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WAR AND SCHOOLING IN SOUTH SUDAN, 2013-2016

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ABSTRACT

South Sudan was embroiled in a civil war from mid-December 2013 to mid-September 2018. Nearly 400,000 people died, and several million were displaced. The economy nearly collapsed as the nation's output was severely reduced, causing inflation to soar. While prior research on the immediate humanitarian crisis in South Sudan has focused on forced displacement and food insecurity, there is little information available about the long-term impact the war had on human capital accumulation in this context. This analysis exploits spatial variation in exposure to violence to estimate the causal impact of the recent civil war on primary school enrollment as a proxy for measuring human capital accumulation. Results based on the difference-in-differences methodology indicate a statistically significant relationship between school enrollment and the war. The study shows that schools located in the South Sudanese war zones lost 85 children per year on average, or 18.5 percent of total enrollment. The diminishing trends in girls' enrollment are unrelated to the war, which is not surprising; social barriers, including gendered domestic roles, early marriage, and out-of-wedlock pregnancies, have long impeded female educational opportunities in South Sudan. These effects are robust to a number of specifications, including holding constant school-level fixed effects and adjusting for the standard errors. The article presents important policy implications for education and the labor market, both locally and internationally.

INTRODUCTION

In December 2013, a little more than two years after it gained independence from Sudan, a civil war broke out in South Sudan. The violence quickly elevated in intensity and area, threatening what little progress the country had made

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during a wobbly transition. The resultant humanitarian situation was considered catastrophic, with millions of people displaced and nearly half the new nation's population facing a severe food shortage (IPC 2017). The destruction of physical capital in recent years thwarted the fundamental development process in South Sudan, with basic services gravely affected (Mayai and Hammond 2014; Addison et al. 2015; Lai and Thyne 2007; Burde et al. 2017). This included institutions in the education sector, which struggled to perform their duties as learning facilities, became homes for armed groups, were destroyed, or closed down. This forced some 400,000 children in three states to drop out of school (Hodgkin and Thomas 2016; Lai and Thyne 2007).

The civil war also caused a drastic disruption of economic activity. Breckenridge (2014) estimated that South Sudan could lose up to US$28 billion if the war continued for more than five years, mainly via a decline in oil production and trade. Indeed, in the course of the war, South Sudan's monthly revenue declined from hundreds of millions to just US$20 million (Ministry of Finance and Planning 2017).

The war significantly threatened human capital investment in South Sudan and put future socioeconomic development at risk. Investment in education, training, and health care in South Sudan was always modest, but it was nearly crowded out by spending on defense and security during the war (Mayai and Hammond 2014; Poirier 2012), thereby weakening prospects for skills development and economic growth (Schultz 1980; Becker 1994; Barro 1999). These deficits in education and training have left postconflict South Sudan without the productive capacities it needs to manage its long-term development and economic aspirations. They also have important implications for human capital accumulation—essentially an investment in people—which is critical for development, due to its importance to labor output and the generation of economically stimulating ideas (Schultz 1960, 1980).

There has been marked interest, both locally and internationally, in understanding how to respond to South Sudan's tragic humanitarian crisis and the economic upheaval caused by the war, particularly the alarming food insecurity and far-reaching socioeconomic consequences (Mayai et al. 2017; IPC 2017). Research commissioned in response to the emergency has often focused largely on the adverse short-term effects of war-induced shocks, but this humanitarian-driven research agenda offers little insight into the long-term deficits in human capacity and skill development that South Sudan must now confront (Brown 2006). Another strand of research has focused mainly on the correlation between schooling and

political stability, citing in particular how certain education policies excite or perpetuate grievances (Burde et al. 2017). However, little is understood as yet about the extent to which South Sudan's civil war has impacted human capital accumulation, especially as it concerns the spatial (i.e., in the states) and gender distribution of such effects.

Fortunately, data from the Assessment Capacities Project (ACAPS) have helped fill this gap, as they retrospectively track primary school enrollment in South Sudan to a prewar time, when the new country was relatively stable. Using these data, supplemented with Armed Conflict Location Event Data (ACLED) on conflict intensity, we explore the nexus between primary school enrollment as a measure of human capital accumulation and the civil war in South Sudan. Our analysis addresses two main research questions: To what extent did South Sudan's civil war affect primary school enrollment? And is the outcome gender differentiated? Human capital accumulation in this case is measured as the average number of children enrolled annually in primary school. Primary school attainment is not often used as a predictor of socioeconomic outcomes, particularly income. However, primary education is an important point of departure into higher learning, which is associated with significant economic gain (Schultz 1988; Card 1994), thus, primary education in developing countries can have a sizable influence on earnings. Research shows, for example, that an additional year of primary education in such contexts accounts for a 10 percent rise in later wages (Klenow and Rodriguez-Clare 1997; Mincer 1974). Therefore, as an economic enabler, primary education is as significant in settings where literacy rates are relatively low as secondary or higher education is in more developed settings, making it an imperative human capital constituent. Similarly, we made the decision to examine primary school enrollment, rather than secondary school or higher education, because of the availability of new, more reliable data.

We assess two hypotheses pertaining to the war in South Sudan and its human capital consequences. First, we expect enrollment to decline in schools directly exposed to the recent war, most of which suffered infrastructural damage, the flight of staff, and a drastic reduction in instructional activities (Mayai and Hammond 2014; Addison et al. 2015; Lai and Thyne 2007; Burde et al. 2017). Second, we expect the war's impact on school enrollment to be more pronounced for male than female children (Burde et al. 2017; Kirk and Winthrop 2007; Lai and Thyne 2007).

There are decisive ways a war can undermine the education process (Akbulut-Yuksel 2009; León 2012). First, due to the threat of violence, schools in war zones are likely to be closed or destroyed (Guariso and Verpoorten 2013). Second,

parents are likely to pull their children out of a school in a threatened area and move them to a safer location, whether or not the new location has a school. Third, displaced people lose their income, which negatively affects their ability to pay for their children's education. That is, a substantial decline in enrollment is expected during a conflict, given the high level of forced displacement. Moreover, youth recruitment into armed forces is ubiquitous in such contexts (Wessells 2002; Lai and Thyne 2007), and prior studies indicate that male children are more likely than female children to be conscripted (Achvarina and Reich 2006; Lai and Thyne 2007). Using children as combatants increases the number of out-of-school children and clearly interferes with their schooling (León 2012; Wessells 2002; Guariso and Verpoorten 2013).

Our identification strategy relies on the following four assumptions. First, exposure to political violence varies by geography, represented in this study by individual states. Our model stratifies schools into locations (states) affected and not affected by conflict. Second, exploiting location-specific exposure to war permits use of the difference-in-differences (DD) approach to estimate an exogenous variation in enrollment between two groups of schools (1 if exposed to war, 0 if not). Third, South Sudan, being recently independent, is an instructive context for studying gender difference relative to the war's effect on school enrollment. Finally, South Sudan is undergoing a dramatic political transformation, making it a suitable context for studying the impact of political violence on human capital accumulation in the 21st century. Given this unique moment in the country's history, lessons from South Sudan could be used to promote the UN Sustainable Development Goals, which advocate for a substantial increase in the number of young adults with the skills and knowledge to meet the 21st century's economic demands (UN Economic and Social Council 2017).

With this study, we provide instructive insights into educational returns to political violence in South Sudan and complement the prevailing literature on education processes in emergencies (Talbot 2013). Given the interplay between education and conflict, analysis of education in emergency contexts is essential to determining the conditions most conducive to future socioeconomic development and political stability (Burde et al. 2017; Lloyd et al. 2010). Education is an equalizer on the socioeconomic development front, as it enables individuals to help build societies and improve their personal wellbeing (Haveman and Smeeding 2006), and it is critical to stability, as it influences the way societies deal with violence. Research shows an appreciable decline in violence in a given society as the number of educated people increases (Gillis 1994). This means that minimizing inequalities in education can reduce group-based grievances, ease resulting tensions, and

possibly engender a more stable state (Burde et al. 2017). Our analysis, therefore, presents empirical evidence to guide local and international policymaking on education processes in emergency situations, with a focus on the present and future socioeconomic challenges people in emergency contexts are likely to grapple with during an unstable time and after stability has been restored.

This work adds to existing research in three important ways. First, by using impact evaluation techniques to estimate the causal impact of war on schooling in South Sudan, this study contributes to a growing literature on education processes in emergencies. Second, this study is the first of its kind, in that it exploits school-level panel data to estimate the average treatment impact of war on primary school enrollment, specifically in South Sudan and more generally in East Africa. Lastly, the study assesses the causal impact of political violence on school enrollment in a context where prior research of this kind is scarce.

The present analysis shows that, although there has been a general surge in primary school enrollment in South Sudan since 2015, the war is associated with considerably reduced school enrollment in locations directly exposed to the conflict. From 2013 to 2016, the schools examined lost on average more than 80 children each, or 18.5 percent of total annual enrollment. With 70 percent of the former ten states directly affected, the overall long-term effect the war has had on schooling in South Sudan could be overwhelming.[1]

Against this backdrop, the remainder of this study proceeds as follows: section two summarizes the history of the civil war in South Sudan; section three reviews the literature on the subject; section four presents materials and analytical strategies; section five presents our results, which are then discussed in section six.

LEGACIES OF CIVIL WAR IN SOUTH SUDAN

Having gained independence from Sudan in 2011, South Sudan is still in the process of forming a stable state. Its institutions have long been overshadowed by personalized politics, with political elites often mired in power squabbles. This infighting enabled the elites to overtly ignore the conventional instruments of governance, including the new nation's constitution, in running state affairs (Awolich and Akol 2013). The result has been protracted violent conflicts of varying magnitude throughout the country.

1 In 2015, a presidential decree created 28 states out of the original 10; in February 2020, this decision was reversed, and the country returned to the previous 10 states.

In December 2013, a disagreement among leaders in the governing political party, the Sudan People's Liberation Movement (SPLM), sparked deadly violence in Juba, the nation's capital. Within a short time, the war had spread to at least four more states, with masses of people, both combatants and civilians, killed or forced to flee to internationally protected encampments (Checchi et al. 2018). Although the degree of destruction varied, basic infrastructure such as schools, government buildings, health-care facilities, and essential economic systems were severely damaged across the affected states. In the education sector alone, the conflict caused 70 percent of schools to close in the states of Jonglei, Upper Nile, and Unity, and as many as 400,000 children dropped out of school (Hodgkin and Thomas 2016). Traditional livelihoods in those states were also significantly disrupted.

The impact of the war on South Sudan's macro economy was also overwhelming. Oil production plummeted, foreign investors fled, and millions of citizens lost their basic livelihoods, ending up as refugees or as internally displaced persons (IDPs). This widespread insecurity resulted in low economic activity, even at the subsistence level. The price of goods skyrocketed, but wages were not adjusted accordingly; as a result, the number of people living below the poverty line increased while purchasing power declined (Reng and Mayai 2016; Shimeles and Verdier-Chouchane 2016). As of late 2017, the country's overall consumer price index stood at 272 percent, 267 percent for food alone (NBS 2017), and the World Bank projected that South Sudan's 2017 real gross domestic product would shrink by 10.5 percent. The high inflation was due chiefly to shocks in the commodity market caused by the war. The conflict also constrained South Sudan's trade with neighboring states, particularly Uganda (Mayer and Thoenig 2016), which proved tragic for a country that depends on imports for essentially all consumable goods and services.

As oil production fell, South Sudan turned to its meager foreign reserves and depleted them through spending on defense and security, meanwhile sparing only limited funds for food, medical needs, and energy imports. Moreover, South Sudan no longer receives development aid, which has compounded the country's fiscal burden, and it is now struggling to raise sufficient revenue to meet its fiscal obligations, especially for basic services.

After the civil war broke out in 2013, two million South Sudanese became internally displaced, 1.9 million sought refuge in neighboring countries, and, as of 2017, an estimated 5.5 million people were facing critical food shortages. In 2017, the United Nations declared a state of famine in parts of the Upper Nile region. Hundreds of thousands of citizens in the northern territory of South

Sudan are thought to have migrated to Sudan in the last few years in search of security and better economic prospects.

A political settlement—the Agreement on the Resolution of the Conflict in the Republic of South Sudan—was signed between the SPLM-In Government (SPLM-IG) and SPLM-In Opposition (SPLM-IO) in August 2015 in Addis Ababa. This established the Transitional Government of National Unity, a government made up mostly of members of the two parties. Although implementation of this agreement commenced in April 2016, the lack of political capital and trust between parties caused it to fail. Deadly events ensued, as many had predicted, including shootouts at the state house in Juba. Riek Machar, a principal signatory to the agreement who represented the SPLM-IO, was driven from Juba and pursued into the Democratic Republic of the Congo by the SPLM-IG security loyalists. The SPLM-IO subsequently split into factions. Gen. Taban Deng Gai, Machar's former chief negotiator, replaced him as the SPLM-IO's lead implementer of the agreement in the Transitional Government. These events reignited the violence countrywide and essentially put the Transitional Government in a coma. The new round of war inflicted humanitarian and economic damage on the civil population. The Intergovernmental Authority on Development, the regional economic and security bloc, attempted to revitalize the Agreement on the Resolution of the Conflict in South Sudan, but there was general skepticism about its ability to restore peace in the Republic of South Sudan. The Government and SPLM-IO eventually signed the Revitalized Agreement for the Resolution of the Conflict in the Republic of South Sudan in September 2018, which is currently being implemented.

The war-engineered shocks to the economy and the population have had adverse consequences for South Sudan's current and future economic outcomes. This has been especially disturbing for a country whose average spending on education before the war was a mere 5.8 percent of the annual budget (Mayai 2015). This paltry investment in education reflects the low priority the country's leaders place on this essential constituent of economic development. In 2008, the number of citizens in South Sudan with a basic education was the lowest in the world, estimated at just 27 percent. The war exacerbated this appalling situation, posing the risk of both short- and long-term underdevelopment. These negative effects of the war on human capital accumulation are concerning, particularly in one of the least developed countries in modern history. Now that the war has ended, improved understanding of this experience will hopefully allow for informed, resilient policymaking.

HUMAN CAPITAL AND POLITICAL VIOLENCE

There is ample, if mixed, evidence on the economic costs of political violence. Numerous studies have found that political instability significantly reduces economic growth, as measured by the annual rate of change in gross domestic product (Abadie and Gardeazabal 2003; Alesina et al. 1996; Lai and Thyne 2007; Shields and Paulson 2015). Addison et al. (2015) found further that political violence threatens both human and social capital and weakens institutions. While examining changes in global education spending and enrollment over an 18-year period (1980-1997), Lai and Thyne (2007) found that political instability reduces the amount of resources put into education and undermines a state's ability to perform its basic functions, such as providing services. Looking at the relationship between conflict and schooling in sub-Saharan Africa, Poirier (2012) found that increasing schooling expenditures by 1 percent of the gross domestic product boosts enrollment and completion rates, and that an increase in military spending, which often occurs in conflict settings, reduces schooling in terms of the level attained.

Weldeegzie (2017) examined the impact of the Ethiopian-Eritrean war on a range of childhood outcomes, including schooling. He found that children exposed to war are likely to drop out of school, struggle with reading, and have relatively low overall educational attainment (Omoeva, Hatch, and Moussa 2016). León (2012) reported on the long-term effects political instability has had on educational attainment in Peru, where children exposed to war lost an average of 0.31 years of schooling as adults. Akresh and De Walque (2008) examined the effects the 1994 Rwandan genocide had on schooling, finding that exposure to war reduced children's education by half a year. Akbulut-Yuksel (2009), who assessed the impact of World War II on educational attainment in Germany, found that children exposed to the war lost an average of 0.4 years of schooling as adults; those who lived in the hardest hit locations lost an average of 1.2 years of schooling. Akbulut-Yuksel also found that children who were exposed to war earned 6 percent less as adults than their peers who were not. In their analysis of the intergenerational effects of political violence, Akresh et al. (2017) found that individuals exposed to the Nigerian Civil War showed lower educational achievement. Finally, according to Guariso and Verpoorten (2013), Rwandan children exposed to war had an 18.5 percent average reduction in total years of schooling.

The long-term effects of political violence on educational attainment varies by gender (Buvinić, Das Gupta, and Shemyakina 2013; Chamarbagwala and Morán 2011). While it generally reduces the amount of schooling all children receive, it

has a different effect on boys than on girls (Burde et al. 2017; Diwakar 2015). In a study of the short- and long-term effects of violence on education in Timor Leste, Justino, Leóne, and Salardi (2014) found that the decline in human capital due to war was more pronounced among boys than girls. There are two presumable explanations for this difference. First, using male children as combatants is common in developing countries (Achvarina and Reich 2006), and Lai and Thyne (2007) found that boys' education suffers more than girls' during a civil war because boys are more likely to be conscripted. However, Kirk and Winthrop (2007) studied gender differences in schooling in Afghanistan, finding that the distance from home to school affects attendance for girls more than boys. They found similarly that, due to mistrust, parents are less likely to send their daughters to schools where the teaching staff is predominately men or outsiders. Attitudes and cultural constructs also tend to favor schooling for boys more than for girls (Kirk and Winthrop 2007; Burde et al. 2017). Østby, Urdal, and Rudolfsen (2016) noted that, as the quality of schooling declines as a result of war, girls' enrollment declines significantly. Finally, the economic shocks of political violence are likely to alter boys' role in the family, with some becoming the main providers (Buvinić et al. 2013).

These studies provide some understanding of the impact political instability can have on human capital development. However, the question remains of how this impact translates into socioeconomic development outcomes at both the macro and micro level. Most economists agree that economic growth is positively and strongly associated with average years of schooling (Barro 1999) and that, by adopting up-to-date technologies, human capital development can accelerate economic growth (Barro 2001; Heckman and Carneiro 2003). Accordingly, a substantial reduction in schooling weakens a population's opportunity to adopt new technologies. In developing countries, the more years of education a person has, the higher their eventual income: one additional year of primary education increases an individual adult's wages by 10 percent (Klenow and Rodriguez-Clare 1997; Mincer 1974). Conversely, as human capital declines due to conflict or related factors, so does average personal income. Perhaps most worrisome is that the negative consequences of war are often transmitted intergenerationally, which can impede the economic progress of future generations and even perpetuate political instability (Akresh et al. 2017; Bricker and Foley 2013; Cervantes-Duarte and Fernández-Cano 2016).

DATA AND METHODS

Although prior research helps to explain the impact of political violence on individual and national socioeconomic outcomes, it does not provide evidence of outcomes at the institutional level, such as a school. This study fills the gap by exploiting space variation in exposure to violence and estimating the impact the South Sudanese civil war had on primary school enrollment as a measure of human capital accumulation. We accomplished this objective by using the sampled schools as the primary units of analysis, with enrollment measured as the average number of children enrolled in each school between 2013 and 2016. The study covers the first four years of a civil war that ended in 2018.

Description of Data

The study used two secondary data sources, ACAPS and ACLED. ACAPS covers school enrollment and background, while the ACLED dataset documents conflict intensity over time and across the ten states. Each dataset is further detailed below.

The ACAPS Dataset

Late in 2016, ACAPS, with support from UNICEF South Sudan, surveyed 393 schools in South Sudan out of an initial sample of 400. The study was an institutional analysis focused on primary schools nationwide that covered functional and nonfunctional schools. The sample included both public (i.e., community and government run) and private primary schools. The survey was designed to educate policymakers about developing humanitarian interventions that would make primary education safe and sustainable, even as the war prevailed. The ACAPS data were used to assess how political instability and its proximate consequences, such as population displacement and macroeconomic shocks, influenced children's education in South Sudan. The dataset came from a pool of randomly selected schools clustered in some of the country's three regions and ten states; enrollment information was generated retrospectively, especially for the 2013-2015 period.

The sampling strategy adopted was as follows. The study commenced with key informant interviews the study team conducted with education officials at the county level to inform a structured survey. The survey was preceded by team visits to some schools, the list of which was reconciled with Education Management Information System (EMIS) records. A nationally representative sample of four hundred schools was then randomly drawn from the more than five thousand

primary schools found in the EMIS database, a 7.3 percent representation. To draw this sample, the study team used a multistage clustering/stratification strategy. The first stage comprised South Sudan's three regions: Equatoria, Bahr el Ghazal, and Upper Nile. The second stage involved urban and rural areas. Twenty counties were selected at the regional level; this meant that at least 30 percent of the sample or two of the twenty counties were allocated to the urban segment of each region. The rest of the counties were chosen from rural settings and allocated in accordance with the total number of rural counties each region contains. The sample targeted schools were listed in the 2013-2015 EMIS database. This restriction induced a downward bias in enrollment, as it excluded schools that opened after this period.

Owing to widespread insecurity, some schools could not be reached. When this occurred, the data-collection team's strategy was to randomly select a school from the list, which was stratified by region and county, to replace the inaccessible schools. In total, 105 schools (26% of the sample) were replaced, with the final dataset adjusted for representativeness. Altogether, the team surveyed 393 primary schools out of the initial sample of 400, a response rate of more than 98 percent.

Key information was gathered about each school's basic infrastructure and ownership, and whether it was functioning or closed. The survey also documented each school's establishment date, the primary reason for closing (if no longer operational), and any institutional or governance support a school was receiving from partners, which were mostly international, such as the UK Department for International Development's Girl Child Education Fund. Finally, the survey recorded information on enrollment at the start of each school year, the number of children who dropped out of school each year, the number of internally displaced and refugee children attending the school, the main reasons children dropped out of school, children's exposure to violent attack or school occupation by armed groups, and size of the teaching staff, measured as the number of teachers available at the start of the most recent school year.

Table 1 details the sample under analysis. The sample size is presented as school years (N=393 * 4=1,572).[2] As noted, one principal objective of the ACAPS survey was to document how the civil war influenced primary education processes in South Sudan by looking at several indicators. Panel A shows school functionality

2 Each school contributed four years of enrollment data. Taken together, the analysis used a total of 1,572 school years.

and its key determinants, with conflict featuring prominently. More than 76 percent of the 393 sampled schools were operating during the data collection. A vast majority of the schools no longer operating had been disrupted by the war; indeed, nearly 63 percent had closed primarily due to political instability.

Panels B and C present information on school ownership and infrastructure. These variables are included in the analysis as correlates of functionality and enrollment. The present analysis indicates that community and government schools had higher rates of closure (37% and 23%, respectively) than private schools (15%); however, government schools constituted the majority, 65.8 percent, community schools 11 percent, and privately owned 23 percent. Infrastructure also played a statistically significant role in school functionality. Schools operating in permanent and semipermanent structures were two to five times more likely to be functional than schools operating in the open air or in mobile structures; they were distributed nearly evenly across categories (permanent structures 37.6%, semipermanent 38%, open air 23.4%; see Panel C).

The size of the teaching staff and the number of internally displaced and refugee children at a school are important factors in understanding enrollment. The average sampled school had 9 teachers, with 23.4 IDPs and refugee children enrolled annually (see Panel D). A unit increase in either variable is positively associated with changes in enrollment; all else held constant, the positive relationship between enrollment and the size of the teaching staff remains. Although this might signify reverse causality more generally, there is little cause to believe this is the case in the South Sudanese context. In fact, a recent review of school enrollment nationwide showed faculty size falling as the rate of enrollment increased. This result calls for increased investment in recruiting and retaining teachers.

Panels E, F, and G summarize enrollment. For the period under investigation, primary school enrollment averaged 464.5 children annually, nearly 267 boys and 196 girls. The average school enrolled 460 children in 2013 and about 466 in 2016. Schools not directly exposed to political instability on average enrolled 500 students a year, compared to an average of 460 for schools in conflict zones. During this period, 35.3 out of 100 boys dropped out of school each year, as did 31 out of 100 girls. Panel G shows that 28.7 percent of the boys dropped out because of the war, whereas 22.9 percent of girls did so. Overall, political instability was the reason for 25.8 percent of dropouts from 2013 to 2016.

Table 1: Sample Characteristics

Variable	Mean	N
Panel A: Functional		
Yes	76.79	1204
No	23.21	364
Primary reason for not functioning		
Conflict related	62.64	228
Other reasons	37.4	136
Panel B: Ownership		
Community	10.97	172
Government	65.82	1032
Private	23.21	364
Panel C: Infrastructure		
Open air	24.35	376
Permanent	37.56	580
Semipermanent	38.08	588
Panel D: Teachers, IDPs, and refugees present		
Number of teachers	9.01	1196
Number of IDPs and refugees	23.43	1568
Panel E: Enrollment		
Total	464.47	963
Boys	266.85	951
Boys [2013]	267.79	200
Boys [2016]	300.16	294
Girls	195.95	952
Girls [2013]	183.60	197
Girls [2016]	228.97	297
Not exposed to war	495.06	175
Exposed to war	457.68	788
2013	459.91	199
2016	465.66	764
Panel F: Dropout rates		
Boys	35.29	1056
Girls	31.02	1044
Panel G: Reasons for dropping out, by gender		
Boys		
Conflict related	28.74	300
Others	71.26	744

Variable	Mean	N
Girls		
Conflict related	22.88	248
Others	77.12	836

Note: Mean represents proportions and averages; N represents number of school years. Author's calculations based on 2016 ACAPS data.

Tables 2A and 2B summarize unadjusted changes in enrollment over the same four-year period. Both tables exploit spatial discontinuity in exposure to the conflict to estimate the average enrollment using the DD framework. The "before" estimates refer to 2013 (peacetime), whereas the "after" estimates refer to 2016 (wartime). Notably, the war had a substantial effect on early education in South Sudan. Although enrollment generally declined in schools in the conflict zones, girls' average registration increased by about 11 students per year. According to the pooled sample, each school in a war zone enrolled six fewer children a year on average, or roughly ten boys per school. However, by treating schools not exposed to war as counterfactuals, average enrollment for schools in war zones decreased by nearly 65 children annually (see Table 2A). Table 3 demonstrates further that the impact of war on schooling is greater for boys than for girls, as average enrollment for boys declined over the years by 48, and by only 22 for girls.

Table 2A: Summary Statistics for Enrollment by Treatment

	Not exposed to war			Exposed to war			
	Before	After	Diff.	Before	After	Diff.	DD
Enrollment	450.0	508.8	58.8	462.5	456.5	-6.0	-64.7
	[N=41]	[N=134]		[N=158]	[N=630]		

Note: Average enrollment rates and differences are across periods and groups, a final difference between the two groups; sample size (N) in brackets. Author's calculations based on ACAPS data.

Table 2B: Summary Statistics for Enrollment by Sex and Treatment

	Not exposed to war			Exposed to war			
Sex	Before	After	Diff.	Before	After	Diff.	DD
Boys	278.9	317.6	38.7	265.0	255.5	-9.5	-48.2
	[N=40]	[N=134]		[N=160]	[N=617]		
Girls	158.1	191.3	33.2	190.1	200.9	10.8	-22.4
	[N=40]	[N=134]		[N=157]	[N=621)		

Note: Average enrollment rates and differences are across periods and groups, a final difference between the two groups; sample size (N) in brackets. Author's calculations based on ACAPS data.

Data on Armed Conflict Events

Tables 3A and 3B summarize conflict intensity by treatment region over time using the ACLED dataset. This dataset details violent events, including date, actor, nature of violence, location, and deaths associated with these events. The ACLED data are matched with school-level data by using state and time period as identifiers. Analysis of the combined dataset helps assess the robustness of the regression estimates offered in Table 5.

Table 3A: Conflict Intensity by Treatment

	Not exposed to war		**Exposed to war**	
Year	Mean	SD	Mean	SD
2013	13.00	1.62	54.92	37.72
2014	25.71	7.35	133.15	75.40
2015	27.26	7.06	109.58	46.51
2016	49.97	29.25	151.82	99.92
N	248		1,320	

Note: Mean represents average conflict events and SD stands for standard deviation.

Table 3B: Conflict-Related Fatalities by Treatment

	Not exposed to war		**Exposed to war**	
Year	Mean	SD	Mean	SD
2013	90.29	67.38	871.24	872.38
2014	165.94	148.17	761.07	709.98
2015	112.74	80.80	445.10	342.21
2016	178.45	154.18	572.52	410.26
N	248		1,320	

Note: Mean represents average conflict events and SD stands for standard deviation.

As Tables 3A and 3B illuminate, South Sudan's human security became more fragile over time and was increasingly threatened by the country's rapidly changing political climate. Before 2013, sporadic yet relatively small-scale communal conflicts had occurred; the situation worsened with the outbreak of the civil war in December 2013. The number of these conflicts rose more than fourfold between 2013 and 2016, confirming the country's deteriorating security situation during the war.

The regions of South Sudan not directly affected by the war (i.e., northern Bahr el Ghazal, Warrap, Eastern Equatoria) averaged 13 conflict events in 2013; the number of events in these regions rose significantly in 2016, indicating the neighborhood effect of instability. In the regions directly affected by the war (i.e., western Bahr el Ghazal, Unity, Central Equatoria, Western Equatoria, Jonglei, Lakes, and Upper Nile), the average number of conflict events nearly tripled, from 54.9 in 2013 to 151.8 in 2016. Notably, the warring zones already had a more volatile security environment before the outbreak of war than their unaffected counterparts, which undoubtedly signaled the spatial (i.e., state) heterogeneity in localized violence. This spatial heterogeneity at the baseline does not seem to drive differential effects on schooling, as our parallel assumption assessment results indicate. Moreover, besides violence-inducing local grievances, most states within the Greater Upper Nile and Equatoria regions suffered major bouts of politically aggravated insecurity. During the period assessed (2013-2016), the politically volatile states experienced an average of 112.37 conflicts, while the less volatile states experienced only 28.98.

The average number of fatalities during the war in South Sudan fluctuated over time, as shown in Table 3B, and did not seem to depend on how many conflict events a region endured. Nationally, each conflict event resulted in 7 deaths per 100 population. Presenting this based on exposure to conflict, a single conflict accounted for 11 deaths per 100 population in nonconflict regions, and 6 deaths per 100 civilians in conflict regions. Because these findings indicate that the frequency of conflict events generally evokes fear, the ensuing number of fatalities is likely to depend on the destructive nature of such events.

Connecting these results to education processes demonstrates that conflict is intimately associated with school closure. Two years, 2014 and 2016, experienced more conflict events than 2015, when the first peace agreement was signed. This is consistent with our estimates presented in Table 5, which point to a greater than 15 percent reduction in school enrollment in 2014 alone; more than 62 percent of the schools not functioning in 2016 had closed due to the conflict.

Description of Control Variables

Although the principal emphasis of this analysis is to complement existing knowledge on the adverse effects political instability has on the socioeconomic outcomes of individuals and societies, recognizing the role of other factors is imperative (Connelly and Zheng 2003; Tansel 2002). Deolalikar (1997), for example, highlighted the significance of infrastructure and other community-level constraints on school enrollment. In this study, we consider school-level or background factors, such as the

size of the teaching staff, school infrastructure, ownership as a proxy for investment (i.e., spending on school), population shifts due to conflict or environmental shocks or both, fixed effects, and secular conditions. To ensure that the causal link between enrollment and war was adequately isolated, we conducted a series of robustness checks before estimating the final empirical model. We specifically assessed the roles the size of the teaching staff, infrastructure, and school ownership play in enrollment, as these variables significantly relate to a school's functionality. The number of IDP and refugee children attending a school also factors into overall enrollment, but changes in enrollment can be a function of other invariant, unobserved conditions, which our analysis captures by using period and omitted fixed effects.

Without controlling for other variables, violence appears to be insignificantly related to enrollment, save for the boys' subsample. Still, when other variables are not controlled for, the effect of political violence on enrollment in the boys' sample is attenuated by 35 percent; however, the statistical relationship still holds at a less than 1 percent confidence level. This result indicates that controlling for other factors does not necessarily matter—war continues to play a fundamental role in the educational attainment of male children. This suggests the relative vulnerability of male children in situations of political instability.

The war caused extensive social and economic troubles in South Sudan that have drastically reduced national and personal incomes, thus a number of measurement concerns are worth noting. The fear of violent attacks and substantial cuts in economic resources likely forced parents to pull their children out of school. However, our sample has no information on the economic determinants of enrollment, which challenges any attempt to accurately estimate the impact of war on enrollment, as children not directly exposed to conflict could still drop out of school due to war-related economic consequences (e.g., a marked drop in household or family earnings). In other words, the influence of a rapidly deteriorating economy on household-level enrollment decisions cannot be ruled out. In addition, schools that closed because of the war are not included in the sample. If these schools stopped operating due to political insecurity, then the impact of war on enrollment is undoubtedly underestimated in this study. Finally, our analysis does not study whether students are generally gaining the skills or knowledge necessary to become productive members of society (Steer et al. 2014).

Identification Strategy

As noted elsewhere, the South Sudanese civil war erupted in Juba in mid-December 2013 and spread quickly, especially to the Upper Nile region. Over the next five years, the war directly affected seven of the country's ten former states, which induced widespread economic and physical insecurity among the population. These seven states include Western Bahr el Ghazal, Unity, Central Equatoria, Western Equatoria, Jonglei, Lakes, and Upper Nile. Lakes and Jonglei also suffered communal violence for nearly a decade, which was equally disruptive. The present analysis uses this spatial distribution of violence as the basis for its identification strategy.

First, it should be noted that geography matters. A school's location determines its exposure to the conflict. As such, primary schools situated in the seven states directly affected by the war constitute the treatment group. Those located in the other three states represent the control group. In other words, the current analysis stratifies the sampled schools into locations exposed and not exposed to political conflict. A school located in a war zone is represented by 1, otherwise 0. Exploiting geography to determine exposure to war engenders the use of a DD approach to estimate the exogenous variation between enrollment and war.

The DD methodology is particularly valuable in netting out time-invariant group differences. An additional strength of this estimation strategy is the assumption of no difference between the two groups prior to the introduction of a policy or occurrence of an event. In Table 4, we evaluate the hypothesis that the two groups of schools did not differ at baseline (i.e., 2013). This is performed by interacting two variables: period (year) and treatment (exposure to war). Enrollment—the dependent variable—is then evaluated as a function of an interaction term. Whether the difference between these groups truly exists is established if the interaction term that involves 2013 (prewar) and the war exposure is statistically significant. Evaluating such a spatial difference in enrollment is restricted to 2013, due to the lack of sufficient quality data for prior periods. As the results show, there is no evidence to suggest that the two groups differed before the outbreak of civil war. A t-test at baseline confirms the same story. Based on this evidence, no time-varying differences are observed between the two groups of schools. Therefore, any parallel trends observed following the outbreak of the conflict can be attributed to the conflict itself (see Figures 1, 2, and 3).

Table 4: Parallel Trends Assumption Test

Variable	(1) Full sample	(2) Boys	(3) Girls
Exposed to war	-27.61	-47.98	24.71
	(53.39)	(34.58)	(27.74)
2016*War (base)	-	-	-
2013*War	40.00	34.12	7.29
	(79.12)	(51.43)	(41.33)
2014*War	-66.91	-43.05	-30.06
	(78.08)	(50.57)	(40.59)
2015*War	-35.36	-15.64	-28.41
	(76.45)	(49.53)	(39.74)
Observations	963	951	952

Note: Standard errors in parentheses.

* p<0.1

Figure 1: Enrollment Trends, South Sudan, 2013-2016

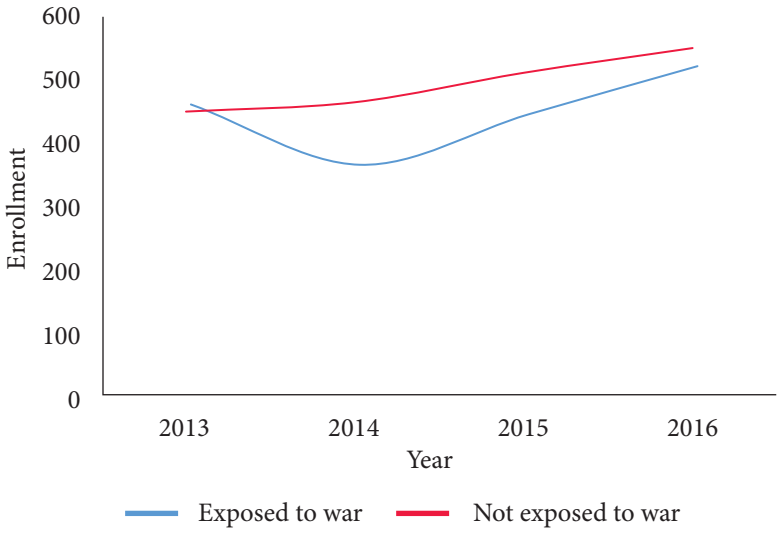


Figure 2: Enrollment Trends for Boys, 2013-2016

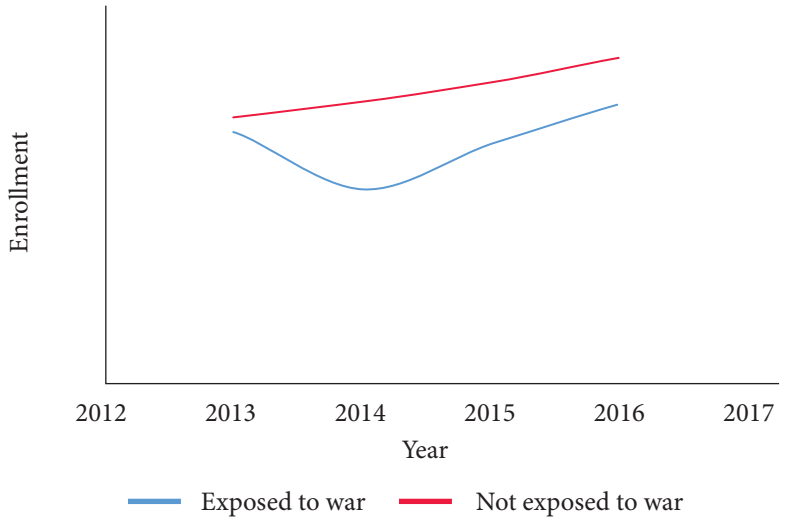
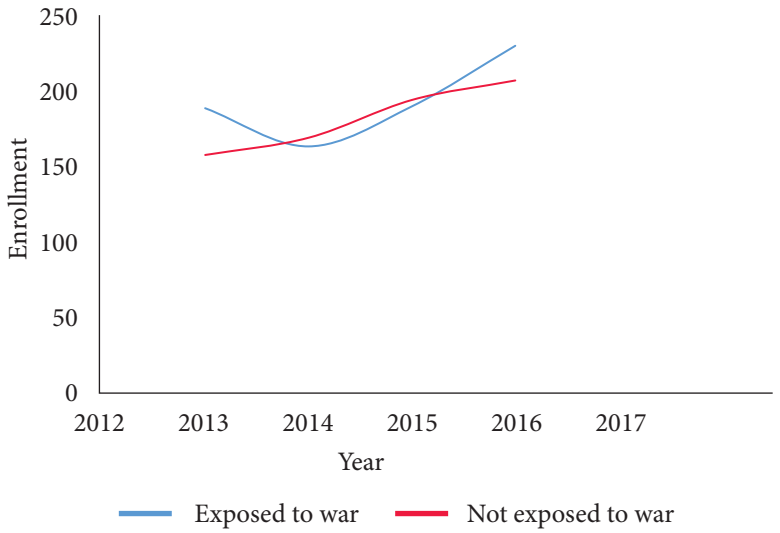


Figure 3: Enrollment Trends for Girls, 2013-2016



Similarly, using the ACLED data, we test how school enrollment responds to conflict intensity, measured as the number of conflict events and associated fatalities at a particular location over time. Although the relationship is not statistically significant, we find a negative association between conflict and enrollment, with each unit of conflict events reducing enrollment by 0.20 for the entire sample, 0.15 for boys, and 0.02 for girls. Finally, a unit increase in

fatalities results in a reduction of 0.03 for the overall sample, 0.02 for boys, and 0.01 for girls (see appendix for these results, Tables A1 and A2).

Let E be a continuous measure of schooling or enrollment for school *i,* and δ the average causal impact of violence on schooling. Let us then evaluate the impact (δ) of war on such a measure using the linear, difference-in-differences equation below. This is an ordinary least squares procedure with enrollment specified as a linear function of war, net of background characteristics and school-level and period fixed effects. The fixed effects component accounts for both measured and omitted invariant variables, and accounting for these variables results in more reliable estimates. We estimate the models by first constructing a dummy variable representing two groups of schools, denoted by D. D equals 1 if the school is located in a state directly exposed to the war, otherwise 0. The average causal effect of war on schooling then becomes

$$\delta = \frac{1}{n}\sum_{i=1}^{n} [E_{it}|D = 1 - E_{it}|D = 0],$$

with the ∑ sign representing the summation of enrollment over the entire sample for the duration of the conflict this analysis is evaluating. Transforming this equation into a linear regression model that nets out the influence of other factors produces

$$E_{ist} = \alpha_i + \beta(X_{is}) + \delta(War\ exposure) + \gamma_t + \varepsilon_t,$$

where *X* represents a set of background variables that do not vary over time but whose values vary across schools. War exposure is an indicator of whether the school is located in a state affected by war (treatment status), and year represents the periods over which the enrollment is being investigated. Because the DD methodology allows individual sample points to act as their own controls, α denotes the school-level fixed effects (Allison 2009). β represents the coefficients of background variables, and δ is the causal impact of war on enrollment, which is represented by E, as noted above. The δ is considered to be additive and constant (Angrist and Pischke 2009), γ estimates the year fixed effects, and ε accounts for random disturbances or unobserved characteristics of individual schools (Imbens and Woolridge 2009). Enrollment is not only a continuous measure of time dimension; it also varies across schools and is measured as the number of children enrolled in a school at the beginning of each school year. Thus, holding other factors constant, including time-invariant omitted variables, the impact of

war on enrollment is estimated for school *i* in state *s* at time *t,* respectively. Using 2013 as the base period, average enrollment is estimated for 2016, the last period.

Background variables include school infrastructure, ownership, size of the faculty, and the presence of IDP and refugee children. Infrastructure is defined as open air, permanent, and semipermanent. School ownership is defined as community, government, and private. Faculty size is defined as the average number of teaching staff available at the start of a school year. IDPs and refugees are defined as the number of IDP and refugee children attending the school during the school year. The information on faculty size and the number of IDPs and refugees is for the most recent period and, as such, the impact of those variables on enrollment is assumed to be constant over time.

The National Bureau of Statistics of South Sudan uses neighborhood-based census tracts (clusters) to generate data for population-based studies. The ten states make up some of the clusters the bureau has defined and used to generate spatially representative samples. The present sample was drawn using these state-distributed tracts. To adjust for standard errors, we take into account the clustering effects by treating individual states as independent groups in which schools are located. Although the clusters are considered independent, schools within them are likely to have similar experiences; this leads to local dependence that could influence the statistical tests of significance.

Lastly, we note some methodological flaws. This work does not take into account the household determinants of enrollment, as the necessary data are absent. Therefore, we are unable to isolate the impact of war from other essential factors in determining enrollment. For example, an economic downturn associated with political instability is likely to have a bearing on a household's decision to continue educating the children, especially the boys (Justino et al. 2014). Late payment of civil servants' salaries also was exacerbated by the war; those serving in the police and education sectors waited as long as eight months to be paid (Mayai et al. 2017). This situation certainly impacts these households' ability to keep their children in school, and since the current analysis is at the individual school level, students' fixed effects could not be measured. Moreover, the communal conflicts that permeated most of South Sudanese society would likely have effects on education processes and general stability comparable to a national conflict. Lack of relevant data on communal conflict hinders our ability to discriminate between the impact of communal violence and violence that is politically motivated. Inaccessible schools are not included in the sample, resulting in additional bias. Finally, enrollment statistics are not a strong measure of school

quality, so even if their school remains operational, children in conflict-affected areas are likely to receive poor quality instruction. The best teachers often seek jobs in a conflict-free area, and students who appear on a school roster may not attend classes regularly, due to a lack of security.

RESULTS

In this section, we estimate the impact of political violence on primary school enrollment. The treatment effect of the war on schooling is presented using three separate models: full sample, boys, and girls. This stratification is necessary, as there is a proven gender dimension to the influence of war on socioeconomic outcomes, particularly in education. We use the full sample to estimate the universal causal impact of war on schooling, producing results that are ideally generalizable at the population level. This is in accordance with the assumption that the effects of war are often far reaching. Gender-stratified evidence is desired, as it could be used to support targeted policies. South Sudan National Gender Policy (sec. 3.2) advances the importance of education in the empowerment of both men and women for sustainable socioeconomic development (MGCSW 2012). Table 5 reveals instructive results, net of school background characteristics, individual fixed effects, and period fixed effects. It shows that primary schools exposed to the war suffered a substantial decline in enrollment. The impact is particularly pronounced for male children. These results reflect the direction of our key hypotheses: that we expect school enrollment to decline in locations directly exposed to war, and that this impact is more pronounced for male than female children, due to the gendered political economy of war (i.e., boys are often conscripted) and sociocultural factors (i.e., there is less focus on educating girls than boys). While some universal aspects of the influence of war are generally expected, the education of young boys suffers more, for reasons previously discussed.

The effect on enrollment at schools caught in the war is especially notable and statistically significant for the first two models. For the full sample, we find that schools exposed to war lost 85 children on average per annum. Considering that the threat of war was constant during the four years of our study, the overall impact amounted to a loss of 340 children per school (73.9% of enrollment) during the conflict window, which is a vast proportion of the average enrollment.

Table 5: Primary School Enrollment and Political Violence

Predictor variable	(1) Full sample	(2) Boys	(3) Girls
Exposed to violence	-85.18*	-80.53***	-8.83
	(40.96)	(21.23)	(27.80)
School ownership [ref=community]			
Government	92.73***	63.79***	24.89
	(23.36)	(13.43)	(20.57)
Private	-24.31	-17.65	-1.46
	(13.56)	(14.76)	(19.26)
Infrastructure [ref=open air]			
Permanent	84.70**	55.34**	35.72*
	(33.24)	(22.43)	(17.53)
Semipermanent	41.52	29.72*	16.15
	(26.70)	(16.11)	(15.04)
Number of teachers	27.38***	10.41***	14.93***
	(1.28)	(2.68)	(1.42)
Number of IDPs and refugees	1.21***	1.05***	0.23
Year [ref=2013]			
2014	-72.26	-47.90	-20.23
	(62.79)	(38.29)	(26.52)
2015	0.85	-3.48	9.68
	(59.61)	(37.14)	(24.66)
2016	72.82	37.74	46.82
	(48.32)	(28.33)	(26.71)
Observations	945	933	934

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

There is a statistically significant relationship between the number of boys who dropped out of primary school and those who experienced war. For our sample, the average enrollment per year decreased by 80.5 boys, or 30 percent of total enrollment. For girls the impact was rather modest, a decrease of 8.8 per year, and was insignificantly related to war at all conventional significance levels. There are several possible reasons for this gender disparity. One is that boys are often conscripted into the army (Lai and Thyne 2007), and child soldiering affects the vast majority of young boys in South Sudan (Fegley 2008). Second, boys are often sent to safe locations, both for safety and educational opportunities. Lai and Thyne (2007) described the experience of the Sudanese "Lost Boys," the more than 20,000 orphaned or displaced youth who were sent to various East

African countries to get an education. Since the start of the conflict in South Sudan, at least one-third of the population has been displaced, a vast majority of them children and women (IPC 2017). Most refugee and IDP encampments offer educational opportunities these days. This is great news for South Sudan, as it helps to minimize their lost opportunities.

Traditional norms dictate that girls in South Sudan are rarely exploited for waging war. Girls are among the members of society considered most vulnerable, along with adult females, young children, and the elderly. Owing to the cultural expectation that these vulnerable members of the community should be protected from violence, girls are often relocated to safe places where they can continue their schooling. However, girls' enrollment in South Sudan schools is lower than boys', and where enrollment is low in general (i.e., for girls and boys), the war's impact on schooling is usually negligible (Shields and Paulson 2015). Distance between home and school also plays an important role in girls' and boys' attendance. In Afghanistan, for example, the distance to school influences girls' attendance more than it does boys' (Kirk and Winthrop 2007). Kirk and Winthrop (2007) note that sociocultural factors, such as early marriage and domestic obligations and being relegated to doing housekeeping and child care, play a role in young girls' school attendance, which stymies their educational progress.

DISCUSSION

This analysis explores the role the civil war in South Sudan has played in primary school enrollment as a measure of human capital accumulation. The civil war in the world's newest country caused significant shocks to its economy, creating the direst humanitarian conditions in the state's brief history. Hundreds of thousands of people were killed during the war and millions were displaced, while nearly half the population suffered food insecurity (Checchi et al. 2018). The state's capacity to deliver basic services was significantly weakened, the economy deteriorated, and primary school enrollment experienced a drastic reduction in the 2013-2016 period. The damaging nature of war, especially its impact on the economy, calls for improved policy regimes, including the imperative to address the long-term ramifications of war for the younger generation.

Using quasi-experimental frameworks by exploiting space-specific exposure to violence, we find a strong relationship between primary school enrollment and political instability in South Sudan, with schools in conflict zones losing on average nearly one hundred children per year. This adverse effect is particularly pertinent

for boys. The decrease in girls' enrollment is not necessarily tied to exposure to political violence, which suggests that gender differentiation in enrollment could be associated with a host of other forces. For example, conscription of young boys is an enduring problem in South Sudan (Burde et al. 2017; Lai and Thyne 2007). Our analysis indicates that sociocultural circumstances, including gendered domestic functions, poverty, early marriage, and pregnancy, all negatively impact girls' education. Therefore, the enrollment of girls, preconflict or otherwise, is expected to be lower than for boys, making the conflict less impactful for girls. As such, external interventions can give girls an advantage by reducing the impact of war on their learning activities and simultaneously addressing these other sociocultural barriers. Increased investment in girls' education from donors and nongovernmental organizations such as Girls Education South Sudan is important in enabling such an advantage.

This research is important due to its unique approach to examining the impact of war on school enrollment. Given the complex ways the impact of war manifests, evidence of its impact at the institutional level is needed to develop policies that target institutions. This study evaluated education processes in emergencies using the DD framework, and the results show that schools in the conflict-battered states of South Sudan lost an average of 85 schoolchildren annually, which constitutes 18.5 percent of average enrollment. A vast majority of young people exposed to the conflict currently have limited ability to find meaningful work in a rapidly evolving postwar labor market.

This analysis presents a causal impact of political violence on education in a relatively new context, South Sudan. Policymakers and political leaders may use this evidence to improve planning for education during emergencies. Although community safety as a whole is paramount during emergencies, the present findings suggest that increased efforts to secure primary education attendance during conflicts could lower the short- and long-term socioeconomic costs of political instability. Guaranteeing safe learning facilities should be an integral part of local, regional, and international relief agendas. For example, increasing education funding for displaced South Sudanese children will strengthen the nation's future capacity. Evidence from the South Sudan School Attendance Management System shows that Girls Education South Sudan grants to primary schools were associated with a 401 percent increase in enrollment, even as the war prevailed. Preventing schools from being destroyed or occupied and keeping teachers and children safe should be a main priority of any intervention (Guariso and Verpoorten 2013; Akbulut-Yuksel 2009). There is also a pressing need to guarantee the safety of young boys, in particular by strengthening and

enforcing local and international child labor laws that address the problem of child soldiering.

In states grappling with violent conflict, policymakers and political leaders often scramble to negotiate political settlements as a way to end instability and establish a point of departure for reconstruction (Kreutz 2010; Mason et al. 2011; Högbladh 2011). A return to stability demands distinct policy options that foster an encompassing reconstruction process. Though nearly every aspect of rebuilding is considered a priority in a postconflict environment, policymakers must target investment programs with an eye toward long-term development. An inclusive, predictable economic recovery program must include children's timely return to school (Albertyn et al. 2003). Moreover, with or without war, education programs must address the wide gender gaps in schooling in South Sudan, as bridging the gap will ultimately lead to improved economic development for all (Kirk and Winthrop 2007). Finally, providing educational opportunities for a greater number of children will not sustain growth and political stability (Bricker and Foley 2013; NBS 2010; Urdal 2006) unless the country's educated youth are also given opportunities for gainful employment. Thus, increasing school enrollment must be accompanied by integrated policies that align education with improved youth employment prospects (Barakat and Urdal 2009; Bricker and Foley 2013). If South Sudan fails to do this, it risks breeding a new legion of educated rebels (LaGraffe 2012; Hoffman and Jamal 2012; Steer et al. 2014; Bricker and Foley 2013; Hilker 2011).

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APPENDIX

Table A1: Regression Results (conflict episodes)

Variables	(1) Full sample	(2) Boys	(3) Girls
Conflict event	-0.20	-0.15	-0.02
	(0.16)	(0.11)	(0.08)
State controls	Yes	Yes	Yes
Year controls	Yes	Yes	Yes
School level controls	Yes	Yes	Yes
IDPs	Yes	Yes	Yes
Observations	945	933	934
R-squared	0.36	0.27	0.33

Note: Standard errors in parentheses.

Table A2: Regression Results (fatalities)

Variables	(1) Full sample	(2) Boys	(3) Girls
Fatalities	-0.03	-0.02	-0.01
	(0.02)	(0.01)	(0.01)
State controls	Yes	Yes	Yes
Year controls	Yes	Yes	Yes
School level controls	Yes	Yes	Yes
IDPs	Yes	Yes	Yes
Observations	945	933	934
R-squared	0.37	0.27	0.33

Note: Standard errors in parentheses.