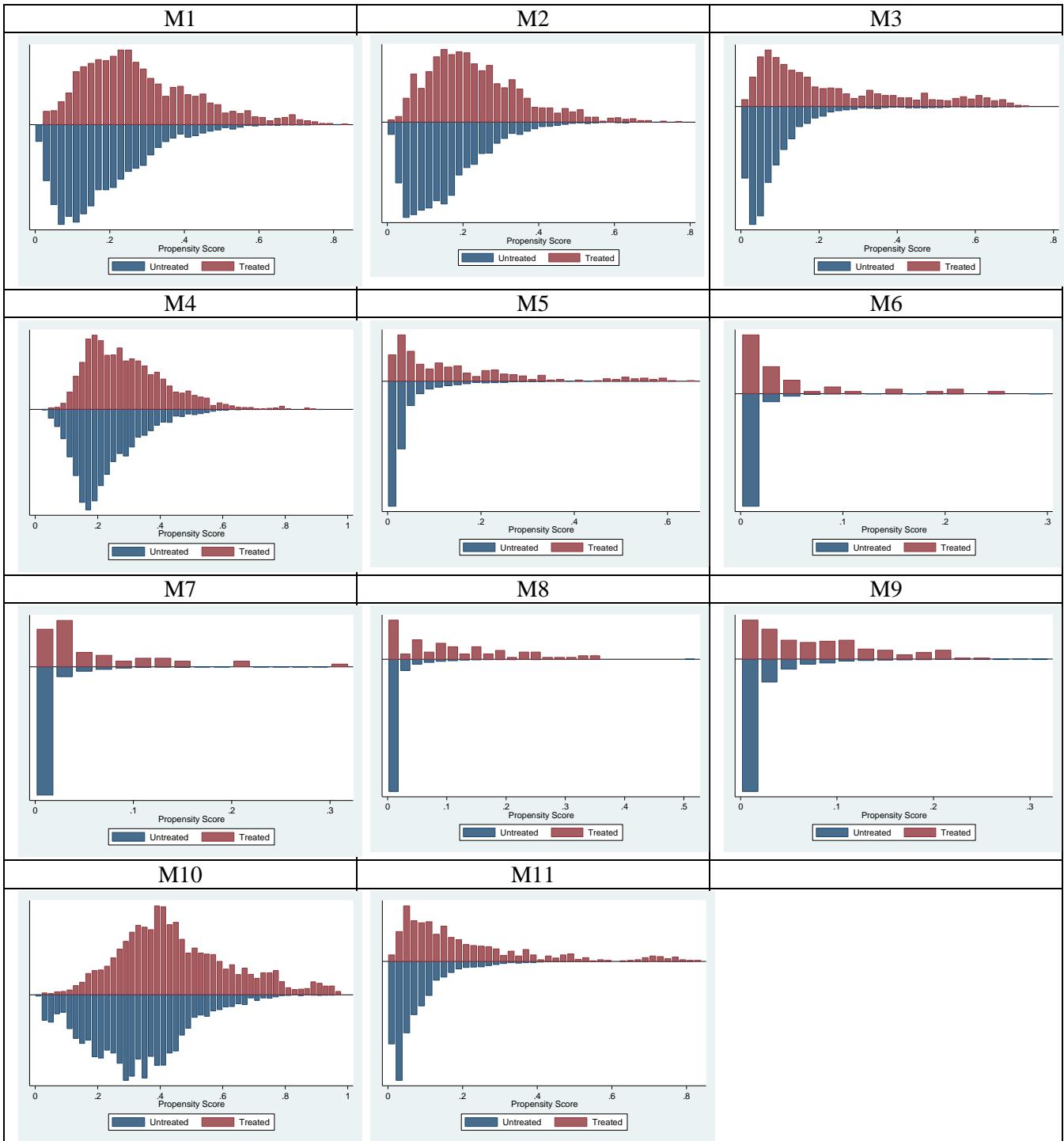
$$(2) \tau_{ATT} = \mathbf{Educ}(\tau|W = 1) = E[\mathbf{Educ}(1)|W = 1] - E[\mathbf{Educ}(0)|W = 1]$$

where $\mathbf{Educ}_i(W_i)$ denotes the potential education outcome (years of education in our case) for each individual i . As the average education level of the counterfactual comparison group - $E[\mathbf{Educ}(0)|W = 1]$ - is not observed, we generate propensity scores to choose a proper substitute from the matched pairs based on propensity scores. Propensity scores are generated by simple probit regression. Individuals are paired chosen from the war victims (treatment group) and the rest (control group) based on the similar propensity scores and then we calculate the average difference in years of schooling across them.

The common support between the treatment and the control group

Figure A1 provides a visual description of the comparison of propensity score distributions between the direct civil war victims (treated) and the matched comparison groups (untreated). The visual analysis of the density distribution of propensity scores is the most straight forward way to check the overlap and the region of common support between the treatment and comparison group (Caliendo and Kopeinig, 2005). To determine the average treatment effect on the treated (ATT), it is sufficient to ensure the existence of potential matches in the control group (Bryson, Dorsett and Purdon, 2002). In our case, except M5, M6, M7 and M8, the rest of the models show a satisfactory match just by visual observations. Overall, most of our empirical models do not encounter any common support problem. We discuss this in further detail in the next section.

Figure A1 The common support between the war victims and the comparison groups



Notes: M1 (Registered deaths); M2 (Registered injury); M3 (Displaced); M4 (Income dropped); M5 (Lost ownership); M6 (Lost job); M7 (Lost farm); M8 (Lost livestock); M9 (Lost assets); M10 (Affected by the war); M11 (Experienced violence)

Combining matching and regression: double-robust estimation

Any method that uses propensity score matching requires that the model is specified correctly with all relevant confounders included in the model (Emsley et al, 2008). In reality it is hard

to ascertain that the empirical models we estimate are correctly specified. However, as a robustness check one can use the concept of double-robust estimators (Robins, 2000; Bang and Robins, 2005). The double-robust estimation method requires a model for estimating the propensity scores and the outcome model (OLS in our case) in the same estimator. Ideally, this method selects only those observations which are on common support and discards the rest of the data. In the context of the present study, by using this method we prune from the data all the observations that are not similar to the propensity scores of war victims, and then run a simple linear OLS regression on the observations that are left in the data set. Additionally this retains the weights from matching, thus indicating how many times each control case will be used in the regression. The double-robust estimators provide unbiased estimates of the treatment effect when either or both of these models are correctly specified. In a sense, it provides more protection against the misspecification (Uysal, 2011).

Table A.1 Comparison of estimated effects of war on years of education: OLS, propensity score matching and doubly robust model

Model	OLS model (coefficients)	Propensity score matching model (ATT)	Double-robust model (coefficients)
M1 Registered deaths	-0.128**	-0.193*	-0.156**
M2 Registered injury	-0.115*	-0.100	-0.100
M3 Displaced	-0.033	-0.139	-0.131
M4 Income dropped	-0.220***	-0.277**	-0.287***
M5 Lost ownership	-0.125	-0.313	-0.102
M6 Lost job	-1.602***	-1.182*	-1.665***
M7 Lost farm	-0.516	-0.412	-0.077
M8 Lost livestock	-0.682***	-0.311	-0.128
M9 Lost assets	-0.200	-0.421	-0.153
M10 Affected by the war	-0.058	-0.226**	-0.106*
M11 Experienced violence	-0.240***	-0.158	-0.021

*** implies significant at 1%, ** implies significant at 5% and * implies significant at 10%.

In Table A.1, we compare the estimates of the linear OLS model, propensity score matching and double-robust model for 11 victimization categories, M1 to M11. We use this table as a sensitivity analysis to assess the specification of the OLS and propensity score matching models. If these models are correctly specified then ideally the double-robust estimates would produce a similar effect. As is shown in Table 5.1.1, M2, M3 and M4 are correctly specified in the propensity score matching. However, M5 and M6 are correctly specified when estimated in the OLS model. We conclude this as they closely match with the

double-robust estimated coefficient of the causal effect of war on years of education. The outcomes from the rest of the models do not conform to the double-robust estimates closely. Overall, the support is mixed, and there exists a trade-off in the estimation model choice between the OLS and propensity scores matching.

Implementing alternative matching criteria

So far, we used the *nearest neighborhood with replacement* as a baseline matching criterion. A number of alternative matching criteria do exist and it is argued that in large samples all of these propensity score matching estimators should yield the same results asymptotically (Smith, 2000). However, choosing an appropriate matching criterion becomes a concern when we are left with small samples (Heckman, Ichimura and Todd, 1997). In our study models such as M6, M7, M8 and M9 have a relatively smaller sample size. As a robustness check we estimate the causal effect of war on education using three additional matching criteria for each of the models. Since performance of different matching criteria depends largely on the data structure and varies case-by-case (Zhao, 2000), we compare the average treatment effect on the treated (victims) from different matching estimators side by side (Table A.2).

Table A.2 Comparison of estimated effects of war on years of education: ATT based on alternative matching criteria

Model		ATT (Nearest Neighbor Baseline)	ATT (Nearest Neighbor no replacement)	ATT (Caliper matching .007)	ATT (Kernel matching)
M1	Registered deaths	-0.193*	-0.172*	-0.186	-0.159*
M2	Registered injury	-0.100	-0.151	-0.096	-0.129
M3	Displaced	-0.139	-0.040	-0.147	-0.002
M4	Income dropped	-0.277**	-0.172*	-0.275**	-0.199**
M5	Lost ownership	-0.313	-0.248	-0.253	-0.225
M6	Lost job	-1.182*	-1.036*	-1.182*	-1.427***
M7	Lost farm	-0.412	-0.294	-0.104	-0.876*
M8	Lost livestock	-0.311	-0.400	-0.253	-0.767**
M9	Lost assets	-0.421	-0.384	-0.409	-0.052
M10	Affected by the war	-0.226**	-0.178**	-0.216**	-0.173**
M11	Experienced violence	-0.158	-0.319**	-0.214	-0.219*

*** implies significant at 1%, ** implies significant at 5% and * implies significant at 10%.

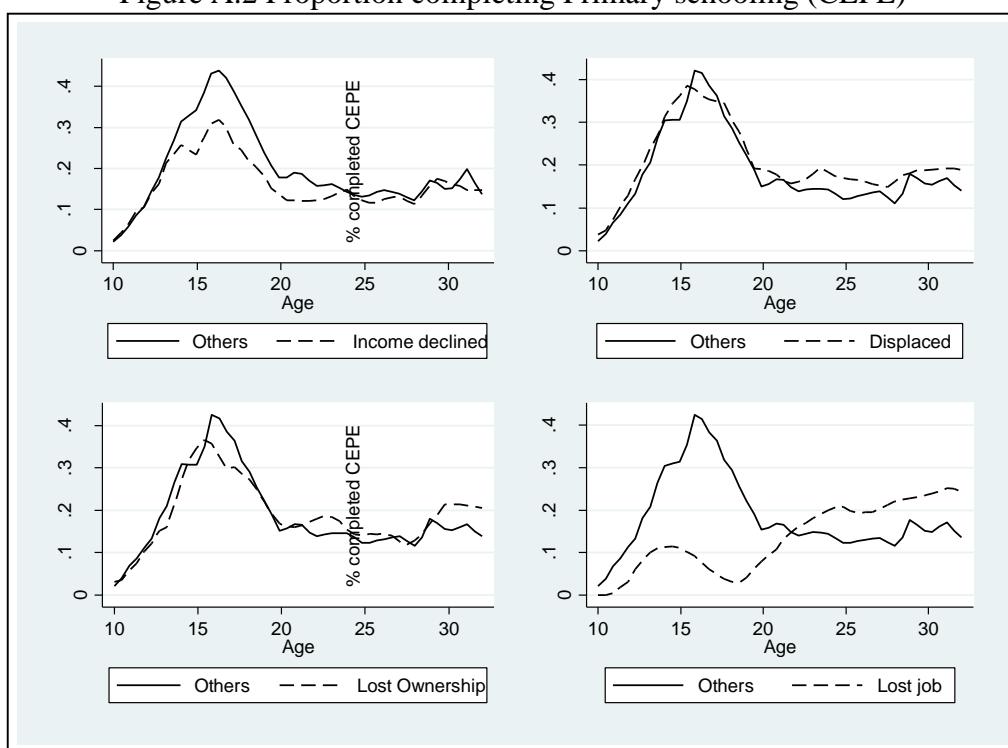
A quick observation of Table A.2 reveals that the causal effect of war on education is negative throughout and this outcome is independent of any matching criterion. If we compare the outcomes from the *nearest neighbor matching with replacement* (baseline) and the *nearest neighbor matching without replacement*, the average war effect on education is largely across the models with a few exceptions. We modify the nearest neighbor matching by imposing a caliper of .007, which in this case is the maximum propensity score distance for matching. This filters the bad matches which are outside the caliper tolerance level. The estimation based on the *caliper matching* yields similar outcomes to baseline models. Finally, we use a non-parametric matching estimator, the *kernel matching*, which uses weighted averages of all entries in the control group to construct the counterfactual outcome.

According to Smith and Todd (2005), kernel matching can be seen as a weighted regression of the counterfactual outcome on an intercept with weights given by the kernel weights. The outcome is similar to the baseline model; however, in most of the models, the estimated effect of war on education is significant using the kernel method. This could possibly be because kernel matching includes observations that are bad matches. Overall, we find robust support for the baseline findings.

II. Using Alternative measures of educational outcomes

Figure A.2 provides the outcomes of non-parametric estimation for four victimization categories. Of the victimized groups, individuals whose family members suffered from income loss or job loss are less likely to complete CEPE. This is evident particularly in the age-cohort with individuals aged between 10 and 22. The internally displaced individuals do not show a different trend in the successful completion of CEPE. Households that suffered from ownership loss, individuals in the aged between 10 and 22, do indicate a drop in the rate of successful completion of six years of primary education.

Figure A.2 Proportion completing Primary schooling (CEPE)



III. Estimating impact of war on sub-samples: The North versus the South

As the final robustness check, we compare empirical outcomes from sub-samples: the North and the South. Table A.3 reports the simple difference-in-difference outcome of average years of education on age-cohorts between the North and the South sub-populations. Out of a total of 50 departments the North has 16 which were located to the north of the United Nations peace-keeping line (also known as the fault line). The rest of the departments are classified as being in the South. As is evident from Table A.3, for both the old and the young cohort, the average years of education is lower in the North. However, the difference is twice as big as for the old cohort (aged between 23 and 32 years) compared to the younger one (aged between 10 and 22 years). As a result the difference-in-difference outcome for years of education is .72 years. This implies individuals in the young-age cohort have on average .72 more years of education compared to the old cohort in the North. It might suggest that despite the historically lower educational outcome in the North, the impact of war on education fell most heavily on the school going age-cohort that was exposed to the war.

Table A.3 Means of Years of Education by Cohort and region

	Years of education		
	South	North	Difference
Old Cohort (Aged 23 to 32 in 2008)	9.13 (0.08)	7.81 (0.15)	1.33 (0.16)
Young cohort (Aged 10 to 22 in 2008)	6.56 (0.04)	5.96 (0.06)	0.61 (0.07)
Difference	2.58 (0.08)	1.85 (0.14)	0.72 (0.17)

Note: Standard errors are in parenthesis, all estimated coefficients are statistically significant at 1 percent

To obtain a generalized picture, we run OLS regression outcomes for the impact of war on the average years of education by region as identified by the victimization indicators. Table 5.4.2 compares the outcomes between the full sample, i.e. the North and the South sample. For the displaced household members and households that registered death due to war, the effect of war is negative and significant only in the North. However, when we compare educational outcomes of households where members lost their jobs or reported declines in income, we find that war had a similar negative effect. Overall, the similarities

and dissimilarities in these findings might have a lot to do with the subjective bias in responses and selection bias into victimization between the North and the South sub-populations. Nevertheless, we do not find any clear evidence in support of the North being the worst war-affected region in terms of education outcomes.

Table A.4 Comparison of OLS estimates of war on years of education: Full sample, the North sample and the South sample

	Full sample	North sample	South sample
Registered deaths	-0.128**	-0.420***	-0.049
Registered injury	-0.115*	-0.163	-0.102
Displaced	-0.033	-0.389***	0.081
Income dropped	-0.220***	-0.257**	-0.211***
Lost ownership	-0.125	-0.325	-0.062
Lost job	-1.602***	-1.092*	-1.701***
Lost farm	-0.516	-0.659	-0.332
Lost livestock	-0.682***	-0.036	-1.066***
Lost assets	-0.200	0.049	-0.273
Affected by the war	-0.058	-0.168	-0.035
Experienced violence	-0.240***	-0.078	-0.292***

Notes: The household level controls include log per capita consumption expenditure, gender, gender of household head, average years of education in the household, ethnic groups and religious groups; *** implies significant at 1%, ** implies significant at 5% and * implies significant at 10%.