



The human capital consequences of civil war: Evidence from Guatemala

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ABSTRACT

We combine data from the 2002 National Population Census and the distribution of the number of human rights violations and victims across 22 departments to examine how Guatemala's 36-year-long civil war affected human capital accumulation. The year of birth and the department of birth jointly determine an individual's exposure during school age to three different periods of the civil war, namely the initial period (1960–1978), the worst period (1979–1984), and the final period (1985–1996). We find a strong negative impact of the civil war on the education of the two most disadvantaged groups, namely rural Mayan males and females. Among rural Mayan males, those who were school age during the three periods of the civil war in departments where more human rights violations were committed completed 0.27, 0.71, and 1.09 years less of schooling respectively whereas rural Mayan females exposed to the three periods of the war completed 0.12, 0.47, and 1.17 years less of schooling respectively. Given an average of 4.66 and 3.83 years of schooling for males and females, these represent declines of 6, 15, and 23% for males and 3, 12, and 30% for females. Our results are robust to the inclusion of indicators for department of residence, year of birth, and controls for different trends in education and human development in war-affected and peaceful departments of Guatemala and suggest that the country's civil war may have deepened gender, regional, sectoral, and ethnic disparities in schooling.

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1. Introduction

The microeconomic impact of war on civilian populations can be substantial and persistent. Not only can people living in war zones suffer injuries and have their property destroyed, they may also be displaced from their homes, lose their means of survival, or be unable to attend school, all of which may result in a permanent decline in their productivity and earnings. Understanding which economic consequences of conflict are more profound or persistent is important for implementing post-conflict reconstruction effectively. Moreover, since war costs tend to be disproportionately borne by the poor and most vulnerable populations, conflict may intensify poverty and inequality (Quinn et al., 2007). Thus, evidence of the negative consequences of war can help identify those populations that reconstruction policy should target. This paper examines how Guatemala's 36-year-long civil war between 1960 and 1996 affected human capital accumulation of individuals exposed to it and which demographic groups were worst affected.

There is a large literature that examines the aggregate effects of armed conflict on investment, income, and growth.¹ One set of studies finds that populations quickly recover back to pre-war trends. Cities that experienced heavy bombing during World War II were indistinguishable from those that were not bombed 20 to 25 years after the war in Japan (Davis and Weinstein, 2002) and in Germany (Brakman et al., 2004). After the Vietnam War, Miguel and Roland (2005) find that physical infrastructure, education, and poverty levels all converged across regions within 25 years.

The cross-country literature also finds rapid recovery of post-war economies (Organski and Kugler, 1977, 1980; Przeworski et al., 2000). Compared to currency crises, banking crises, and sudden shifts in executive power, Cerra and Saxena (2008) find that while civil wars cause the largest short-run fall in output (6% on average), output also rebounds quickly only in the case of civil war, recovering half of the fall within a decade. In countries affected by civil war, economic, social, and political development are also found to improve steadily after a war (Chen et al., 2008). Evidence on the short-run effects of war and violence also exists. Abadie and Gardeazabal (2003) find that terrorist violence in the Basque region of Spain significantly reduced economic growth relative to its neighboring regions. Justino and

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¹ See Blattman and Miguel, (forthcoming) for an extensive survey of the causes and effects of civil war.

Verwimp (2006) find that 20% of the Rwandan population moved into poverty after the genocide. In a study of African countries affected by internal armed conflicts, Stewart et al. (2001) find that primary school enrollments decreased in only three out of eighteen countries, but improved in five during civil conflicts and that on average, girls fared better than boys since boys often serve in the army.

The recent availability of data from war regions has resulted in a growing empirical literature that estimates the microeconomic effects of war on income, poverty, wealth, health, and education, for both combatants and civilians. The long-term health effects of war appear to be significant. Alderman et al. (2004) find that young children who suffered from war-related malnutrition in Zimbabwe are significantly shorter as adults and that this may affect their lifetime labor productivity. Akresh et al. (2007) find a negative relationship between height-for-age z-scores and exposure to the Rwandan civil war, the effect being particularly strong for girls. In a similar paper, Akresh et al. (2009) find that an additional month of war exposure in rural Burundi decreases children's height-for-age z-scores compared to non-exposed children.

There is a growing body of research that estimates the impact of war on schooling and labor market outcomes. Examining the effect of Uganda's civil conflict on combatants, Blattman and Annan (2007) find that male youth who were recruited into armed groups received less schooling, are less likely to have a skilled job, and also earn lower wages. de Walque (2006) finds that individuals with an urban, educated background are more likely to have died during the Cambodian genocide period of 1975–1978 and as a result, males of school age during that period have less education than previous or subsequent cohorts. Akresh and de Walque (2008) find a strong negative impact of the Rwandan genocide on schooling, with children exposed to the civil war experiencing an 18.3% decline in their average years of education. The authors find a stronger negative effect for males and for the non-poor. For Central Asia, Shemyakina (2006) finds that adolescent Tajik girls whose homes were destroyed during the civil war are less likely to obtain secondary education and that this affects their wages. Unlike Stewart et al. (2001), de Walque (2006), and Akresh and de Walque (2008), Shemyakina (2006) finds that the civil war in Tajikistan only decreased school enrollments of 12–16 year old girls living in high conflict intensity areas but had no significant impact on the education of boys or younger children.

In this paper, we examine the impact of Guatemala's 36-year-long civil war (1960–1996) on children's human capital accumulation. Even though the civil war lasted 36 years, the worst period of the war began in 1979 and ended in 1984, during which over 90% of the total human rights violations were committed. According to the Commission for Historical Clarification (CEH) and Recovery of Historical Memory Project (REMHI), roughly 200,000 individuals lost their lives or disappeared, more than 500,000 people or 8.3% of the 1983 population were displaced, and many Mayan villages were completely destroyed as a result of the civil war (Perera and Chauche, 1995; Archdiocese of Guatemala, 1999; Commission for Historical Clarification, 1999)². Of the cases of human rights violations documented by the CEH, 83% of fully identified victims were Mayan and 17% were Ladino.³ The civil war in Guatemala began as a military rebellion that intensified during the 1970s. The period between 1960 and 1978 was relatively peaceful, until the worst period of the war began in 1979 and lasted until 1984. From 1985 onwards, the violence declined rapidly, until the war ended in 1996. Most human rights violations were committed by the state against the civilian population and left a large number of children

orphaned and abandoned. Families and communities lost property and their means of survival. The increase in military spending diverted necessary investments of public resources away from health and education, resulting in the abandonment of social development.⁴ This accelerated the deterioration of health and educational conditions in those areas most severely affected by the confrontation. In addition, the destruction of physical assets, including private and community property, and the loss of infrastructure, such as bridges and electrical towers, also represented considerable losses and amounted to over 6% of the country's 1990 gross domestic product. These material losses frequently involved the total destruction of family capital, especially among Mayan families, and particularly in the west and north-west of Guatemala.

Given the length of the war, the economic consequences are estimated to be severe. Based on its investigation of the economic costs of the armed confrontation and taking only the 10-year period between 1980 and 1989, the CEH estimates that the total direct quantifiable costs were equivalent to zero production in Guatemala for almost 15 months, equal to 121% of the country's 1990 GDP. The majority of the costs resulted from the loss of production potential due to the death, disappearance, or forced displacement of individuals who had to abandon their daily activities or from recruitment into the Patrullas de Autodefensa Civil (PAC), the Army, or the guerrillas. The destruction of physical assets, including private and community property, and the loss of infrastructure also represented considerable losses. These material losses frequently involved the total destruction of family capital, especially among Mayan families, and particularly in the west and north-west of Guatemala.

We use the 2002 National Population Census and the distribution of the number of human rights violations and victims across departments to examine the magnitude of the war's effect on years of schooling and grade completion. Even though previous studies have examined the effect of civil war on schooling, this paper contributes to the literature in three important dimensions. First, Guatemala's civil war is unique in that it lasted 36 years and had three distinct periods with varying levels of war intensity. This allows us to examine the schooling outcomes of three cohorts who may have been differentially affected by the war, as illustrated in Table 1. The first cohort was school age during the initial, relatively peaceful period (1960–1978), the second cohort was school age during the worst period of the war (1979–1984), and the third cohort was school age during the latter part of the war (1985–1996), which again was relatively peaceful. We therefore expect a small impact of the war on the education of the first and third cohorts but a fairly large effect on the schooling of the second cohort. Our empirical strategy enables us to assess the long-term and incremental effects of internal conflict, which is not possible with most civil wars since they last a relatively short period of time.

Second, we estimate the effect of the war on schooling outcomes for eight demographic groups based on gender, urban–rural residence, and ethnicity in order to identify those groups that were most affected by the war. This is particularly relevant since most civil wars target specific ethnic groups and as a result may affect various demographic groups differently. Moreover, since these eight groups generally represent varying levels of wealth, we can examine the effect of the war on more socio-economically privileged groups, namely urban non-Mayans, as well as on socially excluded and poorer groups, namely rural Mayans.⁵ Since the majority of human rights violations occurred against the Mayan population in rural areas, we expect that the civil war in Guatemala may have disproportionately affected the schooling of rural Mayan children.

² The CEH was sponsored by the United Nations whereas the REMHI was sponsored by the Archdiocese of Guatemala.

³ According to the Guatemalan population census of 2002, 41% of the total population was self-identified as Mayan and 59% was self-identified as Ladinos. Mayan refers to the native or indigenous population and Ladinos are a socio-ethnic category that, in the Guatemalan case, represents a mix between Spanish and Mayans.

⁴ In 1985, public investment in physical capital reached its lowest level in the last 40 years and represented only 2% of the country's GDP.

⁵ According to the poverty reduction strategy report (Secretaría Planificación y Programación, 2006), 31% of Mayans and 14% of non-Mayans had an income less than \$1 in 1989.

Table 1

Cohorts unexposed and exposed to the civil war.

Year of birth	Period during which school age (7–19 years)	Level of war intensity
1920–1941	Pre-war period (before 1960)	None
1942–1960	Initial period (1960–1978)	Low
1961–1977	Worst period (1979–1984)	High
1978–1983	Latter period (1985–1996)	Low

Finally, we include an analysis of schooling outcomes for a cohort who was school age for each of grades 1 to 6 during post-war years, that is from 1997 onwards. Since the war ended in December 1996 and our data comes from the 2002 Census, we observe individuals who were old enough to have had the opportunity to complete grades 1 to 6 after the war ended. By comparing grade completion of these post-war cohorts to those who were primary school age during the latter period of the war, we examine the speed of post-war recovery in terms of education.

We find a strong negative impact of the civil war on the education of rural Mayan males and females, which supports the conclusion that internal armed conflict reinforces poverty and social exclusion among the most vulnerable groups. Among rural Mayan males, those who were school age during the three periods of the civil war in departments where more human rights violations were committed completed 0.27, 0.71, and 1.09 years less of schooling respectively whereas rural Mayan females exposed to the three periods of the war completed 0.12, 0.47, and 1.17 years less of schooling respectively. Given an average of 4.66 and 3.83 years of schooling for males and females, these represent declines of 6, 15, and 23% for males and 3, 12, and 30% for females. Our results are robust to the inclusion of indicators for department of residence, year of birth, and controls for different trends in education and human development in war-affected and peaceful departments of Guatemala. Examining grade completion, we find that it was primarily due to a lower likelihood of completing primary school grades that rural Mayan males and females received less schooling as a result of the war. This result is not surprising since only 25% of the population in Guatemala receive more than a primary education. Finally, we find that rural Mayan males and females who were primary school age during post-war years in higher war intensity departments were more likely to complete each of grades 1 through 6 or higher, suggesting that at least primary school outcomes improved immediately after the war for the two groups most affected by it.

Our results show that Guatemala's civil war had a negative impact on the human capital accumulation of two of the most vulnerable demographic groups and may have lowered the adult wages and labor productivity of these individuals. That rural Mayan children who were school age during the final, relatively peaceful period of the war received less schooling than those who were school age during the most violent period is an interesting finding, for which we provide three possible explanations.

First, the war may have resulted in long-term poverty among rural Mayans and destruction of schools and other infrastructure in rural Mayan communities which lasted well after the majority of violence declined. Second, the sheer length of the war may have decreased parents' expectations of future returns to education for their children due to the uncertainty of when the war would end and reconstruction would begin. Third, children in our sample who were school age during the latter period of the war may include individuals whose parents were displaced from their homes. If these displaced families remained in or moved to higher war intensity departments and if their children were born after they were displaced, then the education of these children may have been most severely affected by the war. Since the majority of displacements occurred among rural Mayans during the worst period of the war (1979–1984), children in our sample who were born in 1978–1983 and were school age in 1985–

1996 may include a large number from displaced families. Given that the loss of property and means of livelihood was greatest for displaced families, it is likely that the poverty of these families was most severely affected by the war. Therefore, it is not surprising that educational outcomes are worst for rural Mayan children who were school age during the latter period of the war.

Guatemala's 36-year-long civil war appears to have intensified gender, regional, sectoral, and ethnic disparities in human capital accumulation. As Table 2 shows, among individuals born between 1920 and 1983, average schooling is 2.27 years higher in the 17 lowest war intensity departments compared to the top five high war intensity departments, 3.74 years higher in urban than in rural areas, and 3.15 years higher among non-Mayan than Mayan people. Gender differences also exist, with female education lagging behind male education throughout the entire country but especially in high war intensity departments and among Mayans. Despite the negative consequences of the war, however, primary school outcomes of the worst affected groups improved among cohorts who were school age during post-war years. While this finding is encouraging and may be due to post-war education policies, we cannot be certain that this improvement continued over time.

This paper is structured as follows. Section 2 describes the historical context and impact of the civil war. Section 3 describes the data and empirical identification strategy. Section 4 presents the results and Section 5 concludes.

2. Civil war in Guatemala

2.1. Political history

Located in Central America, Guatemala borders Mexico to the north and west, the Pacific Ocean to the southwest, Belize and the Caribbean Sea to the northeast, and Honduras and El Salvador to the southeast. With a current population of 13,002,206, the country consists of 22 geographical departments, which in turn consist of 331 counties. More than half of Guatemalans are descendants of indigenous Mayans and a substantial proportion of the population are of mixed European and indigenous ancestry and are known as Ladinos. Most of Guatemala's population is rural, though urbanization is accelerating. The predominant religion is Roman Catholicism, into which many indigenous Guatemalans have incorporated traditional forms of worship. Between 1960 and 1996, the country experienced a 36-year civil war, the worst period of which occurred between 1979 and 1984.

After Spanish colonial rule for 300 years, Guatemala gained independence from Spain in 1821. An authoritarian state was then created which excluded the indigenous population, was racist in its precepts and practices, and served to protect the economic interests of the privileged minority. The state gradually evolved as an instrument for the protection of the concentration of productive wealth in the hands of the non-Mayan population, guaranteeing the continuation of social exclusion and injustice, which led to protest and political instability. Faced with movements proposing economic, political, social, or cultural change, the state increasingly resorted to violence and terror in order to maintain social control.

Among the potential causes of the Guatemalan civil war was the chronic status quo of inequality and social exclusion that was inherited from the colonial period (Perera and Chauche, 1995; Archdiocese of Guatemala, 1999; Commission for Historical Clarification, 1999). For example, in Quiché, the department most affected by the civil war and where almost 100% of the population is Mayan, by 1964 90 and 97% of households did not have access to water and electricity, respectively.⁶

⁶ This data is from the National Population Census of 1964.

Table 2
Disparities in educational attainment: by gender, region, sector, and ethnicity.
Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), *Archdiocese of Guatemala (1999)*, and *Commission for Historical Clarification (1999)*.

Panel A	All individuals		Males		Females		(Males – Females)		(LWI – HWI)		
	LWI	HWI	LWI	HWI	LWI	HWI	LWI	HWI	All	Males	Females
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Years of Schooling	4.64	2.37	5.03	2.92	4.28	1.87	0.75	1.06	2.27	2.11	2.42
Primary School	0.42	0.19	0.47	0.24	0.38	0.15	0.08	0.09	0.23	0.23	0.24
Secondary School	0.24	0.09	0.25	0.10	0.22	0.07	0.03	0.03	0.15	0.15	0.15
High School	0.15	0.05	0.16	0.06	0.14	0.04	0.02	0.01	0.10	0.10	0.10
Observations	3,436,013	1,103,656	1,632,588	525,675	1,803,425	577,981					
Panel B	All individuals		Males		Females		(Males – Females)		(Urban – Rural)		
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	All	Males	Females
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Years of Schooling	6.03	2.29	6.50	2.75	5.62	1.87	0.88	0.88	3.74	3.75	3.75
Primary School	0.57	0.18	0.62	0.22	0.53	0.14	0.10	0.08	0.39	0.40	0.39
Secondary School	0.36	0.05	0.39	0.07	0.33	0.04	0.05	0.02	0.30	0.32	0.29
High School	0.23	0.03	0.25	0.03	0.22	0.02	0.03	0.01	0.21	0.22	0.20
Observations	2,178,374	2,361,295	1,019,511	1,138,752	1,158,863	1,222,543					
Panel C	All Individuals		Males		Females		(Males – Females)		(Non-Mayan – Mayan)		
	Non-Mayan	Mayan	Non-Mayan	Mayan	Non-Mayan	Mayan	Non-Mayan	Mayan	All	Males	Females
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Years of Schooling	5.39	2.24	5.66	2.90	5.14	1.65	0.52	1.25	3.15	2.76	3.49
Primary School	0.50	0.18	0.53	0.24	0.47	0.12	0.06	0.11	0.32	0.30	0.35
Secondary School	0.29	0.07	0.31	0.09	0.28	0.05	0.03	0.04	0.23	0.22	0.23
High School	0.19	0.04	0.19	0.05	0.18	0.03	0.01	0.02	0.15	0.15	0.16
Observations	2,659,416	1,880,253	1,263,981	894,282	1,395,435	985,971					

Data for non-migrant individuals born between 1920 and 1983 are used to construct these figures.

Another factor that may have played a relevant role in the Guatemalan civil war was the global cold war confrontation. In 1954 an authoritarian right-wing government was installed, after overthrowing the popular elected liberal president Jacobo Arbenz. This liberal president had started an extensive land reform program in 1952, which adversely affected big land owners and favored mainly Mayan and poor Ladinos. After six years of authoritarian rule from 1954 to 1960, a group of junior military officers revolted in 1960. When they failed, several went into hiding and established close ties with Cuba, forming the first guerrilla group. This group became the nucleus of the forces that were in armed insurrection against the government for the next 36 years. Throughout the armed confrontation, insurgent groups adopted Marxist doctrine. On December 29 1996, the Government of President Alvaro Arzú Irigoyen, together with the Guatemalan National Revolutionary Unity (URNG), with the participation of the United Nations as moderator and with the support of the international community, concluded a long negotiating process, by signing the Peace Accords.

The CEH found that state forces and related paramilitary groups were responsible for 93% of the violations documented by the CEH, including 92% of the arbitrary executions and 91% of forced disappearances. Victims included men, women and children of all social strata: workers, professionals, church members, politicians, peasants, students and academics; in ethnic terms, the vast majority were Mayans. According to the CEH, 83% of fully identified victims were Mayan and 17% were Ladino.

Between 1962 and 1970, victims were mainly peasants, members of rural union organizations, university and secondary school teachers and students, and guerrilla sympathizers. Between 1971 and 1978, military operations were more selective and geographically dispersed. Victims included community and union leaders, catechists, and students. During the most violent and bloody period of the entire armed confrontation, 1979 to 1984, military operations were concen-

trated in Quiché, Huehuetenango, Chimaltenango, Alta and Baja Verapaz, the south coast, and the capital (Fig. 1). During this period, 91% of the total human rights violations were committed, the victims being mainly Mayan and to a lesser extent Ladino. Fig. 2, which shows the number of human rights violations committed by the state and guerrillas over the 1960–1996 period, reveals the sharp increase in these violations between 1979 and 1984. Fig. 3 shows the geographical distribution of the victims of the civil war across Guatemala's 22 departments. With almost 96 victims per 1000 population, Quiché experienced the worst of the war, followed by Baja Verapaz, Alta Verapaz, Petén, and Huehuetenango. During the final period, 1985 to 1996, operations were selective and affected the Mayan and Ladino population to a similar extent.

2.2. Civilian impacts of the War

Civil war can affect human capital accumulation through several channels. First, the forced displacement of families as well as the loss of income-earning members in families may reduce resources available to many households. In order to maintain certain consumption levels, resources may be drawn away from schooling and towards more basic needs such as food, shelter, clothing, and health. During the Guatemalan civil war, estimates of the number of displaced people vary from 500,000 to a million and a half people in the most intense period from 1981 to 1983, all of whom lost relatives and property. Moreover, the armed confrontation left a large number of children orphaned, abandoned, and their families destroyed. Thus, it is likely that children were removed from schools and possibly even made to engage in domestic or market work.

Second, infrastructure, such as schools and educational facilities, may be destroyed and teachers may be killed. As a result, children may have to travel long distances to attend school or stop attending school entirely. Third, since civilians are often the victims of armed forces and

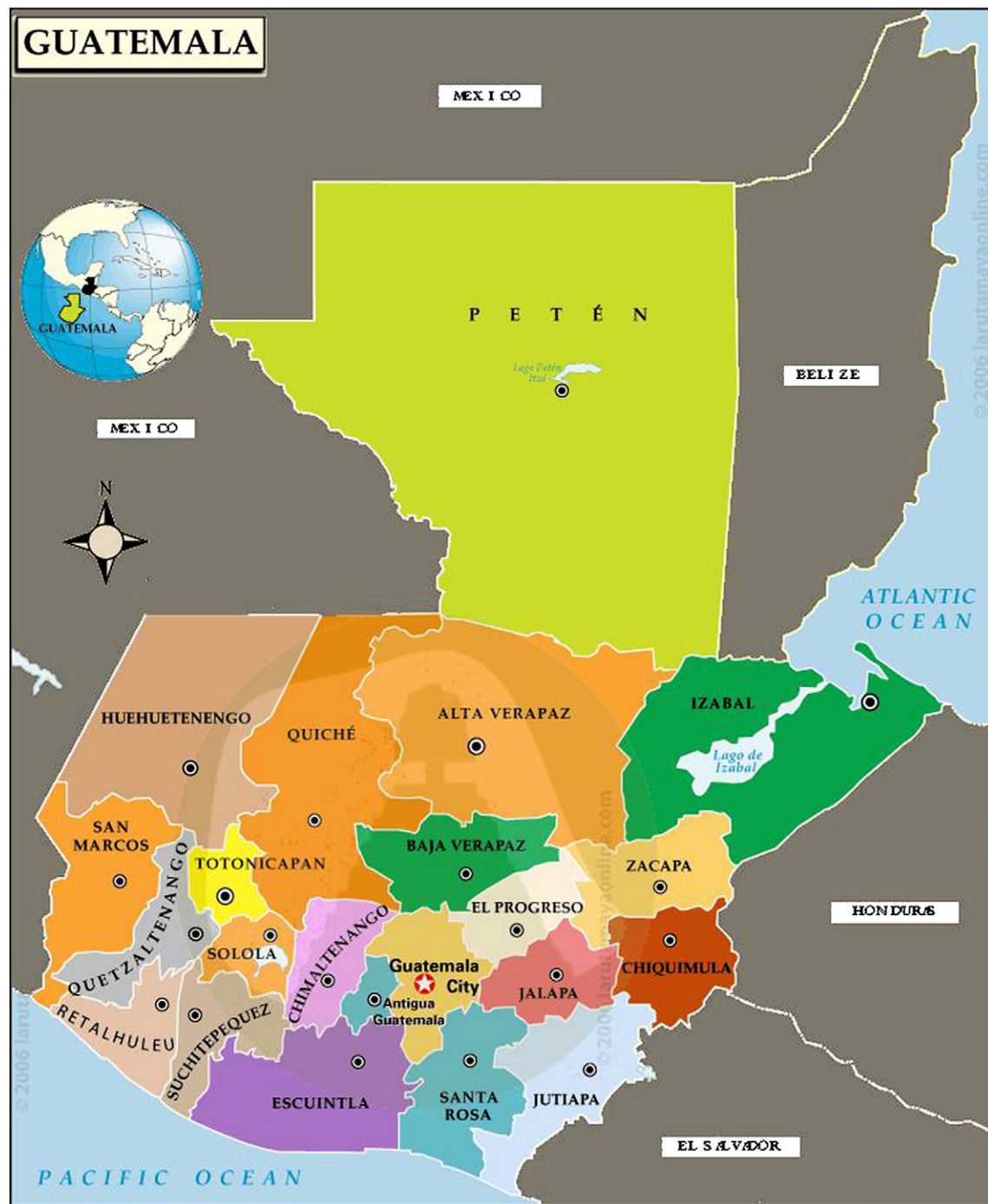


Fig. 1. Map of Guatemala.

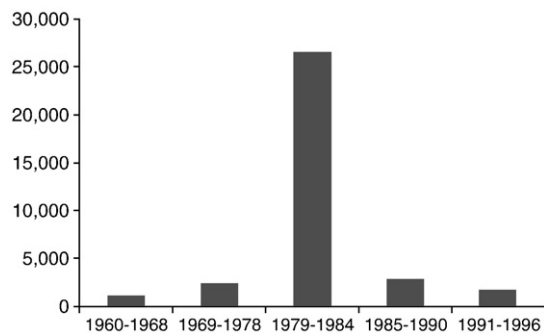


Fig. 2. Number of killings and disappearances in Guatemala: 1960–1996.

militias, parents may withdraw their children from school in order to keep them safe. A large number of children were among the direct victims of arbitrary execution, forced disappearance, torture, rape, and other violations of their fundamental rights during the civil war in Guatemala. This may have induced parents to stop sending their children to school. Finally, the expected returns to schooling may fall as a result of civil wars, which may discourage parents from sending their children to school. The destruction of existing industries and lack of creation of new industries may result in a scarcity of skilled jobs, making parents redistribute household resources away from individuals with lower expected returns and toward those with higher ones.

Armed conflict may have a stronger impact on certain groups of individuals. While previous analyses of school enrollments have

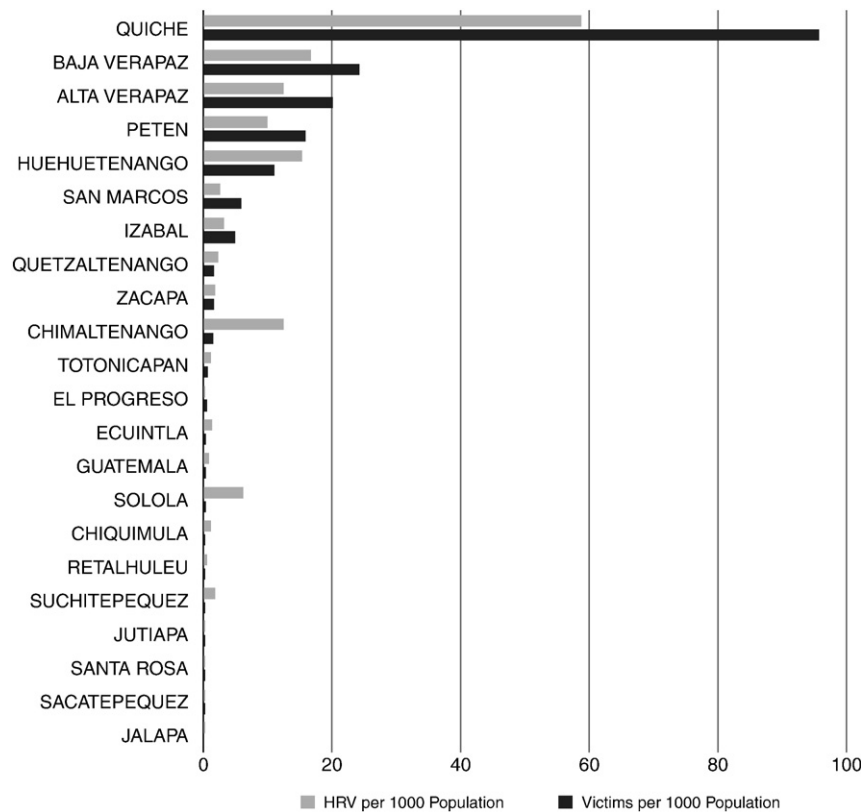


Fig. 3. Number of victims and human rights violations per 1000 population in departments.

found that males fare particularly badly since they are more likely to become combatants (Stewart et al., 2001; de Walque, 2006; Akresh and de Walque, 2008), it is also possible that the most vulnerable groups in the population may be affected the most. For example, Shemyakina, (2006)'s study finds that females rather than males received less secondary education in Tajikistan as a result of the civil war. In this paper, we find that Guatemala's civil war had a strong negative effect on the education of the two most disadvantaged groups – rural Mayan males and females. Thus, the war appears to have deepened the poverty of the poorest groups, which affected their schooling. In addition, rural Mayan males may have been more likely to engage in conflict and therefore less likely to attend school. Females, on the other hand, may have been affected for different reasons. Since girls in Guatemala receive less schooling on average, get married at an early age, and usually engage in household chores and child rearing rather than market work, they may be more likely to receive less schooling than boys, especially when resources become scarce. Parents may also withdraw their daughters from school in order to protect them from being sexually assaulted, raped, and harassed.

Unlike many other civil wars, the war in Guatemala lasted 36 years. Thus, the effect of Guatemala's civil war on human capital accumulation may be very different from other shorter wars. The loss of property and means of livelihood, the destruction of entire communities and villages, and the forced displacement of families over a 36-year period may have created several generations of individuals with deep-rooted poverty and inferior health and educational outcomes. The post-war recovery of these and subsequent generations may therefore have been slow and difficult. We find that schooling among rural Mayan males and females deteriorated even more during the latter period of the war than during the worst period. This indicates that the war may have resulted in long-term poverty among rural Mayans which lasted well after the majority of violence subsided.

3. Data and estimation

3.1. Data

In this paper we attempt to measure the effect that Guatemala's civil war had on the educational achievements of cohorts who were exposed to the three periods of the war, namely the initial period (1960–1978), the worst period (1979–1984), and the latter period (1985–1996). We use several sources of data for this study. Two data sources provide information on the geographical intensity of the civil war in Guatemala. The first source is from the Commission of Historical Clarification and provides the number of human rights violations and acts of violence across the country's 22 departments (Commission for Historical Clarification, 1999). The second data source is from the Recovery of Historical Memory Project and provides the number of victims in each of the country's 22 departments (Archdiocese of Guatemala, 1999). Using the total population in each department from the 1983 National Population Census, the year closest to the 1979–1984 period, we calculate the number of victims and human rights violations relative to the population in these departments.⁷ As can be seen in Fig. 3, the six departments with the highest number of victims per 1000 population include Quiché, Baja Verapaz, Alta Verapaz, Petén, Huehuetenango, and San Marcos. The highest number of human rights violations per 1000 population occurred in Quiché, Baja Verapaz, Huehuetenango, Alta Verapaz, Chimaltenango, and Petén. We categorize as high war intensity departments the five departments that fall in both categories – namely, Quiché, Baja Verapaz, Alta Verapaz, Petén, Huehuetenango – and the remaining 17 departments as low war intensity.

⁷ The 1983 Census was administered and published by the Dirección General de Estadísticas, Guatemala.

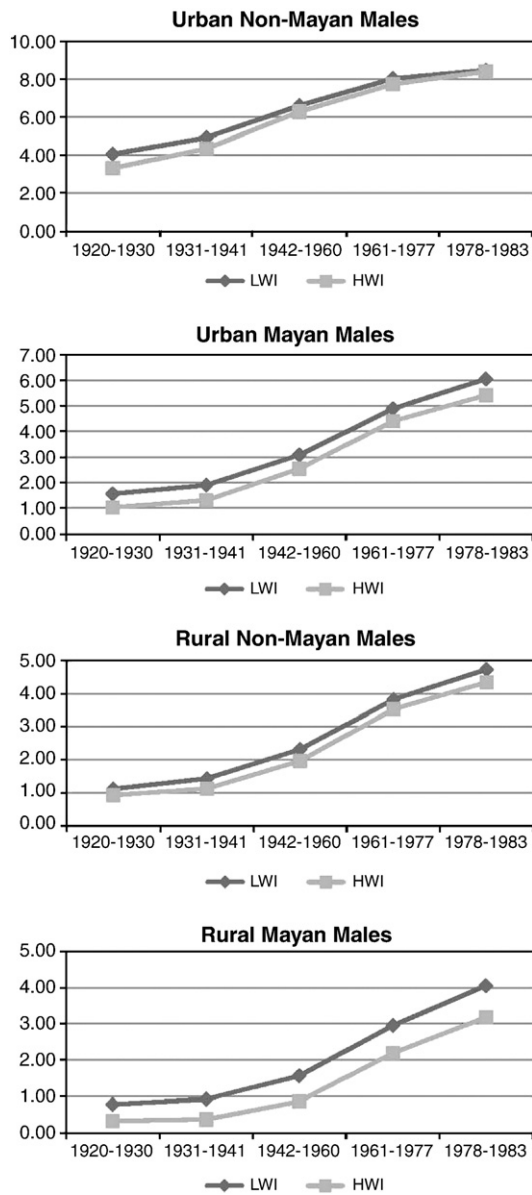


Fig. 4. Years of schooling of males born between 1920 and 1983 in high war intensity (HWI) and low war intensity (LWI) departments.

Our third source of data is the 2002 National Population Census, which was published by the Instituto Nacional de Estadística, Guatemala. From the 2002 Census we get information on an individual's birth year, demographic characteristics, schooling, department of birth, and department of residence in December 1996, when the peace accord was signed. Due to the massive population displacement that occurred during the civil war, we restrict our analysis to individuals who had the same department of birth and department of residence at the time of the signing of the peace accord in December 1996, which allows us to identify an individual's department of schooling.⁸ Even though many of the individuals in this restricted sample consist of non-displaced or non-migrant people, it is possible that some individuals in this sample may have been born after their parents were displaced during the war. This is especially true for individuals born during the worst period of the war, when the majority of forced displacements occurred. Therefore, our sample

⁸ This restriction has two potential problems, which we address in Section 4.3.

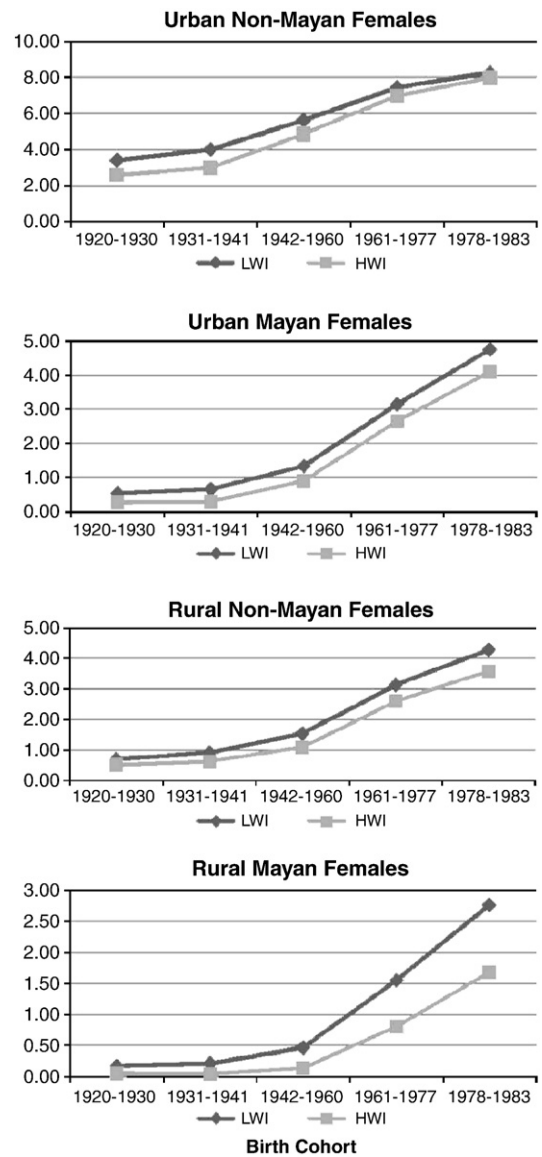


Fig. 5. Years of schooling of females born between 1920 and 1983 in high war intensity (HWI) and low war intensity (LWI) departments.

most likely includes non-displaced as well as displaced individuals, the latter group comprising younger cohorts, especially those born in or after 1979 when the most violent period of the war began.

In order to allow for completion of schooling by 2002, we include individuals who were born between 1920 and 1983. The youngest cohort – i.e. those who were born in 1983 – were 19 years old in 2002 and therefore had the opportunity to complete high school by the time of the 2002 census.⁹ Figs. 4 and 5 show the average years of schooling for five different cohorts of eight demographic groups in high and low war intensity departments. The first two cohorts consist of individuals born between 1920 and 1930 and between 1931 and 1941, all of whom were at least 19 years old at the start of the war in

⁹ We top code an individual's years of schooling to 12 years, that is we assign 12 years of schooling even to individuals who completed more than 12 years by attending college, who constitute only 5% of our sample. In Guatemala, primary school consists of grades 1 to 6, secondary school of grades 7 to 9, and high school includes grades 10 to 12. Children usually attend primary school when they are between 7 and 12 years old, secondary school when they are 13 to 15 years old, and high school when they are between 16 and 18 years old.

Table 3
 Difference-in-differences comparing exposed with unexposed cohorts in high and low war intensity departments: years of schooling for males.
 Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), *Archdiocese of Guatemala* (1999), and *Commission for Historical Clarification* (1999).

	Urban non-Mayan males			Urban Mayan Males		
	HWI	LWI	Difference (HWI – LWI)	HWI	LWI	Difference (HWI – LWI)
Born 1978–1983 (Exposed 3)	8.4 (0.031)	8.47 (0.008)	–0.07 (0.032)	5.41 (0.027)	6.05 (0.017)	–0.64 (0.032)
Born 1961–1977 (Exposed 2)	7.73 (0.027)	8.03 (0.007)	–0.30 (0.028)	4.40 (0.022)	4.88 (0.022)	–0.48 (0.025)
Born 1942–1960 (Exposed 1)	6.28 (0.037)	6.60 (0.01)	–0.32 (0.039)	2.54 (0.024)	3.07 (0.014)	–0.53 (0.028)
Born 1920–1941 (Unexposed)	3.94 (0.050)	4.60 (0.016)	–0.66 (0.053)	1.20 (0.026)	1.76 (0.026)	–0.56 (0.031)
Difference (Exposed 3 – Unexposed)	4.46 (0.059)	3.87 (0.018)	0.59 (0.062)	4.21 (0.038)	4.29 (0.023)	–0.08 (0.045)
Difference (Exposed 2 – Unexposed)	3.79 (0.058)	3.43 (0.017)	0.36 (0.060)	3.20 (0.034)	3.12 (0.034)	0.08 (0.040)
Difference (Exposed 1 – Unexposed)	2.34 (0.063)	2.00 (0.019)	0.34 (0.066)	1.34 (0.035)	1.31 (0.021)	0.03 (0.041)
	Rural Non-Mayan Males			Rural Mayan Males		
	HWI	LWI	Difference (HWI – LWI)	HWI	LWI	Difference (HWI – LWI)
Born 1978–1983 (Exposed 3)	4.33 (0.024)	4.73 (0.010)	–0.40 (0.026)	3.17 (0.010)	4.04 (0.013)	–0.87 (0.017)
Born 1961–1977 (Exposed 2)	3.52 (0.018)	3.82 (0.018)	–0.30 (0.019)	2.18 (0.007)	2.94 (0.007)	–0.76 (0.011)
Born 1942–1960 (Exposed 1)	1.96 (0.019)	2.31 (0.007)	–0.35 (0.021)	0.86 (0.006)	1.56 (0.008)	–0.70 (0.01)
Born 1920–1941 (Unexposed)	1.05 (0.021)	1.31 (0.021)	–0.26 (0.023)	0.35 (0.006)	0.87 (0.006)	–0.52 (0.011)
Difference (Exposed 3 – Unexposed)	3.28 (0.032)	3.42 (0.013)	–0.14 (0.035)	2.82 (0.012)	3.17 (0.016)	–0.35 (0.020)
Difference (Exposed 2 – Unexposed)	2.47 (0.028)	2.51 (0.028)	–0.04 (0.030)	1.83 (0.00)	2.07 (0.00)	–0.24 (0.016)
Difference (Exposed 1 – Unexposed)	0.91 (0.029)	1.00 (0.011)	–0.09 (0.031)	0.51 (0.009)	0.69 (0.012)	–0.18 (0.015)

1960 and therefore not exposed to the civil war during their school age. The last three cohorts consist of individuals who were school age during the three periods of the war. Individuals born between 1942 and 1960 were school age during the initial, relatively peaceful period of the war (1960–1978) since they were at least 19 years old in 1979. Individuals born between 1961 and 1977 were school age during the worst period of the war (1979–1984) during some or all of their primary, secondary, and high school years. The eldest children in this cohort were 18 years old in 1979 whereas the youngest children were 7 years old in 1984. Individuals born between 1978 and 1983 were school age during the latter part of the war (1985–1996) which again was a relatively peaceful period.

As Figs. 4 and 5 show, educational attainment improved over time for all eight demographic groups in both high and low war intensity departments. This increase in educational attainment reflects the general tendency in developing countries for schooling outcomes to improve over time and suggests that children who were school age during the civil war did not attain less schooling on average than their older cohorts. Another characteristic of schooling in poor countries is that there tends to be convergence in schooling outcomes between less and more educated regions and groups over time. In Guatemala, we see a pattern of regional convergence for the more privileged groups, namely urban non-Mayan males and females. However, for the less privileged groups, such as rural Mayan males and females, there is a widening divergence between high and low war intensity departments, which may have been the result of the civil war.

From the 1964 National Population Census, we obtain information on three key variables that measure the level of education and human

development in the country's 22 departments at the start of the civil war.¹⁰ We use the enrollment rate of 7 to 17 year old children to measure initial levels of schooling and the proportion of households without access to water and electricity to measure differences in the provision of basic services. We use this information to control for different trends in education and human development across departments.

3.2. Empirical analysis

The year of birth and the department of birth jointly determine an individual's exposure to the civil war. The identification strategy therefore exploits variation in the war's intensity across departments and which cohorts were school age during the three periods of the war, which can be illustrated using difference-in-differences tables. In Tables 3 and 4, we show the average years of schooling for eight demographic groups who were school age during the three periods of the civil war – those born in 1942–1960, 1961–1977, and 1978–1983 – and individuals who had completed school age by 1960 – those born in 1920–1941. Columns 1 and 2 show the average years of schooling for these groups in the 5 high war intensity departments (HWI) and 17 low war intensity departments (LWI), respectively.

Educational attainment is higher for younger cohorts compared to older ones in both high and low intensity war departments. This is

¹⁰ The 1964 Census was administered and published by the Dirección General de Estadísticas, Guatemala.

Table 4

Difference-in-differences comparing exposed with unexposed cohorts in high and low war intensity departments: years of schooling for females.

Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), [Archdiocese of Guatemala \(1999\)](#), and [Commission for Historical Clarification \(1999\)](#).

	Urban non-Mayan females			Urban Mayan females		
	HWI	LWI	Difference (HWI – LWI)	HWI	LWI	Difference (HWI – LWI)
Born 1978–1983 (Exposed 3)	7.97 (0.031)	8.27 (0.009)	–0.30 (0.032)	4.10 (0.027)	4.75 (0.016)	–0.65 (0.031)
Born 1961–1977 (Exposed 2)	6.97 (0.027)	7.44 (0.027)	–0.47 (0.028)	2.65 (0.018)	3.14 (0.018)	–0.49 (0.022)
Born 1942–1960 (Exposed 1)	4.85 (0.035)	5.59 (0.01)	–0.74 (0.036)	0.88 (0.015)	1.32 (0.01)	–0.44 (0.018)
Born 1920–1941 (Unexposed)	2.84 (0.042)	3.78 (0.042)	–0.94 (0.045)	0.27 (0.012)	0.60 (0.012)	–0.33 (0.016)
Difference (Exposed 3 – Unexposed)	5.13 (0.052)	4.49 (0.017)	0.64 (0.055)	3.83 (0.029)	4.15 (0.019)	–0.32 (0.035)
Difference (Exposed 2 – Unexposed)	4.13 (0.050)	3.66 (0.050)	0.47 (0.053)	2.38 (0.022)	2.54 (0.022)	–0.16 (0.027)
Difference (Exposed 1 – Unexposed)	2.01 (0.055)	1.81 (0.017)	0.20 (0.058)	0.61 (0.019)	0.72 (0.014)	–0.11 (0.024)
	Rural Non-Mayan Females			Rural Mayan Females		
	HWI	LWI	Difference (HWI – LWI)	HWI	LWI	Difference (HWI – LWI)
Born 1978–1983 (Exposed 3)	3.57 (0.022)	4.27 (0.010)	–0.70 (0.024)	1.68 (0.008)	2.76 (0.011)	–1.08 (0.014)
Born 1961–1977 (Exposed 2)	2.60 (0.016)	3.13 (0.016)	–0.53 (0.018)	0.80 (0.004)	1.55 (0.004)	–0.75 (0.008)
Born 1942–1960 (Exposed 1)	1.09 (0.016)	1.54 (0.006)	–0.45 (0.017)	0.14 (0.002)	0.46 (0.004)	–0.32 (0.005)
Born 1920–1941 (Unexposed)	0.58 (0.017)	0.83 (0.017)	–0.25 (0.019)	0.05 (0.002)	0.20 (0.002)	–0.14 (0.005)
Difference (Exposed 3 – Unexposed)	2.99 (0.028)	3.44 (0.013)	–0.45 (0.031)	1.62 (0.008)	2.56 (0.012)	–0.93 (0.015)
Difference (Exposed 2 – Unexposed)	2.02 (0.024)	2.30 (0.024)	–0.28 (0.026)	0.75 (0.005)	1.35 (0.005)	–0.60 (0.009)
Difference (Exposed 1 – Unexposed)	0.51 (0.024)	0.71 (0.01)	–0.20 (0.026)	0.09 (0.003)	0.26 (0.006)	–0.17 (0.007)

true for all eight demographic groups and is consistent with the increasing trend in educational attainment that is observed in most developing countries. Further, schooling in high war intensity departments is lower than that in low war intensity departments for all cohorts in all groups. The difference-in-differences calculation shows statistically significant increases of 0.34, 0.36, and 0.59 years of schooling for each successive cohort exposed to the war compared to the unexposed cohort among the most privileged group, namely urban non-Mayan males. A similar pattern is found for urban non-Mayan females, with each successive exposed cohort obtaining 0.20, 0.47, and 0.64 additional years of schooling compared to the unexposed cohort. For all other groups (except urban Mayan males), the difference-in-differences estimate is increasingly negative for each successive cohort. Rural Mayan females are the worst affected group, with each successive exposed cohort obtaining 0.17, 0.60, and 0.93 less years of schooling compared to the unexposed cohort. Rural non-Mayan females, urban Mayan females, and rural Mayan males also appear to be negatively affected by the war.

These results provide preliminary evidence that the educational attainment of certain groups, namely urban non-Mayan males and females, may not have been adversely affected by the civil war. On the other hand, more vulnerable groups and especially those that were targeted as victims appear to have fared particularly badly. The exposed cohort was at least 18 years old in 2002 and had completed their school age by 2002, the Census year. The results in [Tables 3 and 4](#) therefore show that among disadvantaged groups, exposed cohorts in high intensity war departments did not simply delay their education but actually completed less schooling during their entire school age years.

[Tables 3 and 4](#) illustrate an empirical identification strategy that relies on the comparison between educational attainment among cohorts who were school age during the war and those who had completed school age by 1960 in low and high war intensity departments. The change in educational attainment between younger and older cohorts in low war intensity departments therefore acts as a control group for what the difference in educational attainment between the cohorts should have looked like in the absence of the civil war. Building on this preliminary analysis, we estimate Eq. (1).¹¹

$$Y_{ijt} = \alpha + \sum_{c=1}^3 \beta_c \text{War}_j * \text{Cohort}_t^c + \delta_j + \gamma_t + \varepsilon_{ijt} \quad (1)$$

Y_{ijt} is the number of years of education attained by individual i who was born in department j in year t . War_j is a measure of the intensity of the war in department j , which we measure in two alternate ways – the number of human rights violations and the number of victims in a department relative to the population of the department in 1983.¹² Cohort_t^c includes three cohorts, namely those born in 1942–1960 (Cohort_t^1), 1961–1977 (Cohort_t^2), and 1978–1983 (Cohort_t^3), with individuals born between 1920 and 1941 being the omitted group. The interactions of a department's war intensity with each of these three cohorts are the key variables of interest and

¹¹ This estimation equation is similar to the one used by [Duflo \(2001\)](#). When estimating grade completion in Section 2, we use a linear probability model. Alternatively, one can use a logit or probit model, which provides us with consistent results that are available upon request.

¹² Specifically, we use the number of human rights violations per 10 people and alternatively the number of victims per 10 people in each department in 1983.

measure an individual's exposure to the war. In order to control for unobserved correlation of observations within departments and for a specific birth cohort, we include department and year of birth fixed effects, δ_j and γ_t respectively. Including department fixed effects purges all observed and unobserved department characteristics that are constant across individuals from the same department, thereby removing any bias that is generated by department characteristics. Year of birth fixed effects control for cohort-specific shocks that may bias our results. ε_{ijt} is a random, idiosyncratic error term. Since correlation among the error terms of all individuals in a given location experiencing the same shocks may bias the OLS standard errors downward, all standard errors are clustered by an individual's county (Moulton, 1986, 1990; Bertrand et al., 2004).

As discussed in Blattman and Miguel (forthcoming), the validity of difference-in-differences methods to examine the impact of war on microeconomic outcomes relies on the assumption of similar underlying human development trends in war-affected and peaceful regions of countries. The difference-in-differences estimator in Eq. (1) relies on the assumption that there were similar underlying trends in education and human development in all departments and that in the absence of the civil war, trends in educational attainment would have been similar in all departments. If, however, departments with higher war intensity had systematically lower levels of education and development than departments with lower war intensity prior to the start of the war in 1960, then lower educational attainment of individuals in higher war intensity departments may not reflect the direct impact of the war but instead the declining socio-economic conditions that contributed to the civil war in the first place. Given the availability of census data in 1964, only a few years after the start of the war, we use information on enrollment and access to water and electricity from the 1964 Census to control for different trends in education and human development across departments.

Figs. 6 and 7 plot the enrollment rate and proportion of households without access to water and electricity in a department in 1964 against the rank of each department with respect to the number of human rights violations and victims per 1000 population. The positive relationship between enrollment rates and war intensity shows that departments with a higher enrollment rate in 1964 had a lower number of human rights violations and victims per 1000 population during the civil war. Similarly, the negative relationship between access to water and electricity and war intensity indicates that departments with a higher proportion of households without these services in 1964 had a larger number of human rights violations and victims per 1000 population during the civil war.

These figures show that the level of education and human development in a department are highly correlated with the war intensity in that department and any decline in educational attainment that individuals experienced in higher war intensity departments may be the result of pre-war disparities in development rather than a consequence of the war itself. In Eq. (1), we therefore include three sets of interactions – those between year of birth indicators and a department's enrollment rate in 1964, those between year of birth indicators and the proportion of households without access to water in 1964, and those between year of birth indicators and the proportion of households without access to electricity in 1964. These interactions explicitly control for different trends in education and human development across departments for individuals born in each year between 1920 and 1983, the inclusion of which constitutes a contribution of our paper to the existing literature.

4. Results

4.1. Baseline difference-in-differences estimation

Table 5 presents regression results for Eq. (1) using years of education as the dependent variable. The difference-in-differences

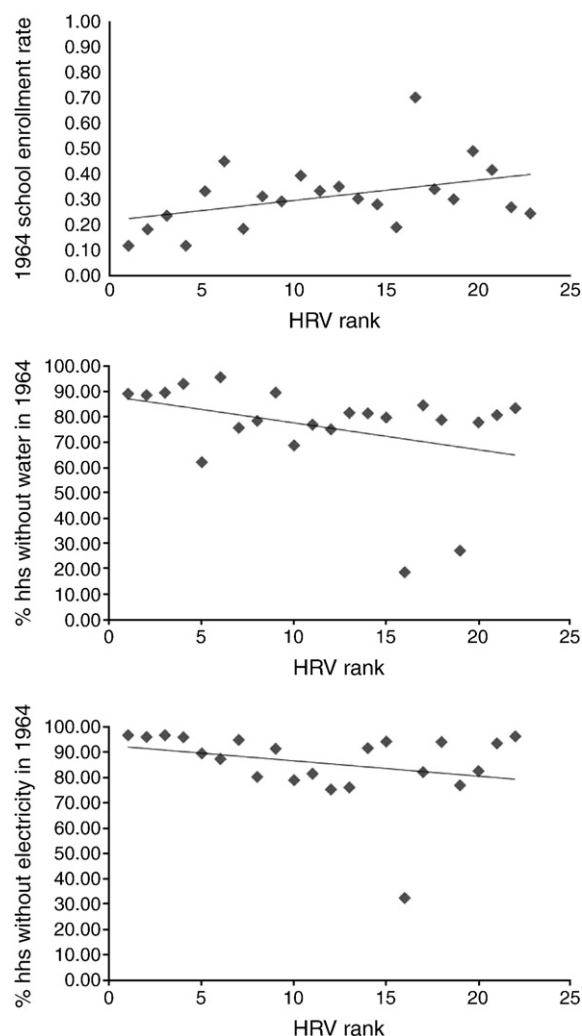


Fig. 6. 1964 Enrollment rates, availability of water and electricity in 1964, and rank of departments (by number of human rights violations).

estimates are the coefficients of the interaction between each of three cohorts and a measure of war intensity in one's department of birth. The top panel of the table (Panel A) uses the population-adjusted number of human rights violations whereas the bottom panel (Panel B) uses the number of victims relative to population to measure civil war intensity in a department. In addition, *F*-test statistics and their significance levels are presented for three hypotheses that test whether or not the difference-in-differences estimates are statistically significantly different for the three cohorts. Columns (1) to (8) show coefficient estimates and robust, cluster-corrected standard errors from regressions estimated for eight demographic groups. All regressions include fixed effects for an individual's department and year of birth as well as controls for different trends in education and human development across departments.

The difference-in-differences coefficients in Panel A are positive for the two most privileged groups, namely urban non-Mayan males and females, and negative for three of the poorer groups in Guatemala, namely rural Mayan males and females and rural non-Mayan females. For all other groups, the difference-in-differences coefficients are statistically insignificant. Among urban non-Mayan males, the difference-in-differences coefficient is positive for the cohort born between 1942 and 1960 but statistically insignificant for the two younger cohorts who were school age during the worst and latter periods of the war. Thus, within a given department and for an individual of a given age, being of school age in a higher war intensity

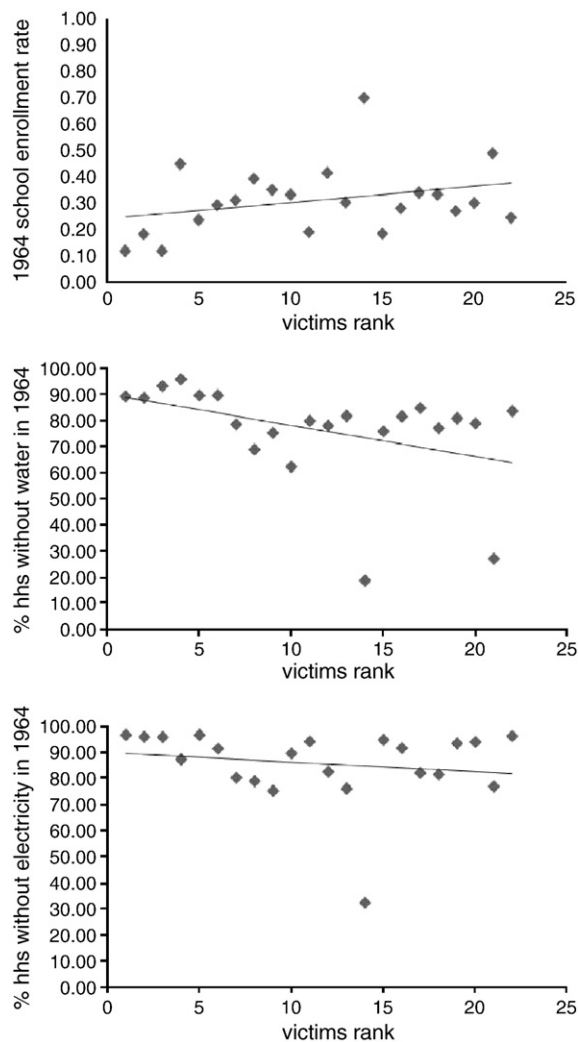


Fig. 7. 1964 Enrollment rates, availability of water and electricity in 1964, and rank of departments (by number of victims).

department during the initial period of Guatemala's civil war (1960–1978) implies an additional 1.25 years of schooling for urban non-Mayan males. The increase in schooling, however, does not continue for the two younger cohorts among this group who were school age during the worst and latter periods of the war. This suggests that while the civil war did not lower schooling among urban non-Mayan males born between 1961 and 1983, it may have dampened any potential increase in schooling that may have occurred among this group in the absence of the civil war.

We find similar results for urban non-Mayan females, though the difference-in-differences coefficient is positive for the two older cohorts who were school age during the war. Those born between 1942 and 1960 and those born between 1961 and 1977 in higher war intensity departments have respectively 1.15 and 1.32 additional years of schooling. Thus, among this group, even individuals who were school age during the worst period of the civil war in higher war intensity departments obtained more schooling. That the difference-in-difference estimate for the cohort who was school age during the latter period of the war is statistically insignificant, once again suggests that any potential improvements in educational outcomes for this group may have been weakened by the civil war.

Columns (4), (7), and (8) show a negative impact of the civil war for rural Mayan males and rural non-Mayan and Mayan females. Among rural non-Mayan females, the difference-in-differences coefficient is negative only for those born between 1942 and 1960 in

higher war intensity departments. For rural Mayan males and females, however, the effect of the civil war is negative and increasingly so for each successive cohort exposed to the civil war in higher war intensity departments. Among rural Mayan males, the three cohorts have 0.27, 0.70, and 1.09 less years of schooling in higher war intensity departments. For rural Mayan females, these figures are 0.12, 0.57, and 1.17. While the difference between β_1 and β_2 are not statistically significantly different for rural Mayan males, all coefficients are statistically significantly different from each other for rural Mayan females. These results are consistent with the corresponding estimates in Tables 3 and 4, that were obtained without any controls. The estimates reported in Panel B, where we use the population-adjusted number of victims rather than the number of human rights violations to measure war intensity, are qualitatively similar to those in Panel A, though the magnitude of the coefficients vary.¹³

That we find a negative effect of the civil war on the educational outcomes of rural Mayan children is not surprising for two reasons. First, the urban and non-Mayan population in Guatemala are wealthier and more privileged than the rural and Mayan population. Second, according to the CEH and REMHI, the majority of victims of the civil war were rural and Mayan people (Commission for Historical Clarification, 1999; Archdiocese of Guatemala, 1999). Our results therefore confirm that the civil war affected the most vulnerable group in Guatemala. While both males and females may receive less education when household property is lost and economic resources become more scarce, males are more likely to become combatants and therefore may attain even less schooling. Females, on the other hand, are more likely to engage in household chores and child-rearing as adults rather than participate in the labor market, making parents redistribute scarce resources away from their daughters' education. In addition, since females are at greater risk of being sexually assaulted, raped, and harassed during a civil war, parents may stop sending their daughters to school.

Perhaps the most interesting finding in Table 5 is that rural Mayan cohorts who were school age during the latter, relatively peaceful period of the war obtained even less schooling than those who were school age during the most violent period in higher war intensity departments. We provide three possible explanations for this finding.

First, despite the decline in violence, poverty among the most vulnerable groups may have intensified during the latter period of the civil war. The loss of property and means of livelihood that these groups experienced during the worst period of the war may not have been recovered after the worst period of the war came to an end. Schools and other infrastructure that were destroyed during the most violent period of the war may not have been reconstructed once the majority of violence ended in 1985. Thus, exposure to such a long-term war may have progressively worsened the poverty of vulnerable groups, which may have further deteriorated schooling outcomes. Second, the sheer length of the war may have decreased parents' expectations of future returns to education for their children. The uncertainty of when the war would end and reconstruction would begin may have discouraged parents from educating their children due to the potential lack of availability of skilled jobs in the future. Third, this result may be explained by the inclusion of children of displaced parents in the 1978–1983 cohort. Since the majority of displacements occurred during the worst period of the war (1979–1984) and among rural Mayan populations, if displaced parents gave birth to their children after their displacement, these children would be included in the 1978–1983 cohort of rural Mayan children in our sample. Since these children were school age during the latter period of the war in 1985–1996 and because it is reasonable to expect that

¹³ The exception is for rural non-Mayan males. Among this group, individuals who were school age during the worst period of the war in higher war intensity departments (measured by the number of victims relative to the population) have 0.39 additional years of schooling.

Table 5

Civil war exposure and years of schooling.

Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), Archdiocese of Guatemala (1999), and Commission for Historical Clarification (1999).

Variable	Coefficient	Males				Females			
		Urban		Rural		Urban		Rural	
		Non-Mayan (1)	Mayan (2)	Non-Mayan (3)	Mayan (4)	Non-Mayan (5)	Mayan (6)	Non-Mayan (7)	Mayan (8)
Panel A: Using human rights violations to measure civil war intensity									
HRV * Born 1942–1960	β_1	1.2536*** (0.3367)	0.2193 (0.3156)	0.1734 (0.4038)	−0.2701** (0.1112)	1.1517** (0.4340)	0.1766 (0.2049)	−0.5201* (0.2704)	−0.1220* (0.0656)
HRV * Born 1961–1977	β_2	0.8845 (0.6057)	0.3263 (0.6179)	0.9017 (0.5402)	−0.7054** (0.3395)	1.3242* (0.6630)	0.2358 (0.5801)	−0.4963 (0.6674)	−0.5742** (0.2799)
HRV * Born 1978–1983	β_3	0.2406 (0.6320)	0.1345 (0.6576)	0.8893 (0.6327)	−1.0911** (0.4893)	0.6393 (0.5874)	−0.0543 (0.7627)	−0.4777 (0.9628)	−1.1720** (0.5035)
F-Statistics for:									
$H_0:\beta_1=\beta_2$		0.55	0.08	11.32***	2.66	0.28	0.02	0.00	3.92*
$H_0:\beta_1=\beta_3$		2.82	0.04	4.12**	3.81*	1.78	0.14	0.00	5.22**
$H_0:\beta_2=\beta_3$		3.35*	0.72	0.00	3.02*	3.82*	1.29	0.00	5.69**
Observations		719,352	300,159	544,629	594,123	824,736	334,127	570,699	651,844
Adjusted R ²		0.1650	0.1620	0.1680	0.1730	0.1870	0.1830	0.1800	0.1680
Panel B: Using victims to measure civil war intensity									
Victims * born 1942–1960	β_1	0.9215** (0.3448)	−0.0894 (0.2669)	−0.0837 (0.2350)	−0.3867*** (0.0936)	0.8020** (0.3371)	−0.1851 (0.1977)	−0.5911*** (0.1753)	−0.0993** (0.0474)
Victims * born 1961–1977	β_2	0.3110 (0.3818)	−0.0346 (0.3334)	0.3899* (0.1965)	−0.5269** (0.1956)	0.5979* (0.3379)	−0.1253 (0.3041)	−0.4053 (0.2866)	−0.3403** (0.1274)
Victims * born 1978–1983	β_3	−0.0940 (0.5757)	−0.1749 (0.5980)	0.6276 (0.4438)	−1.2115** (0.4644)	0.2868 (0.4767)	−0.4168 (0.6871)	−0.5475 (0.7258)	−1.1512** (0.4439)
F-Statistics for:									
$H_0:\beta_1=\beta_2$		2.99*	0.08	10.99***	0.88	1.06	0.06	0.52	2.89*
$H_0:\beta_1=\beta_3$		2.84	0.04	4.07**	3.83*	1.81	0.14	0.00	5.22**
$H_0:\beta_2=\beta_3$		1.29	0.20	0.48	5.13**	0.99	0.50	0.09	6.14**
Observations		719,352	300,159	544,629	594,123	824,736	334,127	570,699	651,844
Adjusted R ²		0.1650	0.1620	0.1680	0.1730	0.1870	0.1830	0.1800	0.1680

Robust standard errors in parentheses are clustered at the county level. * significant at 10%, ** significant at 5%, *** significant at 1%. The sample includes individuals born between 1920 and 1983 who have the same department of birth and department of residence in December 1996. All regressions include fixed effects for department and year of birth and interactions of year of birth indicators with the enrollment rate in 1964, the proportion of households without access to water in 1964, and the proportion of households without access to electricity in 1964.

the loss of property and means of livelihood was greatest for displaced families, the schooling of these children may have been most severely affected by the war. As discussed in DiGeorgio-Lutz and Hale (2004), the majority of families in conflict affected areas who fled their homes during the early 1980s were displaced in the mountains near their place of origin, thus remaining in departments with higher war intensity. Thus, our sample of children who were born in 1978–1983 and were school age in 1985–1996 may include a large number from displaced families. Therefore, it is not surprising that educational outcomes are worst for rural Mayan children who were school age during the latter period of the war.

That our difference-in-differences estimates are robust to the inclusion of interactions between year of birth indicators and the enrollment rate, availability of water, and availability of electricity in 1964, suggests that our results are not driven by different educational and human development trends across departments. In order to provide an additional check and more credibility to our estimates, however, we estimate regressions for a control experiment by dividing the pre-war cohorts into 2 groups, that is those born between 1904 and 1919 and those born between 1920 and 1941. In our control experiment, we use the 1904–1919 cohort as the omitted group and include the interaction of War_j with the cohort born between 1920 and 1941. Since individuals born between 1920 and 1941 were at least 19 years old by 1960, their schooling should not have been affected by the war.

In Table 6 we present results of the control experiment. The difference-in-differences estimate for the 1920–1941 cohort in both Panels A and B are not statistically significantly different from zero for all eight demographic groups. Thus, there is no systematic difference in the average years of schooling of younger and older cohorts not

exposed to the war in higher and lower war intensity departments. These results indicate that the difference-in-differences estimates presented in Table 5 are not driven by inappropriate identification assumptions.

4.2. Grade completion

Following the same logic as Table 5, Tables 7 and 8 report results for completion of grades 1 to 12 or higher using the number of human rights violations to measure war intensity whereas Tables 9 and 10 present results using the number of victims to measure war intensity. Since the results for grade completion are very similar using the number of human rights violations and alternatively the number of victims to measure war intensity, we focus on discussing the first set of results (Tables 7 and 8). The objective of this analysis is to determine at which level of schooling the civil war had the largest negative impact and for which groups.

Even though the results in Table 5 show a positive difference-in-differences estimate among urban non-Mayan males for the 1942–1960 cohort, we find that the difference-in-differences estimate is negative for all three cohorts with respect to completion of grades 1 to 3 or higher. Among this group, the estimate for the 1978–1983 cohort is also negative for completion of grades 4 and 5 or higher. Similarly, despite a positive difference-in-differences estimate for years of schooling for the 1942–1960 cohort among urban non-Mayan females, the estimates are negative for the 1961–1977 and 1978–1983 cohorts for completion of grades 1 to 3 or higher. For completion of grade 6 or higher, the estimate becomes positive for the 1942–1960 cohort among both these groups. Moreover, for completion of grades 7 to 12 or higher, the difference-in-differences estimate is positive for all three exposed cohorts among

Table 6

Civil war exposure and years of schooling: control experiment.

Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), [Archdiocese of Guatemala \(1999\)](#), and [Commission for Historical Clarification \(1999\)](#).

Variable	Males				Females			
	Urban		Rural		Urban		Rural	
	Non-Mayan (1)	Mayan (2)	Non-Mayan (3)	Mayan (4)	Non-Mayan (5)	Mayan (6)	Non-Mayan (7)	Mayan (8)
<i>Panel A: Using human rights violations to measure civil war intensity</i>								
HRV * Born 1920–1941	0.7222 (0.6252)	0.5385 (0.4090)	−0.2905 (0.3183)	0.1147 (0.1330)	0.2423 (0.5212)	0.0166 (0.1741)	−0.1586 (0.3311)	−0.0329 (0.0667)
Observations	78,125	35,692	71,779	69,483	91,596	37,005	61,843	65,070
Adjusted R ²	0.147	0.0441	0.0515	0.0448	0.124	0.0395	0.0388	0.0203
<i>Panel B: Using victims to measure civil war intensity</i>								
Victims * born 1920–1941	0.4829 (0.4200)	0.2735 (0.2231)	−0.0836 (0.2300)	0.0838 (0.0778)	0.0731 (0.3669)	0.1036 (0.0772)	−0.1422 (0.2227)	0.0024 (0.0453)
Observations	78,125	35,692	71,779	69,483	91,596	37,005	61,843	65,070
Adjusted R ²	0.1470	0.0441	0.0515	0.0448	0.1240	0.0395	0.0388	0.0203

Robust standard errors in parentheses are clustered at the county level. * significant at 10%, ** significant at 5%, *** significant at 1%. The sample includes individuals born between 1904 and 1941 who have the same department of birth and department of residence in December 1996. All regressions include fixed effects for department and year of birth and interactions of year of birth indicators with the enrollment rate in 1964, the proportion of households without access to water in 1964, and the proportion of households without access to electricity in 1964.

Table 7

Completion of primary school grades: using human rights violations to measure civil war intensity.

Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), [Archdiocese of Guatemala \(1999\)](#), and [Commission for Historical Clarification \(1999\)](#).

Grade	Variable	Males				Females			
		Urban		Rural		Urban		Rural	
		Non-Mayan (1)	Mayan (2)	Non-Mayan (3)	Mayan (4)	Non-Mayan (5)	Mayan (6)	Non-Mayan (7)	Mayan (8)
Grade 1	HRV * Born 1942–1960	−0.1088*** (0.0396)	0.0412 (0.0348)	0.0121 (0.0686)	−0.0320 (0.0280)	−0.0372 (0.0476)	0.0432 (0.0358)	−0.1593*** (0.0574)	−0.0304 (0.0193)
	HRV * Born 1961–1977	−0.2035*** (0.0699)	0.1454*** (0.0506)	0.1660** (0.0693)	−0.0204 (0.0684)	−0.1701** (0.0707)	0.0389 (0.0693)	−0.0332 (0.0731)	−0.1071 (0.0727)
	HRV * Born 1978–1983	−0.2630*** (0.0744)	0.1378*** (0.0449)	0.1719*** (0.0571)	0.0133 (0.0713)	−0.2706*** (0.0802)	0.0136 (0.0732)	0.0153 (0.0658)	−0.1848* (0.0972)
Grade 2	HRV * Born 1942–1960	−0.1245*** (0.0423)	0.0327 (0.0380)	0.0002 (0.0658)	−0.0449* (0.0252)	−0.0252 (0.0446)	0.0353 (0.0333)	−0.1689*** (0.0562)	−0.0267 (0.0169)
	HRV * Born 1961–1977	−0.2442*** (0.0759)	0.1214** (0.0512)	0.1338** (0.0649)	−0.0498 (0.0683)	−0.1879*** (0.0676)	0.0245 (0.0669)	−0.0712 (0.0759)	−0.1018 (0.0665)
	HRV * Born 1978–1983	−0.3029*** (0.0811)	0.1145*** (0.0416)	0.1277** (0.0567)	−0.0262 (0.0707)	−0.2925*** (0.0793)	−0.0051 (0.0725)	−0.0202 (0.0726)	−0.1885* (0.0955)
Grade 3	HRV * Born 1942–1960	−0.0789* (0.0459)	0.0179 (0.0391)	0.0187 (0.0548)	−0.0382* (0.0191)	−0.0048 (0.0507)	0.0247 (0.0309)	−0.1250*** (0.0396)	−0.0194* (0.0104)
	HRV * Born 1961–1977	−0.2253*** (0.0807)	0.0541 (0.0530)	0.1311** (0.0516)	−0.0724 (0.0572)	−0.1777** (0.0661)	0.0242 (0.0651)	−0.1137 (0.0830)	−0.0831 (0.0494)
	HRV * Born 1978–1983	−0.3210*** (0.0854)	0.0376 (0.0466)	0.1092** (0.0500)	−0.0923 (0.0655)	−0.3027*** (0.0729)	−0.0343 (0.0736)	−0.0855 (0.0983)	−0.1721** (0.0846)
Grade 4	HRV * Born 1942–1960	0.0450 (0.0584)	0.0231 (0.0433)	−0.0083 (0.0523)	−0.0290* (0.0171)	0.0995 (0.0791)	0.0177 (0.0258)	−0.0792** (0.0339)	−0.0112 (0.0070)
	HRV * Born 1961–1977	−0.1150 (0.0969)	0.0161 (0.0726)	0.0780 (0.0829)	−0.0967* (0.0486)	−0.0371 (0.0959)	0.0101 (0.0666)	−0.1199 (0.1004)	−0.0689** (0.0331)
	HRV * Born 1978–1983	−0.2336** (0.0926)	−0.0356 (0.0692)	0.0657 (0.0805)	−0.1543** (0.0706)	−0.1555 (0.0925)	−0.0452 (0.0807)	−0.1150 (0.1336)	−0.1530** (0.0668)
Grade 5	HRV * Born 1942–1960	0.0819 (0.0579)	0.0179 (0.0386)	−0.0099 (0.0464)	−0.0299* (0.0153)	0.1248 (0.0766)	0.0126 (0.0232)	−0.0399 (0.0263)	−0.0101* (0.0058)
	HRV * Born 1961–1977	−0.0713 (0.1004)	−0.0024 (0.0796)	0.0308 (0.0852)	−0.1049** (0.0393)	0.0271 (0.1007)	0.0061 (0.0672)	−0.1334 (0.0953)	−0.0620*** (0.0217)
	HRV * Born 1978–1983	−0.1954** (0.0945)	−0.0551 (0.0797)	0.0093 (0.0937)	−0.1840*** (0.0636)	−0.0735 (0.0916)	−0.0357 (0.0884)	−0.1201 (0.1335)	−0.1362** (0.0510)
Grade 6	HRV * Born 1942–1960	0.1113* (0.0632)	0.0218 (0.0362)	−0.0022 (0.0421)	−0.0278* (0.0145)	0.1394* (0.0763)	0.0138 (0.0189)	−0.0221 (0.0246)	−0.0073 (0.0047)
	HRV * Born 1961–1977	−0.0374 (0.0978)	−0.0042 (0.0797)	0.0300 (0.0881)	−0.1012*** (0.0340)	0.0632 (0.1059)	0.0092 (0.0637)	−0.1253 (0.0889)	−0.0498*** (0.0171)
	HRV * Born 1978–1983	−0.1548 (0.0976)	−0.0444 (0.0856)	0.0107 (0.0959)	−0.1787*** (0.0582)	−0.0118 (0.0996)	−0.0238 (0.0921)	−0.1213 (0.1348)	−0.1151*** (0.0417)

Robust standard errors in parentheses are clustered at the county level. * significant at 10%, ** significant at 5%, *** significant at 1%. The sample includes individuals born between 1920 and 1983 who have the same department of birth and department of residence in December 1996. All regressions include fixed effects for department and year of birth and interactions of year of birth indicators with the enrollment rate in 1964, the proportion of households without access to water in 1964, and the proportion of households without access to electricity in 1964.

Table 8
Completion of secondary and high school grades: using human rights violations to measure civil war intensity.
Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), *Archdiocese of Guatemala (1999)*, and *Commission for Historical Clarification (1999)*.

Grade	Variable	Males				Females			
		Urban		Rural		Urban		Rural	
		Non-Mayan (1)	Mayan (2)	Non-Mayan (3)	Mayan (4)	Non-Mayan (5)	Mayan (6)	Non-Mayan (7)	Mayan (8)
Grade 7	HRV * Born 1942–1960	0.2412*** (0.0464)	0.0098 (0.0234)	0.0285 (0.0249)	–0.0151* (0.0076)	0.1720*** (0.0388)	0.0035 (0.0114)	0.0110 (0.0129)	–0.0031 (0.0019)
	HRV * Born 1961–1977	0.3311*** (0.0599)	–0.0091 (0.0675)	0.0738 (0.0494)	–0.0584*** (0.0205)	0.3227*** (0.0799)	0.0181 (0.0517)	0.0228 (0.0434)	–0.0243** (0.0099)
	HRV * Born 1978–1983	0.2787*** (0.0528)	–0.0207 (0.0896)	0.0815 (0.0731)	–0.1349*** (0.0378)	0.3110*** (0.0762)	0.0049 (0.0857)	0.0057 (0.0825)	–0.0596** (0.0240)
Grade 8	HRV * Born 1942–1960	0.2444*** (0.0463)	0.0117 (0.0221)	0.0288 (0.0230)	–0.0140* (0.0070)	0.1670*** (0.0377)	0.0045 (0.0110)	0.0155 (0.0120)	–0.0035** (0.0017)
	HRV * Born 1961–1977	0.3246*** (0.0602)	–0.0024 (0.0658)	0.0678 (0.0459)	–0.0515*** (0.0185)	0.3242*** (0.0774)	0.0202 (0.0489)	0.0194 (0.0390)	–0.0222** (0.0094)
	HRV * Born 1978–1983	0.2929*** (0.0490)	–0.0127 (0.0840)	0.0786 (0.0700)	–0.1103*** (0.0327)	0.3274*** (0.0742)	0.0104 (0.0831)	–0.0005 (0.0754)	–0.0515** (0.0215)
Grade 9	HRV * Born 1942–1960	0.2243*** (0.0479)	0.0098 (0.0204)	0.0337 (0.0212)	–0.0111* (0.0065)	0.1498*** (0.0385)	0.0062 (0.0099)	0.0168 (0.0116)	–0.0031* (0.0018)
	HRV * Born 1961–1977	0.3053*** (0.0516)	0.0060 (0.0603)	0.0623 (0.0403)	–0.0432** (0.0166)	0.3115*** (0.0700)	0.0226 (0.0440)	0.0221 (0.0342)	–0.0186** (0.0082)
	HRV * Born 1978–1983	0.2789*** (0.0443)	–0.0045 (0.0759)	0.0662 (0.0627)	–0.0900*** (0.0286)	0.3024*** (0.0674)	0.0161 (0.0737)	–0.0017 (0.0684)	–0.0426** (0.0182)
Grade 10	HRV * Born 1942–1960	0.2126*** (0.0512)	0.0111 (0.0181)	0.0272 (0.0172)	–0.0093* (0.0048)	0.1306*** (0.0320)	0.0055 (0.0083)	0.0113 (0.0106)	–0.0029 (0.0018)
	HRV * Born 1961–1977	0.2789*** (0.0449)	–0.0024 (0.0491)	0.0497 (0.0316)	–0.0366*** (0.0121)	0.2938*** (0.0622)	0.0219 (0.0362)	0.0177 (0.0280)	–0.0137* (0.0071)
	HRV * Born 1978–1983	0.3145*** (0.0398)	0.0085 (0.0602)	0.0708 (0.0486)	–0.0546** (0.0202)	0.2990*** (0.0644)	0.0198 (0.0585)	–0.0045 (0.0535)	–0.0273* (0.0145)
Grade 11	HRV * Born 1942–1960	0.2010*** (0.0483)	0.0090 (0.0174)	0.0258* (0.0150)	–0.0102** (0.0048)	0.1262*** (0.0329)	0.0040 (0.0080)	0.0106 (0.0107)	–0.0022 (0.0015)
	HRV * Born 1961–1977	0.2662*** (0.0432)	–0.0015 (0.0471)	0.0443 (0.0302)	–0.0379*** (0.0120)	0.2799*** (0.0608)	0.0204 (0.0340)	0.0105 (0.0271)	–0.0124* (0.0065)
	HRV * Born 1978–1983	0.2873*** (0.0403)	0.0058 (0.0524)	0.0578 (0.0416)	–0.0448** (0.0179)	0.2727*** (0.0582)	0.0139 (0.0498)	–0.0123 (0.0480)	–0.0239* (0.0131)
Grade 12	HRV * Born 1942–1960	0.2040*** (0.0472)	0.0132 (0.0172)	0.0189 (0.0141)	–0.0085* (0.0045)	0.1097*** (0.0304)	0.0056 (0.0072)	0.0091 (0.0099)	–0.0020 (0.0016)
	HRV * Born 1961–1977	0.2749*** (0.0443)	0.0053 (0.0440)	0.0344 (0.0284)	–0.0324*** (0.0106)	0.2746*** (0.0532)	0.0195 (0.0299)	0.0079 (0.0239)	–0.0103* (0.0057)
	HRV * Born 1978–1983	0.2590*** (0.0388)	0.0033 (0.0428)	0.0401 (0.0360)	–0.0344** (0.0153)	0.2335*** (0.0548)	0.0111 (0.0384)	–0.0176 (0.0374)	–0.0175 (0.0107)

Robust standard errors in parentheses are clustered at the county level. * significant at 10%, ** significant at 5%, *** significant at 1%. The sample includes individuals born between 1920 and 1983 who have the same department of birth and department of residence in December 1996. All regressions include fixed effects for department and year of birth and interactions of year of birth indicators with the enrollment rate in 1964, the proportion of households without access to water in 1964, and the proportion of households without access to electricity in 1964.

urban non-Mayans. These results, together with those presented in Table 5 show that among the two most privileged groups, average years of schooling increased for exposed cohorts and this increase was due to a greater probability of completing secondary and high school grades (grades 7 to 12) rather than primary school grades. Among urban non-Mayans, however, the youngest children in each exposed cohort appear to have been negatively affected by the war since they were less likely to complete grades 1 to 3 or higher.

For urban Mayan males and rural non-Mayan males, the likelihood of completing the lower primary grades is greater for some exposed cohorts, which does not appear to affect average years of schooling for these individuals, as the results in Table 5 show. Among rural non-Mayan females, however, the 1942–1960 cohort is less likely to complete grades 1 to 4 or higher, which is consistent with negative difference-in-differences estimate we find for this group with respect to years of schooling.

For the two groups most negatively affected by the war, we find negative difference-in-difference estimates for exposed cohorts for completion of almost every grade. Among rural Mayan males, only the 1942–1960 exposed cohort is less likely to complete grades 2 and 3 or higher. However, from grade 4 onwards, the 1961–1977 and 1978–1983 exposed cohorts are also less likely to complete each grade or higher,

with the negative difference-in-differences estimate being larger in magnitude for those individuals who were school age during the latter period of the war. The estimates are largest for the last three grades of primary school (grades 4, 5, and 6), followed by secondary school grades (grades 7, 8, and 9). Thus, exposed rural Mayan males completed fewer years of schooling mostly due to their lower likelihood of completing primary and secondary school. Moreover, similar to our findings for years of schooling, the negative effect of the war is strongest for those individuals exposed to the latter period of the war.

For rural Mayan females, the difference-in-differences estimate is negative and large in magnitude for the 1978–1983 cohort for completion of all primary school grades. As discussed in Section 1, this may be explained by deepening poverty among rural Mayans and the inclusion of children of displaced parents in the 1978–1983 cohort. Even though the difference-in-differences estimates are negative for the other two cohorts, they are not as large in magnitude and are even statistically insignificant for the completion of some primary school grades. For secondary and high school grades, the estimates are fairly small, though still negative for exposed cohorts for most grades. These results indicate that it was mostly due to a lower likelihood of completing primary school grades that rural Mayan females completed fewer years of schooling.

Table 9

Completion of primary school grades: using victims to measure civil war intensity.

Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), *Archdiocese of Guatemala* (1999), and *Commission for Historical Clarification* (1999).

Grade	Variable	Males				Females			
		Urban		Rural		Urban		Rural	
		Non-Mayan (1)	Mayan (2)	Non-Mayan (3)	Mayan (4)	Non-Mayan (5)	Mayan (6)	Non-Mayan (7)	Mayan (8)
Grade 1	Victims * Born 1942–1960	–0.0699** (0.0333)	–0.0058 (0.0288)	–0.0563 (0.0610)	–0.0752*** (0.0273)	–0.0200 (0.0390)	–0.0196 (0.0315)	–0.1836*** (0.0452)	–0.0206 (0.0164)
	Victims * Born 1961–1977	–0.1051*** (0.0348)	0.0539** (0.0265)	0.0528* (0.0303)	–0.0457 (0.0415)	–0.1011*** (0.0357)	–0.0229 (0.0354)	–0.0439 (0.0374)	–0.0593 (0.0353)
	Victims * Born 1978–1983	–0.2235*** (0.0572)	0.0910** (0.0376)	0.1026*** (0.0353)	–0.0303 (0.0680)	–0.2529*** (0.0620)	–0.0493 (0.0625)	–0.0090 (0.0500)	–0.1753** (0.0849)
Grade 2	Victims * Born 1942–1960	–0.0792*** (0.0290)	–0.0128 (0.0313)	–0.0566 (0.0567)	–0.0851*** (0.0240)	–0.0021 (0.0415)	–0.0243 (0.0336)	–0.1729*** (0.0424)	–0.0219 (0.0140)
	Victims * Born 1961–1977	–0.1273*** (0.0371)	0.0402 (0.0255)	0.0411 (0.0280)	–0.0616 (0.0410)	–0.1082*** (0.0362)	–0.0295 (0.0349)	–0.0528 (0.0379)	–0.0598* (0.0318)
	Victims * Born 1978–1983	–0.2568*** (0.0620)	0.0691** (0.0308)	0.0701* (0.0377)	–0.0668 (0.0670)	–0.2690*** (0.0635)	–0.0649 (0.0619)	–0.0239 (0.0545)	–0.1840** (0.0832)
Grade 3	Victims * Born 1942–1960	–0.0351 (0.0373)	–0.0188 (0.0332)	–0.0276 (0.0407)	–0.0676*** (0.0179)	0.0118 (0.0520)	–0.0371 (0.0370)	–0.1214*** (0.0331)	–0.0180* (0.0096)
	Victims * Born 1961–1977	–0.1157** (0.0464)	0.0053 (0.0269)	0.0487*** (0.0172)	–0.0675* (0.0335)	–0.1069** (0.0401)	–0.0314 (0.0337)	–0.0758** (0.0367)	–0.0507** (0.0227)
	Victims * Born 1978–1983	–0.2764*** (0.0694)	0.0008 (0.0380)	0.0622 (0.0378)	–0.1223* (0.0617)	–0.2857*** (0.0611)	–0.0963 (0.0615)	–0.0815 (0.0694)	–0.1711** (0.0743)
Grade 4	Victims * Born 1942–1960	0.0661 (0.0536)	–0.0049 (0.0420)	–0.0075 (0.0267)	–0.0389*** (0.0133)	0.0910 (0.0718)	–0.0267 (0.0318)	–0.0569* (0.0294)	–0.0095 (0.0068)
	Victims * Born 1961–1977	–0.0602 (0.0581)	–0.0114 (0.0411)	0.0545** (0.0219)	–0.0676** (0.0263)	–0.0328 (0.0561)	–0.0271 (0.0356)	–0.0640 (0.0390)	–0.0416*** (0.0141)
	Victims * Born 1978–1983	–0.2122** (0.0783)	–0.0636 (0.0634)	0.0663 (0.0465)	–0.1646** (0.0652)	–0.1638** (0.0793)	–0.0898 (0.0698)	–0.0923 (0.0911)	–0.1515** (0.0582)
Grade 5	Victims * Born 1942–1960	0.0894* (0.0527)	–0.0001 (0.0361)	0.0075 (0.0293)	–0.0338** (0.0127)	0.1105 (0.0663)	–0.0242 (0.0268)	–0.0152 (0.0271)	–0.0077 (0.0052)
	Victims * Born 1961–1977	–0.0422 (0.0607)	–0.0153 (0.0441)	0.0369 (0.0235)	–0.0680*** (0.0205)	0.0060 (0.0571)	–0.0238 (0.0360)	–0.0713* (0.0375)	–0.0368*** (0.0090)
	Victims * Born 1978–1983	–0.1876** (0.0819)	–0.0733 (0.0732)	0.0266 (0.0548)	–0.1883*** (0.0583)	–0.0878 (0.0773)	–0.0727 (0.0796)	–0.0948 (0.0938)	–0.1339*** (0.0447)
Grade 6	Victims * Born 1942–1960	0.1136* (0.0589)	0.0103 (0.0340)	0.0094 (0.0256)	–0.0285** (0.0111)	0.1213* (0.0647)	–0.0127 (0.0224)	–0.0055 (0.0240)	–0.0050 (0.0046)
	Victims * Born 1961–1977	–0.0236 (0.0591)	–0.0113 (0.0447)	0.0311 (0.0254)	–0.0634*** (0.0173)	0.0273 (0.0601)	–0.0142 (0.0344)	–0.0726* (0.0360)	–0.0293*** (0.0074)
	Victims * Born 1978–1983	–0.1523* (0.0857)	–0.0559 (0.0797)	0.0222 (0.0562)	–0.1799*** (0.0532)	–0.0300 (0.0852)	–0.0504 (0.0847)	–0.1042 (0.0993)	–0.1130*** (0.0368)

Robust standard errors in parentheses are clustered at the county level. * significant at 10%, ** significant at 5%, *** significant at 1%. The sample includes individuals born between 1920 and 1983 who have the same department of birth and department of residence in December 1996. All regressions include fixed effects for department and year of birth and interactions of year of birth indicators with the enrollment rate in 1964, the proportion of households without access to water in 1964, and the proportion of households without access to electricity in 1964.

The majority of individuals in Guatemala obtain either no education or some primary education, with less than 25% of the population receiving more than primary education. Moreover, completion of primary school is necessary for post-primary education. Therefore, it is not surprising that rural Mayan males and females completed less schooling on average mostly as a result of their lower likelihood of completing primary school grades.

In order to see whether or not the regressions for grade completion are based on appropriate identifying assumptions, we conduct a control experiment for completion of each grade, similar to what we estimated for years of schooling. The coefficient of the variable (HRV * Born 1920–1941) is reported in Table 11 and the coefficient of the variable (Victims * Born 1920–1941) is reported in Table 12. The difference-in-differences estimate is negative and statistically significant only for urban Mayan males for completion of grades 1 and 2 or higher and for rural Mayan females for completion of grade 7 or higher. Thus, it is possible that our results are driven by inappropriate identifying assumptions for these three regressions. However, given that less schooling of rural Mayan females is driven mostly by their lower likelihood of completing grades 1 to 6 or higher, our control experiment does not invalidate our main results.

4.3. Schooling outcomes for displaced or migrant people

In this section, we examine how restricting our sample to those individuals who had the same department of birth and residence in 1996 may potentially affect our results. This restriction allows us to identify an individual's department of schooling. However, there are two potential problems associated with it.

The first potential problem is that we may falsely identify the birth department of those individuals who temporarily migrated out of their birth department but returned to it before the peace accord was signed in December 1996. This may have happened if, for example, people in high war intensity departments wanted to escape the worst period of the war. If these temporary migrants received more schooling in their place of refuge than they would have in their birth place, we may underestimate the effect of the civil war. On the other hand, if temporary migrants received less schooling in their place of refuge than they would have in their birth place, we may overstate the direct effect of the war. Even though it is possible that temporary migrants may have returned to their birth place before the war ended, there are several reasons why we believe that return migration before or after even 1996 may not be very likely.

Table 10

Completion of secondary and high school grades: using victims to measure civil war intensity.

Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), Archdiocese of Guatemala (1999), and Commission for Historical Clarification (1999).

Grade	Variable	Males				Females			
		Urban		Rural		Urban		Rural	
		Non-Mayan (1)	Mayan (2)	Non-Mayan (3)	Mayan (4)	Non-Mayan (5)	Mayan (6)	Non-Mayan (7)	Mayan (8)
Grade 7	Victims * Born 1942–1960	0.1436*** (0.0462)	–0.0122 (0.0194)	0.0035 (0.0156)	–0.0124** (0.0056)	0.1061*** (0.0287)	–0.0113 (0.0084)	–0.0178** (0.0081)	–0.0041* (0.0021)
	Victims * Born 1961–1977	0.1403*** (0.0382)	–0.0225 (0.0380)	0.0284 (0.0212)	–0.0341*** (0.0114)	0.1627*** (0.0351)	0.0001 (0.0277)	–0.0089 (0.0210)	–0.0159*** (0.0058)
	Victims * Born 1978–1983	0.1800*** (0.0527)	–0.0429 (0.0861)	0.0561 (0.0584)	–0.1324*** (0.0366)	0.2444*** (0.0577)	–0.0098 (0.0804)	–0.0234 (0.0717)	–0.0607** (0.0234)
Grade 8	Victims * Born 1942–1960	0.1495*** (0.0455)	–0.0094 (0.0185)	0.0043 (0.0148)	–0.0119** (0.0054)	0.0984*** (0.0270)	–0.0085 (0.0073)	–0.0088 (0.0076)	–0.0039* (0.0020)
	Victims * Born 1961–1977	0.1383*** (0.0384)	–0.0177 (0.0369)	0.0246 (0.0208)	–0.0304*** (0.0102)	0.1613*** (0.0329)	0.0028 (0.0257)	–0.0074 (0.0193)	–0.0140** (0.0055)
	Victims * Born 1978–1983	0.1971*** (0.0491)	–0.0339 (0.0806)	0.0537 (0.0575)	–0.1084*** (0.0317)	0.2580*** (0.0551)	–0.0025 (0.0776)	–0.0250 (0.0661)	–0.0519** (0.0209)
Grade 9	Victims * Born 1942–1960	0.1365*** (0.0460)	–0.0115 (0.0173)	0.0117 (0.0130)	–0.0101* (0.0051)	0.0875*** (0.0259)	–0.0051 (0.0060)	–0.0059 (0.0081)	–0.0035 (0.0021)
	Victims * Born 1961–1977	0.1313*** (0.0331)	–0.0126 (0.0335)	0.0231 (0.0173)	–0.0260*** (0.0092)	0.1582*** (0.0305)	0.0055 (0.0229)	–0.0042 (0.0173)	–0.0118** (0.0050)
	Victims * Born 1978–1983	0.1901*** (0.0446)	–0.0259 (0.0725)	0.0438 (0.0506)	–0.0891*** (0.0276)	0.2393*** (0.0504)	0.0048 (0.0685)	–0.0246 (0.0605)	–0.0430** (0.0180)
Grade 10	Victims * Born 1942–1960	0.1419*** (0.0447)	–0.0081 (0.0149)	0.0095 (0.0131)	–0.0083* (0.0041)	0.0699*** (0.0255)	–0.0034 (0.0059)	–0.0055 (0.0078)	–0.0027 (0.0018)
	Victims * Born 1961–1977	0.1284*** (0.0253)	–0.0162 (0.0265)	0.0183 (0.0160)	–0.0219*** (0.0069)	0.1476*** (0.0299)	0.0069 (0.0194)	–0.0021 (0.0136)	–0.0084* (0.0043)
	Victims * Born 1978–1983	0.2428*** (0.0388)	–0.0108 (0.0567)	0.0528 (0.0422)	–0.0537*** (0.0197)	0.2376*** (0.0533)	0.0109 (0.0548)	–0.0215 (0.0459)	–0.0272* (0.0144)
Grade 11	Victims * Born 1942–1960	0.1315*** (0.0417)	–0.0097 (0.0152)	0.0105 (0.0114)	–0.0086** (0.0042)	0.0694** (0.0261)	–0.0072 (0.0056)	–0.0020 (0.0079)	–0.0013 (0.0013)
	Victims * Born 1961–1977	0.1209*** (0.0258)	–0.0153 (0.0261)	0.0167 (0.0154)	–0.0223*** (0.0069)	0.1415*** (0.0300)	0.0043 (0.0177)	–0.0035 (0.0129)	–0.0070* (0.0038)
	Victims * Born 1978–1983	0.2169*** (0.0393)	–0.0130 (0.0494)	0.0423 (0.0354)	–0.0434** (0.0174)	0.2153*** (0.0500)	0.0027 (0.0455)	–0.0250 (0.0405)	–0.0230* (0.0127)
Grade 12	Victims * Born 1942–1960	0.1337*** (0.0428)	–0.0063 (0.0149)	0.0078 (0.0096)	–0.0063 (0.0039)	0.0581** (0.0255)	–0.0050 (0.0058)	0.0044 (0.0081)	–0.0010 (0.0010)
	Victims * Born 1961–1977	0.1261*** (0.0268)	–0.0117 (0.0244)	0.0137 (0.0132)	–0.0184*** (0.0061)	0.1424*** (0.0288)	0.0041 (0.0164)	0.0014 (0.0117)	–0.0056* (0.0030)
	Victims * Born 1978–1983	0.1878*** (0.0375)	–0.0164 (0.0396)	0.0289 (0.0286)	–0.0323** (0.0147)	0.1813*** (0.0508)	0.0005 (0.0354)	–0.0223 (0.0311)	–0.0165 (0.0100)

Robust standard errors in parentheses are clustered at the county level. * significant at 10%, ** significant at 5%, *** significant at 1%. The sample includes individuals born between 1920 and 1983 who have the same department of birth and department of residence in December 1996. All regressions include fixed effects for department and year of birth and interactions of year of birth indicators with the enrollment rate in 1964, the proportion of households without access to water in 1964, and the proportion of households without access to electricity in 1964.

First, it is unlikely that individuals who migrated out of high war intensity departments in order to escape the violence would return before the peace accord was signed in December 1996 since there was no guarantee that the violence had ended before then. Even though the number of displaced people is estimated to be roughly 1 million, only 324,187 of these were resettled by December 1996 and the rest never returned to their original community (DiGeorgio-Lutz and Hale, 2004). Second, as discussed in DiGeorgio-Lutz and Hale (2004), when people were displaced from their homes, they did so in groups and thus displacement involved entire communities. Further, because most communities were forced to escape from violent massacres, they lost most of their property and their homes. Thus, most displaced populations did not have homes or property to return to. Further, the destruction of entire villages made it impossible for displaced people to return home. For example, the government's scorched-earth counterinsurgency war in the conflict zones between 1981 and 1983 completely destroyed more than 440 Mayan villages along with the Mayan's ability to engage in subsistence agriculture. Third, when complete destruction of villages did not occur, squatter groups occupied and continue to occupy them. Fourth, displaced populations faced serious human rights violations should they attempt to return to their homes because of the stigma of their alleged association as

guerrillas or guerrilla sympathizers who were responsible for the armed confrontation. Despite these reasons, it is still possible that some temporary migrants returned to their birth department before December 1996, in which case we may underestimate or overestimate the effect of the war on educational outcomes. We acknowledge this as a limitation of this paper and it should be considered in evaluating our results.

The second potential problem of our restriction is that we do not examine the effect of the war on displaced people since we cannot identify the department in which they were school age. Since displaced individuals who migrated out of high war intensity departments may have been among the most severely affected by the war, we may underestimate the effect of the war by excluding this group. However, because our data does not include the entire migration history of individuals, we are unable to assess the effect of the war on displaced populations since we cannot identify their department of schooling.

As discussed in Section 1, our sample may include children who were born after their parents were displaced. Since the majority of displacements occurred between 1979 and 1984, children born after 1979 and therefore included in the cohort of those born between 1978 and 1983 may include the children of displaced parents. Our results

Table 11

Control experiment for completion of school grades using human rights violations to measure civil war intensity: coefficients and standard errors of HRV * Born 1920–1941. Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), [Archdiocese of Guatemala \(1999\)](#), and [Commission for Historical Clarification \(1999\)](#).

Grade	Males				Females			
	Urban		Rural		Urban		Rural	
	Non-Mayan (1)	Mayan (2)	Non-Mayan (3)	Mayan (4)	Non-Mayan (5)	Mayan (6)	Non-Mayan (7)	Mayan (8)
Grade 1	−0.2111** (0.0787)	0.0676 (0.0803)	−0.0906 (0.0831)	−0.0026 (0.0324)	−0.0883 (0.0671)	0.0209 (0.0280)	−0.0589 (0.0867)	−0.0011 (0.0165)
Grade 2	−0.1798* (0.0939)	0.0355 (0.0785)	−0.0607 (0.0772)	−0.0038 (0.0271)	−0.0818 (0.0693)	0.0163 (0.0240)	−0.0402 (0.0731)	−0.0022 (0.0151)
Grade 3	−0.0972 (0.0738)	0.0654 (0.0618)	−0.0384 (0.0603)	0.0149 (0.0252)	−0.0217 (0.0733)	−0.0083 (0.0256)	−0.0256 (0.0546)	−0.0088 (0.0151)
Grade 4	0.1318* (0.0696)	0.1032** (0.0496)	−0.0165 (0.0482)	0.0006 (0.0205)	0.0719 (0.0772)	0.0005 (0.0234)	−0.0327 (0.0385)	−0.0053 (0.0093)
Grade 5	0.1656** (0.0658)	0.0875* (0.0446)	−0.0133 (0.0348)	0.0187 (0.0169)	0.1086** (0.0477)	−0.0013 (0.0197)	−0.0029 (0.0383)	−0.0042 (0.0083)
Grade 6	0.1685*** (0.0620)	0.0669 (0.0407)	−0.0222 (0.0321)	0.0165 (0.0128)	0.0815* (0.0473)	0.0006 (0.0167)	−0.0150 (0.0370)	−0.0036 (0.0058)
Grade 7	0.1557** (0.0669)	0.0295 (0.0277)	0.0005 (0.0182)	0.0138* (0.0074)	0.0395 (0.0480)	0.0110 (0.0128)	0.0024 (0.0236)	−0.0049** (0.0023)
Grade 8	0.1332** (0.0644)	0.0267 (0.0246)	−0.0044 (0.0165)	0.0108* (0.0060)	0.0369 (0.0419)	0.0002 (0.0139)	−0.0015 (0.0236)	−0.0017 (0.0022)
Grade 9	0.1285** (0.0559)	0.0125 (0.0223)	−0.0192 (0.0161)	0.0071 (0.0056)	0.0391 (0.0434)	−0.0069 (0.0109)	−0.0038 (0.0233)	−0.0015 (0.0020)
Grade 10	0.1229*** (0.0440)	0.0134 (0.0204)	−0.0085 (0.0141)	0.0129** (0.0050)	0.0219 (0.0389)	−0.0084 (0.0092)	0.0026 (0.0113)	0.0005 (0.0007)
Grade 11	0.1096** (0.0445)	0.0139 (0.0196)	−0.0079 (0.0140)	0.0134*** (0.0049)	0.0134 (0.0383)	−0.0039 (0.0069)	0.0049 (0.0121)	−0.0000 (0.0008)
Grade 12	0.0946** (0.0431)	0.0162 (0.0168)	−0.0095 (0.0145)	0.0125*** (0.0044)	0.0213 (0.0462)	−0.0040 (0.0065)	0.0120 (0.0095)	−0.0000 (0.0008)

Robust standard errors in parentheses are clustered at the county level. * significant at 10%, ** significant at 5%, *** significant at 1%. The sample includes individuals born between 1920 and 1983 who have the same department of birth and department of residence in December 1996. All regressions include fixed effects for department and year of birth and interactions of year of birth indicators with the enrollment rate in 1964, the proportion of households without access to water in 1964, and the proportion of households without access to electricity in 1964.

Table 12

Control experiment for completion of school grades using victims to measure civil war intensity: coefficients and standard errors of Victims * Born 1920–1941. Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), [Archdiocese of Guatemala \(1999\)](#), and [Commission for Historical Clarification \(1999\)](#).

Grade	Males				Females			
	Urban		Rural		Urban		Rural	
	Non-Mayan (1)	Mayan (2)	Non-Mayan (3)	Mayan (4)	Non-Mayan (5)	Mayan (6)	Non-Mayan (7)	Mayan (8)
Grade 1	−0.1419*** (0.0463)	0.0213 (0.0448)	−0.0253 (0.0523)	0.0048 (0.0194)	−0.0429 (0.0445)	0.0262* (0.0142)	−0.0377 (0.0536)	0.0078 (0.0115)
Grade 2	−0.1311** (0.0488)	0.0021 (0.0440)	−0.0082 (0.0516)	0.0045 (0.0162)	−0.0359 (0.0453)	0.0155 (0.0120)	−0.0274 (0.0462)	0.0057 (0.0111)
Grade 3	−0.0701* (0.0400)	0.0205 (0.0339)	−0.0037 (0.0413)	0.0149 (0.0146)	−0.0000 (0.0455)	0.0043 (0.0137)	−0.0210 (0.0365)	−0.0014 (0.0098)
Grade 4	0.0755 (0.0481)	0.0549** (0.0256)	−0.0019 (0.0364)	0.0003 (0.0124)	0.0283 (0.0550)	0.0146 (0.0118)	−0.0290 (0.0274)	−0.0021 (0.0061)
Grade 5	0.0967** (0.0452)	0.0489** (0.0240)	−0.0013 (0.0265)	0.0096 (0.0095)	0.0485 (0.0330)	0.0083 (0.0104)	−0.0088 (0.0264)	−0.0015 (0.0052)
Grade 6	0.1027** (0.0422)	0.0375* (0.0213)	−0.0078 (0.0232)	0.0082 (0.0077)	0.0368 (0.0342)	0.0110 (0.0075)	−0.0168 (0.0249)	−0.0007 (0.0039)
Grade 7	0.1112** (0.0537)	0.0216 (0.0144)	−0.0008 (0.0132)	0.0077* (0.0044)	0.0111 (0.0337)	0.0129* (0.0067)	−0.0014 (0.0151)	−0.0031** (0.0014)
Grade 8	0.1020* (0.0511)	0.0175 (0.0136)	−0.0039 (0.0120)	0.0062* (0.0037)	0.0113 (0.0306)	0.0065 (0.0071)	−0.0044 (0.0156)	−0.0011 (0.0013)
Grade 9	0.1010** (0.0448)	0.0119 (0.0128)	−0.0132 (0.0122)	0.0043 (0.0034)	0.0143 (0.0288)	0.0015 (0.0054)	−0.0060 (0.0155)	−0.0010 (0.0012)
Grade 10	0.0877** (0.0360)	0.0136 (0.0119)	−0.0054 (0.0106)	0.0076*** (0.0028)	0.0005 (0.0265)	−0.0012 (0.0050)	0.0010 (0.0066)	0.0002 (0.0003)
Grade 11	0.0780** (0.0356)	0.0128 (0.0114)	−0.0055 (0.0104)	0.0081*** (0.0027)	−0.0026 (0.0263)	0.0018 (0.0034)	0.0022 (0.0072)	−0.0002 (0.0004)
Grade 12	0.0712** (0.0337)	0.0111 (0.0097)	−0.0065 (0.0106)	0.0077*** (0.0026)	0.0037 (0.0299)	0.0022 (0.0028)	0.0070 (0.0052)	−0.0002 (0.0003)

Robust standard errors in parentheses are clustered at the county level. * significant at 10%, ** significant at 5%, *** significant at 1%. The sample includes individuals born between 1904 and 1941 who have the same department of birth and department of residence in December 1996. All regressions include fixed effects for department and year of birth and interactions of year of birth indicators with the enrollment rate in 1964, the proportion of households without access to water in 1964, and the proportion of households without access to electricity in 1964.

show that those born in 1978–1983 had worse schooling outcomes than those born in 1961–1977 even though the latter group was school age during the worst period of the war, which may reflect the inclusion of children of displaced parents in the 1978–1983 cohort. Therefore, even though we restrict our sample to individuals who have the same department of birth and residence in December 1996, it may still include displaced individuals, especially among the 1978–1983 cohort.

Even though some displaced individuals may be included in our sample, our restriction excludes a large number of displaced individuals, especially among older cohorts. In Tables 13 and 14, we present schooling outcomes for migrants and non-migrants among our eight demographic groups, separately for the top 5 high war intensity departments (Quiché, Baja Verapaz, Alta Verapaz, Petén, and Huehuetenango) and the 17 low war intensity departments. Migrants are defined as those having a different birth department and department of residence in December 1996 whereas non-migrants are defined as those having the same birth department and department of residence in December 1996. Even though some migrants have slightly worse schooling outcomes among urban non-Mayan males and females, there is little difference between the schooling outcomes of migrants and non-migrants among the two groups most affected by the civil war, namely rural Mayan males and females in high war intensity departments. This shows that rural Mayan males and females from high war intensity departments who migrated or were displaced from their birth place received similar levels of schooling on average than those who remained in their birth place. Thus, it is unlikely that we underestimate the average effect of the war on educational outcomes by excluding migrants or displaced individuals from our sample.

Table 13

Schooling of migrant and non-migrant males.

Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), Archdiocese of Guatemala (1999), and Commission for Historical Clarification (1999).

	Migrants from HWI departments	Non-migrants in HWI departments	Migrants from LWI departments	Non-migrants in LWI departments
<i>Urban non-Mayan males</i>				
Years of schooling	7.32	7.17	7.02	7.47
Primary school	0.71	0.68	0.69	0.72
Secondary school	0.46	0.44	0.42	0.47
High school	0.31	0.31	0.27	0.31
Observations	27,144	54,237	190,708	665,115
<i>Urban Mayan males</i>				
Years of schooling	4.41	3.91	5.31	4.36
Primary school	0.42	0.35	0.51	0.40
Secondary school	0.18	0.17	0.24	0.18
High school	0.10	0.10	0.14	0.10
Observations	16,832	81,519	28,624	218,640
<i>Rural non-Mayan males</i>				
Years of schooling	3.34	3.10	3.27	3.34
Primary school	0.30	0.25	0.29	0.29
Secondary school	0.11	0.07	0.10	0.09
High school	0.05	0.04	0.05	0.05
Observations	9955	71,786	84,983	472,843
<i>Rural Mayan males</i>				
Years of schooling	1.94	1.91	2.85	2.60
Primary school	0.14	0.13	0.23	0.20
Secondary school	0.04	0.03	0.08	0.05
High school	0.02	0.01	0.03	0.03
Observations	25,314	318,133	14,907	275,990

The sample includes individuals born between 1920 and 1983. Migrants include individuals who have a different birth department and department of residence in December 1996. Non-migrants include individuals who have the same department of birth and department of residence in December 1996.

Table 14

Schooling of migrant and non-migrant females.

Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), Archdiocese of Guatemala (1999), and Commission for Historical Clarification (1999).

	Migrants from HWI departments	Non-migrants in HWI departments	Migrants from LWI departments	Non-migrants in LWI departments
<i>Urban non-Mayan females</i>				
Years of schooling	6.04	6.34	6.00	6.84
Primary school	0.58	0.59	0.57	0.65
Secondary school	0.35	0.38	0.33	0.43
High school	0.23	0.27	0.21	0.28
Observations	31,885	63,017	237,413	761,719
<i>Urban Mayan females</i>				
Years of schooling	2.65	2.37	3.55	2.83
Primary school	0.23	0.20	0.31	0.24
Secondary school	0.11	0.10	0.15	0.11
High school	0.06	0.06	0.08	0.06
Observations	15,989	91,597	28,571	242,530
<i>Rural non-Mayan females</i>				
Years of schooling	2.64	2.37	2.73	2.80
Primary school	0.21	0.17	0.22	0.23
Secondary school	0.08	0.06	0.08	0.08
High school	0.04	0.03	0.04	0.04
Observations	10,095	75,491	89,386	495,208
<i>Rural Mayan females</i>				
Years of schooling	0.83	0.81	1.62	1.44
Primary school	0.05	0.05	0.11	0.09
Secondary school	0.01	0.01	0.04	0.03
High school	0.01	0.00	0.02	0.01
Observations	23,592	347,876	14,753	303,968

The sample includes individuals born between 1920 and 1983. Migrants include individuals who have a different birth department and department of residence in December 1996. Non-migrants include individuals who have the same department of birth and department of residence in December 1996.

4.4. Post-war schooling outcomes

In this section, we include an analysis of schooling outcomes for a cohort who was school age for each of grades 1 to 6 during post-war years, that is from 1997 onwards. Table 15 describes the sample and cohorts that we use to examine completion of grades 1 to 6 or higher. For completion of grade 1 or higher, we include individuals born between 1978 and 1995. We compare individuals born between 1978 and 1989, who were 7 years old during the latter period of the war, to those born between 1990 and 1995. Individuals born in 1990 were 7 years old in 1997 and therefore old enough to attend grade 1 during the post-war period. Those born in 1995 were 7 years old in 2002 and therefore old enough to be attending grade 1 at the time of the 2002 Census. For completion of grades 2 to 6 or higher, the post-war cohorts consist of individuals born in 1989–1994, 1988–1993, 1987–1992, 1986–1991, and 1985–1990 respectively. School age cohorts for each of grades 2 to 6 during the latter period of the war (1978–1985) consist of those born in 1978–1988, 1978–1987, 1978–1986, 1978–1985, and 1978–1984 respectively. These cohorts were respectively 8, 9, 10, 11, and 12 years old during the latter period of the war.

We estimate Eq. (2),

$$Y_{ijt} = \alpha + \beta War_j * Cohort_t + \delta_j + \gamma_t + \varepsilon_{ijt}, \quad (2)$$

where $Cohort_t$ includes individuals who were the appropriate age for each grade during the post-war period from 1997 onwards. We present the results of these regressions in Table 16.¹⁴

¹⁴ We use a linear probability model to estimate all regressions. Logit and probit models provide similar results and are available upon request.

Table 15

Cohorts used in post-war analysis.

Grade	Cohorts included in sample	Cohorts of grade-specific age		Age of oldest cohort	
		in 1978–1983	in 1997–2002	in 1997	in 2002
1	1978–1995	1978–1989	1990–1995	7	7
2	1978–1994	1978–1988	1989–1994	8	8
3	1978–1993	1978–1987	1988–1993	9	9
4	1978–1992	1978–1986	1987–1992	10	10
5	1978–1991	1978–1985	1986–1991	11	11
6	1978–1990	1978–1984	1985–1990	12	12

As shown in Panel A, for urban non-Mayan males, there is a greater likelihood of completing grades 1 to 4 or higher for post-war cohorts in higher war intensity departments. Similar results are found for urban non-Mayan females for grades 1 to 3 and for rural non-Mayan females for grades 1 to 4. For the two groups whose education was negatively affected by the war – rural Mayan males and females – there is a greater likelihood of completing each grade among post-war cohorts. Among rural Mayan males, post-war cohorts in higher war intensity departments are between 11 and 13 percentage points more likely to complete grades 1 to 6 or higher whereas for rural Mayan females these figures range from 4 to 13 percentage points. For rural Mayan females, the difference-in-differences coefficient is negative and larger in magnitude for completion of grades 1 to 3 or higher whereas for rural Mayan males, the estimate is fairly similar for all primary school grades. This most likely reflects the fact that more males complete higher grades than females in Guatemala.

Table 16

Probability of completing primary school grades for post-war cohorts.

Data sources: 2002 National Population Census (Instituto Nacional de Estadística (INE), Guatemala), [Archdiocese of Guatemala \(1999\)](#), and [Commission for Historical Clarification \(1999\)](#).

Dependent variable	DID variable	Males				Females			
		Urban		Rural		Urban		Rural	
		Non-Mayan (1)	Mayan (2)	Non-Mayan (3)	Mayan (4)	Non-Mayan (5)	Mayan (6)	Non-Mayan (7)	Mayan (8)
Panel A: Using human rights violations to measure civil war intensity									
Grade 1	HRV * Born 1990–1995	0.0879*** (0.0222)	− 0.0094 (0.0591)	0.0099 (0.0210)	0.1110*** (0.0340)	0.0795*** (0.0191)	− 0.0344 (0.0737)	0.0591* (0.0340)	0.1361*** (0.0497)
Grade 2	HRV * Born 1989–1994	0.1038*** (0.0248)	0.0023 (0.0353)	0.0066 (0.0241)	0.0960** (0.0360)	0.0907*** (0.0195)	− 0.0451 (0.0534)	0.0702** (0.0323)	0.1220** (0.0466)
Grade 3	HRV * Born 1988–1993	0.1140*** (0.0308)	0.0111 (0.0250)	0.0258 (0.0306)	0.1229*** (0.0307)	0.0652*** (0.0230)	− 0.0094 (0.0469)	0.0781* (0.0419)	0.1052*** (0.0367)
Grade 4	HRV * Born 1987–1992	0.0938** (0.0357)	0.0289 (0.0283)	0.0542 (0.0531)	0.1328*** (0.0327)	0.0276 (0.0352)	0.0021 (0.0266)	0.0950* (0.0553)	0.0737*** (0.0249)
Grade 5	HRV * Born 1986–1991	0.0461 (0.0341)	0.0176 (0.0325)	0.0657 (0.0493)	0.1231*** (0.0308)	0.0055 (0.0367)	− 0.0073 (0.0250)	0.0685 (0.0490)	0.0452** (0.0173)
Grade 6	HRV * Born 1985–1990	0.0312 (0.0292)	0.0144 (0.0349)	0.0566 (0.0451)	0.1108*** (0.0289)	− 0.0225 (0.0383)	0.0112 (0.0264)	0.0121 (0.0467)	0.0398*** (0.0128)
Observations		438,123	190,566	373,220	402,864	459,363	203,007	377,937	426,130
Panel B: Using victims to measure civil war intensity									
Grade 1	Victims * Born 1990–1995	0.0456*** (0.0141)	− 0.0102 (0.0364)	0.0103 (0.0131)	0.0777*** (0.0225)	0.0352** (0.0133)	− 0.0274 (0.0455)	0.0266* (0.0153)	0.0861** (0.0326)
Grade 2	Victims * Born 1989–1994	0.0536*** (0.0176)	− 0.0049 (0.0218)	0.0083 (0.0147)	0.0669*** (0.0233)	0.0443*** (0.0131)	− 0.0355 (0.0336)	0.0357** (0.0171)	0.0769** (0.0301)
Grade 3	Victims * Born 1988–1993	0.0603*** (0.0213)	− 0.0025 (0.0144)	0.0119 (0.0192)	0.0834*** (0.0195)	0.0295* (0.0158)	− 0.0116 (0.0289)	0.0392* (0.0225)	0.0672*** (0.0240)
Grade 4	Victims * Born 1987–1992	0.0535** (0.0252)	0.0099 (0.0160)	0.0129 (0.0295)	0.0870*** (0.0204)	− 0.0001 (0.0220)	0.0020 (0.0161)	0.0382 (0.0258)	0.0480*** (0.0168)
Grade 5	Victims * Born 1986–1991	0.0214 (0.0254)	0.0008 (0.0203)	0.0193 (0.0247)	0.0768*** (0.0191)	− 0.0154 (0.0235)	− 0.0025 (0.0145)	0.0235 (0.0248)	0.0299** (0.0121)
Grade 6	Victims * Born 1985–1990	0.0140 (0.0215)	− 0.0014 (0.0220)	0.0213 (0.0218)	0.0669*** (0.0176)	− 0.0303 (0.0242)	0.0063 (0.0159)	− 0.0059 (0.0258)	0.0247*** (0.0085)
Observations		438,123	190,566	373,220	402,864	459,363	203,007	377,937	426,130

Robust standard errors in parentheses are clustered at the county level. * significant at 10%, ** significant at 5%, *** significant at 1%. The sample includes individuals born between 1920 and 1983 who have the same department of birth and department of residence in December 1996. All regressions include fixed effects for department and year of birth and interactions of year of birth indicators with the enrollment rate in 1964, the proportion of households without access to water in 1964, and the proportion of households without access to electricity in 1964.

Using the number of victims to measure the intensity of the civil war (Panel B) provides similar results, though the magnitude of the coefficients is smaller. These results show that despite the negative consequences of the war, primary school outcomes of the worst affected groups improved among cohorts who were school age during post-war years. However, since we can only examine primary school outcomes among a few post-war cohorts, we cannot be certain that this improvement continued over time.

5. Conclusion

In this paper, we investigate the impact of Guatemala's 36-year-long civil war (1960–1996) on educational outcomes of individuals. The empirical identification strategy uses a difference-in-differences approach by comparing the difference in the schooling of cohorts who were school age during the three periods of the war with those who had completed school age by 1960 in departments that experienced higher and lower war intensity. Besides including fixed effects for an individual's department of residence and year of birth, we also include interactions between year of birth indicators and the 1964 enrollment rate as well as interactions between year of birth indicators and the availability of water and electricity in a department in 1964. These interactions allow us to control for differences in pre-war levels of education and human development in higher and lower war intensity departments that may have influenced levels and trends in educational attainment in these departments even in the absence of the war.

We find a strong negative impact of the civil war on the education of rural Mayan males and females, which supports the conclusion that internal armed conflict reinforces poverty and social exclusion among the most vulnerable groups. Among rural Mayan males, those who were school age during the three periods of the civil war in departments where more human rights violations were committed completed 0.27, 0.71, and 1.09 years less of schooling respectively whereas rural Mayan females exposed to the three periods of the war completed 0.12, 0.47, and 1.17 years less of schooling respectively. Given an average of 4.66 and 3.83 years of schooling for males and females, these represent declines of 6, 15, and 23% for males and 3, 12, and 30% for females. Our results are robust to the inclusion of indicators for department of residence, year of birth, and controls for different trends in education and human development in war-affected and peaceful departments of Guatemala. Examining grade completion, we find that it was primarily due to a lower likelihood of completing primary school grades that rural Mayan males and females received less schooling as a result of the war. This result is not surprising since only 25% of the population in Guatemala receive more than a primary education. Finally, we find that rural Mayan males and females who were primary school age during post-war years in higher war intensity departments were more likely to complete each of grades 1 through 6 or higher, suggesting that at least primary school outcomes improved immediately after the war for the two groups most affected by it.

Understanding the mechanisms by which civil war affects human capital formation and accumulation is important in formulating effective post-war policies to protect individuals from the negative consequences of wars. While our analysis does indicate some likely mechanisms through which households responded to the civil war, our data does not allow us to address whether or not it was through orphanhood that school age children in higher war intensity departments received less education. As discussed in 2, civil war can result in the displacement of families and the loss of property and means of livelihood. It can cause the destruction of schools and infrastructure and delay the construction of new schools due to the loss of capital and human resources. It can also heighten security fears, especially for girls. Moreover, the destruction of existing industries and lack of development of new ones may reduce the expected returns to education for both boys and girls. All these factors may discourage investment in human capital during a civil war and result in low levels of human capital formation and accumulation among individuals exposed to war.

Our results indicate that exposure to Guatemala's civil war had a large, negative, and long-term effect on the education of rural Mayan males and females who were school age between 1960 and 1996. Moreover, each successive cohort exposed to the war during three distinct periods, of violence and conflict obtained less and less schooling. These results can be explained by a combination of factors. First, Guatemala's 36-year-long civil war increased poverty among one of the poorest groups in the country. Due to the loss of property, their means of livelihood and wealth, and the death of income-earning family members, rural Mayan households may have reallocated limited resources away from educating sons and especially daughters for whom expected returns to education are generally low and security fears are high. In addition, rural Mayan males may have been more likely to become combatants and therefore not attend school.

Second, the finding that cohorts who were school age after the bloodiest period of the war have worse schooling outcomes than those who were school age during the most violent period suggests that even though internal conflict subsided dramatically between 1985 and 1996, the poverty of affected households may have worsened and that this adversely affected educational outcomes. The end of the majority of violence in 1985 did not result in the reconstruction of schools and other infrastructure, most of which were destroyed during the second period of the war. Moreover, the sheer length of the war may have

lowered parents' expectations of future returns to schooling for their children due to the lack of creation of skilled jobs. This finding may also be driven by the inclusion of children of displaced rural Mayan households in the cohort exposed to the latter period of the war. Since displaced households most likely experienced the greatest loss of property and income, their children may have fared particularly badly in terms of education.¹⁵

That the war had a negative impact on the education of males and females among the most disadvantaged group shows that it worsened the position of rural Mayans amongst the poorest groups by deteriorating their educational attainment. As Table 2 reveals, the war may have reinforced already existing gender, regional, sectoral, and ethnic differences in educational outcomes. Our post-war analysis indicates that at least primary school outcomes improved for rural Mayan males and females who were school age after the signing of the peace agreement in December 1996. While this result provides some evidence of post-war recovery, at least in terms of primary education, we cannot be certain that subsequent cohorts will experience similar improvements nor that existing educational disparities will be narrowed in the near future.

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¹⁵ Note that our results cannot be explained by the possibility that a large number of educated individuals were killed during the war since rural Mayan males and females constitute the least educated group in Guatemala.

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