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Regional Inequalities and Civil Conflict in Sub-Saharan Africa[1]

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The case study literature is ripe with examples of a positive association between inequality and civil war, but systematic country-level studies have largely failed to find a significant relationship. One reason for this discrepancy may be that large-N studies tend to ignore spatial variations in group welfare within countries, although civil wars often take place within limited areas. We address this gap in the literature by applying GIS operations to *Demographic and Health Surveys* to construct new disaggregated data on welfare and socioeconomic inequalities *between* and *within* subnational regions in 22 countries in Sub-Saharan Africa. These measures are coupled with geographical data on the location of conflict zones for the period 1986–2004. We find that conflict onsets are more likely in regions with (1) low levels of education; (2) strong relative deprivation regarding household assets; (3) strong intraregional inequalities; and (4) combined presence of natural resources and relative deprivation.

Socioeconomic status has long been associated with engagement in violent conflict. Recent economic models of civil war focus on opportunity costs for rebel recruitment (e.g., Collier and Hoeffler 2004) whereas classical theories of relative

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deprivation argue that shared grievances and inequalities motivate people to take up arms (e.g., Gurr 1970). Lipton (1977) argued that spatial inequality in poverty is an overriding source of conflict in poor countries, particularly in Africa. Geographical variations of inequality within countries have recently begun to attract considerable interest among policymakers, and inequality was at the forefront of both the *World Development Report 2006* (World Bank 2006) and the *Human Development Report 2005* (UNDP 2005). Despite popular concern, spatial and regional inequalities and their consequences have rarely been systematically documented and analyzed. A notable exception to this is a WIDER-UNU project on inequality and development (Kanbur and Venables 2005), which concludes that regional inequalities tend to be severe and on the increase.[2] The case study literature is ripe with examples of an association between inequality and civil conflict (e.g., Stewart 2002). In contrast to this, large-N studies have largely failed to find a significant relationship between inequality and civil war (Collier and Hoeffler 2004; Fearon and Laitin 2003; Hegre, Gissinger, and Gleditsch 2003).

One potential reason for this discrepancy of findings between the case studies and the large-N studies is that the latter tend to rely exclusively on country-aggregate measures of individual-based (vertical) inequality, such as the national Gini coefficient. We argue that it is premature to dismiss socioeconomic inequality as a cause of civil conflict based on such measures, for two reasons: First, civil wars often take place within limited areas. Second, civil wars are conflicts between groups—not confrontations between individuals randomly fighting each other. Neglecting or failing to measure the spatial variations and group aspect of inequalities may produce tests that do not capture the essential group dynamics of civil conflicts.

Case studies suggest that what matters for conflict is 'horizontal inequality,' or inequality that coincides with identity-based cleavages (Stewart 2000, 2002). Echoing theories of relative deprivation, the argument is that inequality coinciding with identity cleavages may enhance group grievances and thus facilitate mobilization for conflict. In one of the few large-N studies of intergroup inequality Østby (2008) found that Stewart's case study findings are verified when ethnically based horizontal inequalities are tested systematically across several developing countries. However, this study was conducted at the national level, with summary measures of horizontal inequalities for the entire country. This does not allow for testing the relationship between geographically clustered poverty and regional engagement in conflict.

In the present study, we overcome this shortcoming by constructing disaggregated objective measures of regional inequalities based on socioeconomic georeferenced data from the *Demographic Health Surveys* (DHS) and using existing data on the spatial location of conflict zones (Buhaug and Rød 2006). By coupling these two data sources, we are able to investigate whether absolute poverty, relative regional welfare (interregional inequality), as well as inequality within regions affect the likelihood of conflict onset in a region. Our data set covers all but two of the regions in 22 countries in Sub-Saharan Africa, 354 regions in total. We are not aware of any other large-N study which has investigated the inequality–conflict nexus across subnational units in several countries.

The article proceeds as follows: the next section summarizes the arguments for disaggregating the study of civil war. In the section Data and Research Design, we focus on the relevance of regions and provide a theoretical framework for the relationship between regional distributions of welfare and conflict culminating in a set of testable hypotheses. We then present data and our disaggregated research design. Further, we provide the empirical tests of the hypotheses, and check for robustness. We find that civil conflict onsets are more likely in

[2] They do not, however, explore the conflict potential of inequality.

regions with the following traits: (1) low levels of absolute welfare in terms of education; (2) strong relative deprivation with regard to household assets; (3) strong intraregional inequalities; and, (4) combined presence of natural resources and relative asset deprivation. Finally, we conclude and suggest an agenda for future research.

Disaggregating the Study of Civil War

To date, the bulk of large-N studies of civil conflict have been conducted at the country level. However, popular and intuitive explanations of why and where civil wars occur often refer to variables like inequality and discrimination of identity groups, phenomena that tend to vary geographically within states. This has contributed to a call for 'disaggregating the study of civil war,' which implies investigating the causes of conflict below the national level (e.g., Buhaug and Lujala 2005; Buhaug and Rød 2006; Hegre and Raleigh 2005; Raleigh and Urdal 2007).

Buhaug and Rød (2006) argue that studies using country-level measurements are likely to involve ecological fallacies. For example, a national, aggregated measure of mountainous terrain might mask a potentially valid relationship between rough terrain and conflict if conflict takes place in the mountainous regions of countries with an overall low extent of mountainous terrain. To avoid such caveats, Buhaug and Rød conduct their study of African civil wars at the subnational level with geographical squares of 100 km^2 as the units of observation. Raleigh and Urdal (2007) and Hegre and Raleigh (2005) adopt similar approaches.

These studies make important contributions to our understanding of the disaggregated causes of civil war, but focus mainly on natural resources and demographic factors. Neither incorporates any subnational direct measure of spatial variations in socioeconomic welfare. Yet, the need for spatial disaggregation of welfare levels and inequalities is equally acute. For example, the horizontal inequality argument only requires one underprivileged group or region to predict conflict. If the rest of the regions in the country were homogenous or had small income differences, a country-level measure would mask that one particular region was underprivileged. We capture such nuances by introducing new welfare data at the subnational level. However, rather than using arbitrarily determined grid cells as the units of analysis we focus on first-level administrative units in each country. In the following section we develop the rationale for our choice of unit of analysis.

Regional Inequalities and Conflict

At least since Aristotle theorists have believed that political discontent and conflict depend not only on the absolute level of economic wealth, but also its distribution. Most studies of inequality and conflict relate somehow to the theory of relative deprivation (Gurr 1970). This theory argues that while absolute poverty may lead to apathy and inactivity, comparisons with those in the same society who do better may inspire radical action and even violence. On the other hand, those who view mobilization as the key to civil unrest tend to minimize the importance of inequality, arguing that such grievance factors are, for the most part, always present in every society (Tilly 1978). Since the seminal article by Russett (1964), who found a positive (moderate) relationship between land inequality and conflict, scholars have performed statistical analyses in an effort to determine the relationship between inequality and political conflict. Despite the persistence of this theme, the literature on inequality and political violence has not produced conclusive evidence on the inequality-conflict link (Lichbach 1989), but the most recent quantitative studies (Collier and Hoeffler 2004; Fearon and Laitin 2003) point in the direction of a zero relationship.

In order to resolve the inequality-conflict puzzle, an important question to explore is *how* inequality matters. Stewart (2002) argues that quantitative assessments of inequality and conflict tend to neglect a vital dimension of human well-being and social stability—the group dimension. Sen (1992, 117) concurs that analyses of inequality should focus on intergroup variations. Even though an individual may feel frustrated if he is economically disadvantaged, he will not start a rebellion on his own. Civil wars are organized group conflicts: that is to say, they are not a matter of individuals randomly committing violence against each other. Based on a series of case studies, Stewart (2002) argues that inequalities coinciding with identity cleavages, or 'horizontal inequalities,' may enhance group grievances and thus facilitate mobilization for conflict. A shared identity may overcome collective action problems (Olson 1965), but a shared group identity is not likely a sufficient factor to produce violent conflict. Rather, we agree with Murshed and Gates (2005), who argue that some shared group grievances are required for identity-based conflict. Inequality can be multidimensional (economic, social, or political) and can be based on various group-identifiers, such as gender (Caprioli 2005; Melander 2005); ethnicity and religion (Gurr 1994; Stewart 2002); urban-rural groups (Gurr 1994; Lipton 1977; Sahn and Stifel 2003), or subnational regions. Below we elaborate why regional identity may be particularly relevant as a social cleavage with regard to distributional issues.

Why Do Regions Matter?

In most African countries, the predominant social cleavage is ethnic and/or regional identity (Erdmann 2004; Scarritt and Mozaffar 1999; Stewart 2002). Although regional belonging is just one of many social identities, such geographical affiliation can be among the most salient and promote the greatest degree of conflict (Herb and Kaplan 1999). First, regional identity often stems from a shared history and overlapping regional and cultural cleavages. Particularly in Africa, subnational regions frequently correspond to ethnic group demarcations, with each region being dominated by a particular ethnic group (Stewart 2002). Regional affiliations may be enforced by regional institutions and parties, or primarily as a set of cultural relations between a specific group and a particular place, that is, a social community. Second, regional boundaries often structure the distribution of state patronage, welfare, and political influence. For example, inequalities between coastal and hinterland regions may sharpen as new economic activities are spatially concentrated (Kanbur and Venables 2005), or the state might choose to favor regions that are dominated by its ethnic kin. Hence, regional boundaries may suddenly form gaps between the haves and the have-nots, which may in turn reinforce geographical identities (Erdmann 2004). This gives subnational regions added political and economic relevance. Regions are not necessarily more important than other sources of identity such as clan or ethnic group. However, regions can be important as both cultural commonalities and socioeconomic and political realities can reinforce or even construct regions as relevant identity units.

Regional inequality and limited economic integration can exacerbate regional competition for the bounties of the state and may even foster conflict. Several African examples illustrate that regional inequalities might be the outcome of state processes of distribution, which can create a sense of commonality and spur aggression. In Kenya, regions are ethnically distinct, have political relevance in the aligning of parliamentary constituencies with ethnic boundaries, and differ systematically in terms of infrastructure and educational attainment (Alwy and Schech 2004). In Cameroon, there is a similar logic of regional consciousness based on the ethnic representation of the regions and ethno-regional communities become ''conduits in regional quests, thirsting for access to state resources''

(Fonchingong 2005, 368). In Nigeria, regions rely on the federal state's distribution of oil revenues for a majority of their income. When oil rents are assigned exclusively to subnational governments, they tend to produce extreme regional inequalities However, due to extensive revenue reallocation, the oil-producing regions have become increasingly cut off from the oil rents over time. Hence, tensions have mounted in the oil-rich Niger Delta regions based on a sense of injustice by not being allowed to keep the share of the revenues they feel entitled to (Davis, Ossowski, and Fedelino 2003).

In theory, at least three kinds of socioeconomic welfare distribution within and between regions could influence the risk of civil conflict. First, the absolute level of regional welfare; second, the relative level of regional welfare (due to interregional inequalities); and third, the level of intraregional inequality. Our disaggregated research design allows us to study each of these factors separately as opposed to, for example, aggregated measures of inequality and polarization at the national level, which by definition lump together the parameters of group-size, intragroup inequality, and intergroup inequality (Esteban and Ray 2005). Below we propose specific, more nuanced hypotheses regarding the conflict potential of absolute welfare, relative welfare, and intraregional inequality.

Absolute Regional Welfare

The direct link from economic development to domestic peace is one of the most robust findings in large-N country-level studies of civil war (Hegre and Sambanis 2006). Collier and Hoeffler (2004) attribute this relationship to the viability of rebel movements through opportunity costs. The recruits of the rebel groups must be paid, and their cost for joining the rebel organization is likely to decrease the lower their alternative income is. Therefore, people in poorer regions have less to lose and should be more inclined to join or form uprisings. Also, forced recruitment is expected to come at a lower cost in poorer regions, as the security infrastructure should be weaker in such areas. Consequently, it should be easier to maintain a rebellion in poorer areas than in richer ones, and strategic rebels are hence expected to target the poorer regions within a country for mobilization purposes. With a regional unit of analysis we can test the mobilization cost argument more directly, since regional absolute welfare is a better measure of local development than, for example, national GDP per capita. Based on the opportunity cost argument we propose the following hypothesis:

Hypothesis 1: *Regional socioeconomic welfare is negatively associated with the risk of civil conflict.*

Relative Regional Welfare

General theories of relative deprivation argue that whereas absolute poverty may lead to apathy and inactivity, comparisons with those who do better may inspire radical action and even violent political mobilization (Gurr 1970). Members of disadvantaged groups are likely to feel frustration and antagonism, especially when their relative deprivation is the result of actual exploitation and discrimination, and this could spur violent action. Even in situations where redressing grievances is not the basis of a conflict, regional inequalities can be exploited and exaggerated by group leaders and conflict entrepreneurs who strive to achieve their own political or economic goals (Stewart 2002). Cohesiveness and motivation for rebellion is easier to maintain when elites can draw on ethnic or regional welfare differences to construct a well-defined identity group with a common enemy.

A substantial strand of research on group inequalities and grievances has been conducted within the Minorities at Risk (MAR) project (Gurr 1994; Saideman et al. 2002; Scarritt and McMillan 1995) with mixed results. Whereas the MAR studies are criticized for selecting on the dependent variable, comparing only groups that are already perceived to be 'at risk,' we include all subnational regional units within the countries of our sample, relying on objective measures of welfare inequalities based on household surveys. However, the general proposition that we aim to test is the same: Both the relative deprivation literature and the strategic moves by actors suggest that conflict should be more likely to occur in relatively deprived regions. This forms the basis of our second hypothesis:

Hypothesis 2a: *Relative socioeconomic deprivation of a region is positively associated with the risk of civil conflict.*

Despite the intuitive logic of the above argument, one cannot assume that it is only resentment by the disadvantaged that may cause political instability. The relatively privileged can also attack the unprivileged. Although the relatively privileged might have little direct material gains to acquire from the very deprived, they might instigate violence to secure their own region's privileged status, fearing that the more deprived may gain political power and demand more resource redistribution, or turn to armed aggression to redress their grievances (Stewart 2000). This is in line with Sambanis and Milanovic (2004, 14) who argue that separatist movements will be developed when they seem profitable for a certain minority group seeking secession, and Toft (2003, 5) who found that violence tends to plague rich and poor regions alike. Case studies have also demonstrated how groups in both rich and poor regions can mobilize against the state to challenge the geographical distribution of resources and socioeconomic welfare (Humphreys and ag Mohamed 2005; Tadjoeddin 2003). With regional data, we can single out the separate effects of being relatively deprived and relatively privileged, and can test an alternative hypothesis assuming a curvilinear relationship between regional deprivation and conflict.

Hypothesis 2b: *The relationship between the relative socioeconomic status of a region and civil conflict risk is u-shaped: The most relatively privileged and the most relatively deprived regions have higher conflict risks than the more equal regions.*

Intraregional Inequality

In their study of urban–rural inequalities in Africa, Sahn and Stifel (2003, 593) conclude that ''the vast majority of the total inequality is attributable to the within region effects.'' Are such inequalities associated with conflict risk, and if so, what is the nature of this relationship? The conflict literature provides two lines of argument that lead to opposite answers to this question. The first focuses on identity formation as the basis for group mobilization. For a group to mobilize, it needs a common identity and a collective unifying structure among its members (Tilly 1978, 84). Sharp intraregional differentials may lead to intragroup resentment and reduce cohesiveness and the ability to take collective action, with different social classes identifying with their counterparts in other regions rather than identifying primarily with their own region (Stewart 2000). In line with this, Sambanis and Milanovic (2004, 25–6) argue that strong intraregional inequality will hamper efforts to collective mobilization because any income gains (or losses) resulting from secession will have to be distributed among the population. Hence, we expect that

Hypothesis 3a: *Intraregional welfare inequality is negatively associated with civil conflict.*

An alternative argument has been framed by economists like Esteban and Ray (2005, 2). They argue that the emergence of economic and cultural elites is a critical explanatory factor regarding conflict escalation in Africa. Intraregional inequality may hence provide the elites with economic means to finance mobilization, particularly since the large pool of poorer individuals should lower the mobilization costs. A related argument by Gates (2002) emphasizes the cost of recruitment and allegiance for rebel groups as a function of the outside options of payoffs for recruits. This leads to the following alternative hypothesis:

Hypothesis 3b: *Intraregional welfare inequality is positively associated with civil conflict.*

The Impact of Natural Resources

Abundance of natural resources is seen as an important factor in civil conflict (Buhaug and Rød 2006; Collier and Hoeffler 2004; Lujala, Gleditsch, and Gilmore 2005; de Soysa 2002). Empirical studies have concluded that excessive natural resource wealth leads to slow-growth, rent-seeking, corruption and rebel looting, all of which can generate or prolong civil war. This phenomenon is part of the so-called ''resource curse.'' For example, diamonds are often seen as a major source of rebel financing in conflicts such as those in Sierra Leone and Angola. Oil wealth has also been associated with civil conflict onset, either through the effect of weakening state apparatuses or by raising the prize for state capture (Fearon and Laitin 2003).

According to Le Billon (2001), resource dependence is also associated with greater socioeconomic inequalities. A relevant question then is whether regional welfare inequalities follow the same pattern as the distribution of natural resources in a country, that is, whether people in resource-rich regions enjoy more social welfare than people in resource-poor regions. Apparently, this is often *not* the case. For instance, the oil-rich Niger Delta region ''is one of the poorest, least developed and least reciprocated for its contributions to national wealth'' (Ikelegbe 2001, 437). The African context provides many examples that regional inequality can be a strong motivation for rebellion when a region is a source of natural resource wealth but receives little of the bounty. In Chad, the resource-rich southern regions have called for greater autonomy as they demand to receive more of the revenues from the oil discoveries in their part of the country. In Humphrey's words, the oil has ''been seen to be fuelling southern ambitions for a federalist state, if not for outright separation'' (Humphreys 2005, 509). Another example is the conflict between the Senegalese government and the Mouvement des Forces Démocratiques de Casamance (MFDC). The Casamance region is endowed with more natural resources than the rest of the country. Separatist sentiments have existed since colonial times among the main ethnic group in the region, the Dioula, due to their perception that they do not benefit from the richness of the region and because they feel discriminated against with regard to education policy and land allocation decisions (Humphreys and ag Mohamed 2005; Minority Rights Group International 1997, 449).

Gurr (1970) defined relative deprivation as the discrepancy between people's 'value expectations' (the goods and services people feel entitled to) and the 'value capabilities' (the goods and services they believe they are capable of obtaining). The larger the discrepancy between these two, the stronger is the feeling of frustration. As demonstrated above, the risk of conflict may be especially pronounced in local communities in which the indigenous people believe

that they are the primary inheritors of all the resources available in their home region, but at the same time are largely denied benefits from this regional prosperity. Hence, we expect that

Hypothesis 4: *The combined presence of relative socioeconomic deprivation and natural resource abundance in a region has a particularly strong positive effect on civil conflict.*

Data and Research Design

A statistical analysis of onsets of civil conflicts in subnational regions serves as the empirical test of the outlined hypotheses. The sample includes all first-level administrative units in countries in Sub-Saharan Africa where at least one DHS was conducted in the period 1986–2001, and for which geographical coordinates of the survey cluster points were available at the time of writing.[3] In total, this amounts to 354 regions in 22 countries.[4]

Sambanis (2004, 273) argues that ''to better measure differences across forms of violence … the unit of analysis cannot always be the country and year.'' This may be especially relevant for wars over self-determination where the insurgents' aims usually have as a referent a predefined territory, such as a particular region. Given that regional belongingness may be an important group identity marker, we argue that the regional level is particularly appropriate for analyzing the inequality-conflict nexus. Regional borders distinguish between sociopolitical units that often coincide with perceived common roots, history, and communality between people—traits which an arbitrarily sized geographical square can never offer. Consequently, our units of analysis are region-years, that is, yearly observations of first-level administrative units (regions/provinces/prefectures), as defined by ESRI (1998). This choice raises the concern that regions may change in shape and composition over time, as some units split and others merge. This is a valid concern, but as we cover a rather limited period of time in this analysis this problem should be less severe.

The Dependent Variable: Regional Conflict Onset

The conflict data are derived from the UCDP/PRIO Armed Conflict Dataset (Version 3-2005b),[5] which includes every armed conflict since 1946 between a state government and an organized opposition group that caused at least 25 battle-related deaths per year (Gleditsch et al. 2002). A major advantage of this data set is that it includes reasonably accurate data on the spatial location of battle zones over time. Rather than the original circular conflict zones we use the GIS-generated conflict polygons from Buhaug and Rød (2006). If a conflict falls below the casualty threshold of 25 battle-related deaths for at least two consecutive calendar years, we record the next observation of conflict as a separate conflict onset. We do not distinguish between internationalized and noninternationalized internal conflicts.

Unfortunately, battle-related death counts are not available per subnational region-year. Hence, our dependent variable, regional conflict onset, is coded as the first year a civil conflict breaks out in a given region, that is, when the region becomes part of a conflict zone as defined by the Armed Conflict Dataset. This generally indicates that rebel activity has occurred in the region, that battles

[3] In the few cases with multiple geo-referenced surveys over time, we weighted considerations of data comparability, currency in time, and sample size in selecting one.

[4] We only lack data for North-Eastern in Kenya and Boesmanland in Namibia.

[5] For the codebook and data, see http://www.prio.no/CSCW/Datasets/Armed-Conflict/UCDP-PRIO/.

between the belligerents have been recorded in the region in the particular year, or that the rebels control the area. The total number of observations in the data set adds up to a maximum of 6,626 region-years. However, since regions with ongoing wars may have a systematically different risk of experiencing a new war, we follow the standard procedure of censoring consecutive years of conflict. Hence, a maximum of 6,208 observations remain for the analyses.

Regional Welfare Variables

The estimates for socioeconomic absolute and relative regional welfare, and intraregional inequalities, are based on regional aggregates of survey data from the DHS[6] conducted in 22 countries during the period 1986–2001 (Appendix A provides a list of the countries and surveys used in this analysis). In a DHS, a sample of households is selected throughout the entire country. Women between the ages of 15 and 49 are interviewed about health, nutrition, and other issues, such as household welfare. The sample design is a probabilistic two-stage sample, in which several enumerated areas (EAs) within each country are randomly selected with a probability proportional to their size.[7] During the last decade, the DHS has begun to include detailed information about the geographical location of each EA. The map of Africa in Figure 1 shows the distribution of the EAs, zooming in the territory of Ghana to provide a more a detailed illustration: The black dots indicate the location of the EAs (or survey clusters) in the 10 different regions in Ghana, and the shade indicates the regional welfare in terms of household assets. Darker colors represent higher regional welfare. Below we outline how these figures were calculated.

The DHS surveys lack information on household income or consumption expenditures. This obstacle is overcome by using the information collected on other welfare characteristics. We use individual- and household-level information from each EA to aggregate measures of regional welfare based on ESRI's (1998) definition of first-level administrative units. More specifically, regional welfare scores are obtained as mean values for the respondents in all the EAs in each region.[8]

For the purpose of testing whether regional socioeconomic welfare is negatively associated with the risk of civil conflict (**Hypothesis 1**), we generate two main indicators of *absolute regional welfare*. First, a household asset index is generated on the basis of the following variables from the DHS surveys: v119–v125 (dummies for whether or not each household has electricity, a radio, a television, a refrigerator, a bicycle, a motorcycle, and/or a car). In LDCs, where many people are part of the informal sectors, household assets might better capture variations in welfare than GDP per capita (Filmer and Pritchett 2001). Our second indicator, education, is based on the variable v133 (highest years of education completed). Thyne (2006) found education to promote peace through two proposed mechanisms. First, education investment by the government can signal that the government attempts to improve people's lives thereby lowering grievances. Second, education might also provide economic, political, and social stability by giving people tools for peaceful conflict resolution.

To test **Hypothesis 2**, we measure *regional relative deprivation* (RRD) as the relative performance of each region compared to the overall performance of the country using the following formula:

[6] See the DHS homepage: http://www.measuredhs.com.

[7] See DHS (1996) for details on the sampling methodology.

[8] In regions with few survey respondents, average education and asset figures are merely proxies for the real average of all the inhabitants, but simulation experiments with similar data show that the bias is likely to be small (Kravdal 2006).

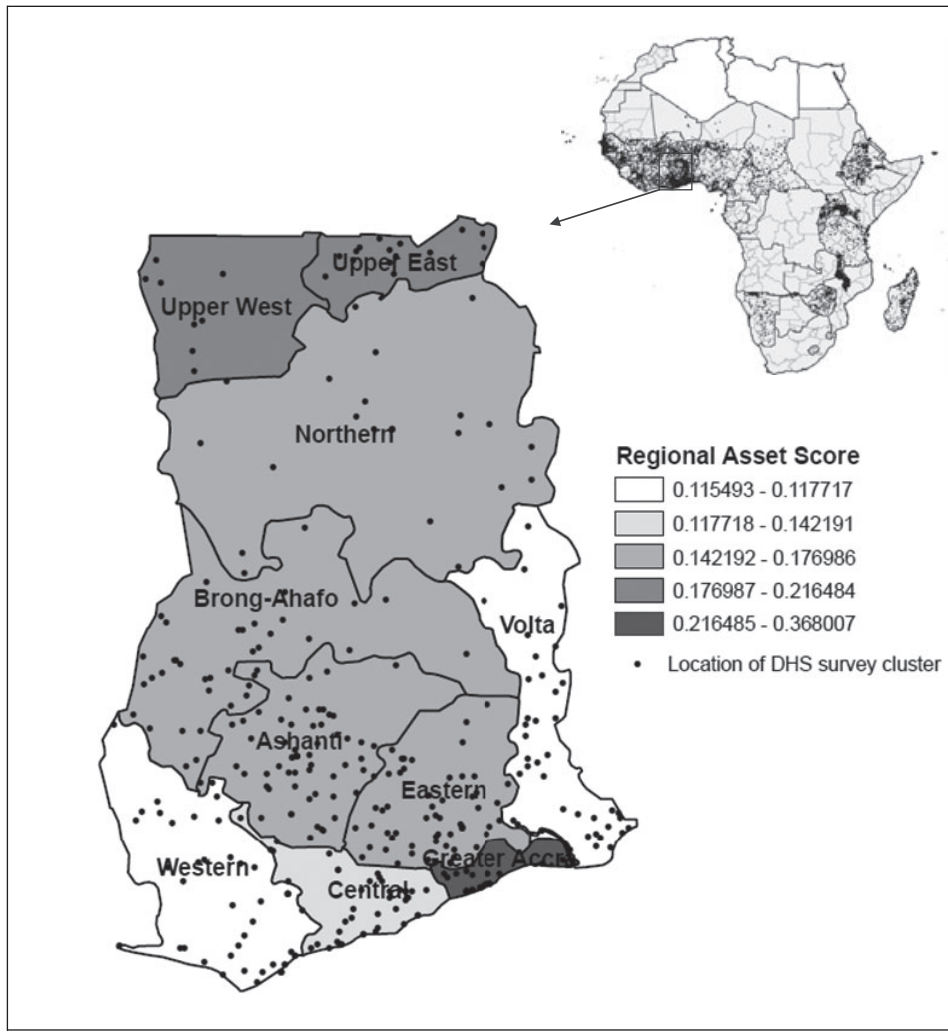

FIG. 1. Geographical Representation of DHS Surveys in SSA and Ghana
Source: Regional Asset data from Demographic and Health Survey, Ghana (1993–94), authors' calculations.

$$\text{RRD} = -1\left(\ln\left[\sum_{i=1}^{M}\frac{A_{i1}/A_{i2}}{M}\right]\right) \tag{1}$$

where M is the maximum number of household assets, A_1 refers to mean asset score of a given region, and A_2 is the corresponding mean score of the country as a whole. This provides a continuous variable ranging from −0.76 (lowest level of relative deprivation, that is, relative *privilege*) to 1.81 (highest level of relative deprivation). The value '0' indicates perfect equality, whereas negative values of RRD refer to relative *privilege* of the region in question. A region that has only half as much wealth as the country average scores 0.69 on the scale, whereas a region that is twice as well off as the country average scores −0.69. A score of 1.0 implies that a region has roughly one third of the

national average. A score of −1.0 would imply that a region is about three, or exactly e = 2.72, times as wealthy as the national average, but this score is outside of our sample. A measure of educational relative deprivation is generated along the same lines. In order to test whether RRD may be related to conflict in a nonlinear manner (**Hypothesis 2b**), we include (centered) squared terms for the RRD measures.

To test **Hypothesis 3a** and **3b**, we measure *intraregional inequality* by calculating regional Gini coefficients for education years and the household assets. For each of the regions, the scores on the various inequality measures were copied to the remaining years in the period 1986–2004.[9]

Finally, if the ''resource curse'' argument is valid, we would expect resource-rich regions to be more conflict-prone than regions without such endowments. We have generated dummies for whether each region has secondary diamond deposits within its borders, and whether or not the region is an oil producer.[10] To test whether the combination of relative welfare deprivation and natural resource abundance puts regions particularly at risk of civil conflict (**Hypothesis 4**), we include two interaction terms for relative deprivation in assets and the existence of diamonds and oil production. For a third interaction term we merge these two valuable natural resources. The terms are centered in order to avoid multicolinearity.

Control Variables and Statistical Methodology

We include a set of region-level control variables potentially associated with conflict. Although many country-level variables are robustly related to conflict onset in the literature, these variables cannot account for geographical variation within countries, which is our main concern in this article. (See, however, online Appendix E for some additional tests with country-level controls).

Conflicts are often expected to occur between groups with different ethnic identities. People in regions dominated by a cultural or ethnic group different from the capital may have weaker national identities and be more likely to mobilize for conflict. Toft (2003) holds that the regional distribution of ethnic groups may be more relevant for conflict than the overall national composition of ethnicity, and even argues that the key to understanding ethnic conflict is the geographical settlement patterns of ethnic groups. As a main control for ethnic identity we use a measure of whether the majority of each region is dominated by a different language family than the capital (Grimes 2000). The variable *ethnic difference* is similar to the one reported in Buhaug and Rød (2006).

The above measure is rather crude. It could be that the way ethnicity is distributed *within* a region also matters for conflict, if for example, regional ethnic heterogeneity reduces regional cohesiveness and hence the ability to take collective action against the state. To test this argument we have also constructed a disaggregated (regional) version of the widely used Ethno-Linguistic Fractionalization (ELF) index as a measure of ethnic diversity using GIS functionalities. In order to calculate the ELF index, one requires data on the location of each ethnic group as well as population counts. For the location of the ethnic groups in each country, we rely on the *Atlas Narodov Mira* (Bruk and Apenchenko 1964). For the population counts, we use the gridded population database from Columbia University.[11] The ELF index is calculated based on the population of

[9] This could be justified since inequality and identities are not expected to change radically over time.

[10] See Gilmore et al. (2005), Lujala, Gleditsch, and Gilmore (2005), and Lujala, Rød, and Thieme (2007) for details.

[11] These data can be obtained from CIESIN, Columbia University: http://sedac.ciesin.columbia.edu/gpw/index.jsp.

each ethnic group in the region as a whole. It is constructed using the Herfindahl index of the share of each ethnic group in the total population (ng/N). The ELF index is equal to the probability that two persons, randomly selected from the county's population, will be from different ethnic groups, given by

$$\mathrm{ELF} = 1 - \sum_{g=1}^{G} \frac{n_g}{N} \tag{2}$$

The *Atlas Narodov Mira* is based on data available in the 1960s and is thus clearly outdated. Fortunately, however, ethnic settlement patterns exhibit considerable inertia (Toft 2003), so it seems reasonable to use this data set, at least for the time being. The gridded population of the world comes with data sets for every 5 years since 1990. We interpolated linearly for years in between and extrapolated linearly to get population counts for 1986–1989.

Population size is a robust predictor of conflict onset in most large-N studies of civil war (Hegre and Raleigh 2005). We include this control using a measure of the regional population size. We generate regional population measures from UNEP-GRID,[12] which has generated a raster representation of population counts for Africa at a resolution of 2.5 arc minutes (approximately 5 km at the equator). The data are available for every decade since 1980. We interpolated linearly for years in between and log-transformed the variable.

The likelihood of conflict for any region should be largely conditional on conflict involvement in neighboring regions. To account for such spatial autocorrelation, we include a variable measuring the logged distance from each region border to the nearest conflict zone in the country. We also include a measure of the distance to conflict in neighboring countries, as spill-over of conflict and unrest across borders may increase conflict propensity.[13] Related to this, we include a dummy of whether or not the region borders on another country. Proximity to international borders may facilitate mobilization, as rebel groups may seek safe havens across the border, and weapons may be more easily smuggled into border regions. Appendix B provides descriptive statistics for all variables.

All the analyses reported here use logistic regression. Since regions are likely to be interdependent, we cluster robust standard errors by country. To account for possible patterns of autocorrelation within region-panels over time, we primarily rely on the Beck, Katz, and Tucker's (1998) cubic spline model based on time since last conflict in the region (or years since 1946 in the case of no previous conflict). We also ran random effects models, grouped by region, as robustness checks (see online Appendix D). The results remained largely unchanged with this specification. Since all the hypotheses predict a change in risk of conflict, we use the Clarify package (King, Tomz, and Wittenberg 2000; Tomz, Wittenberg, and King 2001) to ease the interpretation through substantive effects and figures.[14]

Empirical Results

Our hypotheses are tested in Tables 1–4. Table 1 tests the impact of regional absolute welfare (**Hypothesis 1**); Table 2 the impact of RRD (**Hypothesis 2a** and

[12] The Global Resource Information Database is available at http://grid2.cr.usgs.gov/datasets/datalist.php3#unep.

[13] For regions in countries without conflict, we assign the highest value on the first variable to avoid missing values. For regions in countries with no conflict in either of their first-order neighbors, we assign the highest value on the second variable.

[14] The statistical tests were conducted using STATA, version SE 9.2, and ArcGIS 9.2 was used to generate region-specific measures and to create the maps.

TABLE 1. Onset of Conflict by Absolute Welfare, African Regions, 1986–2004

	(1)	*(2)*	*(3)*
Distance to internal conflict[a,b]	0.009 (0.15)	0.010 (0.16)	0.025 (0.47)
Distance to neighboring conflict[a,b]	−0.078** (−2.04)	−0.072 (−1.58)	−0.079** (−2.11)
International border	−0.200 (−0.56)	−0.282 (−0.98)	−0.524* (−1.67)
Population size[b]	0.005 (0.03)	−0.018 (−0.12)	0.021 (0.16)
Ethnic difference	0.068 (0.19)	0.077 (0.21)	0.105 (0.28)
Diamonds	0.748*** (2.74)	0.717*** (2.62)	0.634*** (2.71)
Oil producer	0.666 (1.38)	0.646 (1.56)	0.728*** (2.71)
Household assets		−1.425 (−0.52)	
Education years			−0.395*** (−4.23)
Constant	−2.530 (−1.06)	−2.011 (−1.02)	−2.196 (−1.07)
Pseudo R^2	0.086	0.088	0.139
Observations	6,208	6,208	6,208
# Countries	22	22	22
# Regions	354	354	354
# Region-years with onset	144	144	144

Note. Logit coefficients with robust *z*-statistics clustered on countries in parenthesis. Estimates for peaceyears and three cubic splines not reported. [a]Lagged 1 year. [b]Logged. *$p < .1$; **$p < .05$; ***$p < .01$.

TABLE 2. Onset of Conflict by Relative Deprivation, African Regions, 1986–2004

	(4)	*(5)*	*(6)*	*(7)*
Distance to internal conflict[a,b]	0.012 (0.19)	0.010 (0.16)	0.013 (0.20)	0.011 (0.17)
Distance to neighboring conflict[a,b]	−0.073* (−1.84)	−0.078** (−2.05)	−0.073* (−1.83)	−0.078** (−2.03)
International border	−0.243 (−0.73)	−0.220 (−0.63)	−0.232 (−0.69)	−0.225 (−0.65)
Population size[b]	−0.003 (−0.02)	0.005 (0.03)	−0.002 (−0.01)	0.006 (0.04)
Ethnic difference	0.022 (0.06)	0.040 (0.11)	0.026 (0.07)	0.031 (0.08)
Diamonds	0.762*** (2.79)	0.755*** (2.69)	0.818*** (3.06)	0.754*** (2.71)
Oil producer	0.691 (1.55)	0.690 (1.49)	0.708 (1.57)	0.699 (1.52)
Relative deprivation (assets)	0.333 (1.06)			
Relative deprivation (education)		0.117 (0.78)		
Relative deprivation (assets)[c]			0.150 (0.50)	
Relative deprivation (assets), sq[c]			0.464*** (3.36)	
Relative deprivation (education)[c]				0.156 (0.73)
Relative deprivation (education), sq[c]				−0.023 (−0.48)
Constant	−2.544 (−1.08)	−2.575 (−1.08)	−2.619 (−1.12)	−2.520 (−1.06)
Pseudo R^2	0.088	0.087	0.090	0.087
Observations	6,208	6,208	6,208	6,208
# Countries	22	22	22	22
# Regions	354	354	354	354
# Region-years with onset	144	144	144	144

Note. Logit coefficients with robust *z*-statistics clustered on countries in parenthesis. Estimates for peaceyears and three cubic splines not reported. [a]Lagged 1 year. [b]Logged. [c]Centered. *$p < .1$; **$p < .05$; ***$p < .01$.

2b); Table 3 the impact of intraregional inequalities (**Hypothesis 3a** and **3b**); and Table 4 the conflict potential of the combination of RRD and natural resources (**Hypothesis 4**).[15]

[15] The online Appendix F reports a full model with all the core variables that proved significant predictors of regional conflict onset in Tables 1–4. In general, the main results hold.

TABLE 3. Onset of Conflict by Intraregional Inequality, African Regions, 1986–2004

	(8)	*(9)*	*(10)*	*(11)*
Distance to internal conflict[a,b]	0.016 (0.25)	0.024 (0.45)	0.009 (0.15)	0.025 (0.46)
Distance to neighbor conflict[a,b]	−0.055 (−1.33)	−0.077** (−2.03)	−0.080** (−2.13)	−0.066 (−1.63)
International border	−0.422 (−1.28)	−0.485 (−1.45)	−0.269 (−0.78)	−0.643** (−2.21)
Population size[b]	−0.061 (−0.45)	0.017 (0.12)	−0.004 (−0.02)	−0.028 (−0.23)
Ethnic difference	0.099 (0.25)	0.014 (0.04)	0.014 (0.04)	−0.072 (−0.17)
Diamonds	0.658*** (2.62)	0.652*** (2.63)	0.740*** (2.70)	0.619*** (2.81)
Oil producer	0.554 (1.53)	0.768*** (2.66)	0.708 (1.31)	0.736** (2.29)
Gini (assets)	3.491*** (3.39)			1.922** (1.98)
Gini (education)		3.600*** (4.09)		3.254*** (3.77)
Regional ELF			0.577 (1.02)	0.706 (1.20)
Constant	−3.939 (−1.64)	−5.618** (−2.54)	−2.559 (−1.07)	−6.188*** (−2.84)
Pseudo R^2	0.106	0.136	0.086	0.141
Observations	6,208	6,208	6,113	6,113
# Countries	22	22	22	22
# Regions	354	354	349	349
# Region-years with onset	144	144	144	144

Note. Logit coefficients with robust *z*-statistics clustered on countries in parenthesis. Estimates for peaceyears and three cubic splines not reported. [a]Lagged 1 year. [b]Logged. * $p < .1$; ** $p < .05$; *** $p < .01$.

TABLE 4. Onset of Conflict by Relative Deprivation and Natural Resources, African Regions, 1986–2004

	(12)	*(13)*	*(14)*
Distance to internal conflict[a,b]	0.013 (0.20)	0.014 (0.20)	0.010 (0.16)
Distance to neighboring conflict[a,b]	−0.071* (−1.72)	−0.081* (−1.86)	−0.076* (−1.91)
International border	−0.267 (−0.80)	−0.271 (−0.82)	−0.244 (−0.72)
Population size[b]	0.023 (0.15)	0.005 (0.03)	0.009 (0.06)
Ethnic difference	0.008 (0.02)	0.040 (0.11)	−0.002 (−0.01)
Relative deprivation (assets)[c]	0.312 (0.95)	0.258 (0.82)	0.310 (1.12)
Diamonds[c]	0.675*** (2.66)		
Relative deprivation (assets)* Diamonds[c]	0.539 (1.03)		
Oil producer[c]		0.542 (1.35)	
Relative deprivation (assets)* Oil producer[c]		0.977 (1.20)	
Natural resources[c]			0.704** (2.32)
Relative deprivation (assets)* Natural resources[c]			0.844** (2.33)
Constant	−2.670 (−1.14)	−2.355 (−0.98)	−2.487 (−1.02)
Pseudo R^2	0.084	0.081	0.090
Observations	6,208	6,208	6,208
# Countries	22	22	22
# Regions	354	354	354
# Region-years with onset	144	144	144

Note. Logit coefficients with robust *z*-statistics clustered on countries in parenthesis. Estimates for peaceyears and three cubic splines not reported. [a]Lagged 1 year. [b]Logged. [c]Centered. * $p < .1$; ** $p < .05$; *** $p < .01$.

Model 1 in Table 1 is our baseline model of regional conflict including all the control variables. The variable measuring distance to the nearest conflict zone in the country of origin is not significant, but the variable measuring distance to the nearest conflict zone in a neighboring country is, as we expected, negative and significant. The further away a region is from a conflict zone, the less likely it is to host a conflict onset itself. In fact the effect is quite strong. If we increase the distance to conflict in a neighboring country from the 5th to the 95th percentile while maintaining the other variables at their mean, the average annual

probability of a conflict onset in the region more than triples (from 1.3 to 4.5 percent). Having an international border does not seem to increase conflict risk. In fact, this variable is most often negative, and sometimes significant, as in Model 3. Population size is also insignificant across the models. The variable measuring ethnic difference from the capital shows the expected positive sign, but never reaches statistical significance. The term for secondary diamonds shows the expected positive sign in all models, and is consistently significant at the 1 percent level. Oil generally has a positive coefficient, but the variable is insignificant in most model specifications. The oil dummy becomes positively significant when education is included in the model. It could be that education is a proxy for good governance. As a valuable resource like oil might be both a blessing and a curse, the negative effects of oil wealth will remain if the region lacks good governance as accounted for by the education variable.

Both of our welfare indicators, household assets and education years, show negative effects on the risk of conflict onset in a region, but whereas the coefficient for household assets fails to reach statistical significance, education is significant at the 1 percent level (Model 3, Table 1). The lower the educational level in a region, the higher the risk that the region will experience a conflict onset. The effect of education is very strong. If we increase the education years in a region from the 5th to the 95th percentile while maintaining the other variables at their mean, the annual probability of a conflict onset decreases from 3.3 to 0.2 percent. Thus, a region with very low average education has a 50 percent chance of experiencing a conflict onset within a period of 21 years, whereas the corresponding time interval for a region with very high average education is 346 years. Perhaps education performs better than assets because it better measures the recruitment costs involved in conflict: The decision to join a rebellion may be dependent on which other alternatives are available to potential rebel soldiers (Collier and Hoeffler 2004). With more education the prospects of securing a stable livelihood in peacetime are improved. An indicator of the investment in human capital is therefore perhaps a good indicator of the perceived loss from warfare in the population. Furthermore, schooling may increase social cohesion and promote understanding and tolerance, and thus counteract violence (Thyne 2006). Thus, our first hypothesis receives support in Table 1 if regional socioeconomic welfare is measured in years of education.[16]

In Table 2, we switch the focus from absolute welfare to relative regional deprivation. Models 4 and 5 fail to provide a positive answer to **Hypothesis 2**. Although the term for relative deprivation in terms of both household assets and education years have positive coefficients, the effects are not significant at the 10 percent level. Contrary to **Hypothesis 2a,** there does not seem to be a positive linear relationship between RRD and conflict. A possible explanation is that the relationship could be nonlinear, as proposed in **Hypothesis 2b**. This hypothesis is tested in Models 6 and 7. Whereas the squared term for RRD in terms of education is nonsignificant in Model 7; Model 6 reveals a strong curvilinear effect for the RRD in terms of household assets, which is statistically significant.

Yet, the single coefficient for the squared term is not a sufficient test of hypothesis **Hypothesis 2b**. Using Clarify (Tomz, Wittenberg, and King 2001, 21–2); we have computed expected probabilities of conflict dependent on relative deprivation, and added confidence intervals. Figure 2 portrays this relationship in detail. While the results from the regression might indicate some support for the notion that also very rich regions are more prone to violence, the results

[16] Our asset index could be criticized for not taking into account market-value weights of each component. Hence, we also tried the 'DHS Wealth Index' (Rutstein and Johnson 2004), which includes several household assets and utility services, each weighted according to their individual loadings resulting from principal component analyses. This term did not perform better than our additive index.

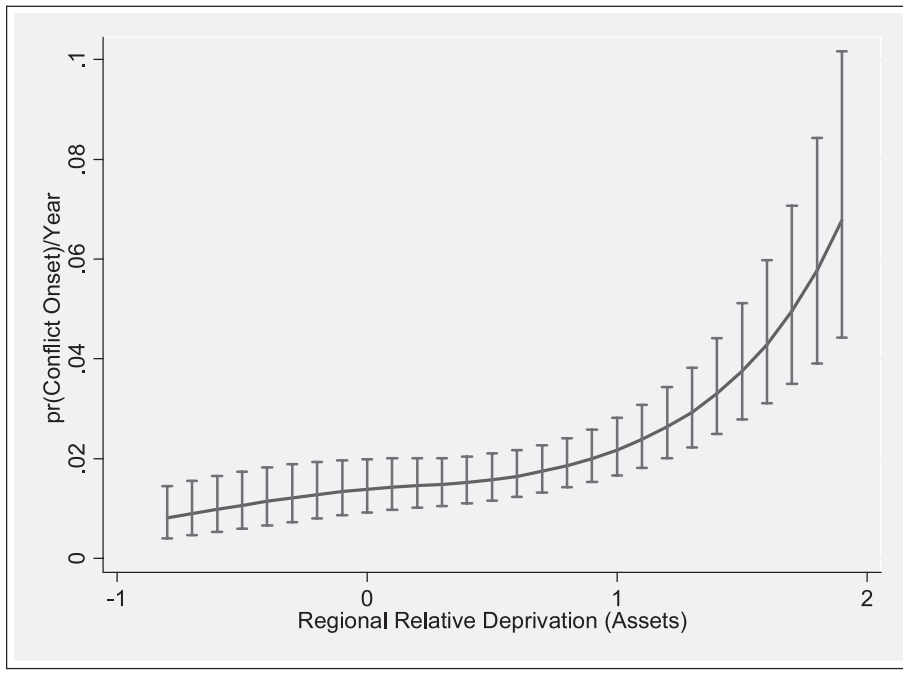

FIG. 2. Relative Asset Deprivation and Conflict, African Regions, 1986–2004
Note. The graph is simulated on the basis of Model 6, Table 2, with the aid of Clarify (Tomz, Wittenberg, and King 2001). All control variables are held at their mean values. Bars represent 90 percent confidence intervals

from the simulation underlying Figure 2 reveals a different picture. The richer regions (in relative terms) are seemingly less at risk of conflict than other regions, yet not always significantly so. Indeed, the only significant result from the graph reflecting the regression results is that the most deprived regions are also most likely to experience an onset. The regions that have the highest risk of conflict are those that score '1' or more on the RRD variable (households in these regions have only about one third or less of the national average in assets). The distribution is highly skewed. No region in our sample is very much richer than the national average, and we can only speculate as to how the relationship would appear if that was the case. Overall, the combined findings of Table 2 and Figure 2 provide support for **Hypothesis 2a**, although the relationship is a J-curve and not a straight line.

Our third hypothesis is tested in Table 3. We expected intraregional socioeconomic inequality to be negatively associated with conflict because such inequality could curb perceptions of group cohesion and thereby hamper mobilization for conflict. However, contrary to **Hypothesis 3a**, the coefficients for the Gini scores both in terms of household assets and education years are in fact strongly and positively related to conflict.

If we increase the regional asset Gini from the 5th to the 95th percentile while maintaining the other variables at their mean, the annual probability of a conflict onset increases from 0.8 percent to 3.7 percent. The corresponding change for education Gini is even stronger, from 0.3 to 3.6 percent. These results are more consistent with our alternative hypothesis, **Hypothesis 3b**, which predicted more onsets in regions with sharp internal inequalities as a result of increased opportunities for group leaders and lower recruitment costs. Our finding, then, is best explained by Esteban and Ray (2005). Within-group inequality seems particularly

dangerous as it puts resources in the hands of potential conflict entrepreneurs while at the same time keeping down the mobilization costs of (the relatively poor) activists. In short, mobilizing the poor is cheaper, and the rich have more resources to implement that mobilization. Also, warlords may articulate intraregional inequalities as resulting from group inequalities due to discriminatory policies from the center (Stewart 2000). Unlike intraregional inequality, intraregional ethnic fractionalization (regional ELF) does not reveal any significant effect, as is demonstrated in Models 10 and 11 in Table 3. This lack of effect may be due to collective action problems in ethnically heterogeneous regions.[17]

Relative deprivation, or inequality, may enhance the risk of conflict under certain conditions, rather than having a strong triggering effect on conflict in itself. As we found no direct linear effect of RRD in itself (Table 2), we investigate whether natural resources may condition this relationship. In Table 4, the term for RRD in household assets is interacted with dummies for being an oil producer having secondary diamond deposits, or either of the two (combined term for natural resources). The interaction terms in Models 12 and 13 both reveal the expected positive sign, but neither is statistically significant. The interaction term between relative deprivation in household assets and natural resources in Model 14, however, is positive and significant at the 10 percent level. This finding is in line with Tadjoeddin (2003) and others, who argue that the level of frustration may increase and provoke conflict when regional abundance in natural resources does not result in correspondingly higher levels of community welfare.

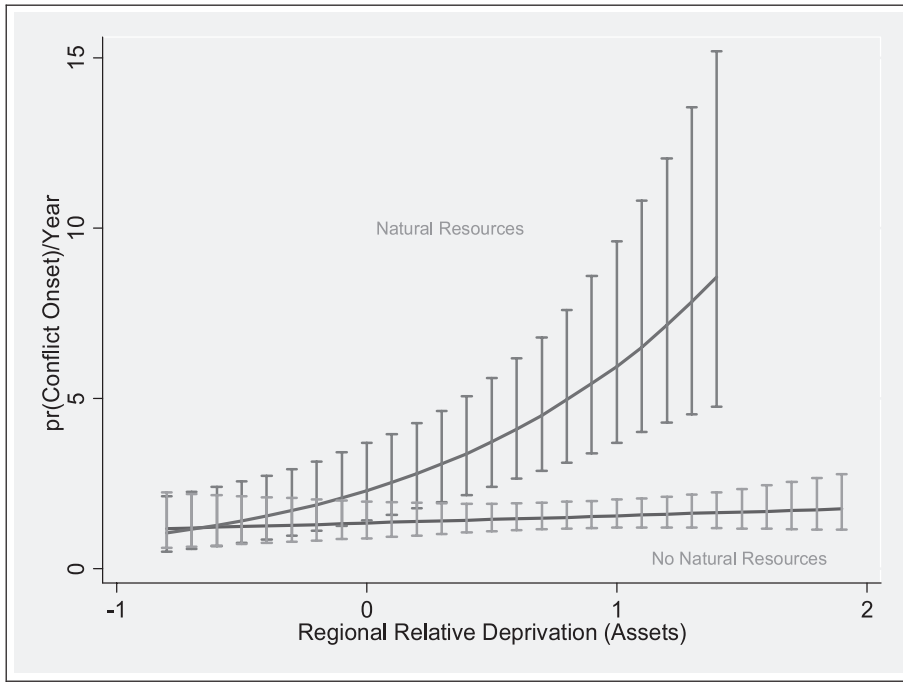

FIG. 3. Relative Asset Deprivation, Natural Resources, and Conflict, African Regions, 1986–2004
Note. The graphs are simulated on the basis of Model 14, Table 4, with the aid of Clarify (Tomz, Wittenberg, and King 2001). All control variables are held at their mean values. Bars represent 90 percent confidence intervals

[17] We also tested a squared term for regional ELF, which turned out statistically insignificant. This is not so surprising. The polarization argument—that conflict is more likely in ethnically polarized countries—usually pertains to the national level, and is not necessarily relevant at the subnational level. Rather we would expect that being an ethnically homogenous region, could facilitate collective action against the state.

The interaction effect is graphed in Figure 3, which shows that relative welfare deprivation is significantly associated with conflict only for regions with natural resources. Whereas the conflict risk is relatively low for the regions in our sample with neither diamonds nor oil (below 3.5 percent regardless of the level of regional deprivation), the picture is dramatically different for the resource-rich regions. Even with relatively weak relative deprivation figures (e.g., two-thirds of the national average), regions with natural resources are significantly more at risk of conflict than regions without natural resources. Our sample does not contain very deprived regions with natural resources, which is why the figure is truncated for the natural resources sample. However, the most deprived resource-rich regions are clearly significantly more at risk of experiencing conflict than both similarly deprived resource-poor regions and nondeprived resource-rich regions. The graph reveals that provided the existence of natural resources, a strongly deprived region (95th percentile) is three times as likely to experience a conflict onset as a region which is not relatively deprived (5th percentile), with annual conflict risks of 5.0 percent versus 1.7 percent, respectively.

This relationship between RRD, natural resources and conflict onset can be illustrated by the case of Chad. The country has been at war in most of the postcolonial era; and virtually all political parties in the country have identifiable regional and ethnic foundations (Marshall and Jaggers 2007). The GIS-generated map in Figure 4 shows the geographical distribution of household asset deprivation, natural resources, and conflict engagement in Chad.

The darker regions indicate more strongly asset deprivation relative to the country mean. Lighter colors indicate relative privilege. Not surprisingly, the capital region (Chari-Baguirmi) is the relatively best off in terms of household assets. The dot-filled polygons represent oil deposits, and the hatched area outlines the location of the internal conflict onset in 1997. In line with our statistical tests, the map shows that the conflict broke out in several regions that had both oil deposits *and* were socially worse off than the country mean. According to Humphreys (2005), this was a result of perceptions in the southern regions of a lack of correspondence between the resource wealth and regional welfare, which led to fighting to secure more income to the South.

Robustness Checks and Alternative Specifications

In order to test the robustness of our results we tried alternative measures for the dependent variable and the core variables. We tried different thresholds for the amount of the regional area covered by conflict (1, 5, and 10 percent), but it did not alter the results. We also tested the effect of RRD as compared to the capital instead of the country mean, but the results were quite similar. Furthermore, there is a potential endogeneity problem with our analysis given that some of the independent variables are based on surveys that were carried out late in our sample period. In order to investigate the severity of this potential problem, we replicated all the models using only the years after the survey was conducted in each country (see online Appendix C). This procedure gives more cases for the replication than a cross-sectional setup but yet avoids the issue of potential reversed causality. The estimated coefficients had the same direction and roughly the same magnitude as in the original models. Most of the significant results also remain significant, at least at the 10 percent level, with the exception of the interaction term for natural resources and regional asset deprivation, which is only borderline significant ($p = 0.101$).[18]

[18] We also tried a cross-sectional design with only one observation per region. The results were not substantially altered with this specification.

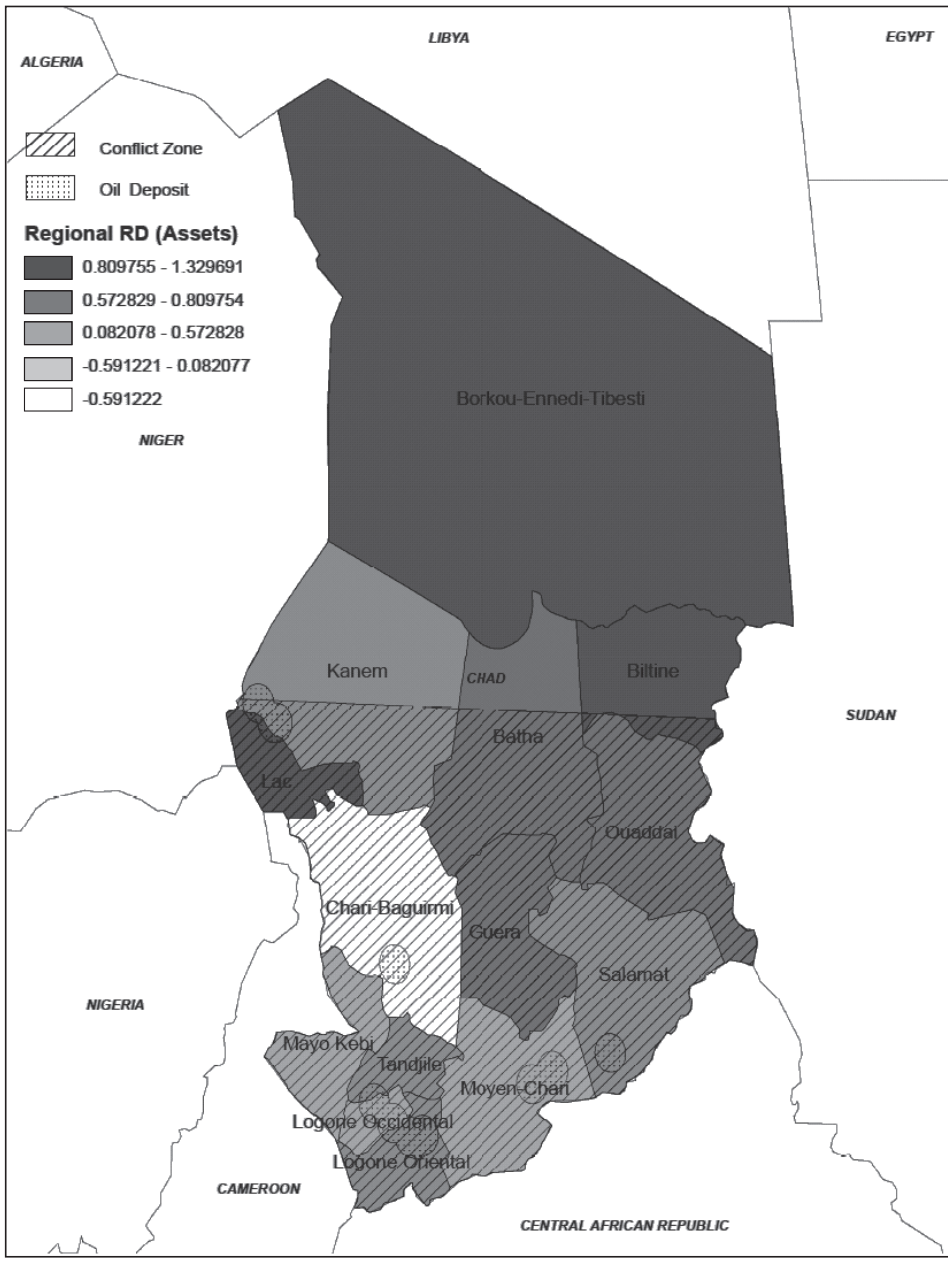

FIG. 4. Relative Asset Deprivation, Natural Resources, and Conflict Onset in Chad, 1997
Source: Regional relative deprivation data from Demographic and Health Survey for Chad in 1996 (see http://www.measuredhs.com), authors' calculations; conflict data from the UCDP/PRIO Armed Conflict Dataset (Gleditsch et al. 2002); oil data from Lujala, Rød, and Thieme (2007).

Since we have panels of regions, error terms from period *t* for a given region might be correlated with error terms from other periods. Hence, we also tried random effects models. Our findings are robust to this estimation technique as well. In fact our last hypothesis even gained stronger support, due to a significant interaction term between relative deprivation and oil (see online Appendix D).

We focus exclusively on region-level variables in this study, to single out factors that can capture spatial variation in conflict risk. However, in addition to accounting for within-country correlations by clustering on country, we reran our models including standard country-level predictors of civil conflict: GDP per capita (Gleditsch 2002), annual growth (World Bank 2004), regime type (Marshall and Jaggers 2000), and total population size (Gleditsch 2002). Our main findings still remained largely unchanged (see online Appendix E).

Concluding Remarks

This article has demonstrated how the combination of geographically referenced survey data and data on the location of conflicts opens up new possibilities for studying geographical inequalities and conflict at the subnational level. Our study represents a first cut at testing the conflict potential of regional inequalities in Sub-Saharan Africa. Unlike other disaggregated studies of civil conflict that use equally sized grid cells as the units of analysis, we focus on theoretically more meaningful administrative units. Based on detailed information about the geographical location of the respondents from national survey data, we were able to generate new measures of regional performance in terms of socioeconomic welfare, measured by education levels and durable household assets. These data were coupled with geographically recorded data on conflict zones and variables such as natural resource deposits.

First, we find that absolute deprivation in terms of education leads to enhanced conflict risk in a region. Furthermore, the joint insight from the analyses presented herein generally strengthens the findings of several case studies (Stewart 2002) that horizontal or intergroup inequalities do matter for civil conflict. We also found strong evidence that intraregional inequalities are positively associated with conflict. This result is consistent with Esteban and Ray's (2005) theory that an increase in intragroup inequality will give more resources to the contributing elites and at the same time decrease the cost of mobilizing the poor. Finally, the positive association between RRD and conflict was found to be particularly strong for regions that have valuable natural resources.

Future research could take several steps to improve the present analysis. First, generalizations would be more reliable if the sample was expanded to include all the countries in Sub-Saharan Africa. There is an (unavoidable) danger of selection bias given that we only include countries with geo-referenced data from the DHS. This is of course a valid criticism. Unfortunately, we do not have data to evaluate how the countries included in our analyses compare to the remaining Sub-Saharan African countries in terms of regional welfare and inequalities, but we *do* know that our countries do not differ significantly with regard to the dependent variable: Comparisons between our 22 countries and the remaining countries in Sub-Saharan Africa with the UCDP/PRIO conflict data show that our sample did not have significantly more (or less) conflict onsets in the period under investigation than the rest of the countries in the region. Hence, although some of the worst cases of civil war, such as Somalia and DRC, fall outside our sample, it seems plausible that our results would extend to these countries.

Furthermore, with a larger number of units it would also be possible to distinguish between territorial and governmental wars (Buhaug 2006). We suspect that issues related to regional inequalities may be particularly relevant for territorial, or secessionist conflicts. Finally, the data presented herein enables future research to model the effects of regional welfare and inequalities on both conflict duration and transition from conflict to peace.

Appendix A: DHS Surveys Used in the Analysis

Country and DHS Survey Year	*Number of Administrative Units*	*Respondents*
Benin (1996)	6 provinces	5,491
Burkina Faso (1992–93)	30 provinces	6,354
Cameroon (1998)	10 provinces	5,501
Central African Republic (1994–95)	16 prefectures	5,884
Chad (1996)	14 prefectures	7,454
Cote d'Ivoire (1994)	50 departments	8,099
Ethiopia (1992)	13 states	15,367
Ghana (1993–94)	10 regions	4,562
Guinea (1999)	33 prefectures	6,753
Kenya (1998)	7 provinces	7,881
Liberia (1986)	13 counties	5,239
Madagascar (1997)	6 provinces	7,060
Malawi (2000)	3 regions	13,220
Mali (1995–96)	6 regions	12,849
Namibia (2000)	25 regions	6,755
Niger (1992)	7 departments	6,503
Nigeria (1990)	31 states	8,781
Senegal (1992–93)	10 regions	6,310
Tanzania (1999)	25 regions	4,029
Togo (1998)	21 regions	8,569
Uganda (2000–01)	10 regions	7,246
Zimbabwe (1999)	8 provinces	5,907

Appendix B: Descriptive Statistics

Variable	*N*	*Mean*	*SD*	*Min*	*Max*
Conflict onset	6,208	0.023	0.151	0	1
Distance to internal conflict[a,b]	6,626	12.438	4.139	0	13.976
Distance to conflict in neighbor country[a,b]	6,626	11.630	4.622	0	14.815
International border	6,626	0.593	0.491	0	1
Diamonds	6,626	0.136	0.342	0	1
Oil production	6,626	0.083	0.277	0	1
Population size[b]	6,626	12.984	1.491	4.007	16.558
Ethnic difference	6,626	0.661	0.473	0	1
Natural resources	6,626	0.216	0.412	0	1
Household assets	6,626	0.216	0.114	0.030	0.650
Education years	6,626	2.833	2.441	0.010	9.667
Relative deprivation (assets)	6,626	0.203	0.436	−0.762	1.812
Relative deprivation (education)	6,626	0.402	0.808	−1.065	5.205
Gini (assets)	6,626	0.489	0.140	0.163	0.893
Gini (education)	6,626	0.672	0.246	0	0.989
Regional ELF	6,531	0.360	0.230	0	0.798

[a]Log-transformed; [b]Lagged with 1 year.

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