

# Consequences of Civil Conflict

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## 1 Introduction

War not only kills directly, but profoundly affects the lives and livelihood of those living in conflict affected countries. In addition to battlefield casualties, armed conflict often leads to forced migration and refugees and the destruction of a societies' infrastructure. This paper is a statistical analysis of the consequences of conflict. The effects of armed conflict are evaluated with respect to the achievement of the Millennium Development Goals; economic growth; the political institutions of a state; and human rights. The direct and indirect mechanisms through which violent conflict degrades population health is also evaluated.

In Section 2, we summarize our methodological choices and our conflict data. Section 3 analyzes the effects of internal armed conflict on the attainment on the Millenium Development Goals. Section 4 discusses the political consequences of armed conflicts.

... Summary of findings

Not all consequences of conflict are measurable or have ever been measured. Indeed, many consequences of armed conflict are not incorporated in our analysis, such as the increased number of young males with war experience, accumulation of light weapons, erosion of trust, etc. Another burden is the environmental impact. Again, there are no indicators that allow a systematic comparison of this burden since the impact of war differ from environment to environment. In some places such as Cambodia and Liberia conflict sets the stage for large-scale illegal logging, in other places other aspects of regulation breaks down, and in Cambodia and elsewhere unexploded ordinances is a major problem caused by the conflict. Such problems of missing data, unmeasurable data make it especially difficult to assess systematically the economic, political, social, environmental and health effects of conflict.

[More on general health in here? E.g. ??]

## 2 Methodology

### 2.1 Countries included in analysis

Many of the indicators have a natural maximum. Primary education attainment cannot exceed 100%, infant mortality rates can hardly go below 5 per 1,000, and measures such as our democracy index has a fixed maximum. Many industrialized countries have reached the maximum values for many indicators. These countries also have almost no armed conflicts (or at least relatively limited conflicts such as the one in Northern Ireland). To avoid that the lack of improvement in our indicators for these countries affect our analysis we remove all but one of the countries that were classified as industrialized in the first World Bank Development Report (*World Development Report 1978*, p.77). The exception is South Africa which we retain in our sample.<sup>1</sup>

### 2.2 Data

We alternate between two datasets in our analysis. Since most of the outcome indicators are measured at five-year intervals, most analyses are based on a dataset containing one observation for each country for each five-year period. For the growth and democracy indicators, however, we use a country-year design with one observation for each country for each year.

The conflict data come from the Uppsala Conflict Data Program (UCDP), the most comprehensive, accurate and widely-used data source on global armed conflicts. The version of these data we use were backdated and adapted for statistical use in collaboration with PRIO and is referred to as the UCDP/PRIO Armed Conflict Data (Gleditsch et al. 2002). UCDP defines an armed conflict as a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths. A civil (or intrastate) conflict occurs between a government and a non-governmental party. This definition of armed conflict is becoming a standard in how conflicts are systematically defined and studied.

Updates to these data have been published annually in the report series *States in Armed Conflict* since 1987, in the *SIPRI Yearbook* since 1988, the *Journal of Peace Research* since

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<sup>1</sup>The industrialized countries we exclude are were Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom, United States.

1993 and in the *Human Security Report* since 2005. The data were also used in the World Bank PRR *Breaking The Conflict Trap* (Collier et al. 2003). The World Bank co-funded the backdating of these data from 1946 to 1989.

We use two different measures of amount of conflict in the preceding five-year period. The first we call ‘Conflict’. It measures the number of years within the preceding five-year period with conflict in the country as recorded in the UCDP/PRIO dataset (Gleditsch et al. 2002). A country without conflict the previous period receives a score of 0, a country with only a one-year minor conflict a score of 1, and a country with minor conflict in each of the five years is assigned a 5. If the conflict was recorded as major conflict (more than 1,000 battle-related deaths within a year), each year of conflict is counted twice. A country with five years of major conflict then receives the maximum score of 10.

The second conflict measure we call ‘Battle Deaths’ It is the log of the count of battle-related deaths due to fighting in the five years preceding the observation period. About 20% of the country-periods in our dataset have conflicts. The median conflict period led to about 2,500 deaths. The most destructive conflict periods (in Afghanistan and Cambodia) caused over 200,000 deaths each.

We also estimate the effect of ‘State Fragility’ as coded in the ‘IDA Fragile States Dynamic List’. Countries are coded as fragile if they host peacekeeping missions or if their policies and/or institutions are weak in terms of economic management, structural policies, policies for social inclusion and equity, and public sector management and institutions.<sup>2</sup> The variable has the value 1 if the country is regarded as ‘fragile’ in at least one of the preceding five years, and the value 0 if it was not coded as fragile in any of these years.

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<sup>2</sup>These are the general criteria for the World Bank *Country Policy and Institutional Assessment* rate (CPIA) which is the basis for the fragility index. The following states are coded as ‘fragile’:

1. All countries which have CPIA < 3.24 from 2004 to 2008
2. All countries which have  $CPIA < (\text{Standardized CPIA Cutoff for year } t = \text{Avg CPIA}_t + (Z\text{-score} * \text{Standard Devt}))$  where  $Z\text{-score} = (3.24 - (\text{Sample Averages}_{2005-2009} / (\text{Sample Standard Dev.}_{2005 - 2009})))$  for years  $t = 1978 - 2003$
3. Countries with an international or regional peacekeeping or political (non-border) mission for a given year observation 1977-2008, including special SRSG friends of political missions.
4. Low-income countries without a CPIA score
5. A country is eligible to graduate out of fragility when  $CPIA_t > \text{Cutoff}$  and it has not qualified in any other way for the previous three years. This rule works in reverse as well, a country only relapses into fragility if it has a  $CPIA_t < \text{cutoff}$  for three years or meets other criteria above or below.
6. Countries which are non-IDA before they join IDA but are fragile once they join IDA (or receive a CPIA score) are coded as fragile in the years preceding.

## 2.3 Conflict Country Categories

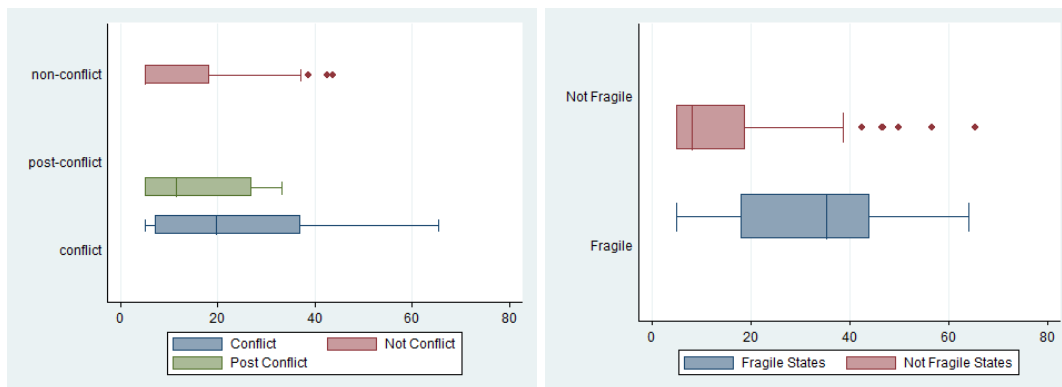
In a number of figures, we present information classified by conflict country category. We group countries into three categories: Countries that have had no conflict between 1980 and 2008 (‘non-conflict’), countries that had at least one year of conflict in the 1981–1990 period but no conflicts thereafter (‘post-conflict’), and countries that had conflicts during the 1991–2008 period (‘conflict’).

## 2.4 Model Specification

### 2.4.1 Country Fixed effects models

Most earlier studies of the effects of conflict on development outcomes compare indicators such as the percentage of the population that suffer from undernourishment for countries with conflict with the same indicators for countries without conflict. Figure 1 exemplifies this analysis by showing the distribution of undernourishment for conflict, post-conflict, and non-conflict countries (left panel) and the corresponding distribution for fragile vs. non-fragile states (right panel).<sup>3</sup>

Figure 1: The Percentage of Population Suffering from Undernourishment, By Conflict Status and State Fragility in 2000



The box plots show clearly that populations in conflict countries on average suffer more from undernourishment than those in non-conflict countries, and that post-conflict countries are located in between the two. It is not certain that these differences are caused by conflicts, however. Undernourishment is closely associated with other aspects of underdevelopment.

<sup>3</sup>The median value in each group is given by the vertical line inside the box in the center of each box-whisker combination. The outer values of this box are the 25th and 75th percentiles. The whiskers represent the ‘adjacent values’ (Tukey 1977) – the upper adjacent value is the largest value smaller than  $x_{75} + \frac{3}{2}(x_{75} - x_{25})$ . The dots are extreme observations outside the adjacent values.

Most conflict studies confirm that development as measured by GDP per capita or energy consumption per capita is among the most robust predictors of civil war (Hegre et al. 2001; Fearon and Laitin 2003; Collier et al. 2003; Hegre and Sambanis 2006). Underdevelopment in a general sense clearly facilitates both the occurrence of conflict and of undernourishment. It is necessary to account for these factors to avoid attributing development effects to factors that tend to cause conflicts in the first place. To do so, we follow Iqbal (2010), in our opinion the most comprehensive and sophisticated study of the health consequences of conflict, in using fixed-effects regression models. These models remove any systematic between-countries differences in the outcome variables and concentrate on the within-country effects. If conflicts increase undernourishment, we should observe an increase relative to the country's average levels in the indicator during the conflict or in the period following the conflict. The fixed-effects model estimate the systematic within-country effect of conflicts.

Fixed-effects models may over-protect against such omitted-variable bias. In particular, in countries that have had conflicts constantly over the entire period for which we have data we will not be able to discern much effect of conflict. Since these countries also are likely to be the most severely affected by conflict, the fixed-effects model may yield overly conservative estimates. This is accentuated by the fact that conflict also hinders development. Some countries may be poor when our data series start (typically at some year between 1970 and 1990) because of the conflicts they have had up to then. Our models will also ignore this effect.

Still, we choose to present a set of conservative estimates. For some indicators, this probably prevents us from identifying an effect of conflict. Still, for other indicators we find very substantial detrimental effects of conflict despite these limitations.

#### **2.4.2 Autocorrelation**

Subsequent observations for the same country may be dependent on each other. To account for this, we also estimate an  $AR_1$  model.

Our empirical models estimate level of infant mortality, undernourishment, per capita income, etc. as a function of conflict. These results explain cross-sectional variation within a sample. In order to visualize the effect over time these results are less useful. While they represent a valid identification of the consequence of conflict, predictions based on these results

omit the case-specific history. Thus, after a given period, the post-conflict lag variables will no longer ‘remember’ the case-specific conflict, and the predicted levels of economic development will be exactly equal to a similar case with no pre-occurring conflict.

We therefore illustrate our results using a period on period change model, and run a number of simulations on these results to visualize the consequences of conflict. The dependent variable in these models are  $X - X[t - 1]$ , with  $X[t - 1]$  included as a control variable. By setting the initial level of for instance GDP/Capita to \$700 in 1969, we can use the estimated conflict dependent growth level to calculate the level of GDP/Capita in 1970. The estimated level for 1970 can in turn be used to estimate 1971, and this routine can be iterated all the way up until today. By holding all other covariates fixed, we can then compare the estimated levels for different conflict scenarios.

Yet, our estimations are uncertain, and a crude comparison of two trends are likely to over-emphasize differences that in reality might be products of the estimation rather than real effects of conflict. Following King, Tomz and Wittenberg (2000) we draw 1000 sets of coefficients from a multi-normal distribution based on the variance/covariance matrix produced by the regression model. Each of these draws are used to simulate the change from period to period for a scenario with conflict and a scenario without conflict. The result is 1000 different estimation of the corresponding level of interest at each period, and it is this set that is the basis for our figures.

### 2.4.3 Matching

While the fixed-effects approach effectively eliminates any omitted-variable bias from country-specific variables such as culture and geography, fixed effects models can not account for unobserved variables that varies *over* time. An alternative approach is matching (Ho et al. 2007). In a fully randomized experiment the effect of a given variable can be gauged directly. By matching observations together, we aim to approach the experimental situation with real world data. In our case, we want to match particular observations of countries that have had conflict with otherwise similar countries that have not had conflict, and then observe how these relatively similar countries differ as an effect of the conflict.

Our analysis is imbalanced as we have a number of countries that reside in a conflict trap, with bad governance and high propensity of violence, and a number of countries that have a

very low risk of internal armed conflict. In between these two groups, we have a number of countries that are able to escape from the conflict trap, but will need at least several decades to reduce the risk level of the most developed countries. Fixed-effects models are very capable of handling unobserved heterogeneity in the first two categories, but not in the latter.

The literature on matching has not converged towards a single “best practice” for a given problem (Hill 2008). Given the relative complexity in the assessment of the underlying assumptions, we rely on the *R MatchIt* package (Ho et al. 2007). This package alternates our dataset to create a better balance between our conflict and non-conflict samples, and provides accessible verification of the post-hoc compliance with the model assumptions. Following Iacus, King and Porro (2009), we employ a Coarsened Exact Matching (CEM) model. In exact matching models, balance is sought by matching all units with the *exact* same value on explanatory variables, and thereby forming subclasses that in turn should differ only with respect to the treatment variable (here, the ‘treatment’ is the occurrence of conflict). Exact matching lends itself poorly to continuous explanatory variables such as the number of battle deaths over the last five years. CEM solves this problem by recoding the continuous variables into categorical variables and then applying the exact matching formula. This method is superior to distance-oriented models (Abadie and Imbens 2006) since it effectively limits how different a matched pair can be.

Having produced a fairly balanced set of matches, the need for control variables are effectively removed. In an ideal state, all observations within a match strata should be similar except for the treatment. While this would be the case with an Exact matching design, the recoding of the CEM procedure retain some imbalance, justifying the inclusion of control variables. Following Blackwell et al. (2009) we estimate the sample average treatment effect on the treated unit through a OLS regression with CEM weights applied.

#### **2.4.4 Time trend dummies**

Most indicators have trends that show improvement in the MDG indicators. Given this strong trend, conflict countries may also improve the general situation in the country. We include dummy variables for each five-year period to account for this trend.

### 3 Millenium Development Goals

We analyze the effect of conflict on seven of the millennium development goals: to end poverty and hunger; achieve universal education; gender equality; child health; maternal health, combat the spread of HIV/AIDS and ensure access to adequate water and sanitation.

Table 1: Summary of Results, Millenium Development Goals

MDG	Label	Indicator	Effect of conflict	Effect of fragility
MDG 1	Ending Poverty and Hunger	Undernourishment	Detrimental	Unclear
MDG 1		Poverty Headcount	Unclear	Unclear
MDG 1		Life expectancy	Detrimental	Detrimental
MDG 1		GDP per capita	Detrimental	–
MDG 2	Universal Education	Prim. Sch. Enrollment	Unclear	Ambiguous
MDG 2		Sec. Sch. Attainment	Detrimental*	Unclear
MDG 3	Gender Parity	Primary School Enrollment	Ambiguous	Unclear
MDG 3		Life expectancy	Ambiguous	Unclear
MDG 4	Child Mortality	Infant Mortality	Detrimental	Detrimental
MDG 4		Under-5 Mortality	Detrimental	Detrimental
MDG 5	Maternal Mortality	Birth Attendance	Unclear	Ambiguous
MDG 6	Combat HIV/AIDS	Proportion HIV positive	Ambiguous	Unclear
MDG 7	Environmental Sustainability	Access to Water	Detrimental	Ambiguous
MDG 7		Access to Sanitation	Unclear	Unclear

\*: Detrimental effect through neighborhood only

Table 1 lists the MDGs that we discuss here. The table reports the various indicators we analyze to gauge the effect of conflict on the attainment of the goals. As the table indicates, we find detrimental effects of conflict on two of the MDG1 indicators and both MDG4 indicators. It is clear that conflicts are partly responsible for the failure to meet these goals. As discussed below, the effects are quite strong. Five years of sustained conflict with only a moderate amount of direct fatalities on average push 3–4% of the population into undernourishment, for instance. We also find conflicts to generate a surplus infant mortality at the same level as the direct deaths – for every soldier killed in battle, one infant dies that would otherwise have survived through the indirect effects of conflict.

We do not find clear effects for the other MDGs. This is partly due to incomplete data – the indicators we use for MDG1 and MDG4 are also among those with best coverage. We find clearer effects of indicators that change relatively rapidly, such as GDP per capita or undernourishment. It is harder to identify the effects of conflict for variables that change more slowly.

Fragile states are less likely to meet the millenium development goals: to end poverty and hunger; universal education; gender equality; child health; maternal health, combat HIV/AIDS, and environmental sustainability.

Table 2 compares the mean and median values across a series of indicators of the MDGs for fragile states and all the other developing countries. (We have excluded from our analysis all countries labeled as industrialized in the first *World Development Report* (1977), except for South Africa. We redefine South Africa as a developing country. This list corresponds with the OECD member states).

Table 2: Summary of Results, Millenium Development Goals 2005

MDG	Label	Indicator	Developing Countries
MDG	Label	Indicator	Median (Mean)
MDG 1	Ending Poverty and Hunger	Undernourishment	6% (12%)
MDG 1		GDP per capita	7.8 (7.8)
MDG 2	Universal Education	Primary School Enrollment	91% (89%)
MDG 2		Secondary School Attainment	71% (70%)
MDG 3	Gender Parity	Female Primary School Enrollment Ratio	0.98 (0.97)
MDG 4	Child Mortality	Infant Mortality per 1000	20 (32)
MDG 4		Under-5 Mortality per 1000	25 (44)
MDG 5	Maternal Mortality	Birth Attendance	97% (82%)
MDG 6	Combat HIV/AIDS	Proportion HIV positive	0.5 (2.4)
MDG 7	Environmental	Access to Water	???
MDG 7	Sustainability	Access to Sanitation	???

Table 3 shows the magnitude of the effect of being a fragile state as compared to a developing country. These estimates ignore missing values. They are therefore most likely conservative estimates. Unfortunately, we cannot estimate certain values without a lot more time. For example, to estimate the total number of children not enrolled in primary school we need more precise age specific population data than we have available to us at this time. This is also true for determining the infant mortality and under 5 year old mortality rates.

### 3.1 MDG 1: Ending Poverty and Hunger

#### 3.1.1 Global Trends

Figure 2 shows the trends in prevalence of undernourishment 1990–2008 for the three conflict categories and the two state fragility categories. The countries that had no conflicts (‘non-conflict’; dashed line) in the 1980–2008 period have a slowly decreasing undernourishment

Table 3: Summary of Results, Millenium Development Goals 2005

Indicator	Total in Developing Countries	Total in Fragile States
Total Populations	5,217 million	530 million
MDG 1 – Poverty Undernourishment	626 million	154 million
MDG 5 No Birth Attendance	Maternal Mortality 939 million	223 million
MDG 6 Proportion HIV positive	Combat HIV/AIDS 125 million	12 million

rate. The countries that had conflict after 1990 ('conflict' – solid line) start with a much higher rate of undernourishment in 1990 (at about 28% as compared to 12%) but decrease steadily. The countries that had conflict during the 1980s but afterwards ('post-conflict' – dotted line) had undernourishment rates at close to 20% but this rate rapidly decreases toward the non-conflict countries over the next 18 years.

Figure 2: Trends in percentage of population that is undernourished, by conflict type and fragility

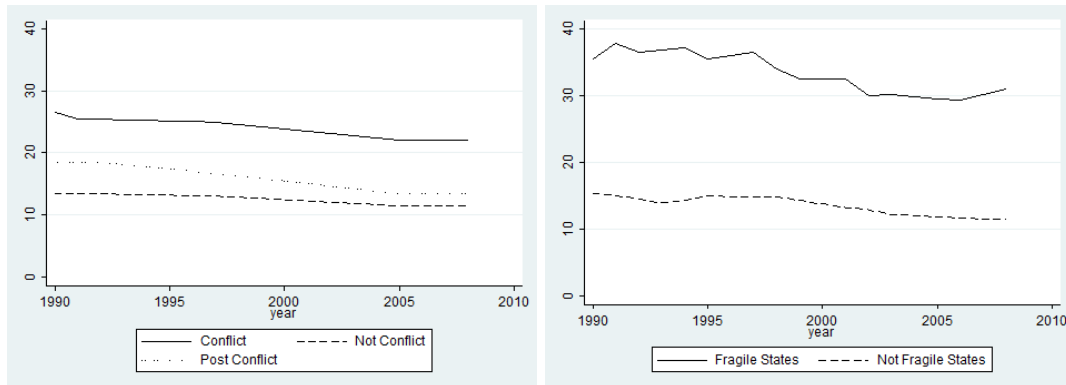


Figure 1 above showed the distribution in 2000 for the countries in each of the categories.

### 3.1.2 Literature on Effects of Conflict on Poverty and Hunger

The literature on the effect of conflict on poverty and hunger is scarce, mostly consisting of NGO reports. Several studies confirm the popular perception that conflicts exacerbate poverty and hunger. Messer and Cohen (2004, 3) argue that “conflict causes food insecurity” and that civil conflicts in Africa since the mid-1960s until 2000 cost the region more than “\$120 billion worth of agricultural production”. Country studies carried out in post-conflict countries also find a marked increase in poverty and hunger during war. For Angola, Sapir and Gomez

(2006, 13) find that malnutrition rates were severely affected by conflict, but that “one year after the cease-fire, Angola had been able to leave behind the high rates of crude mortality and malnutrition that field surveys had recorded during conflict”. For Mozambique, Brück (2006, 33) finds a more lasting effect of conflict. In 1997, five years after the civil ended, he reported that in the northern part of the country “39 percent of all children under 3 years of age [were] moderately or severely underweight”. Mozambique had a prevalence of undernourishment among the population of 52 % in 1997. For comparison, Burkina Faso which has similar GDP per capita but have largely avoided conflict, undernourishment affected only 12% of the population<sup>4</sup>. According to the World Bank (2007, 17), Sub-Saharan Africa (SSA) “alone remains seriously off-track to to achieve the poverty reduction MDG”. SSA is also the region of the world with the most civil conflict.

We are not aware of any cross-national studies of conflict’s effect on undernourishment beyond those reported here, nor any systematic cross-national studies of the relationship between conflict and the poverty headcount variables referred to in Table 1. Poverty and undernourishment, however, are to a large extent determined by economic development broadly defined and captured by the Gross Domestic Product (Collier and Dollar 2002). Several studies show that civil conflicts wreak havoc on the economies of the countries they take place in. According to Collier (1999) this happens through five processes: destruction of resources, disruption of social order, diversion of public expenditure, dissaving, and the shifting of assets out of the country. In *Breaking the Conflict Trap*, Collier et al. (2003) consequently describe civil war as development in reverse, “after a typical civil war of seven years duration, incomes would be around 15 percent lower than had the war not happened”. There is a substantial literature on the effect of conflict on economic factors, both directly on issues such as GDP growth, but also on the composition of a country’s economy and on the effect on e.g. military expenditure.<sup>5</sup> Here we focus on recent articles that deal directly with the impact of civil conflict on the economy.<sup>6</sup>

Collier (1999) argues that civil wars are “liable to be more damaging than international wars” and find that during “civil war the annual [GDP] growth rate is reduced by 2.2%“. He finds a difference between long and short wars, and while short wars “cause continued post-war

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<sup>4</sup>Data from the World Development Indicators

<sup>5</sup>See Collier et al. (2003), Koubi (2005), and Chen, Loayza and Reynal-Querol (2008) for reviews.

<sup>6</sup>Readers are referred to these studies for additional reviews.

[GDP] decline, [...] sufficiently long wars give rise to a phase of rapid growth” (Collier 1999, p. 175–176). The reason for the continued decline in GDP after short wars, Collier attributes to post-war environments being less capital-friendly than that country’s the pre-war capital environment. Koubi (2005) studies the effect of both inter- and intranational wars on average growth in per capita real output. He finds that a war’s severity, measured in amount of battle deaths, has a significant negative impact on growth. When he repeats that analysis *without* civil wars, the statistical significance disappears, indicating that the “association between war and economic growth is due to civil wars” (Koubi 2005, 76–77). Koubi (2005, 78) also find, in accordance with Collier (1999) that “the more severe or longer the war, the higher the subsequent, medium-term economic growth”. Similarly, Chen, Loayza and Reynal-Querol (2008, p. 71) find that the “average level of per capita GDP is significantly lower after the war than before it”, and this they argue is “undoubtedly a direct reflection of the cost of war”. They, too, find that after “the destruction from war, recovery is achieved through above average growth“ but this growth follows the pattern of “an inverted U, with the strongest results achieved in the fourth or fifth year after the onset of peace“. (Chen, Loayza and Reynal-Querol 2008, p. 72, 79).

In addition to the impact on the domestic economy, the effects of civil wars tend to spill over into neighboring countries (Buhaug and Gleditsch 2008; Gleditsch and Ward 2000; Salehyan and Gleditsch 2006). This spill-over takes the form of increased risk of civil war for countries with neighbors in a state a civil war, but the influence can also be substantial for the neighbors’ economic growth. Murdoch and Sandler (2002, p. 96) argue that a neighboring civil war may affect a country’s GDP through collateral damage where battles close to the border may destroy infrastructure and capital, and by increasing “perceived risk to would-be investors and divert foreign direct investment away from neighbors at peace”. Investigating this argument they find that a civil war creates “significant negative influence on short-run growth within the country and its neighbors” (Murdoch and Sandler 2002, p. 106–07). Murdoch and Sandler (2004) extend the time-frame and approach of their earlier paper. They argue that the spill-over effects may go beyond a country’s immediate neighbors, “owing to regional economic integration and regional multiplier effects”. In contrast to the relatively modest effects they found for immediate neighbors in the earlier paper, for neighbors within a radius of 800 km they find that “a civil war at home is associated with a decline in economic

growth of 0.1648, while an additional civil war in a neighbor is associated with a decline of approximately 0.05 or about 30 % of the home-country effect” (Murdoch and Sandler 2004, 145). This implies that “a country in a region with three or more civil wars may be equally impacted as a country experiencing a civil war” (Murdoch and Sandler 2004, 150).

### 3.1.3 Empirical Analysis

**Undernourishment** Table 4 shows results from estimating a set of fixed-effects models with the percentage of the population that is undernourished as the dependent variable and the two different operationalizations of conflict as main independent variables.<sup>7</sup> To account for global changes in the average levels for the indicators, we include dummy variables for each five-year period. In model 1, we estimate the effect of the ‘Conflict’ variable. Conflicts clearly lead to undernourishment in the following five-year period. The estimate for the conflict variable is 0.828, implying that a single year of minor conflict increases the proportion of the population that is undernourished by 0.8%. Five years of major conflict is estimated to lead to an 8.2% increase in this proportion.

We have tested whether the effect of conflict is contingent on the size of the country – in a large country, a conflict may be extremely detrimental to the region experiencing warfare, but have little impact on the country as an entity. We do not find signs of such an interactive term, however. For this outcome, the effect of conflict seems to be country-wide. This implies that for a country of median size of about 8 million inhabitants, a single year of conflict (with up to 1,000 battle deaths) moves a total of 65,000 people into the undernourishment category. Five years of major conflict affects about 650,000 persons.

In models 2 and 3, the conflict measure is the count of battle-related deaths due to fighting in the five years preceding the observation period. Also this indicator indicates a strong, detrimental effect of conflict. The estimate of 0.494 implies that a conflict of median severity (2,500 deaths over 5 years) increases the undernourished proportion of population by about 3.8% percentage points.<sup>8</sup> This corresponds to about 300,000 persons in the median country.

In model 4, we estimate the effect of state fragility on undernourishment. Fragile states also have higher proportions of undernourished populations. Controlling for unobserved country-level factors and time trends, fragile states on average have 2.4% higher proportion of under-

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<sup>7</sup>Variable name in WB dataset: `sn_itk_defc_zs`. Source: WDI???

<sup>8</sup>The logarithm of 2,500 is 7.82, which multiplied by the parameter estimates 0.494 is 3.8%.

Table 4: Effect of Conflict on Undernourishment, 1992–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td80	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td85	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td90	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td95	2.543***	2.505***	2.526***	1.077*	15.56***
	(0.681)	(0.692)	(0.693)	(0.509)	(2.385)
td00	1.540**	1.500**	1.510**	0	14.64***
	(0.493)	(0.501)	(0.501)	(.)	(2.463)
td05	0	0	0	-1.479**	13.47***
	(.)	(.)	(.)	(0.491)	(2.470)
logged total population	-0.578	-2.364	-2.528	-1.988	0.101
	(3.236)	(3.277)	(3.286)	(3.370)	(0.321)
conflict_1	0.783***				1.033**
	(0.158)				(0.386)
lneiconf_5	-0.0699	-0.127	-0.127		0.216
	(0.105)	(0.105)	(0.105)		(0.225)
lnbdeadbest1_5		0.392***	0.355**		
		(0.0958)	(0.107)		
bdbpop1_5			0.0533		
			(0.0691)		
fsida_5				0.856	
				(1.192)	
Constant	21.13	37.91	39.35	35.72	0
	(29.37)	(29.71)	(29.80)	(30.33)	(.)
Observations	413	413	413	413	413
Log likelihood	-996.0	-1001.6	-1001.1	-1014.9	
$\chi^2$					376.8

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

nourishment than non-fragile states.

Model 5 presents the results from the AR(1) model.

Figure 3 illustrates the estimated effect of conflict on undernourishment for a hypothetical country. This country had a population of about 15 millions in 1970, increasing to 35 millions in 2005.<sup>9</sup> The initial undernourishment proportion for the hypothetical country was about 17% in 1970. The dotted line in the figure represents the baseline scenario without any conflicts. The estimates of Model 1 in Table 4 imply that the poverty rate for the hypothetical country is constant from 1970 to 1995, and thereafter slowly decreasing.

Figure 3: Simulated effect of conflict on undernourishment.



The dashed line shows estimated poverty rates if this country had five years of minor conflict starting in 1980. The prevalence of undernourishment then increases to about 21% during those five years.

The solid line shows estimated poverty rates if the country had fifteen years of major conflict, starting in 1975. Undernourishment then increases to 25% for the entire 15-year period.

**Undernourishment** Table 5 shows the results from the same set of models estimated with life expectancy as the MDG1 indicator.

**Poverty** We then turn to the effect of conflict on poverty – the percentage of a country’s population that live on less than USD1.25 per day.<sup>10</sup> The results are presented in Table

<sup>9</sup>This is close to the size of Tanzania.  
<sup>10</sup>Variable name in WB dataset: si\_pov\_dday. Source: WDI???

Table 5: Effect of Conflict on Life Expectancy, 1970–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	1.582*** (0.371)	1.621*** (0.370)	1.603*** (0.369)	1.883*** (0.374)	2.150*** (0.0838)
td80	3.110*** (0.395)	3.173*** (0.393)	3.122*** (0.394)	3.376*** (0.397)	4.397*** (0.123)
td85	4.411*** (0.437)	4.451*** (0.434)	4.396*** (0.434)	4.619*** (0.433)	6.416*** (0.153)
td90	5.253*** (0.486)	5.329*** (0.483)	5.266*** (0.483)	5.387*** (0.477)	7.872*** (0.190)
td95	5.632*** (0.534)	5.672*** (0.530)	5.591*** (0.530)	5.663*** (0.520)	8.888*** (0.164)
td00	6.054*** (0.576)	6.109*** (0.572)	5.996*** (0.574)	6.095*** (0.564)	9.783*** (0.184)
td05	6.769*** (0.613)	6.817*** (0.609)	6.672*** (0.612)	6.815*** (0.606)	10.86*** (0.204)
logged total population	5.066*** (0.677)	4.989*** (0.674)	5.079*** (0.674)	5.371*** (0.670)	-0.223 (0.268)
conflict_1	-0.109* (0.0538)				-0.135** (0.0501)
lneiconf_5	0.00766 (0.0404)	0.0103 (0.0401)	0.0133 (0.0401)		-0.00529 (0.0406)
lnbdeadb1_5		-0.124*** (0.0353)	-0.172*** (0.0424)		
bdbpop1_5			0.0496* (0.0242)		
fsida_5				-1.361*** (0.327)	
Constant	12.58* (5.669)	13.26* (5.637)	12.53* (5.639)	9.997 (5.591)	56.89*** (2.305)
Observations	1072	1072	1072	1072	1072
Log likelihood	-2532.8	-2528.0	-2525.5	-2525.1	
$\chi^2$					6202.6

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

6. We find little trace of a direct effect of conflict on poverty. Estimates are largely in the expected direction, but not statistically significant. This is partly due to data sparseness – we have three consecutive observations for only just above 50 countries, and never more than 89 countries for a given year. Data also tend to be most sparse in conflict countries – we lack for instance data for Afghanistan, DRC, Algeria and Sudan for the year 2000.

Table 6: Effect of Conflict on Poverty Rates, 1980–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td80	-0.0107	-0.459	-1.671	-0.0395	0
	(4.147)	(4.130)	(4.203)	(4.113)	(.)
td85	0	0	0	0	-9.944
	(.)	(.)	(.)	(.)	(.)
td90	-0.696	-0.494	-0.260	-0.612	-12.31
	(1.876)	(1.879)	(1.880)	(1.861)	(.)
td95	-2.351	-2.216	-1.823	-2.248	-12.93
	(2.026)	(2.005)	(2.017)	(1.985)	(.)
td00	-2.617	-2.382	-1.869	-2.617	-13.10
	(2.285)	(2.270)	(2.292)	(2.239)	(.)
td05	-5.770*	-5.640*	-5.069	-6.041*	-17.48
	(2.635)	(2.606)	(2.628)	(2.601)	(.)
logged total population	-11.25*	-11.88*	-12.64*	-10.67*	0.225
	(5.547)	(5.442)	(5.452)	(5.365)	(.)
conflict_1	-0.121				0.721
	(0.259)				(.)
lneiconf_5	0.222	0.210	0.189		0.757
	(0.178)	(0.178)	(0.178)		(.)
lnbdeadb1_5		-0.194	0.0243		
		(0.175)	(0.231)		
bdbpop1_5			-0.152		
			(0.105)		
fsida_5				0.975	
				(2.242)	
Constant	135.5*	141.6**	148.7**	130.9*	32.23
	(52.53)	(51.51)	(51.59)	(50.68)	(.)
Observations	292	292	292	292	292
Log likelihood	-870.3	-869.5	-867.9	-871.6	
$\chi^2$					.

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Growth** Figure 4 shows the trends in average GDP per capita for countries separately for the three conflict categories as well as for the two state fragility categories. The figure shows clearly that no-conflict and no-failed countries are much richer than the conflict- and failure-affected countries. Moreover, the no-conflict and non-failed countries have seen substantial economic growth over the period, whereas the other groups have stagnated. The figures underestimate this difference, since countries that end their conflicts then enter the post-conflict category and eventually the no-conflict category. Given the steady decrease in the share of countries with conflict over the period, this means that the no-conflict category is expanded with new countries that are poor partly due to their conflict history.

Figure 4: Mean GDP per capita over time by conflict and state fragility status

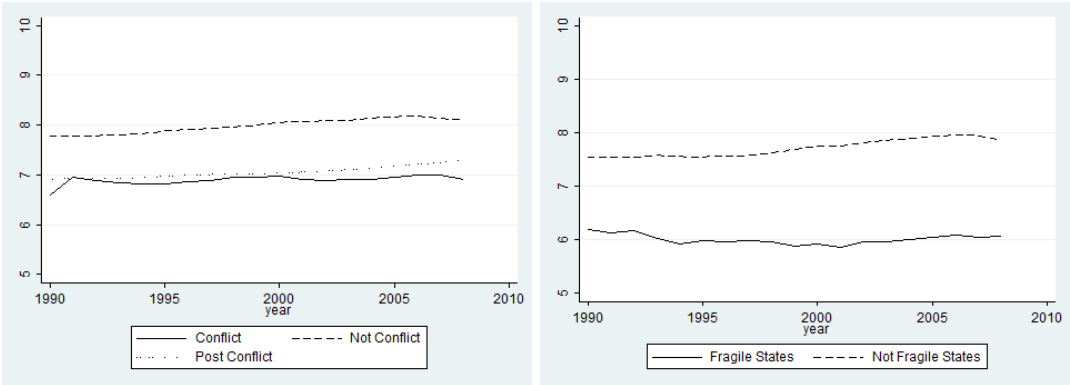


Figure 5 shows the distribution in GDP per capita for the year 2000 for the various categories.

Figure 5: Distribution of GDP per capita in 2000 by conflict and state fragility status

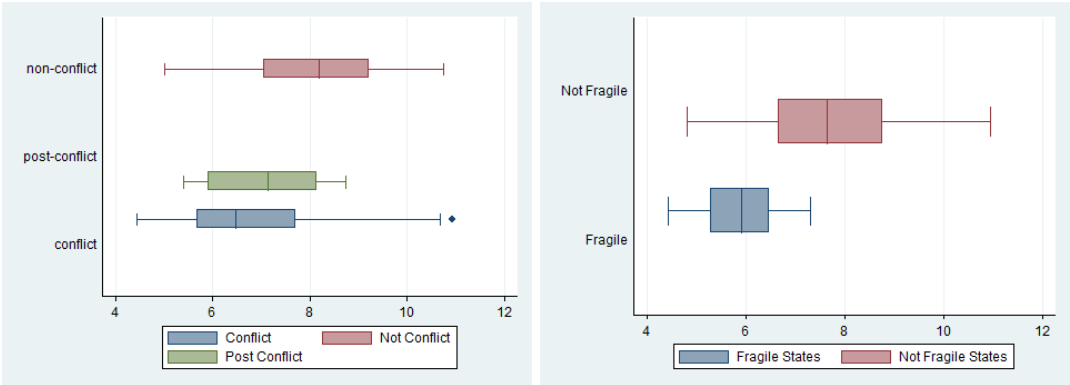


Table 7 shows the estimates from a fixed-effects model estimation of the relationship between conflict and economic growth measured as the annual increase in log GDP per capita. Here we use a dataset with annual observations. We estimate an OLS model with panel-

corrected standard errors, correcting for autocorrelation.<sup>11</sup> Conflict clearly affects economic growth in our estimations, corroborating the studies reviewed above. One year of minor conflict is estimated to reduce annual growth by between 1% and 2%, major conflicts are assumed to have twice as high effect. The analyses using battle deaths as conflict variables indicate effects of the same magnitude – minor conflicts with 25 battle-related deaths per year leads to an annual 1% growth shortfall, whereas the most lethal conflicts with more than 100,000 deaths per five-year period cause a growth reduction of about 4% per year.

### 3.2 MDG 2: Universal Education

#### 3.2.1 Global Trends

[In graphs and brief discussion here.]

As for the other indicators we analyze, education enrollment and attainment has seen a steady improvement from the 1960s to today at the global level. On average, countries have improved attainment percentages by about 2% in every five-year period. Figure 6 shows trends in education levels.

Figure 6: Trends in secondary education attainment rates 1990–2008, by conflict and fragility

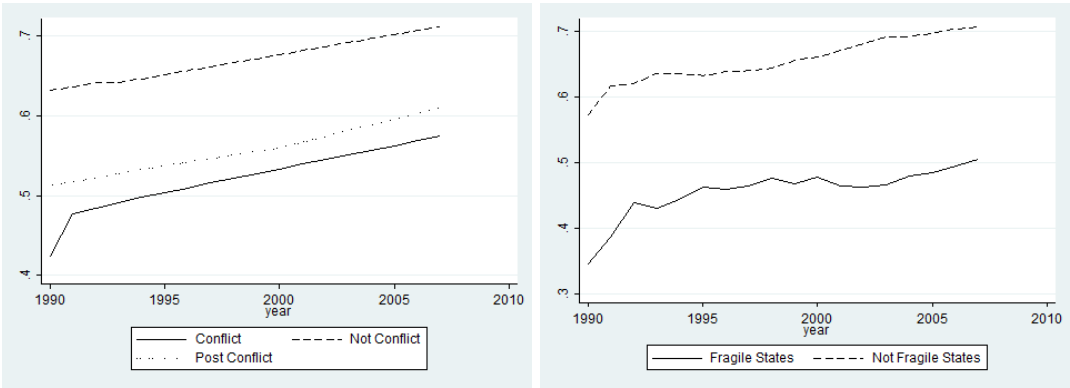


Figure 7 shows the distribution...

#### 3.2.2 Literature on Effects of Conflict on Education

The effect of conflict on education is interesting given education’s importance for development in general. In the 1990 edition of the *World Development Report* (ref) education is seen as one of four key components for combating e.g. poverty, and education coupled with economic

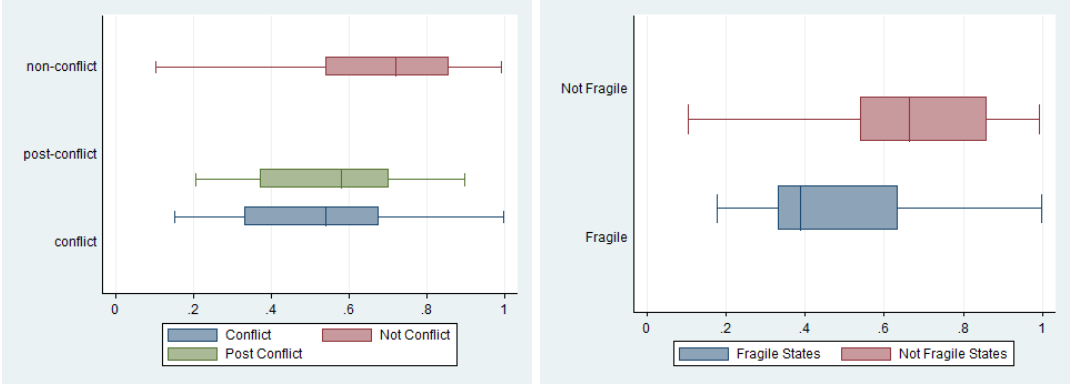
<sup>11</sup>We assume that the autocorrelation is similar for all panels. Estimated autocorrelation is relatively weak, at about  $\hat{\rho} = 0.35$ .

Table 7: Effect of Conflict on Annual Growth in GDP per Capita (PPP, logged), 1960–2005, OLS with Panel-Corrected Standard Errors

	(1) C	(2) C with lags	(3) C, lags, FE	(4) BD	(5) BD with lags	(6) est6
conflict	-0.0160*** (0.00303)	-0.0178*** (0.00423)		-0.0168*** (0.00419)		
td65	0.0361** (0.0126)	0.0560** (0.0181)	0.0549** (0.0180)	0.0466** (0.0166)	0.0358** (0.0126)	
td70	0.0187 (0.0132)	0.0211 (0.0175)	0.0204 (0.0174)	0.0163 (0.0159)	0.0186 (0.0132)	
td75	0.00353 (0.0131)	0.00517 (0.0172)	0.00379 (0.0171)	0.00236 (0.0157)	0.00290 (0.0132)	
td80	-0.0101 (0.0128)	-0.00662 (0.0169)	-0.00800 (0.0168)	-0.0119 (0.0156)	-0.0113 (0.0128)	
td85	-0.00727 (0.0125)	-0.00553 (0.0166)	-0.00678 (0.0165)	-0.00981 (0.0154)	-0.00839 (0.0126)	
td90	-0.0206 (0.0124)	-0.00998 (0.0165)	-0.0111 (0.0164)	-0.0156 (0.0155)	-0.0221 (0.0124)	
td95	0.00807 (0.0122)	0.00834 (0.0164)	0.00738 (0.0163)	0.00237 (0.0154)	0.00695 (0.0122)	
td00	0.0132 (0.0122)	0.0152 (0.0163)	0.0147 (0.0162)	0.00538 (0.0154)	0.0127 (0.0122)	
td05	0.0181 (0.0124)	0.0193 (0.0166)	0.0197 (0.0165)	0.0105 (0.0156)	0.0186 (0.0124)	
conflict_1		-0.00571 (0.00459)	-0.0103* (0.00440)	-0.00473 (0.00466)		
conflict_2		0.00236 (0.00469)	-0.000982 (0.00474)	0.00300 (0.00473)		
conflict_3		-0.000136 (0.00482)	-0.00272 (0.00487)	-0.000121 (0.00482)		
conflict_4		0.00406 (0.00477)	0.00292 (0.00486)	0.00469 (0.00477)		
conflict_5		0.00358 (0.00480)	0.00287 (0.00488)	0.00435 (0.00484)		
conflict_6		0.00296 (0.00480)	0.00223 (0.00486)	0.00398 (0.00483)		
conflict_7		-0.00122 (0.00483)	-0.00160 (0.00488)	-0.00130 (0.00486)		
conflict_8		0.00528 (0.00485)	0.00431 (0.00489)	0.00483 (0.00487)		
conflict_9		-0.000564 (0.00475)	-0.0000236 (0.00481)	-0.0000683 (0.00480)		
conflict_10		0.00236 (0.00435)	0.00235 (0.00440)	0.00193 (0.00430)		
bd					-0.00220*** (0.000656)	-0.00237* (0.00101)
bd_1						-0.00111 (0.00108)
bd_2						0.00215* (0.00109)
bd_3						-0.00103 (0.00109)
bd_4						-0.000803 (0.00107)
bd_5						0.000377 (0.00108)
bd_6						-0.0000260 (0.00108)
bd_7						-0.000445 (0.00109)
bd_8						0.00163 (0.00110)
bd_9						0.00122 (0.00107)
bd_10						-0.000501 (0.00100)
Constant	0.0172 (0.0106)	0.0141 (0.0152)	0.0143 (0.0151)	0.0162 (0.0135)	0.0165 (0.0106)	0.0225*** (0.00394)
Observations	5956	5235	5235	5235	5960	5235
Log likelihood						
$\chi^2$	81.81	91.30	59.60	32611.0	61.81	21.05

Standard errors in parentheses  
\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$   
C: measure. BD: Battle Deaths measure

Figure 7: Distribution of secondary education attainment rates in 2000, by conflict and fragility

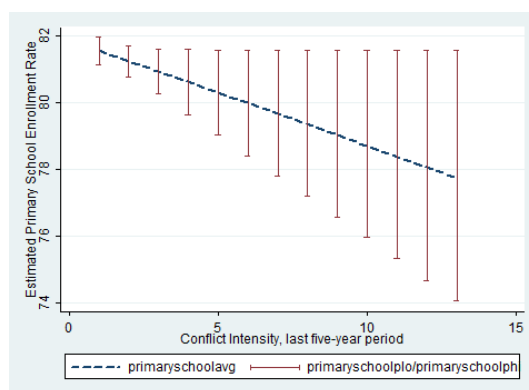


growth is often seen as the way out of a *conflict trap*. The effect of conflict on education has received more systematic attention from researchers than poverty and hunger. There exists several African country studies (see e.g. edited Addison), that all report significant negative effects of conflict. In a study on the educational cost of World War II, Ichino and Winter-Ebmer (2004) find that children of school age during that war received less education than children in neutral countries. Furthermore, these individuals experienced a significant earnings gap 40 years after the conflict had ended. World War II clearly is unique in terms of size and severity, but researchers find similar results for civil conflicts as well. On the aggregate level Lai and Thyne (2007) find that during civil war a state “reduces its educational expenditures by 3,1 % to 3,6 % each year”<sup>4</sup>. Perhaps more significantly the authors find that this reduction in spending is not due to a “guns for butter” tradeoff but that civil wars disrupt a state’s “general ability to provide social services like education to its citizenry”. The authors find a similar effect of conflict on enrollment. This is perhaps more disturbing since such an effect is likely to linger on long after the conflict has ended. In a report on Afghanistan, Human Rights Watch (2007, 74) document several direct attacks against schools, and argue that schools might become the target of attacks because they are seen as “symbols of the government or the work of foreigners”. Such an argument has not, to the best of our knowledge, been made for other conflicts however.

### 3.2.3 Empirical Analysis

Table 8 shows the results from estimating fixed-effects regression models of the effect of conflict on primary education enrollment as a percentage of the relevant age group.<sup>12</sup> The first column presents results for a model with the ‘Conflict’ variable as well as its interaction with the country’s population size. The estimates indicate that conflicts adversely affect enrollment rates for small countries. Figure 8 shows how estimated primary school enrollment rates change with conflict in the country. The wide confidence band shows that the result is not statistically significant.

Figure 8: Estimated average enrollment in primary education, by ln(battle deaths)



In Model 2 we have removed the interaction term with population. This model shows no relationship between conflict and primary school enrollment rates. In Model 3, we replace the ‘Conflict’ variable with the battle deaths variable. Again, the analysis shows no effect of conflict. The AR(1) model in column 5 yields similar results.

The state fragility index seems to be associated with primary school enrollment rates, but in opposite direction of what one would expect – fragile states seem to have enrollment rates 8 percentage points higher.

Table 9 shows the same set of models for male secondary school attainment rates, measured as the percentage of the relevant age group. Again, there is no discernible effect of conflict on education levels in the country – none of the estimates are statistically significant.

Conflicts in the neighborhood seem to hurt secondary education, however. Countries that have a neighbor that had five years of minor conflict in the preceding period experience an average reduction in education attainment of 1.3%. This roughly corresponds to losing 3–4

<sup>12</sup>Variable name in WB dataset: se-prm-nenr. Source: WDI???

Table 8: Effect of Conflict on Primary Education Attainment, 1995–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td80	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td85	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td90	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td95	0	0	0	0	78.13
	(.)	(.)	(.)	(.)	(.)
td00	0.462	0.427	0.369	0.0510	81.40
	(0.993)	(0.994)	(0.991)	(0.968)	(.)
td05	1.715	1.671	1.523	0.793	84.32
	(1.402)	(1.411)	(1.407)	(1.335)	(.)
logged total population	32.58***	32.57***	32.82***	33.13***	0.452
	(6.502)	(6.561)	(6.534)	(6.366)	(.)
conflict_1	0.116				-0.798
	(0.316)				(.)
lneiconf_5	0.329	0.321	0.328		-0.618
	(0.199)	(0.198)	(0.197)		(.)
lnbdeadb1_5		0.0116	-0.159		
		(0.186)	(0.210)		
bdbpop1_5			0.222		
			(0.130)		
fsida_5				7.006***	
				(2.079)	
Constant	-209.2***	-209.0***	-211.2***	-212.9***	0
	(56.84)	(57.32)	(57.09)	(55.67)	(.)
Observations	359	359	359	359	359
Log likelihood	-1050.9	-1051.0	-1048.6	-1044.2	
$\chi^2$					.

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 9: Effect of Conflict on Secondary Education Attainment, 1970–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	0.0424*** (0.00767)	0.0425*** (0.00767)	0.0422*** (0.00766)	0.0444*** (0.00783)	0.0508*** (0.00556)
td80	0.0791*** (0.00809)	0.0792*** (0.00811)	0.0783*** (0.00811)	0.0766*** (0.00825)	0.0981*** (0.00870)
td85	0.119*** (0.00889)	0.119*** (0.00887)	0.118*** (0.00887)	0.115*** (0.00891)	0.151*** (0.0111)
td90	0.148*** (0.00979)	0.148*** (0.00979)	0.147*** (0.00979)	0.143*** (0.00973)	0.192*** (0.0137)
td95	0.173*** (0.0106)	0.174*** (0.0106)	0.172*** (0.0106)	0.167*** (0.0104)	0.226*** (0.0116)
td00	0.192*** (0.0114)	0.192*** (0.0114)	0.190*** (0.0114)	0.186*** (0.0113)	0.251*** (0.0123)
td05	0.211*** (0.0121)	0.211*** (0.0120)	0.208*** (0.0121)	0.208*** (0.0121)	0.275*** (0.0130)
logged total population	0.0645*** (0.0132)	0.0643*** (0.0132)	0.0655*** (0.0132)	0.0675*** (0.0131)	-0.00463 (0.00568)
conflict_1	-0.000117 (0.00112)				-0.00187 (0.00110)
lneiconf_5	-0.00252** (0.000838)	-0.00251** (0.000837)	-0.00244** (0.000837)		-0.00183 (0.00127)
lnbdeadb1.5		-0.000228 (0.000739)	-0.00120 (0.000887)		
bdbpop1.5			0.00100* (0.000506)		
fsida_5				0.000516 (0.00684)	
Constant	-0.158 (0.110)	-0.156 (0.110)	-0.166 (0.110)	-0.194 (0.110)	0.425*** (0.0526)
Observations	1081	1081	1081	1082	1081
Log likelihood	1629.7	1629.7	1632.0	1626.1	
$\chi^2$					742.5

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

years of development relative to similar countries located in peaceful neighborhoods.

### 3.3 MDG 3: Gender Parity

Measures: Difference in male and female education levels? Difference in male and female life expectancy?

#### 3.3.1 Global Trends

[In graphs and brief discussion here]

Figure 9 shows trends in the ratio of female to male primary school enrollment levels.

Figure 9: Trends in female-to-male primary education enrollment ratio 1990–2008, by conflict and fragility

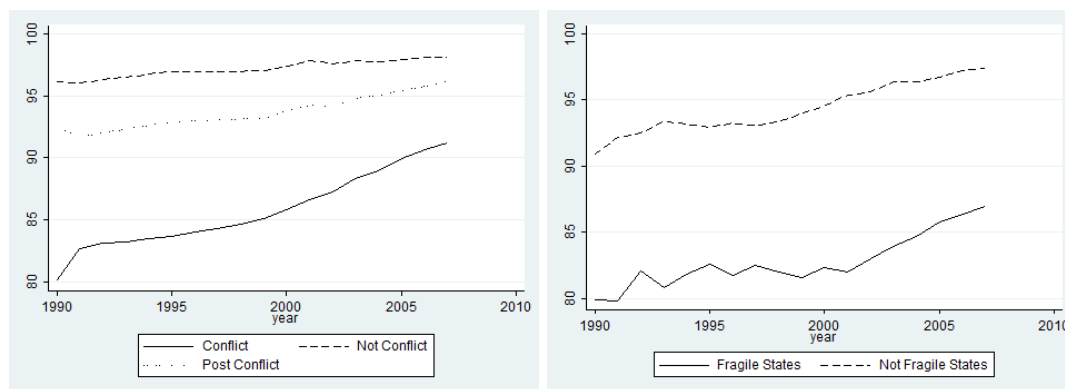


Figure 10 shows the distribution...

Figure 10: Distribution of female-to-male primary education enrollment ratio in 2000, by conflict and fragility

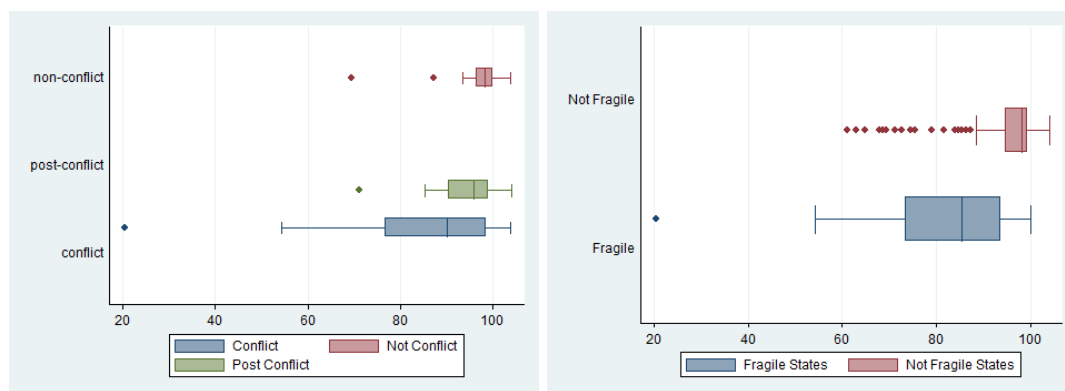


Figure 11 shows trends in the ratio of female to male life expectancy.

Figure 12 shows the distribution...

Figure 11: Trends in female-to-male life expectancy ratio 19XX–2005, by conflict and fragility

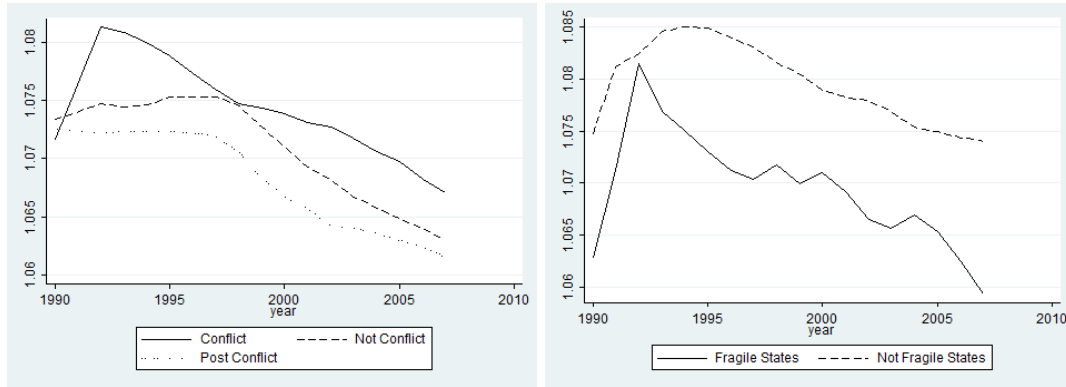
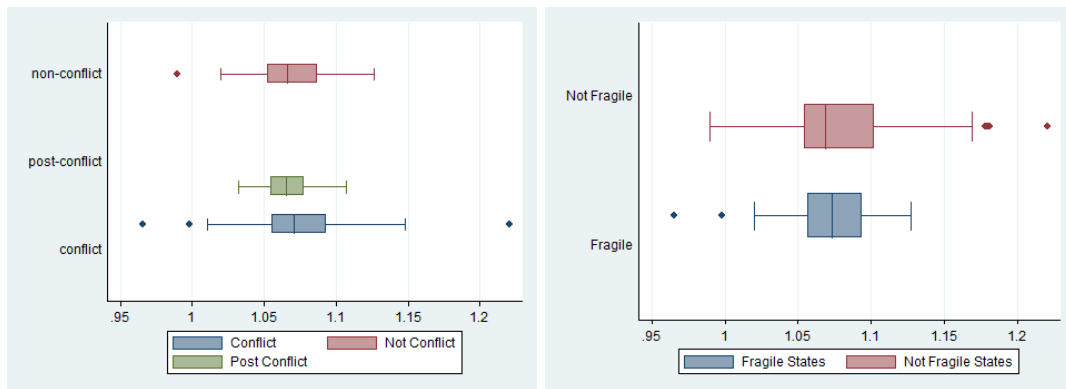


Figure 12: Distribution of female-to-male life expectancy ratio in 2000, by conflict and fragility



– negative effects on growth and mortality probably tend to hurt the progress toward the MDG3

### 3.3.2 Literature on Effects of Conflict on Gender Equality

With the adoption by the United Nations Security Council of resolution 1325 on “Women, Peace and Security” there has been a growing interest in gender and war. There is a burgeoning literature on gender and conflict, but mainly with conflict as the *dependent* variable. Caprioli (2000) and Caprioli and Boyer (2001) study various forms of interstate crisis and find that having more gender equality at the domestic level leads to states behaving more peacefully in international relations. Similarly Melander (2005 *a,b*) finds gender equality to be negatively correlated with human rights abuses as well as intrastate conflict.

Some studies find conflicts to harm women more than men, however, despite the fact that most soldiers are men. International Committee of the Red Cross (2001, p. 28) argues that “women are particularly susceptible to marginalization, poverty and the suffering engendered

by armed conflict, especially when they are already victims of discrimination in peacetime”. The United Nations Development Fund for Women (Rehn and Sirleaf 2002, p. 6) argues that “The magnitude of violence suffered by women before, during and after conflict is overwhelming”. The most systematic study of the impact of armed conflict on gender differences in conflict effects has been carried out by Neumayer and Plümper (2006). They find a significant and largely robust negative effect of conflict on female life expectancy, and conclude that “a civil war reduces [the female to male life expectancy ratio] by 0.34 percentage points” and that this shows that “the direct and indirect consequences of wars combined either kill more women than men or that the killed women are younger on average than the killed men” (Neumayer and Plümper 2006, 744, 747).

### 3.3.3 Empirical Analysis

... Table 10 shows the standard set of models run with the ratio of female to male primary school enrollment (measured as a percentage) .<sup>13</sup>

The results of this analysis are contra-intuitive. In contrast to the clear negative relationship between conflict and gender parity seen in Figures 9 and 10, the analysis indicates a positive relationship....<sup>14</sup>

## 3.4 MDG 4: Infant Mortality Rates

### 3.4.1 Global Trends

[In graphs and brief discussion here] <sup>15</sup> Figure 13 shows the trends in log infant mortality rates for non-conflict, post-conflict and conflict countries.

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<sup>13</sup>Source: United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics. Note: Break in series between 1997 and 1998 due to change from International Standard Classification of Education (ISCED76) to ISCED97. Recent data are provisional.

<sup>14</sup>We are working on some explanations of this. Gender parity is difficult to analyze, because the trend within each country shows a very predictable movement towards gender parity. Some countries move towards parity faster than other countries, and this unobserved quantity is apparently highly correlated with population size. When we add country fixed effects, the global time fixed effects are less efficient than population, which end up being strongly positive. Compare this with the AR(1) model, where the temporal fixed effects are strong but where population is not. Similarly, the post-conflict indicators are also more likely to show up late in the dataset, and might therefore pick up this trend. In the CFE models, conflict appears to be leveling out gender differences, whereas there seems to be no effect in the AR(1) model. Neither of these models appear very trustworthy. Observing that the lagged dependent variable account for 91% of the variance in gender parity, we use this variable and population to create a set of matched observations. Based on these matches, we find a statistically significant effect of -3.10 from the presence of any conflict in the preceding ten years on gender parity. This latter result throws further doubt on the positive effect from the fixed effects models.

<sup>15</sup>Variable name in WB dataset: ssp\_dyn\_imrt\_in. Source: WDI???

Table 10: Effect of Conflict on Parity in Primary School Enrollment, 1970–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	-1.207 (1.477)	-1.128 (1.484)	-1.178 (1.483)	-1.378 (1.508)	1.581 (1.622)
td80	-0.463 (1.546)	-0.271 (1.552)	-0.373 (1.552)	0.351 (1.571)	6.082** (1.871)
td85	-0.871 (1.667)	-0.500 (1.669)	-0.581 (1.668)	0.493 (1.680)	8.888*** (2.050)
td90	-0.957 (1.798)	-0.547 (1.801)	-0.631 (1.799)	0.624 (1.807)	11.37*** (2.179)
td95	-1.779 (1.937)	-1.233 (1.935)	-1.347 (1.934)	0.110 (1.940)	12.71*** (2.219)
td00	-2.047 (2.061)	-1.541 (2.063)	-1.704 (2.063)	-0.346 (2.074)	14.01*** (2.252)
td05	-0.551 (2.174)	-0.0289 (2.176)	-0.254 (2.178)	0.486 (2.201)	16.39*** (2.294)
logged total population	19.13*** (2.123)	18.71*** (2.127)	18.77*** (2.125)	18.52*** (2.153)	-0.896** (0.331)
conflict_1	0.479*** (0.145)				-0.113 (0.198)
lneiconf_5	0.481*** (0.111)	0.495*** (0.112)	0.501*** (0.112)		-0.0292 (0.142)
lnbdeadb1_5		0.180 (0.0977)	0.0704 (0.117)		
bdbpop1_5			0.109 (0.0648)		
fsida_5				1.240 (0.940)	
Constant	-80.55*** (17.60)	-77.10*** (17.64)	-77.52*** (17.62)	-73.64*** (17.84)	86.51*** (3.378)
Observations	943	943	943	943	943
Log likelihood	-3098.1	-3102.5	-3100.8	-3115.7	
$\chi^2$					228.0

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 11: Effect of Conflict on Female to Male Life Expectancy, 1970–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	0.551** (0.197)	0.533** (0.196)	0.526** (0.196)	0.482* (0.200)	0.328* (0.157)
td80	1.069*** (0.209)	1.042*** (0.209)	1.021*** (0.209)	1.103*** (0.213)	0.772*** (0.231)
td85	1.451*** (0.232)	1.436*** (0.230)	1.414*** (0.231)	1.544*** (0.232)	1.074*** (0.289)
td90	1.935*** (0.257)	1.905*** (0.256)	1.879*** (0.257)	2.056*** (0.256)	1.441*** (0.349)
td95	2.332*** (0.283)	2.319*** (0.281)	2.286*** (0.282)	2.489*** (0.279)	1.739*** (0.289)
td00	1.988*** (0.305)	1.968*** (0.304)	1.922*** (0.305)	2.128*** (0.302)	1.195*** (0.281)
td05	1.797*** (0.325)	1.780*** (0.323)	1.721*** (0.325)	1.877*** (0.325)	0.750* (0.292)
logged total population	-1.963*** (0.359)	-1.933*** (0.357)	-1.896*** (0.358)	-2.072*** (0.359)	-0.0309 (0.115)
conflict_1	0.0517 (0.0285)				0.0228 (0.0306)
lneiconf_5	0.0453* (0.0214)	0.0443* (0.0213)	0.0455* (0.0213)		-0.0190 (0.0251)
lnbdeadb1_5		0.0551** (0.0187)	0.0354 (0.0225)		
bdbpop1_5			0.0202 (0.0128)		
fsida_5				0.123 (0.175)	
Constant	122.6*** (3.003)	122.3*** (2.991)	122.0*** (2.995)	123.8*** (2.996)	106.9*** (1.183)
Observations	1072	1072	1072	1072	1072
Log likelihood	-1851.8	-1848.7	-1847.2	-1856.4	
$\chi^2$					87.38

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Figure 13: Trends in average infant mortality rates 1990–2008, by conflict and fragility

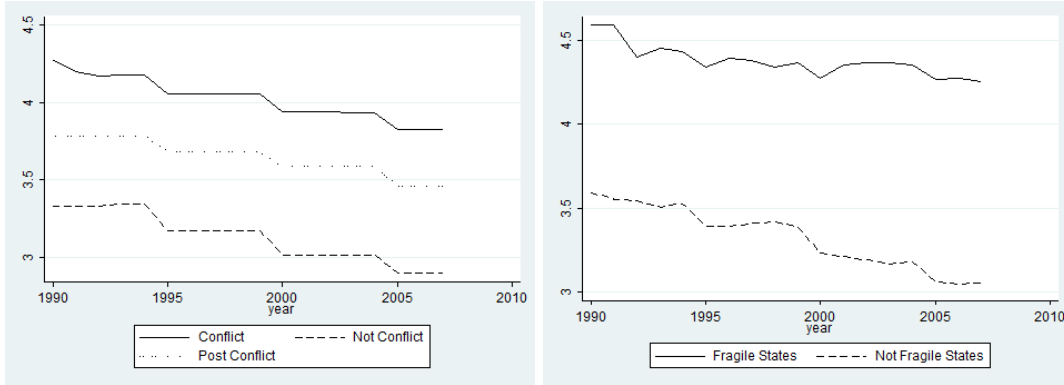
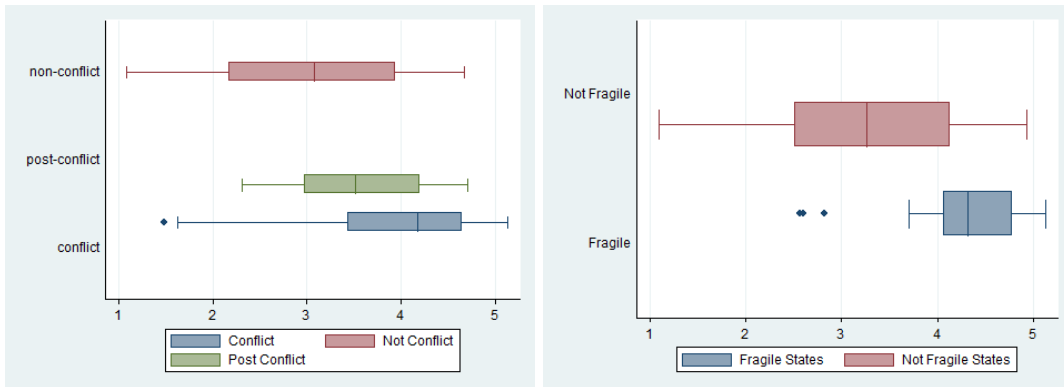


Figure 14 shows...

Figure 14: Distribution of average infant mortality rates in 2000, by conflict and fragility



### 3.4.2 Literature on Effects of Conflict on Infant Mortality

Infant mortality is highly correlated with other indicators of socio-economic development such as GDP per capita. Effects of conflict on infant mortality are likely to be similar to those for GDP per capita. Infant mortality rates (IMR) are often employed as a proxy for a state's general socio-economic development as an independent variable (Abouharb and Kimball 2007) since the data coverage for infant mortality is good in every region of the world.

Davis and Kuritsky (2002); Ammons (1996); ? all find that conflict increases infant mortality. For Sub-Saharan Africa, (Davis and Kuritsky 2002, 9)<sup>16</sup> find that countries that experienced conflict had average infant mortality rates 10 % higher than those without any conflict experience. In contrast to the fixed effects analysis we will utilize below, ?, 8 conduct a a cross-national time-series regression. The most recent and comprehensive study on the

<sup>16</sup>Konfliktdata: Sivard R. World Military and Social Expenditures

effect of conflict on infant mortality is Iqbal (2010). Employing econometric models similar to ours she finds that infant mortality is increased by conflict. Her finding, however, is not very robust. She attributes the lack of a highly significant and robust relationship to “the possibility that during protracted conflicts, populations adjust to societal conditions and appropriately guard against infant mortality. Consequently, as the conflict perpetuates, the increase in infant mortality caused by major conflict during the first year is addressed by societies through capacity building and resource allocation” (Iqbal 2010, p. 88).

### **3.4.3 Empirical Analysis**

Table 12 shows results from estimating a set of fixed-effects models with log infant mortality rates as dependent variable and various operationalizations of conflict as main independent variables. The analysis indicates that conflicts has a detrimental effect on infant mortality rates. We do not find the effect to be clearly contingent on the size of the country.

The results in Model 1 indicate that one year of minor conflict increase log infant mortality rates by 0.0113, or approximately 1.13%. For a country with infant mortality rates at 75 per 1000 live births (typical of SSA in 2005), this translates into an increase to 75.9 per thousand. The estimates imply that a 5-year major conflict increases mortality rates to 84. This is a considerably change. In a typical country about 250,000 children are born every year. Increasing infant mortality rates from 75 to 75.9 means a surplus mortality of 225 children per year. Increasing to 84 translates into a surplus infant mortality of 2250 per year. These estimates imply that infant mortality rates are of the same magnitude as the number of direct battle deaths in the conflict. In Africa South of Sahara, average infant mortality rates were reduced from about 94 in 1985 to 75 in 2005. The effect of five years of civil war, then, is typically to set a country back 10 years relative to African countries that avoided conflict.

Model 3 estimates the relationship between infant mortality rates and the battle deaths measure. Figure 15 shows the estimated relationship based on the model – infant mortality increases strongly in conflict. The relationship is statistically significant as reflected in the narrow confidence bands for the estimates.

Model 4 estimates the relationship between fragile state status and infant mortality. The relationship is very clear and of the same magnitude as a major conflict. Fragile states have infant mortality rates roughly 10% higher than comparable countries according to these

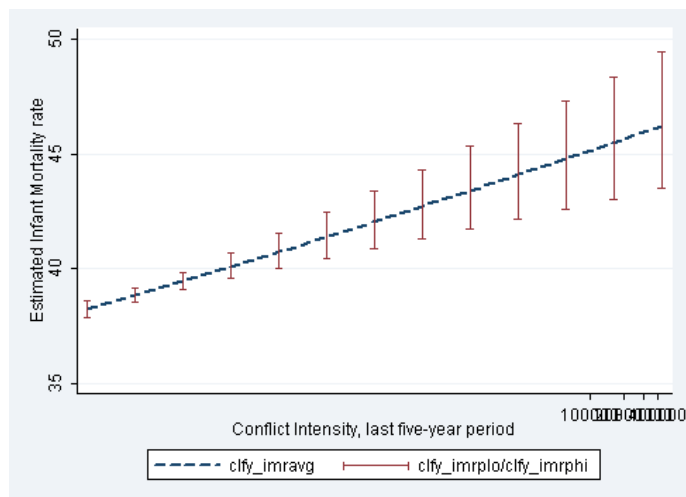
Table 12: Effect of Conflict on Infant Mortality Rates, 1970–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	-0.186*** (0.0308)	-0.191*** (0.0305)	-0.190*** (0.0305)	-0.212*** (0.0311)	-0.162*** (0.00671)
td80	-0.421*** (0.0323)	-0.428*** (0.0320)	-0.423*** (0.0320)	-0.433*** (0.0325)	-0.353*** (0.0109)
td85	-0.633*** (0.0359)	-0.638*** (0.0356)	-0.632*** (0.0356)	-0.635*** (0.0356)	-0.535*** (0.0190)
td90	-0.815*** (0.0395)	-0.824*** (0.0392)	-0.818*** (0.0392)	-0.808*** (0.0388)	-0.687*** (0.0241)
td95	-0.970*** (0.0435)	-0.975*** (0.0430)	-0.967*** (0.0430)	-0.952*** (0.0424)	-0.827*** (0.0173)
td00	-1.145*** (0.0469)	-1.151*** (0.0464)	-1.141*** (0.0465)	-1.129*** (0.0460)	-0.978*** (0.0202)
td05	-1.321*** (0.0498)	-1.327*** (0.0493)	-1.314*** (0.0496)	-1.312*** (0.0494)	-1.135*** (0.0227)
logged total population	0.320*** (0.0549)	0.328*** (0.0544)	0.320*** (0.0544)	0.287*** (0.0545)	0.0776*** (0.0211)
conflict_1	0.0112* (0.00434)				0.00824** (0.00289)
lneiconf_5	0.00476 (0.00325)	0.00451 (0.00322)	0.00424 (0.00322)		0.00395 (0.00268)
lnbdeadb1.5		0.0127*** (0.00282)	0.0170*** (0.00341)		
bdbpop1.5			-0.00428* (0.00193)		
fsida_5				0.0997*** (0.0270)	
Constant	1.742*** (0.462)	1.666*** (0.458)	1.733*** (0.458)	2.047*** (0.457)	3.726*** (0.187)
Observations	1040	1040	1040	1040	1040
Log likelihood	182.8	190.8	193.7	185.3	
$\chi^2$					7828.9

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Figure 15: Estimated average infant mortality rates, by  $\ln(\text{battle deaths})$



estimates.

In contrast to Iqbal (2010), we find the effect of conflict on IMR to be strong and robust. The finding holds for different specifications of conflict, and in Table 13 we show the corresponding results from estimating the effect of conflict on under-5 child mortality rates. The results for this indicator are almost similar to those for infant mortality.

### 3.5 MDG 5: Maternal Mortality/Birth Attendance

#### 3.5.1 Global Trends

#### 3.5.2 Literature on Effects of Conflict on Maternal Mortality

The literature on the effect of conflict on maternal mortality is scarce and firm conclusions can not be drawn from it. Maternal mortality rates, however, are highly correlated with other health indicators such as infant mortality rates (corr estimat?), and a number of studies do find that conflict adversely affects maternal mortality rates. O’Hare and Southall (2007, 564)<sup>17</sup> find for Sub-Saharan Africa that “the median adjusted maternal mortality in countries with recent conflict was 1000/100,000 births versus 690/100,000 births in countries without recent conflict”. Hill et al. (2007) do not study the effect of conflict in particular, but they find that of all global maternal deaths, 50% occurred in Sub-Saharan Africa, a region with relatively high prevalence of conflict. As is the case for most of the articles reviewed in this paper, the study may suffer from omitted variable bias. And other studies report divergent

<sup>17</sup>Konfliktdata: IDS Working paper 128. Institute of Development Studies, 2001

Table 13: Effect of Conflict on Under-5 Mortality Rates, 1970–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	xtreg, AR(1)
td75	-0.203*** (0.0346)	-0.210*** (0.0343)	-0.209*** (0.0343)	-0.224*** (0.0337)	-0.177*** (0.0196)
td80	-0.452*** (0.0358)	-0.461*** (0.0355)	-0.458*** (0.0355)	-0.457*** (0.0350)	-0.384*** (0.0277)
td85	-0.685*** (0.0402)	-0.693*** (0.0398)	-0.687*** (0.0398)	-0.668*** (0.0385)	-0.584*** (0.0342)
td90	-0.871*** (0.0444)	-0.885*** (0.0440)	-0.879*** (0.0441)	-0.843*** (0.0418)	-0.746*** (0.0399)
td95	-1.037*** (0.0491)	-1.049*** (0.0486)	-1.040*** (0.0487)	-0.985*** (0.0457)	-0.891*** (0.0448)
td00	-1.209*** (0.0533)	-1.223*** (0.0528)	-1.210*** (0.0531)	-1.165*** (0.0496)	-1.049*** (0.0493)
td05	-1.396*** (0.0567)	-1.409*** (0.0561)	-1.394*** (0.0566)	-1.357*** (0.0531)	-1.229*** (0.0531)
logged total population	0.285*** (0.0631)	0.295*** (0.0624)	0.286*** (0.0625)	0.202*** (0.0588)	0.0844* (0.0401)
conflict_1	0.0112* (0.00477)				0.00494 (0.00363)
lneiconf_5	0.00629 (0.00365)	0.00644 (0.00361)	0.00628 (0.00360)		0.000599 (0.00272)
lnbdeadb1_5		0.0151*** (0.00335)	0.0190*** (0.00394)		
bdbpop1_5			-0.00446 (0.00238)		
fsida_5				0.106*** (0.0293)	
Constant	2.391*** (0.535)	2.304*** (0.529)	2.382*** (0.530)	3.130*** (0.494)	4.092*** (0.343)
Observations	982	982	982	1018	940
Log likelihood	107.4	116.1	118.1	112.2	
$\chi^2$					710.9

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

findings. In a case study of the city Beira in Mozambique, Cutts et al. (1996) do not find a strong connection between conflict and maternal mortality. (Murray et al. 2002, 347) do not look explicitly at maternal mortality, but find that war increases mortality in general. They argue, however, that “considerably more research is needed on this question to before the global results on the indirect effects of conflict on mortality can be assessed”.

### **3.5.3 Empirical Analysis**

Data for maternal mortality are too sparse to allow the type of statistical study we use here, and we have to resort to a proxy. Other studies show that maternal mortality can be effectively reduced when births take place in the presence of skilled medical personnel. Table 14 shows the results from a set of models estimating the relationship between civil conflict and the proportion of births attended by skilled medical personnel.<sup>18</sup> The data are very sparse, covering only about half of low-income countries in 2000, and considerably fewer countries in 2005 and 1995. Data before 1995 are not available.

Our standard set models indicate no relationship between conflict and birth attendance. We also estimated simpler regression models. The results obtained are very uncertain, indicating that countries with recent conflict have 1–2 percent lower proportion of births with skilled medical attendance.

## **3.6 MDG 6: Combat HIV/AIDS**

### **3.6.1 Global Trends**

Figure 16 shows the trends in prevalence of HIV/AIDS 1990–2008.

Figure 17 shows the distribution for the year 2000.

### **3.6.2 Literature on Effects of Conflict**

Conflict and HIV/AIDS prevalence relate to each other in a complicated fashion. In contrast to the other MDG goals, some of the otherwise detrimental effects of conflict may possibly prevent the spread of the disease. There are evidence for detrimental effects of conflict. Violence often causes large-scale migration (Moore and Shellman 2004; Davenport, Moore and Poe 2003), and refugees and refugee camps can greatly facilitate the transmission of

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<sup>18</sup>Variable name in WB dataset: XXXX. Source: WDI???

Table 14: Effect of Conflict on Births Attended by Skilled Health Workers, 1995–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td80	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td85	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td90	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td95	0	0	0	0	-4.287
	(.)	(.)	(.)	(.)	(.)
td00	1.491*	1.377*	1.386*	1.307*	-3.140
	(0.672)	(0.675)	(0.677)	(0.645)	(.)
td05	2.637**	2.661**	2.669**	2.449**	0
	(0.875)	(0.882)	(0.885)	(0.810)	(.)
logged total population	16.57***	16.11***	16.29***	17.12***	-2.711
	(4.588)	(4.613)	(4.638)	(4.443)	(.)
conflict_1	0.421				-1.504
	(0.276)				(.)
lneiconf_5	0.00314	-0.0109	-0.0122		-0.327
	(0.138)	(0.140)	(0.140)		(.)
lnbdeadbest1_5		0.0976	0.144		
		(0.162)	(0.184)		
bdbpop1_5			-0.0642		
			(0.120)		
fsida_5				3.471*	
				(1.511)	
Constant	-75.23	-70.72	-72.30	-80.30*	104.4
	(41.12)	(41.32)	(41.54)	(39.93)	(.)
Observations	257	257	257	258	257
Log likelihood	-580.4	-582.4	-582.1	-579.7	
$\chi^2$					.

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Figure 16: Trends in average prevalence of HIV/AIDS 1990–2008, by conflict and fragility

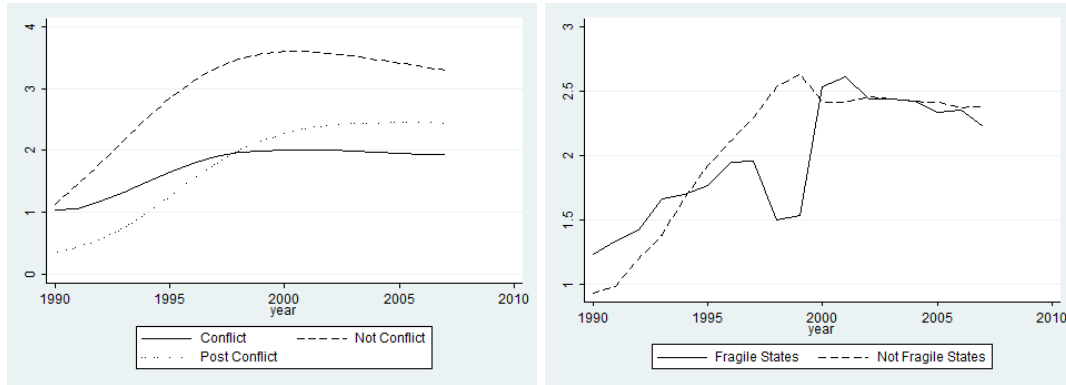
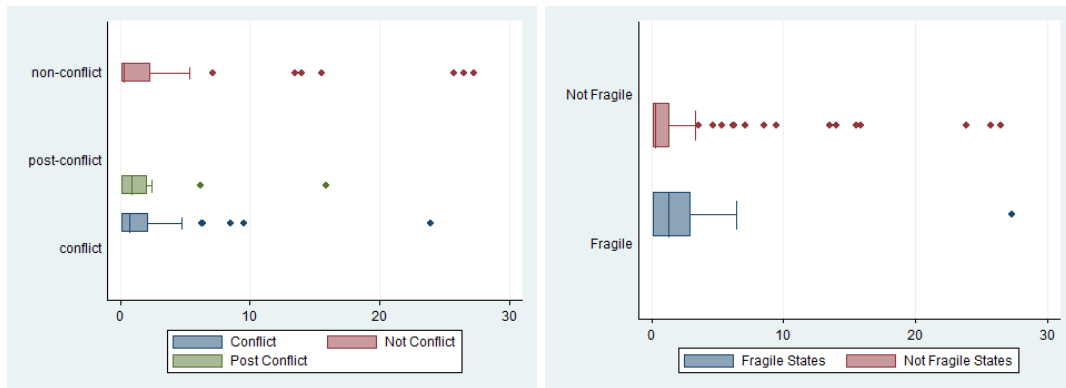


Figure 17: Distribution of prevalence of HIV/AIDS in 2000, by conflict and fragility



HIV/AIDS as well as other infectious diseases. War can also facilitate the spread of HIV/AIDS given the increase of sexual violence often seen during conflicts. Elbe (2002) investigates how HIV/AIDS has changed the way wars are fought, and argues that the epidemic has had an impact on the “nature and conduct of armed conflict in Africa”. HIV/AIDS Elbe (2002) argues has influenced three components of armed conflicts in Africa: their combatants, “by diminishing the operational efficiency of many of Africa’s armed forces“ (p. 163); how the conflicts are conducted, by providing armed forces with “a novel psychological and biological weapon of war“ (p. 167), and their social significance, “by significantly increasing the number of eventual war-related casualties“ (p. 171).

A few medical studies assess the net effect of conflict on HIV/AIDS prevalence. Using UCDP/PRIO Conflict data as the basis for making an index of armed conflict level ranging from 0 to 30, i.e. the number of years a country is in conflict, Strand et al. (2007) find a marked negative effect of conflict on HIV/AIDS which they attribute to “constraints in population mobility and normal civil interactions” and possible also the “disruption of medical services

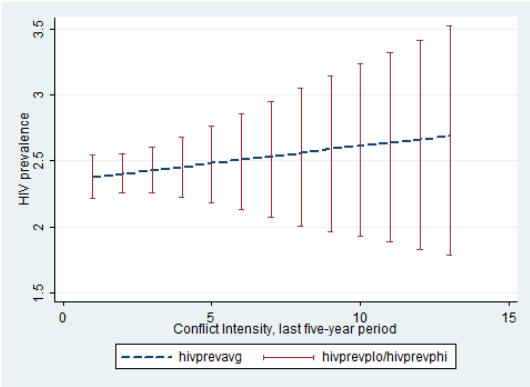
(e.g. vaccination campaigns), where contaminated needles have been reported to account for an important part of HIV transmission during peace time” (Strand et al. 2007, p. 470). Similarly, Spiegel et al. (2007) do not find any evidence for the claim that conflict increases HIV prevalence in a study of seven Sub-Saharan African countries. In contrast, Mansson et al. (2009) find in a study of police officers in Guinea-Bissau a positive effect of conflict on HIV/AIDS prevalence.

### 3.6.3 Empirical Analysis

Our analysis on the relationship between civil conflict and HIV/AIDS prevalence is reported in Table 15. Prevalence is measured as the percentage of the population in the 15–49 age group that are HIV positive.<sup>19</sup> Data coverage for this indicator is a bit too sparse to allow drawing firm inferences. The analysis yields ambiguous results, reflecting the conclusions from the literature review. Model 1 implies that small countries with conflict have a somewhat higher HIV prevalence than small non-conflict countries. In large countries, however, the estimates indicate that conflicts reduce HIV prevalence. Conflict in neighboring countries, moreover, seem to reduce HIV prevalence.

The state fragility index, curiously, is also associated with lower HIV prevalence.

Figure 18: Estimated average HIV/AIDS prevalence, by ln(battle deaths)



<sup>19</sup>Variable name in WB dataset: sh\_dyn\_aids\_zs. Source: WDI???

Table 15: Effect of Conflict on HIV / AIDS Sero-Prevalence, 1990–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td80	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td85	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td90	0	0	0	-1.533***	-1.989***
	(.)	(.)	(.)	(0.428)	(0.338)
td95	1.555***	1.542***	1.510***	0	-0.447
	(0.416)	(0.417)	(0.413)	(.)	(0.235)
td00	1.883***	1.872***	1.845***	0.557	0.147
	(0.527)	(0.527)	(0.522)	(0.407)	(0.122)
td05	1.413*	1.389*	1.423*	0.372	0
	(0.649)	(0.648)	(0.643)	(0.491)	(.)
logged total population	2.152	2.276	2.551	1.742	-0.131
	(1.859)	(1.851)	(1.839)	(1.860)	(0.173)
conflict_1	-0.0587				-0.0374
	(0.0918)				(0.0589)
lneiconf_5	-0.216***	-0.219***	-0.223***		-0.0670
	(0.0632)	(0.0633)	(0.0628)		(0.0666)
lnbdeadb1_5		-0.0162	0.0265		
		(0.0589)	(0.0611)		
bdbpop1_5			-0.115*		
			(0.0484)		
fsida_5				-0.867	
				(0.609)	
Constant	-16.80	-17.92	-20.25	-12.82	4.057**
	(16.17)	(16.10)	(15.99)	(16.37)	(1.493)
Observations	389	389	389	389	389
Log likelihood	-819.2	-819.5	-815.4	-827.0	
$\chi^2$					51.85

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

### 3.7 MDG 7: Environmental Sustainability

#### 3.7.1 Global Trends

[In graphs and brief discussion here] We study two proxies for the goal of environmental sustainability. The first is the percentage of the population that has access to adequate sanitation.<sup>20</sup> The second is the percentage of the population with access to water.<sup>21</sup>

Figure 19 shows the trends in the percentage of the population with access to sanitation.

Figure 19: Trends in the percentage of population with at least adequate access to excreta disposal facilities, 1990–2006, by conflict and fragility

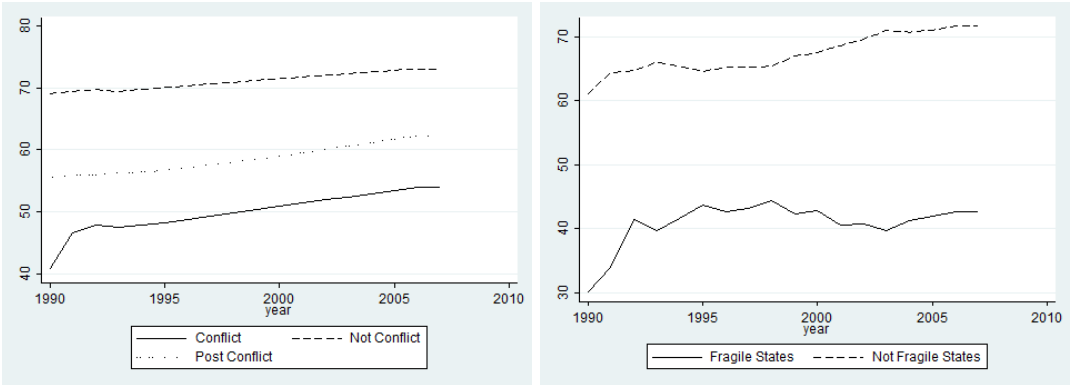


Figure 20 shows the distribution in the percentage of the population with access to sanitation.

Figure 20: Distribution of the percentage of population with at least adequate access to excreta disposal facilities, in 2000, by conflict and fragility

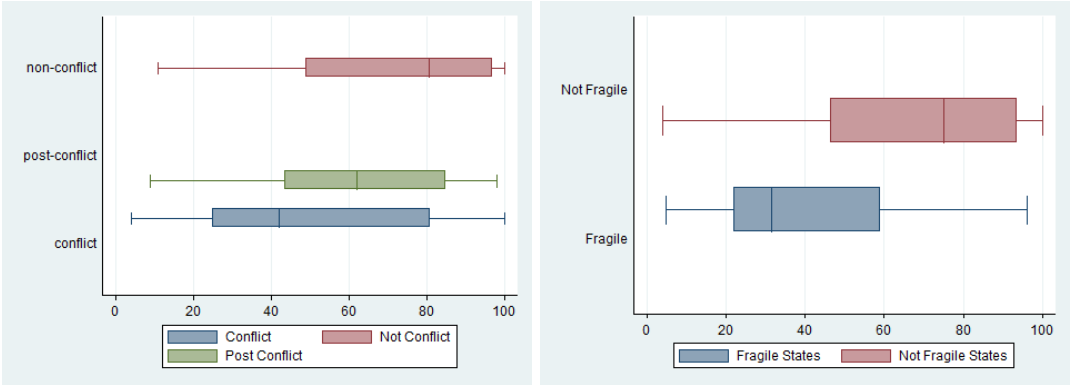


Figure 21 shows the trends in the percentage of the population with access to water.

<sup>20</sup>More precisely, the percentage of the population with at least adequate access to excreta disposal facilities. Improved facilities range from simple pit latrines to flush toilets. The variable is labeled sh\_sta.acs in the WDI.

<sup>21</sup>The percentage of population with access to an improved water source such as household connection, public standpipe, borehole, protected well or rainwater collection. A person must have access to at least 20 liters a day within one km. The variable is labeled sh.h2o.safe.zs in the WDI.

Figure 21: Trends in the percentage of population with access to an improved water source, 1990–2006, by conflict and fragility

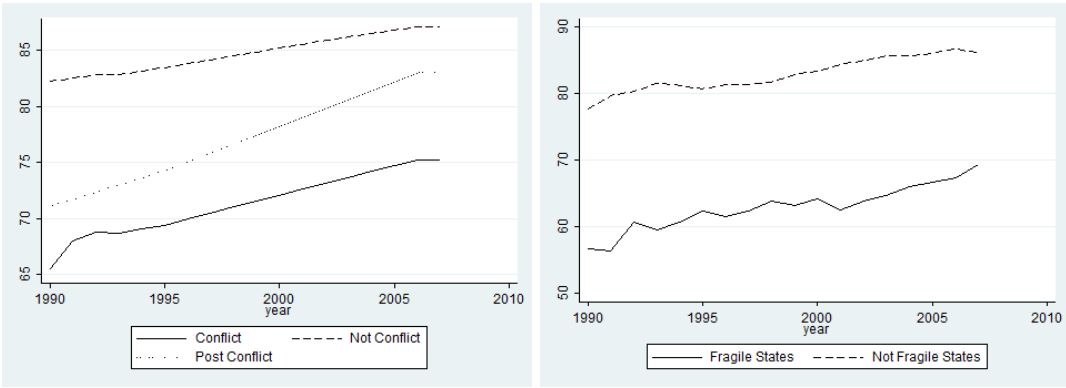
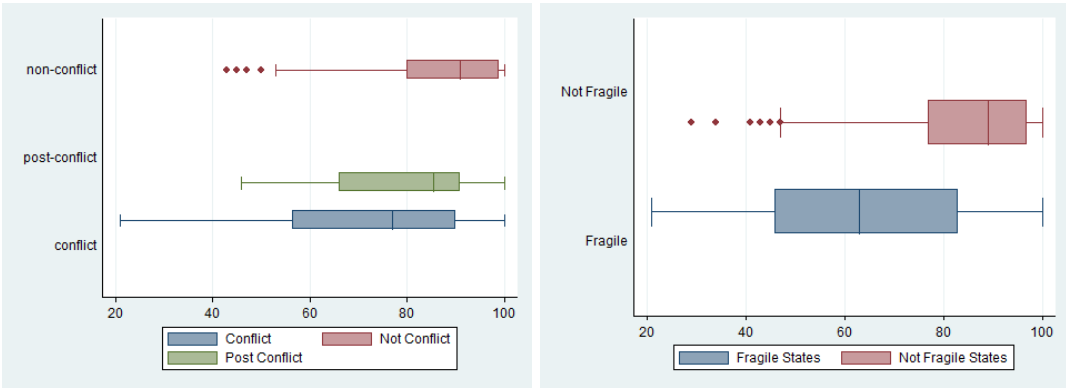


Figure 22 shows the distribution of the population with access to water.

Figure 22: Distribution of the percentage of population with access to an improved water source, in 2000, by conflict and fragility



**3.7.2 Literature on Effects of Conflict**

The literature on the effect of conflict on access to adequate water and sanitation facilities is at best scarce. Although there has been much interest in water as a dependent variable when explaining conflict (refs), almost no attention has been given to the consequences of conflict on people’s access to water supplies. The % of population without access to adequate water and sanitation facilities has gone down in every region of the world, but the shortfall between the MDG target and what has actually been achieved is greatest in the region with the most conflict, Sub-Saharan Africa (World Bank 2007). According to the same report less than 20 % of less developed countries are on track to reach the goal in access to water, and less than 35 % the goal in access to sanitation. Similar findings are reported by the (UN 2009, 45–46).

### 3.7.3 Empirical Analysis

Our analysis on the relationship between civil conflict and our environmental variables are reported in Tables 16 and 17. <sup>22</sup>

Table 16: Effect of Conflict on Access to Water, 1990–2005

	(1) Conflict	(2) Battle Deaths	(3) BD*Pop.	(4) Fragility	(5) PCSE, AR(1)
td75	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
td80	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
td85	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
td90	0 (.)	0 (.)	0 (.)	0 (.)	84.67 (.)
td95	2.133*** (0.640)	1.969** (0.639)	1.972** (0.640)	2.087** (0.645)	87.34 (.)
td00	4.048*** (0.785)	3.876*** (0.785)	3.891*** (0.790)	3.921*** (0.791)	89.59 (.)
td05	6.330*** (0.969)	6.104*** (0.969)	6.129*** (0.977)	5.880*** (0.961)	91.70 (.)
logged total population	5.719* (2.814)	6.474* (2.794)	6.443* (2.802)	7.341** (2.799)	-1.030 (.)
conflict_1	-0.381** (0.135)				-0.675 (.)
lneiconf_5	0.158 (0.0972)	0.159 (0.0975)	0.158 (0.0977)		-0.106 (.)
lnbdeadb1_5		-0.212* (0.0875)	-0.199 (0.106)		
bdbpop1_5			-0.0142 (0.0675)		
fsida_5				1.875 (1.102)	
Constant	22.48 (24.89)	15.67 (24.69)	15.95 (24.76)	7.924 (24.76)	0 (.)
Observations	515	515	515	515	515
Log likelihood	-1379.3	-1380.8	-1380.7	-1384.6	
$\chi^2$					.

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

<sup>22</sup>Variable name in WB dataset: sh\_dyn\_aids\_zs. Source: WDI???

Table 17: Effect of Conflict on Access to Sanitation, 1990–2005

	(1)	(2)	(3)	(4)	(5)
	Conflict	Battle Deaths	BD*Pop.	Fragility	PCSE, AR(1)
td75	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td80	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td85	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
td90	0	0	0	0	75.58***
	(.)	(.)	(.)	(.)	(10.76)
td95	2.314***	2.219***	2.191***	2.261***	78.23***
	(0.604)	(0.604)	(0.603)	(0.606)	(10.72)
td00	4.014***	3.925***	3.826***	3.993***	80.27***
	(0.741)	(0.742)	(0.744)	(0.741)	(10.73)
td05	5.692***	5.577***	5.416***	5.757***	82.07***
	(0.917)	(0.918)	(0.924)	(0.901)	(10.64)
logged total population	4.077	4.650	4.871	4.639	-1.901
	(2.651)	(2.639)	(2.640)	(2.625)	(1.180)
conflict_1	-0.209				-0.407*
	(0.127)				(0.194)
lneiconf_5	-0.0914	-0.0936	-0.0866		-0.186
	(0.0932)	(0.0935)	(0.0935)		(0.177)
lnbdeadbest1_5		-0.0343	-0.122		
		(0.0837)	(0.104)		
bdbpop1_5			0.0927		
			(0.0662)		
fsida_5				0.673	
				(1.019)	
Constant	20.82	15.50	13.52	14.78	0
	(23.52)	(23.40)	(23.41)	(23.31)	(.)
Observations	499	499	499	499	499
Log likelihood	-1301.2	-1303.0	-1301.6	-1303.5	
$\chi^2$					390.3

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

## 4 Political consequences

There is surprisingly little systematic comparative research on the political consequences of civil war. A handful of empirical studies document that civil wars tend to be followed by a surge in human rights abuses and restrictions on civil liberties (?) (Colaresi & Carey 2008). The impact of civil war on formal political institutions is less well studied, but some studies indicate that war results in centralization of authority (?) (Hegre, Elbadawi & Milante 2007; Hegre & Strand 2008). A related body of literature examines the endogeneity of democratization and interstate war (Mitchell et al 1999; Bueno de Mesquita et al. 1992; Rasler & Thompson 2004). Another body focuses on the impact of interstate war on leadership tenure (Goemans 2000; Goemans et al. n.d.; Bueno de Mesquita & Siverson 1995), but few if any studies have looked at these issues with regard to civil war. Another set of political consequences of civil war relates to the notion of the 'conflict trap' (Collier et al. 2003). Experiencing civil war drastically increases the risk of renewed occurrences of civil war with in the same country and in neighboring countries (Hegre et al. 2001; Collier & Hoeffler 2004; Walter 2004; Collier et al. 2008; Quinn et al. 2007). Civil war is also regularly associated with large-scale violence against civilians (Eck & Hultman 2007).

Table 18 shows results from PCSE model of effect of conflict on democracy measured as the SIP score (Gates et al. 2006).

Table 18: Effect of Conflict on Democracy, 19XX–2005, OLS with Panel-Corrected Standard Errors

	(1) C	(2) C with lags	(3) C, lags, FE	(4) BD	(5) BD with lags
conflict	-0.0154*** (0.00403)	-0.0139** (0.00510)	-0.00842 (0.00516)		
td85	0.0148 (0.0118)	0.0178 (0.0121)		0.0150 (0.0118)	
td90	0.0613*** (0.0159)	0.0654*** (0.0167)		0.0609*** (0.0159)	
td95	0.0696*** (0.0190)	0.0783*** (0.0203)		0.0697*** (0.0190)	
td00	0.0888*** (0.0214)	0.0991*** (0.0226)		0.0889*** (0.0214)	
td05	0 (0)	0 (0)		0 (0)	
conflict_1		-0.00148 (0.00531)	0.00527 (0.00539)		
conflict_2		-0.00251 (0.00524)	0.00487 (0.00527)		
conflict_3		-0.0109* (0.00527)	-0.00251 (0.00532)		
conflict_4		-0.0152** (0.00525)	-0.00701 (0.00534)		
conflict_5		-0.000143 (0.00523)	0.00740 (0.00533)		
conflict_6		-0.0131* (0.00514)	-0.00599 (0.00523)		
conflict_7		-0.00488 (0.00511)	0.000648 (0.00520)		
conflict_8		-0.00210 (0.00507)	0.00327 (0.00518)		
conflict_9		-0.00388 (0.00503)	0.00200 (0.00519)		
conflict_10		-0.00509 (0.00471)	0.0000639 (0.00487)		
bd				-0.00215* (0.000894)	-0.00223 (0.00115)
bd_1					0.000450 (0.00120)
bd_2					-0.000318 (0.00123)
bd_3					-0.00241* (0.00122)
bd_4					-0.00436*** (0.00123)
bd_5					-0.000579 (0.00122)
bd_6					-0.00246* (0.00125)
bd_7					-0.00141 (0.00122)
bd_8					0.0000317 (0.00122)
bd_9					0.000477 (0.00116)
bd_10					0.0000478 (0.00103)
Constant	0.426*** (0.0207)	0.434*** (0.0240)	0.909*** (0.00450)	0.424*** (0.0208)	0.469*** (0.0298)
Observations	7120	5526	5526	7120	5526
Log likelihood					
$\chi^2$	37.20	48.00	1279035.5	27.63	24.33

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

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