CIVIL WAR EXPOSURE AND SCHOOL ENROLMENT: EVIDENCE FROM THE MOZAMBICAN CIVIL WAR

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Abstract:

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Keywords: Civil War, Education, Mozambique, Gender.

JEL Classification: I20, O12, O55

I. Introduction

As mentioned in a report of the UNDP (2005)[2], "*education is one of the building blocks of human development*". Indeed, ensuring that children (boys and girls) worldwide will be able to enrol in school is a foundation for progress in other areas, such as health and democracy, for instance. Unfortunately, following the DFID framework document (2001)[3], a common ascertainment in most conflict-affected countries is as follows: "*recent wars have led to the destruction of the basic social infrastructure*". In particular, school and health centres are increasingly targeted by military activity.

This evidence has prompted an increasing number of microeconomic statistical case studies analysing the effect of exposure to armed conflict on education, particularly in relation to the school attainment of exposed children. The current paper aims to provide another piece of evidence on the link between civil conflict and schooling using a new micro-level database on the Mozambican Civil War, which was one of the most violent and longest civil wars.

The DFID framework document (2001) reported that during the Mozambican Civil War, over 40% of the health centres and schools were destroyed. Moreover, the 2005 UNDP Report observed that half of all primary schools were closed or destroyed during this conflict, reducing access to education and health care. Consequently, many young Mozambicans are uneducated, generating circumstances that could weaken the state (Collier, 2000). Regarding this point, the DFID framework document noted that "*Mozambique's successful emergence from conflict has been in no small part due to its success in re-legitimising the state in the eyes of its population*". This was done by re-establishing and carrying basic services (mainly education and health services). Nevertheless, as indicated by the Demographic and Health

Survey (DHS: 2003), a significant portion of the Mozambican population has no education (for example, of the women born between 1984 and 1989 (that is, aged from 15-19 years), 23.5% have no education, and of the women born between 1979 and 1983 (that is, aged from 20-25 years), 37.3% have no education. These two categories of women were exposed to the Mozambican Civil War during their first years of life).[4]

The present paper examines the long-term consequences of the Mozambican Civil War on education, focusing on the effect of conflict exposure on the school enrolment of Mozambican adults who survived this conflict. The previous literature on this topic has mainly focused on the effect of conflicts on the school attainment of individuals who were enrolled in school during the war period. These studies found that the exposure to the conflict reduces the likelihood of completing an educational level. Notwithstanding, these studies did not focus on the most direct and negative effect of conflicts, the decrease in the school enrolment rate.[5] To the best of my knowledge, only the paper of Shemyakina (2010) has tackled this important issue, analysing the effect of damage to the household dwelling on school enrolment.[6] The novelty of the current paper is the analysis of the effect that the number of years of conflict exposure, before the age of entry in primary school and during the period in which individuals were of primary school age, has on school enrolment. Using this methodology, the present study focuses on the most critical period of life for school enrolment.

This microeconomic analysis uses single household survey data derived from the Demographic and Health Survey (the fourth phase of DHS: DHS+: 2003), which provides individual-level information on men and women born between 1907 and 2004. This DHS representative household survey is combined with a new database that was especially

designed to examine the spatial and temporal evolution of the Mozambican Civil War and that provides the conflict period for each Mozambican province. The empirical identification strategy exploits exogenous variations in the timing and duration of the war across the Mozambican provinces. Using this heterogeneity, the current study distinguishes which individuals faced the conflict, at what age and for how long in order to examine how exposure to conflict during the early years of life affects the school enrolment of such individuals.

After controlling for cohort of birth, region of birth, childhood place of residence, and ethno-linguistic characteristics, the estimates suggested that both exposure to the conflict during the first seven years of life (the pre-primary school grade period of life) and during the traditional period at which individuals are enrolled in the primary school grade (between seven and thirteen years of age) induced a reduction in the probability of school enrolment. No effects were found for an in-utero exposure to the conflict or an exposure during the traditional period at which individuals are enrolled in the primary school grade (between seven and thirteen years of age). Furthermore, the results indicated that the negative effect of the civil war on school enrolment was led by the reduction in girls' participation in school, as no effect was found for boys. Finally, the findings showed that the mechanism leading to the difference found between girls and boys was due to choices made by households during the war period.

The remainder of this paper is structured as follows. Section 2 provides a brief background of the Mozambican civil war. Section 3 discusses the possible channels through which civil war may affect education and presents the relevant literature on this topic. A description of the data and the identification strategy for the empirical analysis are described

in Section 4. Section 5 presents the main results and tests their robustness. Section 6 concludes.

II. Overview of the Mozambican Civil War

After its independence, the new Republic of Mozambique faced an internal conflict between the *"Frente de Libertação de Moçambique"* (FRELIMO) and the *"Resistência Nacional Moçambicana"* (RENAMO). This civil war lasted fifteen years, from 1977 to 1992[7].

The origins of the Mozambican Civil War lie in two conflicts that occurred in the 1960s and the 1970s, the Mozambican war of independence led by FRELIMO and the war in Rhodesia.

In 1965, Rhodesia unilaterally declared its independence, but it was confronted with internal Zimbabwean resistance, mainly from the "*Zimbabwe African National Liberation Army*" (ZANLA). The ideology of the ZANLA was similar to that of the FRELIMO, which welcomed and offered a haven to the ZANLA in north-western Mozambique. From this haven, the ZANLA were able to operate in Rhodesia (Smith, 1997). In response to these attacks, Rhodesia formed a counter-insurgency unit, which attacked the FRELIMO's infrastructure inside Mozambican territory (Stiff, 1999). Some years later, on 25 June 1975, Mozambique became independent, and the FRELIMO came to power. At this time, the FRELIMO complied with international requirements and closed its borders with Rhodesia, depriving it of access to the *"Beira Corridor"* (a supply road connecting Rhodesia to the Mozambican port of Beira). Among other reprisals, Rhodesia supported the Mozambican

dissidents opposed to the FRELIMO. These dissidents were implanted within the Rhodesian counter-insurgency structures to form the RENAMO and fight against the FRELIMO in Mozambique (Robinson, 2006).

Later, following Zimbabwean independence, the RENAMO lost the support of Rhodesia. Then, South Africa became the new supporters of the RENAMO in an effort to destabilise Mozambique (Vines, 1991). However, in 1989, South Africa's opinion on the best strategy towards Mozambique began to change. In fact, the continuation of conflict on its borders proved to be an important source of inconvenience (for example, illegal influx of refugees), resulting in a decline in South Africa's support of the RENAMO. Despite the decline in South Africa's support, the conflict continued, and it was only on 4 October 1992 that the twelfth round of the Rome talks led to the resolution of the conflict.[8]

This civil war directly killed more than one hundred thousand Mozambicans, and nearly one million perished by its indirect consequences, such as starvation and the disruption of health services.[9] Moreover, other consequences include the RENAMO's military strategy, which was based on kidnapping, looting and mutilation against the civilian population[10] as well as the enrolment of child soldiers.[11]

Domingues (2011), provide a more detailed description of the geographical and temporal pattern of the spread of this civil war. The analysis of this spread clearly indicate that it is not lead by the school enrolment rate of the population but rather by geographical distance to the Zimbabwean frontier, from which the firsts RENAMO attack's was been launched.

III. Education and War: Literature review and different channels

3.1 - Related literature: evidences from other countries

During recent years, the number of microeconomic studies estimating the effect of exposure to civil conflict on education (for example, on school drop-out or the completion of schooling) has considerably increased. This section provides an overview of this rising literature.[12]

One of the pioneering microanalyses in this field is that of Shemyakina (2010)[13]. This paper focused on the Tajikistan conflict and used data on household residence and community dwelling damages, both capturing the insecurity experienced by the household as measures of individuals' exposure to armed conflict. Conclusions were then drawn on the effect of armed conflict on the accumulation of schooling. In a first approach, this paper compared the educational attainment of adults who should have completed their mandatory schooling (the first nine grades of schooling) before the start of the war with the educational attainment of adults who were of school age during the war period. The results indicated that individuals exposed to the conflict when they were of school age had a lower probability of completing their mandatory nine grades of schooling, and this effect was larger for women. In a second step, the paper focused on the effect of exposure to conflict on school enrolment. The results showed that girls were less likely to be enrolled in school if their household dwelling was damaged during the war. Furthermore, no effect of conflict exposure was found for boys.

Following this study, Chamarbagwala and Morán (2011) investigated the effect of the Guatemalan Civil War on educational attainment. To measure the intensity of the conflict,

they examined the distribution of the number of victims and human rights violations that occurred during this conflict across the 22 Guatemalan departments. They found that exposure to conflict was linked to fewer years of schooling completed, and the strong negative effect of the war was found for rural Mayan men and women, the most disadvantaged group of the Guatemalan population. This result suggests that this conflict strengthened existing disparities in schooling.

Finally, Swee (2009) and Akbulut-Yuksel (2009) focused in the case of Bosnia and Herzegovina and in the case of Germany during World War II, respectively. The results of these studies were similar to those of the papers mentioned above. These two studies found that children who lived in the most war-affected area subsequently completed fewer years of school as adults. Of note, Swee (2009) only found a negative effect of conflict exposure on the completion of secondary schooling, with no effect on primary schooling attainment. Furthermore, this result appeared to be driven by males. This suggested that youth soldiering, affecting males but not females, was a key channel to explaining the impact of war exposure, whereas the destruction of infrastructure was not significant.

Akresh and de Walque (2008) analysed the case of the Rwanda genocide. Their identification strategy utilised two databases (a pre-war survey and a post-war survey) while previous studies only used a unique survey. This strategy, which utilised the pre-war data to control for baseline schooling levels for a given age group, found results similar to those previously mentioned. The Rwanda genocide resulted in lower education attainment among war-exposed children. Furthermore, there was a stronger negative effect for boys and for children from non-poor families. A potential explanation is that these children initially had higher schooling outcomes and therefore had more to lose after the genocide. This stronger

negative effect for boys from non-poor families is also highlighted by the recent study of Verwimp and Van Bajel (2011). They find that in rural Burundi, among four categories of children exposed to the conflict, the schooling of boys from non-poor households have been the most affected by the conflict, followed by the schooling of boys and girls from poor households and lastly by the schooling of girls from non-poor households.

Blattman and Annan (2009) used exogenous variation in rebel recruitment methods during the Uganda Civil War to estimate the impact of this conflict on adolescent and young adult males. Using this strategy, the study found a persistent negative effect of the conscription on education. These young males, who were soldiers at the time of conflict, had fewer years of schooling.

More recently, Valente (2011) finds contradictory results from the case of Nepal. She exploits within- and between-district variation in the intensity of violence to estimate the impact of the Maoist insurgency in Nepal (between 1996 and 2006) on the education enrolment and attainment of women. The results of this study provide robust evidence of a small positive effect of conflict intensity on the education attainment of Nepalese women but no effect on the school enrolment.

Finally, Justino et al. (2011) estimate the effect of two potential channels by which a conflict can affect education by studying the consequences of the conflict in Timor Leste. They find that being displaced by conflict decreases school attendance, with a stronger effect on boys, while an exposure to house destruction is correlated with an increase in school attendance for girls. This means that the negative effect of destruction of the house could be mitigated if the household has kept other assets, though this may not be the case for displaced households.

3.2 - The Effects of Civil War on Education: The different channels

The literature on the effect of conflicts on education has mentioned several channels through which conflicts can deplete the education level in a cohort, and several of the previous studies cited have attempted to identify some of these channels. These channels can be categorised into five mechanisms.

Destruction:

The most obvious channel by which civil war damages education is the destruction of resources. Firstly, wars and military conflict affect the functioning of educational systems and damage the education infrastructure (Seitz, 2004). As mentioned by the UNDP (2005), *"Schools are often a target for groups hostile to the government because of the association with state authority".* Furthermore, other educational facilities and infrastructures necessary for the functioning of schools are also damaged or destroyed (for example, roads, bus, power plants), thereby reducing the accessibility to education (Swee, 2009). Secondly, another type of destruction must be considered: that experienced by the population. Some conflicts especially targeted people with a relatively high level of education (for example, Cambodian Civil War[14]), diminishing the level of education in a cohort. Cases in which teachers were killed have particularly prevented children from attending classes. This last consequence illustrates an essential point, that the main consequence of a civil war on education is due to death, but data are available only for survivors. Therefore, studies focusing on the education level of survivors cannot account for the entire effect of conflicts on education; the estimated effect will be in the lower bounds of the true effects.

Migration:

During periods of war, a portion of the population is forced to leave home to escape from violence and fights (Verwimp and Van Bavel, 2011; Justino et al., 2011). Displaced children may lose access to school, and migrants who leave the country induce a loss of human capital for the country of origin and potential other adverse externalities (for example, as mentioned by Rodriguez and Sanchez (2009) and Swee (2009), the migration of teachers impacts the quality and the accessibility of education). Of note, data are not available on migrants who leave their country, inducing a misestimation of the real effect of the conflict Furthermore, as indicated by Chamarbagwala and Morán (2011), the forced migration may also reduce the income earned by members of households, thus reducing the resources available for schooling.

Substitution:

In the context of war, households can change their preferences, inducing two types of substitutions. Firstly, parents can decide to substitute education expenditure with basic necessities; this is a particularly strong phenomenon when resources are scarce. The economic situation might not allow households to pay for children's schooling[15]. Furthermore, this expenditure substitution can be generalised at the government level. In a war context, the government may decide to allocate an increasing share to the defence sector compared with the social sector (health and education), reducing the quality and/or quantity of school facilities. Indeed, the availability and quality of school facilities has been linked to student attendance and achievement (Glewwe *et al.* 1994). The second type of substitution is a direct

substitution between household members. For example, as mentioned by Akresh and de Walque, (2008), a household may choose to replace dead or injured males with children; this labour substitution induces the removal of children from school.

Deprivation:

Armed conflict can lead to a deprivation in children's access to school. Older children may be needed to substitute for adult household members who have become fighters or may be required to become fighters themselves (Justino, 2007). Furthermore, as mentioned by Chamarbagwala and Morán (2011) and Swee (2009), parents living in an insecure area attempt to protect their children by sheltering them rather than sending them to school. Girls may remain at home to avoid sexual assaults and harassment on their way to school (Machel 1996), or they may be removed from school before their education is complete and get married in order to help lift the burden from their families. Moreover, as mentioned by Bush and Saltarelli (2000) and Shemyakina, (2010), in the post-conflict context, winners can restrict the losers' access to education.

Disincentive:

Finally, as mentioned by Shemyakina (2010) and Rodriguez and Sanchez (2009), civil war may restrict job opportunities for skilled individuals during the post-war period. This phenomenon induces a reduction in the returns of schooling investment, leading individuals to stop attending school.

IV. Data and Empirical Strategy

All of studies previously mentioned highlighted that conflict exposure among individuals who were of school age during the war period reduced the number of years of schooling completed by these individuals, but some differences appeared. Some studies found a stronger effect for women than for men and others found a reverse result. In addition, some studies found a stronger effect for poor families, and other studies found a larger effect for non-poor families. Furthermore, the channels implicated in the negative effects differ by country and seem to be context-dependent. Finally, although the majority of these studies mentioned that one of the most direct effects of the civil conflict on schooling is the reduction in the probability of school enrolment, little research attention has been given to the impact of conflict exposure on school enrolment.[16]

Using a new database on the Mozambican conflict, the aim of the present paper is to analyse the consequences of conflict exposure on school enrolment, focusing on exposure before the age of entry in primary school and during the period in which individuals are of primary school age. The estimation strategy does not allow the clear identification of the different channels presented above. However, controlling for migration and distinguishing the conflict effect between men and women allows for the elimination of some channels and the discussion of other channels as a potential cause of the effect of the conflict on education.

4.1 - Data

This study uses individual data derived from the Mozambican Demographic and Health Surveys (DHS) collected during the fourth phase DHS + (DHS IV: 2003). This cross-

sectional survey is based on a representative sample of households and uses standardised household questionnaires. The DHS program collects data on households and members of these households (for example, the region of residence, the age and the gender of the household members). However, this survey provides information only on the current characteristics of individuals and households. Therefore, the data do not accurately reflect conditions experienced by individuals in their childhood, because individuals are adults at the time of the survey. For this reason, the specifications do not contain variables that control for the initial characteristics of the origin household of each individual.[17] Nevertheless, some controls are included for each econometric specification, **the childhood place of residence** (broken down by city, town and countryside) and **the region of residence,** both capturing the influence of the environment on the probability of school enrolment. The 11 regional dummies capture the potential differences between the Mozambican provinces, and the childhood place of residence captures the effects of environmental differences between urban and non-urban areas (for example, access and quality of educational system). Furthermore, the childhood place of residence and the region of residence can also be regarded as proxies of the childhood characteristics in terms of household wealth (Haddad and Hoddinott 1994; Garrett and Ruel 1999) and parental education (Glewwe 1999; Chen and Li 2009), as it has been documented that living in an urban area is positively correlated with wealth and education. Finally, the childhood place of residence also captures the fact that urban areas can be safer than rural areas during the civil war period. Two other variables are also added, **the individual spoken language** and **the gender**, which can also influence education (Naylor and Smith (2004) and Parker, Rubalcava and Teruel (2005)).

[Table 1 here]

[Table 2 here]

This DHS survey is merged with a new database on the Mozambican Civil War that allows the determination of the start and end dates of the conflict for each province, thereby highlighting the existing heterogeneity of the conflict exposure across the Mozambican provinces.[18] The current study takes advantage of this heterogeneity in the empirical strategy in order to capture the effect of this civil war on school enrolment. Therefore, by combining these two datasets, several measures of individual exposure to the conflict are defined. Using the region of residence and the date of birth of each individual (both provided by DHS) and the start and end dates of the civil war for each Mozambican province, the present work determines which individuals faced a period of conflict, at what age, and for how long. The variables of exposure to the conflict are the following:

NBY_PREPRIM: this variable is defined as the number of years of war exposure faced by an individual during the pre-primary schooling period of life. This period of life is from birth to seven years of age, the age of traditional school enrolment in Mozambique. Therefore, this is an interval variable [0;7], where 0 corresponds to an individual exposed to the civil war after 25 years of age, meaning that this individual was not exposed to the conflict during the school enrolment period of life and 7 is the number of years of war exposure for an individual born in the civil war and who was exposed until 7 years of age.

NBY_PRIM: in order to take into account the fact that 7 year could be a restrictive threshold to indicate the age of school enrolment, particularly in Africa, the empirical strategy also include a variable that capture the duration of civil war exposure after 7 years. This variable is defined as the number of years of war exposure faced by an individual during the primary schooling period of life. This period of life is from seven years of age to thirteen

years of age. This period corresponds to the duration of the traditional school enrolment in the primary level of education in Mozambique. Therefore, this is an interval variable [0;7], where 0 corresponds to an individual exposed to the civil war after 25 years of age, meaning that this individual was not exposed to the conflict during the school enrolment period of the life, and 7 is the number of years of war exposure for an individual exposed to the conflict during the entire period when an individual is typically enrolled in the primary level of schooling, regardless of the fact that he has been exposed before seven years of age and/or after thirteen years of age.

[Table 3 here]

For these two conflict exposure variables, the population coded 0 includes individuals whose exposure to the conflict began after 25 years of life. This threshold has been selected based on the Mozambican educational system. This system consists of the following three successive grades of schooling: the primary, from 7 years to 13 years, the secondary, from 14 years to 19 years, and the higher level of school, finishing at 25 years of life.[19] Thereby, 25 years is selected as the age at which exposure to the conflict cannot influence the education of an individual. As a robustness test, the same two conflict exposure variables are redefined with a threshold of 19 years of age to indicate that an individual was not exposed to the conflict (see Section 5.2). Exposure to the war after 25 years of age indicates that these individuals belong to an older cohort than the war-exposed cohort and that this older cohort has potentially experienced poor schooling conditions compared with the younger cohort. Indeed, the general tendency shows an improvement in developing countries for schooling outcomes with each new birth cohort (Akresh and De Walque 2008). Therefore, a negative

effect found for the "war-exposed cohort" in comparison to the older cohort may be an underestimation of the true effect of the conflict exposure.

The design of these two variables of the exposure to the war is based on the assumption that the current region of residence of the household coincides with the region where the individual lived during the period of war exposure. However, it is well-documented that civil wars are a cause of internal migration. Consequently, internal migrations are a potential source of bias in this empirical strategy. To account for this phenomenon, one solution is to perform a robustness test that restricts the sample to individuals who indicate that they have lived in the same place for their entire life. The Mozambican DHS+ indicates this type of information, providing the number of years lived in the same place of residence. This allows the use of a restricted sample of individuals who declare that they "always" lived in the same place of residence.

4.2 - Empirical Strategy

The empirical strategy provides an assessment of the effect of exposure to the war at different ages on school enrolment, using the two exposure variables described previously and data on the school enrolment of adults over the age of 18 (this ensures that these individuals will not be enrolled later).

The dependent variable $EDUC_{ijt}$ is coded 1 if an individual i, in a province j, born on date t, has been enrolled in school and 0 otherwise. Given that the dependent variable is a dummy variable, the analysis utilises a probability model in order to assess whether the individual's likelihood of school enrolment is influenced by exposure to the civil war. A

normal distribution is assumed for the idiosyncratic term; therefore, the empirical strategy consists of the estimation of a probit model.

The estimated equations are as follows:

$$P(EDUC_{ijt} = 1) = F(\beta NBY\_PREPRIM_{ijt} + \beta Z_i) \tag{1}$$

$$P(EDUC_{ijt} = 1) = F(\beta NBY\_PREPRIM_{ijt} + \beta NBY\_PRIM_{ijt} + \beta Z_i) \tag{2}$$

Where F is a standard normal cumulative distribution function, $P(EDUC_{ijt})$ is the probability for an individual i, in a province j, born on date t to have been enrolled in school, and $NBY\_PREPRIM_{ijt}$, and NBY_PRIM_{ijt} are the variables of interest previously defined. Z_i is a set of control variables, including childhood place of residence fixed effects, 28 dummy variables capturing the language spoken by the individual, a gender fixed effects and the interaction between regions of residence fixed effects and 5-years cohort fixed effects in order to capture the general tendency in developing countries for schooling outcomes to improve with each new birth cohort. Finally, as previously mentioned, the DHS survey does not provide information on the current characteristics of individuals and households and, therefore, these specifications do not contain control variables for these characteristics.

Several potential caveats call into question the validity of the empirical strategy. The first is the non-exogeneity of the civil war. Regarding this point, the pattern displayed by the geographical spread of the civil war on Mozambican soil indicates that the first attacks took place near the Zimbabwean border and that the last Mozambican province to be affected by the conflict was located a significant distance from this border. Therefore, we can assume that

the identification strategy is based on the plausibly exogenous spread of civil war induced by the geographic distance to the Zimbabwean border. Second, the unobservable characteristics of a Mozambican province can be linked with the school enrolment of its population: for example, the available educational infrastructures of each province or the wealth level of each province prior to the civil war (for which I have no data). Third, the unobservable characteristics of a particular birth cohort can also be linked to school enrolment—for example, the birth cohort born between 1964 and 1975 were exposed during their childhood to the Mozambican War of Independence. As a result, the school enrolment of this cohort could be affected by this war. However, I have no data on this conflict disaggregated at the province level. Therefore, as these birth cohorts are used as a control group, the results found using my empirical strategy could be biased downward relative to results found using a hypothetical control group that was never exposed to any conflict. In short, these two types of unobserved variables (at the province and cohort level) can bias the estimated effect of civil war exposure on school enrolment downward or upward. These two threats are accounted for by the use of province- and cohort-fixed effects and all of their interactions. Fourth, I designed the conflict exposure variables based on the assumption that the household's current region of residence coincides with the region in which its members had lived during the period of war exposure. However, civil wars are a cause of migration. Consequently, migrations may lead us to misattribute the duration of civil war exposure, introducing error to the analysis. Therefore, I restrict the sample to women who indicated that they had always lived in the same place of residence. With this restricted sample, the duration of civil war exposure can be estimated with more accuracy. Nevertheless, the use of this restricted sample of women could lead to a selection bias because women who migrated could have particular wealth/anthropometric characteristics. There is thus a tradeoff between control for the exact duration of exposure to civil war and the potential bias induced by the restriction of the

sample of study. To address this issue, in addition to the results from the restricted sample of non-migrant women, I provide the results using the entire sample of women (i.e., both migrant and non-migrant).

V. Results and Robustness

5.1 - Results

Table 4 presents probit regression results for equation (1) and (2) in Column 1 and 2, respectively. The results from Panel A, which includes the entire sample of individuals, indicate clearly that the number of years of exposure to the conflict during the pre-primary years of life (from birth to seven years of life) had a negative impact (significant at 1 percent level) on school enrolment. For an average individual in the sample, a marginal increase in the duration of civil war exposure reduced the probability of school enrolment by 1.8 percent. This effect is comparable with the effect found for a conflict exposure during the ages at which an individual is traditionally enrolled in the primary grade of school (between seven and thirteen years of life). For an average individual in the sample, a marginal increase in the duration of civil war exposure during this period reduced the probability of school enrolment by 1.7 percent. Panel B, which only includes individuals who always lived in the same region (to control for migration), displays similar results. For an average individual in the sample, a marginal increase in the duration of civil war exposure during the pre-primary years of life reduced the probability of school enrolment by 2.6 percent and a marginal increase in the duration of civil war exposure between seven and thirteen years of life reduced the probability of school enrolment by 2.0 percent. Furthermore, Panels A and B indicate that being a woman induced a stronger negative impact on the probability of school enrolment. This last result

calls for a replication of this analysis by differentiating the effect of conflict exposure by the gender of the child. Finally, as reported in Table 5, all of these results are consistent using a logit model.

[Table 4 here]

[Table 5 here]

Table 6 presents probit regression results for equation (1) and (2) in Column 1 and 2, respectively. In dividing the sample by gender, Panels A1 and B1 display results for men only, and Panels A2 and B2 show results for women only. The main result indicated by Table 6 is that there was only a negative and significant effect of civil war exposure on school enrolment for girls, and no effect was found for boys. This finding states that the previous results were led by the impact of civil war exposure on the school enrolment of girls. As indicated in Panel A2, for the entire sample of women, a marginal increase in the duration of civil war exposure suffered reduced the probability of school enrolment by 2.3 percent. The same effect is found for a marginal increase in the duration of civil war exposure suffered during the primary grade of school. As indicated in Panel B2, for the restricted sample of women who always lived in the same place of residence, a marginal increase in the duration of civil war exposure faced by these women during the pre-primary years of life reduced the probability of school enrolment by 3.4 percent and a marginal increase in the duration of civil war exposure between seven and thirteen years of life reduced the probability of school enrolment by 2.8 percent. The larger effect found for the restricted sample confirmed that individuals from households that migrated (*i.e,* fled from the violence) had a lower effect of conflict exposure on school enrolment. The same pattern was found using a logit model.[20]

[Table 6 here]

Table 7 provides the results of the estimation of the two specifications previously presented and introduces a new variable **CWexp_in_utero$_{ijt}$** to the set of conflict exposure variables used in the empirical strategy displayed in Table 6. This variable takes into account the influence of the number of months of civil war faced during the nine months prior to birth, as the literature has found that in-utero exposure to a shock can have a lasting effect on health and education in adulthood (Almond *et al.,* 2007). This variable is used to analyse the particular case of individuals born during the conflict. Indeed, these individuals are characterised by suffering from the number of years of war that they experience during their first years of life and from the compounded number of months of war prior to their birth, through the health of their mother during pregnancy. However, the results indicate that war exposure prior to birth had no robust effect on the probability of enrolment.[21] Furthermore, Table 7 confirms the previous findings. Both war exposure prior to seven years of life and during the period in which an individual is typically in the primary school grades have an effect on the school enrolment of girls. No effect was found for males.

[Table 7 here]

5.2 – Robustness

Table 8 provides the results for a robustness test using the restricted sample of individuals who always lived in the same province. Panel C1 and C2 display the results found for the same empirical stratification followed in Table 6. However, in this case, for all conflict exposure variables, the population coded 0 are individuals whose exposure to the conflict

began after 18 years of life rather than 25 years of life, as coded previously. This change did not question the logic of the previously described results.

[Table 8 here]

Table 9, provides the results for another robustness tests that controls whereas the previous results are depending on region or not. Therefore, in Table 9, the province sample controls for the robustness of the results to the region. Panel D1 and D2 include all provinces except for Niassa, the province with the shortest period of civil war, and Panel E1 and E2 exclude Gaza, the province with the longest period of civil war. The estimation results are robust to these alternative sample specifications.

[Table 9 here]

5.3 – Discussion

The results of the empirical strategies indicate that a conflict exposure during the first seven years of life had the same impact than an exposure during the period at which an individual is enrolled in the primary level. All coefficients previously mentioned in this paper were estimated for a marginal increase in the duration of civil war that an individual suffered during their life, calculated at the mean of the independent variables. However, the variable capturing the number of years of conflict exposure is a discrete variable with a range of values [0;7]. Therefore, in order to capture the effect of duration spent in the conflict for each additional year of conflict, the predicted probability of school enrolment must be calculated based on the number of years of conflict exposure suffered by an individual. To illustrate this

point, using the sample of women who always lived in the same place of residence,[22] the relative predicted probability was calculated. These relative predicted probabilities are calculated relative to a woman never exposed to the civil war. For a woman never exposed to conflict, her probability of being enrolled at school was fixed 100 percent. Table 10 indicates that a woman exposed to seven years of conflict had a .716 probability of school enrolment, whereas a woman exposed to six years of conflict had a 74.1 percent chance of being enrolled in school. These last results suggest that the relative predicted probability loss induced by an additional year of civil war exposure after six years of conflict already faced is approximately .025. Figure 1 displays the relative predicted probability of school enrolment throughout the duration of civil war exposure. The pattern showed by this figure indicates that each additional year of conflict exposure induced an increasing loss of the relative predicted probability of enrolment. The total relative predicted probability loss induced by a civil war exposure during this period is .148.[23] Finally, on average, civil war exposure during the first seven years of life had the same impact and during the primary grade of school reduced the probability of school enrolment by 10 and 8 percent, respectively.[24] No robust effect was found for conflict exposure during the period at which an individual is typically enrolled in the primary grade of school (between seven and thirteen years of age). Furthermore, no effect was found for in-utero exposure to the civil war, meaning that there were no effects through the health of the mother during the pregnancy on the probability of school enrolment. Furthermore, the results from the empirical strategies indicate that the Mozambican Civil War only had an impact on the school enrolment of girls, as no effect was found for boys. These results are robust for the use of alternative samples and alternative definition of War exposure. Moreover, these results are robust for the control of migration.

[Table 10 here]

[Figure 1 here]

As previously mentioned, controlling for *"migration"* and distinguishing the conflict effect between males and females allows for the elimination of some channels and the discussion of other channels as a potential cause of the effect of the conflict on education. After using a restricted sample of individuals who always lived in the same place, the results continued to indicate a difference between males and females. In term of channels leading to these results, the *"destruction"* channels can be eliminated because this channel is not gender-specific. Destruction of the educational infrastructures has the same impact on the school enrolment of boys and girls. As a consequence, the mechanisms leading to a reduction in the probability of the school enrolment of girls is linked to the other three channels, *"substitution", "disincentive" a*nd *"deprivation"*. These channels are characterised by links to household choices or risk management. Unfortunately, the data do not allow for the disentangling of these channels.

VI. Conclusion

The aim of this paper was to analyse the impact of civil war exposure on school enrolment. This paper explored these issues using a database on the Mozambican Civil War that was specifically designed to examine the spatial and temporal evolution of this conflict.

This empirical strategy accounts for variations in the timing and duration of the war across the different Mozambican provinces. Combining this information with the DHS representative household survey allowed for the identification of individuals who were exposed to the conflict, at what age and for how long they were exposed. Focusing on the

number of years of civil war exposure during the most sensitive years of life for children's school enrolment, the civil war was found to have a negative effect on school enrolment. Both a conflict exposure prior to seven years of age and during the period between seven and thirteen years of age have an effect on the probability of participating in school; no effect was found for exposure prior to birth (induced by in-utero conflict exposure). Furthermore, the paper identifies that the Mozambican Civil War only had an effect on girls' school enrolment, as no significant effect was found for boys. Finally, as discussed in the paper, the mechanisms leading to a reduction in the probability of the school enrolment of girls were linked to household choices or risk management.

This negative impact of civil war exposure highlights the importance of preventing conflicts. Furthermore, as each additional year of war exposure decreases the probability of a child's enrolment in school, it is also important to quickly end conflicts that could not be prevented. Moreover, the results indicated that women were the most affected population. Therefore, post-war recovery policy should have a strong focus on the improvement of the enrolment of women who are of the age to participate in the primary school grade. In addition, older women should benefit from literacy programs or other programs that involve learning to read and write with incentives to participate in the programs. Among several examples of programs that have a positive impact on the school enrolment of girls in contexts with weak institutions and lower quality education, the following are of note: the Quetta Urban Fellowship program in Pakistan (evaluated by Kim, Alderman, and Orazem, 1999), the Food-for-Education program in Bangladesh (evaluated by Ravallion and Wodon, 2000), and the Japan Fund for Poverty Reduction (JFPR) scholarship program in Cambodia (evaluated by Filmer and Schady, 2008).

Policies designed to improve the education of women are an investment with the highest returns of all development investments, yielding both private and social benefits (see reviews in Strauss and Thomas, 1995), such as the reduction of both child and maternal mortality rates (Caldwell, 1979), the increase of women's labour force participation rates and earnings (Macunovich, 2000), an improvement of the protection against HIV/AIDS infection (Corno and De Walque, 2007 and Duflo *et al.,* 2006) and the creation of intergenerational education benefits (Bowles, 2005).

Table 1: Description of key variables

Variable	Description
EDUC	School enrolment indicator (=1 if the individual has been enrolled in school)
NBY_PREPRIM	Conflict exposure variable in the pre-primary (number of years of war exposure from 0 through 6 years of life)
NBY_PRIM	Conflict exposure variable in the primary (number of years of war exposure from 7 through 13 years of life)
Gender	Indicator (=1 if female)
Date of Birth	Year of birth of the individual
Language spoken	Dummies for the language spoken by an individual (proxy for the ethnicity)
Childhood place of residence	Dummies (city, town, countryside)
Living in the place of residence	Indicator (=1 if an individual has always lived in the same place of residence)

Table 2: Descriptive statistics of key variables

Variable	Nb of Obs	Sample Mean	Std. Dev.	Min.	Max.
EDUC	63,496	0.5592951	0.4964756	0	1
NBY_PREPRIM	23,866	3.816559	2.579967	0	7
NBY_PRIM	27,335	2.487873	2.758265	0	7
Gender	24,148	.6982359	.459033	0	1
male	7,287				
female	16,861				
Childhood place of residence	15,282				
city	4,003				
town	1,715				
countryside	9,564				
Living always in the place of residence	8,646				

Table 3: Conflict period for each Mozambican province

Province	Conflict Start Date	Conflict End Date
Cabo Delgado	1984	91
Niassa	1983	88
Nampula	1983	92
Zambézia	1982	91
Tete	1979	91
Sofala	1979	91
Manica	1979	90
Gaza	1979	92
Inhambane	1981	92
Maputo	1982	92

Table 4: Probit results, marginal effect of conflict exposure on school enrolment, calculated at the mean of the independent variables

Dependent variable: EDUC is coded 1 if an individual has been enrolled in school and 0 otherwise		
	1	2
Panel A: Entire sample		
NBY_PREPRIM	-.01360	-.01807
	(.004)***	(.005) ***
NBY_PREPRIM_PRIM		-.01764
		(.004) ***
Female	-.17308	-.18173
	(.014)***	(.015) ***
Observations	8,755	8,076
Panel B: Restricted sample of individuals who always lived in the same place of residence		
NBY_PREPRIM	-.01965***	-.02600
	(.005)	(.008) ***
NBY_PREPRIM_PRIM		-.02035
		(.005) ***
Female	-.19558***	-.21014
	(.013)	(.014) ***
Observations	5,099	4,694

Note: Robust standard errors in parentheses and clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. All provinces are included in the regressions. All regressions include as control: the use of the interaction between region and 5-year cohort fixed effects, Ethno-linguistic dummies, Childhood place of residence fixed effects, and Province dummies.

Table 5: Logit results, marginal effect of conflict exposure on school enrolment, calculated at the mean of the independent variables

Dependent variable: EDUC is coded 1 if an individual has been enrolled in school and 0 otherwise		
	1	2
Panel A: Entire sample		
NBY_PREPRIM	-.01231	-.01707
	(.004) ***	(.004) ***
NBY_PREPRIM_PRIM		-.01684
		(.004) ***
Female	-.15266	-.16171
	(.011) ***	(.012) ***
Observations	8,755	8,076
Panel B: Restricted sample of individuals who always lived in the same place of residence		
NBY_PREPRIM	-.01839	-.02551
	(.005) ***	(.007) ***
NBY_PREPRIM_PRIM		-.02087
		(.004) ***
Female	-.17642	-.19204
	(.010) ***	(.011) ***
Observations	5,099	4,694

Note: Robust standard errors in parentheses and clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. All provinces are included in the regressions. All regressions include as control: the use of the interaction between region and 5-year cohort fixed effects, Ethno-linguistic dummies, Childhood place of residence fixed effects, and Province dummies.

Table 6: Probit results, marginal effect of conflict exposure on school enrolment, calculated at the mean of the independent variables

Dependent variable: EDUC is coded 1 if an individual has been enrolled in school and 0 otherwise					
	1	2		1	2
Panel A1: Entire sample of men			Panel A2: Entire sample of women		
NBY_PREPRIM	-.00287	.00080	NBY_PREPRIM	-.01664	-.02383
	(.007)	(.008)		(.005) ***	(.005) ***
NBY_PREPRIM_PRIM		.00100	NBY_PREPRIM_PRIM		-.02379
		(.008)			(.006) ***
Observations	1,431	1,263	Observations	7,080	6,539***
Panel B1: Restricted sample of men who always lived in the same place of residence			Panel B2: Restricted sample of women who always lived in the same place of residence		
NBY_PREPRIM	-.00787	.00155	NBY_PREPRIM	-.02407	-.03436
	(.011)	(.015)		(.006) ***	(.010) ***
NBY_PREPRIM_PRIM		.00589	NBY_PREPRIM_PRIM		-.02878
		(.019)			(.007) ***
Observations	732	643	Observations	4,119	3,805

Note: Robust standard errors in parentheses and clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. All provinces are included in the regressions. All regressions include as control: the use of the interaction between region and 5-year cohort fixed effects, Ethno-linguistic dummies, Childhood place of residence fixed effects, and Province dummies.

Table 7: Probit results, marginal effect of conflict exposure on school enrolment, calculated at the mean of the independent variables

Dependent variable: EDUC is coded 1 if an individual has been enrolled in school and 0 otherwise					
	1	2		1	2
Panel A1: Entire sample of men			Panel A2: Entire sample of women		
CWexp_in_utero	-.00202	-.00222	CWexp_in_utero	.00112	-.00887
	(.003)	(.004)		(.003)	(.006)
NBY_PREPRIM	-.00250	.00076	NBY_PREPRIM	-.01693	-.02399
	(.006)	(.008)		(.005) ***	(.006) ***
NBY_PREPRIM_PRIM		-.00131	NBY_PREPRIM_PRIM		-.03286
		(.009)			(.011) ***
Observations	1,431	1,263	Observations	7,080	6,539
Panel B1: Restricted sample of men who always lived in the same place of residence			Panel B2: Restricted sample of women who always lived in the same place of residence		
CWexp_in_utero	-.00891	-.01028	CWexp_in_utero	-.00144	-.01469
	(.005) *	(.009)		(.005)	(.008) *
NBY_PREPRIM	-.00628	.00125	NBY_PREPRIM	-.02379	-.03520
	(.011)	(.015)		(.006) ***	(.011) ***
NBY_PREPRIM_PRIM		-.00411	NBY_PREPRIM_PRIM		-.04267
		(.021)			(.012) ***
Observations	732	643	Observations	4,119	3,805

Note: Robust standard errors in parentheses and clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. All provinces are included in the regressions. All regressions include as control: the use of the interaction between region and 5-year cohort fixed effects, Ethno-linguistic dummies, Childhood place of residence fixed effects, and Province dummies.

Table 8: Probit results, marginal effect of conflict exposure on school enrolment, calculated at the mean of the independent variables

Dependent variable: EDUC is coded 1 if an individual has been enrolled in school and 0 otherwise					
	1	2		1	2
Panel C1: Restricted sample of men who always lived in the same place of residence			Panel C2: Restricted sample of women who always lived in the same place of residence		
NBY_PREPRIM	-.00969	-.00023	NBY_PREPRIM	-.02498	-.03593
	(.013)	(.017)		(.006) ***	(.011) ***
NBY_PREPRIM_PRIM		.00618	NBY_PREPRIM_PRIM		-.03207
		(.022)			(.008) ***
Observations	830	741	Observations	4,915	4,601

Note: Robust standard errors in parentheses and clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. All provinces are included in the regressions. All regressions include as control: the use of the interaction between region and 5-year cohort fixed effects, Ethno-linguistic dummies, Childhood place of residence fixed effects, and Province dummies.

Table 9: Probit results, marginal effect of conflict exposure on school enrolment, calculated at the mean of the independent variables

Dependent variable: EDUC is coded 1 if an individual has been enrolled in school and 0 otherwise					
	1	2		1	2

Estimation without Niassa Province (province with the longest period of conflict)

Panel D1: Restricted sample of men who always lived in the same place of residence			Panel D2: Restricted sample of women who always lived in the same place of residence		
NBY_PREPRIM	-.01037	-.00073	NBY_PREPRIM	-.02722	-.03775
	(.012)	(.016)		(.006) ***	(.010) ***
NBY_PREPRIM_PRIM		.00443	NBY_PREPRIM_PRIM		-.02816
		(.019)			(.008) ***
Observations	675	593	Observations	3,821	3,520

Estimation without Gaza Province (province with the longest period of conflict)

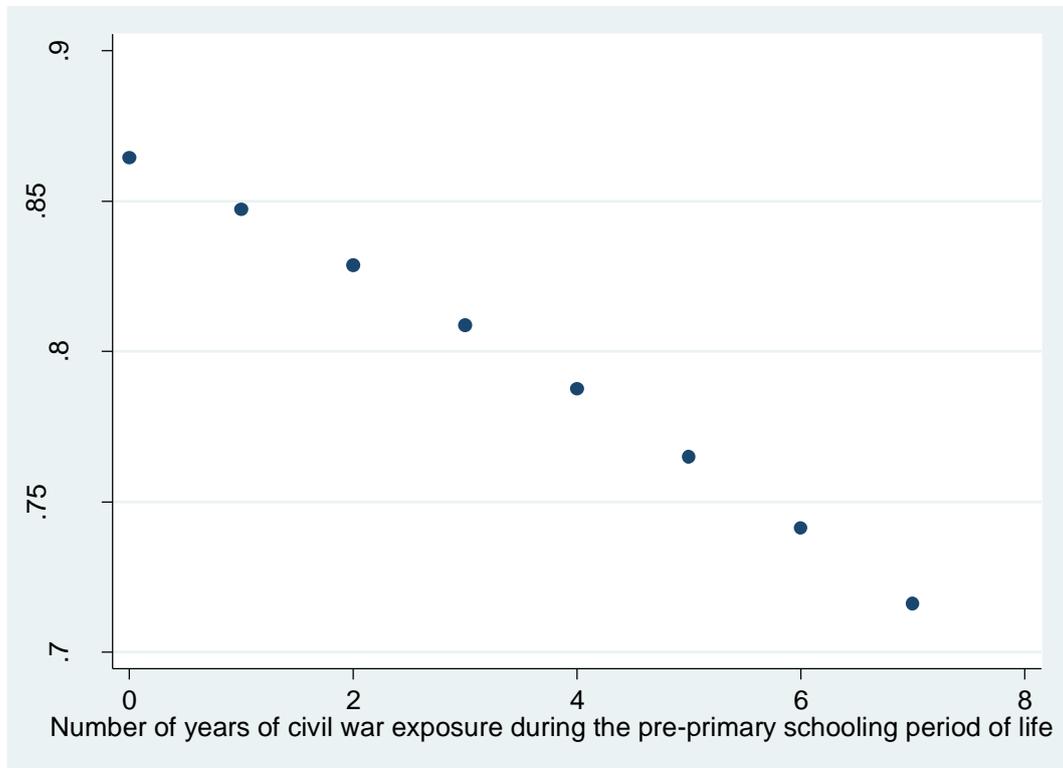| Panel E1: Restricted sample of men who always lived in the same place of residence			Panel E2: Restricted sample of men who always lived in the same place of residence		
NBY_PREPRIM	-.00928	.00073	NBY_PREPRIM	-.02345	-.03449
	(.012)	(.018)		(.006) ***	(.012) ***
NBY_PREPRIM_PRIM		.00972	NBY_PREPRIM_PRIM		-.03134
		(.024)			(.009) ***
Observations	641	560	Observations	3,682	3,406

Note: Robust standard errors in parentheses and clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include as control: the use of the interaction between region and 5-year cohort fixed effects, Ethno-linguistic dummies, Childhood place of residence fixed effects, and Province dummies.

Table 10: Relative predicted probability for a woman who always lived in the same place of residence to be enrolled in school based on the number of year of civil war exposure

Number of years of civil war exposure	Relative predicted probability of school enrolment	Relative predicted probability loss
0	.86429	
1	.84716	.01713
2	.82866	.01851
3	.80878	.01988
4	.78754	.02123
5	.76499	.02255
6	.74117	.02381
7	.71617	.02501

Note: To calculate the relative predicted probability of school enrolment, the predicted probability for a woman never exposed to civil war is fixed at 100%. This table provides the results for a restricted sample of women who have always lived in the same place of residence.

Figure 1: Relative predicted probability of school enrolment throughout the duration of civil war exposure (source: author)

Note: To calculate the relative predicted probability of school enrolment, the predicted probability for a woman never exposed to civil war is fixed at 100%. This table provides the results for a restricted sample of women who have always lived in the same place of residence.

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Appendix

Annex 1

Table A1: Proportion of non-educated Mozambican individuals included in the DHS 2003 sample, by gender and age

Age	Women	Men
15-19	23.5	7.3
20-24	37.3	11.6
25-29	44.7	18.1
30-34	43.2	18.9

Source : Instituto Nacional de Estatistica and Ministerio da Saude and ORC Macro/DHS Program: MOÇAMBIQUE. Inquérito Demográfico e de Saúde (2003)

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[4] See also Table A1, in Annex 1, for a more detailed descriptive statistic from the "MOÇAMBIQUE Inquérito Demográfico e de Saúde (2003)"

[5] As mentioned by Watkins (2000), two-thirds of the African counties affected by conflicts had school enrolment rates less than 50%.

[6] Nevertheless, some findings exist in the macro-level literature on the consequences of conflict on human capital. For example, Stewart *et al.,* (2001) find that the primary school enrolment decreases in three out of eighteen countries affected by civil wars. More recently, two other studies have focused on this issue at the micro-level: Valente (2011) find no effect on school enrolment of women exposed to the Maoist insurgency in Nepal (between 1996 and 2006), and Justino *et al.,* (2011) find that household displacement induced by the conflict in Timor Leste has resulted in a negative effect on primary school attendance, notably for boys.

[7] Information provided by UCDP/PRIO Armed Conflict Dataset. Note that based on the Correlate of War (COW), the Mozambican Civil War only occurred from 1979 to 1992.

[8] See Domingues (2011) for a detailed description of the Mozambican Civil War.

[9] Gersony, Robert. *Summary of Mozambican Refugee Accounts of Principally Conflict-Related Experience in Mozambique*, (Washington D.C.: Bureau for Refugee Programs, US Department of State, April 1988).p41

[10] Wilson, Ken. "Cults of Violence and Counter-Violence in Mozambique", *Journal of Southern African Studies*, Vol 18, No 3, September 1992, pp527-82. p531.

[11] Hanlon, Joseph. "Are Donors to Mozambique Promoting Corruption?", Paper submitted to the conference 'Towards a New Political Economy of Development', Sheffield 3-4 July 2002. pp369-372.

[12] See also Justino *et al.*, (2011) for a recent review and discussion of the empirical results of research on the impact of violent conflict on human capital and on the mechanisms by which a conflict affects the education of a population.

[13] A previous version of this study was published in 2006.

[14] See de Walque (2005).

[15] This channel is mentioned by Davies (2004), Shemyakina (2010), and Akresh and de Walque, (2008).

[16] To the best of my knowledge, only the paper of Shemyakina (2010) has focused on this issue

[17] The coding of variable and summary statistics for the DHS (2003) sample are reported in Table 1 and Table 2.

[18] See Table 3, which identified the conflict period for each Mozambican province.

[19] This description of the Mozambican educational system corresponds to the traditional thresholds to pass from an education level to another for an individual enrolled in school at 7 years who never repeated a year of school.

[20] Results not reported in this paper.

[21] CWexp_in_utero is only significant in two specifications of eight and estimated coefficient is very small.

[22] The specification used to calculate the predicted probability of school enrolment is provided in Table 6, Panel B2, Column 1.This specification is chosen because it focuses on women, it controls for internal migration, and it only includes the number of years of exposure during the first seven years of life, which was the period with the significant impact on school enrolment.

[23] This total predicted probability loss for the pre-school period is calculated as the following: .86429 - .71617 = .14812; regarding the total average decrease of the probability of women, on the sample, being enrolled in school due to the conflict exposure during the two periods of age considered in this study is a decrease by.19 percent.

[24] This is the average for the civil war exposure variable NBY_PREPRIM, using a probit model. Results are not reported.