Subnational Variation in Civil Conflict Risk[1]

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Abstract

Most quantitative assessments of civil conflict draw on yearly country-level data to determine a baseline hazard of conflict onset. The first problem with such analyses is that they assume that civil conflicts are distributed uniformly throughout the country. This is rarely the case; most intrastate armed conflicts take place in the periphery of the country, well away from the capital and often along international borders. The second problem with most quantitative analyses of conflict is that they ignore factors associated with the precipitation of violence, such as elections and natural disasters and other trigger mechanisms. Given that baseline hazards are relatively static, most of the temporal variation in risk is associated with such precipitating factors. Analysts fail to disaggregate temporally as well as spatially.

To more adequately assess the base-line hazard and specific population at risk of armed conflict, geo-referenced data from Asia are analyzed with simulation models of both national and sub-national conflict. The two models are integrated to generate maps of the predicted risk of armed conflict, within and across countries. Aspects of social, economic and political exclusion as well as endemic poverty and physical geography are featured as the principal indicators of latent conflict. A closer presentation of the results for Nepal and the Philippines serves to highlight the advantages of focusing on the location of conflict. This paper attempts to address these two problems by identifying these precipitating factors in combination with subnational data makes it possible to explain both the timing and location of civil conflict.

Introduction

The scientific study of war has been successful in identifying a handful of country characteristics that systematically covary with a higher probability of civil conflict onset (see Hegre & Sambanis 2006).[2] As important as this body of research is, it suffers from two shortcomings that limit its value for policy and practitioners. First, most results are driven by cross-sectional variation in the data; in order words, the identified risk factors do a good job of explaining which countries are more at risk, but do not adequately predict the timing of conflict onset. The reason is simple: these factors are either time-invariant (e.g. ethnic fragmentation) or change only slowly (population, GDP). Little attention has been given to uncover factors and events that might exhibit a more sudden, short-term effect on conflict risk. In contrast, forecasting armed conflict is all about capturing temporal dynamics in risk. Second, civil war studies traditionally apply a rigid country-level approach whereby aggregate country data are used and any resulting conflict is assumed to affect the entire country. A number of peripheral conflicts in the contemporary world illustrate the limit of such an assumption; moreover, this procedure fails to explain variations in conflict prevalence and intensity within countries. For early warning purposes, highlighting potential local hotspots of political violence is superior to merely establishing that country i is more at risk than j at time t. Recent advances in data collection and methodology demonstrate that more spatially sensitive research designs are now feasible (e.g. Buhaug & Rød 2006; Buhaug, Gates & Lujala 2009; Raleigh & Urdal 2007).

In this paper, we develop a unified conflict prediction methodology that combines a quantitative assessment of conflict risk at the country level with subnational socioeconomic, demographic, and ethnopolitical data to estimate conflict risk at the first-order subnational administrative level. Using South and Southeast Asia (hereafter referred to simply as Asia)[3] as a test case, we show how the estimated probability of observing intrastate armed conflict varies substantially not only between states but also within most countries. This region is analytically appealing for several reasons: it is home to about half of the world population; it is extremely

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[2] While some reserve the term 'war' to the most severe conflicts, typically requiring at least 1,000 deaths, we use 'war' and 'conflict' interchangeably, denoting domestic political violence between the state and an organized opposition that results in 25 or more battle-deaths in a year. See Gleditsch et al. (2002) for further details.

[3] More specifically, we consider Asian countries east of Afghanistan and south of Russia, and include Indonesia and the Philippines.

diverse in political and cultural terms; it contains some of the wealthiest (Brunei, Singapore) as well as poorest (Myanmar, Nepal) economies; and subnational socioeconomic data are superior in both availability and quality, compared to Africa.

The paper proceeds as follows: First, we describe the country-level model of civil conflict prevalence and present predicted risk scores for countries in Asia, based on a simulation with the most recent available data on the independent variables in the model. Then, we develop a model of subnational conflict risk and discuss determinants of conflict location. The two models are then integrated to generate maps of the predicted risk of armed conflict, within and across countries. A closer presentation of the results for Nepal and the Philippines serves to highlight the advantageous nuances offered by this methodology. The paper ends with some concluding remarks.

On the utility of conflict prediction

Most quantitative assessments of civil conflict draw on a cross-sectional dataset of annualized country data to determine a baseline risk of conflict onset. Political forecasting work has also tended to rely on macro-quantitative data. Both theoretically and empirically, the level of aggregation is too high. One problem with such analyses is that they assume that civil conflicts are distributed uniformly throughout the country. This is rarely the case; most intrastate armed conflicts take place in the periphery of the country, well away from the capital and often along international borders. Plausible causal and aggravating factors of civil conflict, such as poverty and disparities in income, health and standards of living, ethnicity, and terrain, too, vary considerably across a country. To adequately assess the base-line hazard and population at risk of conflict, subnational geo-referenced data are required. These factors serve to identify the location of latent conflict.

The second problem is that quantitative analysis of conflict tends to focus on factors that vary more cross-nationally than cross-temporally. Factors plausibly associated with the precipitation of violence (or triggers) offer an opportunity to disaggregate temporally as well as spatially. Given that baseline hazards are relatively static, most of the temporal variation in risk is associated with precipitating factors such as elections and natural disasters. Identifying these precipitating factors allows us to explain the occurrence of civil conflict as well as to forecast where conflict is likely to occur in the near future.

Being able to identify the location of latent conflict, we can assess where people are at risk. In the same way that identifying the likelihood of a natural disaster in a particular location, we offer a first step at modeling the risk of armed conflict specific to particular regions in different countries. Indeed, this projects genesis came through a contract with the UN Office for the Coordination of Humanitarian Affairs. The project 'quantifies the risk posed by earthquake, flood (and storm surge), landslide, cyclone and tropical storm, tsunumi, drought, and social unrest in the form of intrastate armed conflict in the Asia-Pacific countries' (OCHA 2009: 6). The hazard of natural disaster or armed conflict can be mapped, thereby identifying a specific region at risk. Mapping the location of latent conflict offers an important policy tool for addressing natural disasters and armed conflict.

'Parts of the developing world are struggling to break out of a vicious cycle of natural and manmade disasters – each phenomenon increasing the propensity of the other' (OCHA 2009: 28). Poverty, weak political institutions, and a high population put a country at risk of both natural and armed civil conflict. Those factors associated with a state's ability to effectively conduct relief operations as well as mitigating the risk of natural disaster are the same factors found to be associated with the risk of armed conflict. Indeed, policies designed to develop local coping capacity for natural disasters may also serve to lower the risk of conflict as well. Mapping where people are at risk can help in the delivery of effective disaster relief policy, which in turn may actually serve to lower the chances of armed conflict from ever occurring in the first place.

Developing a country-level model of conflict risk

The first step in generating a subnational conflict prediction model is to establish a country-level model of conflict risk. Risk is here understood as the probability of a conflict occurring within a short time period. Hence, this analysis differs from most statistical studies of civil war, which explore determinants of conflict outbreak (e.g. Collier & Hoeffler 2004; Fearon & Laitin 2003; Hegre & Sambanis 2006). This is because the paper seeks to determine where conflict is more likely tomorrow (or, to be more precise, within the next calendar year), rather than where *new* conflicts are likely to break out. While prevalence is analytically distinct from outbreak – the former captures elements of both onset and duration – most country factors important for explaining conflict outbreak also influence occurrence.

For practical purposes, we use the calendar year as the time unit in the empirical model below. Using data covering the 1951–2004 period, we generate estimates for all covariates believed to exhibit a systematic effect of conflict risk. We then apply the parameter estimates on a dataset with up-to-date values on all regressors for countries in Asia to calculate the estimated probability of observing conflict by country within the following calendar year. Further below, we use these estimates in combination with subnational data to generate a consistent, cross-national measure of conflict risk with subnational variation for key countries.

All armed conflicts have idiosyncratic traits; yet, earlier research has identified a handful of generic factors that correlate with the frequency of conflict. Armed intrastate conflict occurs disproportionately in countries with large and ethnically heterogeneous populations, low national income, poor economic growth, inconsistent and unstable political systems, and with a recent history of conflict (cf. Hegre & Sambanis 2006). The largely stationary nature of these factors implies that they are not well suited to predict the timing of conflict onset. In fact, most results are driven almost entirely by cross-sectional variation rather than by changes in the covariates over time. Standard measures of economic growth and political instability only partially capture the potentially precipitating effect of rapid adverse changes to the political milieu. Accordingly, we decided to supplement the Hegre & Sambanis-inspired empirical model with two factors that plausibly might act as triggers of political violence: onset of severe natural disasters and significant regime changes. While the relationship between natural disasters and armed conflict is poorly understood, two recent studies suggest that sudden and severe disasters (earthquakes, volcanoes, floods, landslides) may disrupt the society, ruin the economy, and create opportunities and motivation for rebellion (Brancati 2007; Nel & Righarts 2008). In addition, there is ample anecdotal evidence that irregular regime changes, such as military coups and assassination of the executive, regularly spark violence that precedes civil war (e.g. Afghanistan 1978, Algeria 1991, Uganda 1971). Finally, we decided to replace the conventional ethnic fractionalization index with a more dynamic and responsive indicator of ethno-political exclusion (see Cederman & Girardin 2007).

In all, our global model of civil war prevalence includes nine country-specific factors plus a time trend variable. Data on the nature of political institutions are taken from the Scalar Index of Polities (SIP) dataset, which omits a possible endogeneity problem evident in the Polity dataset (Gates et al. 2006; see also Vreeland 2008). We include both a linear term (values are

bound between 0, implying a perfect dictatorship, and 1, representing a pure democracy) and its squared term to capture a possible non-linear effect. Both measures are lagged one year. We also include dummy indicators for regular (elections, leader resignation, etc) and irregular regime changes (coup, assassination, etc) in year, based on the Archigos political leader dataset (Goemans, Gleditsch & Chiozza 2008). As a measure of extent of ethno-political exclusion, we constructed an index similar to the *N** developed by Cederman & Girardin (2007). Unlike the original index, which is based exclusively on the static Atlas Narodov Mira, we use a time-varying indicator developed from the unpublished Ethnic Power Relations (EPR) Database. The index varies between 0 and 1 (before log-transformation), where higher values denote a larger share of the population excluded from access to national power. Ethnically homogenous countries (e.g. North Korea), and countries in which ethnicity bears no real political significance (e.g. Scandinavian countries), are by default assigned a value of 0. Complementing the leader change dummies as proxies for societal shock, we measure the severity of natural disasters by country year. A number of alternative operationalizations were tested; the number of people killed in disasters in year (logged and lagged) was found to perform most consistently. Data on GDP per capita (logged and lagged) and country population are taken from Gleditsch (2002). We decided not to include national economic growth due to the reciprocal relationship between conflict and economic activity (Collier et al. 2003).

Finally, we include two time trends. Conflict history, which is particularly crucial in analyses of conflict prevalence, is captures through a decaying function to account for a non-linear healing effect of time, $decay = 2^{-(\frac{T}{\alpha})}$ where α is the half-life (in years) and T is the duration of peace until the time of observation. Several iterations revealed that a half-life parameter of just one year yielded the strongest results. Second, we control for the non-linear pattern in civil conflict by including a squared year variable, centered around 1991 (the peak year in conflict frequency). The results from the global regression analysis are shown in Table 1.

Table 1. Determinants of armed intrastate conflict occurrence, 1951–2004

	β	SE β	p value
SIP Democracy index[a]	.521	.268	.052
SIP Democracy squared[a]	-.377	1.083	.728
Regular regime change	.059	.189	.754
Irregular regime change	.914	.370	.014
$N*$ ethnic exclusion[b]	.924	.293	.002
Disaster deaths[a,b]	.030	.032	.353
GDP capita[a,b]	-.304	.095	.015
Population[b]	.211	.071	.001
Conflict history decay	5.092	.233	<.001
Time squared	-.001	.0003	<.001
Intercept	-3.493	.714	<.001
Wald χ^2			992.59
Observations			6,378

Note: Global logit regression model with robust standard errors clustered on countries;

[a] data lagged one time period; [b] natural logarithm.

Most results in Table 1 are in line with work on intrastate conflict onset. The weak effect of the democracy indicators is representative of the emerging consensus that economic development trumps institutional consistency in explaining the relative absence of armed conflict in Western societies. Earlier reports of a democratic civil peace (e.g. Hegre et al. 2001) largely disappear when the endogenous factionalism category in the Polity data is removed (see Strand 2007; Vreeland 2008), although results shown here should be interpreted with some caution as the SIP scores will be affected by ongoing conflict. Regular regime changes also appear disconnected from conflict risk, but irregular shifts of political leadership is very important in explaining the prevalence of intrastate during the post-WWII era. Political exclusion for sizable minority populations is also a significant risk factor. Natural disasters, in contrast, do not appear to affect the baseline probability of armed conflict. The notion of severe disasters constituting a political shock that increases the risk of violent conflict (e.g. Brancati 2007) therefore seems unfounded. Per capita income is strongly and negatively linked to armed conflict incidence – unsurprisingly – although the magnitude of the effect is somewhat smaller than that for conflict

onset (estimates not shown). This indicates that a serious endogeneity problem is unlikely. The model also shows that civil conflict is disproportionately a feature of populous countries. Finally, we see two types of time trends evident in the data: civil conflict risk is highest around the end of the Cold War, and the overall most powerful predictor of armed intrastate conflict is time since the previous conflict.

In the next section, we use the parameter estimates from Table 1 to estimate the probability of armed civil conflict risk in Asian countries today.

Predicting conflict in Asia I: Country-level assessment

Almost half of all ongoing armed conflicts in the contemporary world are fought in Asia east of Afghanistan (Figure 1). While the rest of the world has been experiencing a decline in the number of civil conflicts since the early 1990s, little discernable trend is evident in the Asia region. As a result, the proportion of the world's armed conflicts fought in Asia has been on the rise. This region also contains some of the most durable insurgencies, as found along the borders of Myanmar and in the central and southern islands of the Philippines. However, Asian conflicts are generally somewhat less deadly than the average intrastate conflict, despite the civil war in Sri Lanka being among the most violent conflicts in recent years.

Figure 1. Frequency of armed conflict, 1946 – 2007
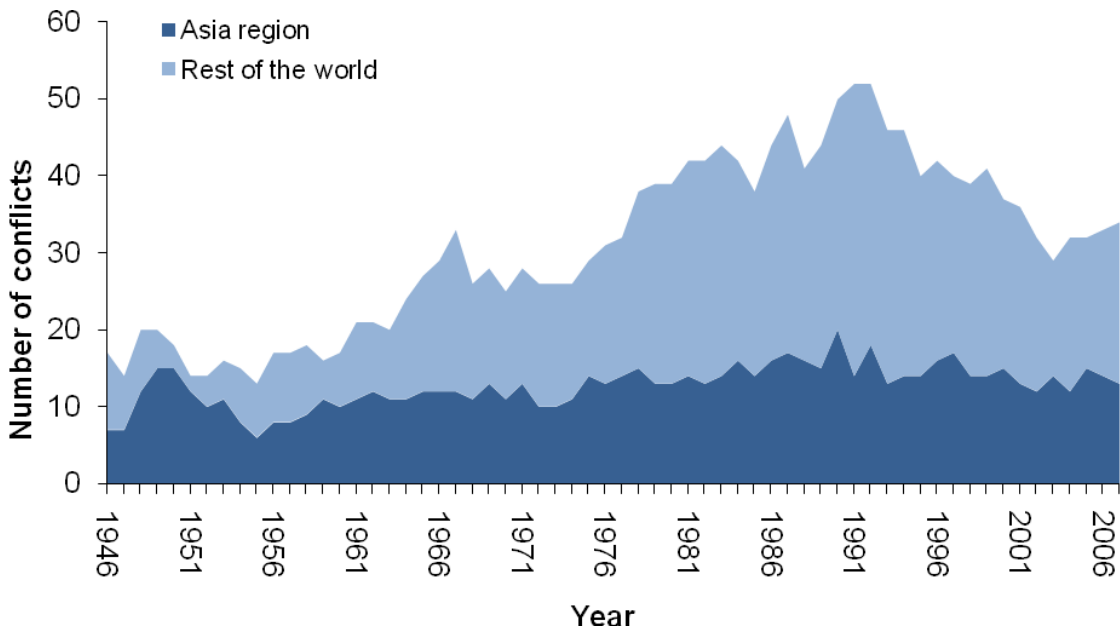
The first step in predicting future armed conflict in Asia is to use the parameter estimates from the empirical model in Table 1 to produce up-to-date risk scores by country. For some country characteristics, it is possible to get accurate data within a matter of months (e.g. GDP, population size, disaster casualties). For other variables in our model, notably the Scalar Index of Polities (SIP) and the *N** index from the Ethnic Power Relations (EPR) dataset, updating occurs much less frequently. Below, we enter the most recently available values on all covariates when generating risk scores, although simulation or imputation of probable values (extrapolation) is a feasible strategy if we want to predict conflict further into the future (see Hegre, Strand & Urdal 2008).

Figure 2 visualizes the output of this assessment, ranking the countries in Asia in ac-cordance with conflict likelihood. As is evident, the region is split in two in terms of conflict risk. The top eight countries are estimated to have a probability of armed conflict that at least ten times higher than the next country on the list. This significant divide is driven largely by the country's previous conflict history. Six of the top eight countries hosted one or more armed conflicts in the last year with conflict data (2007), while the remaining two countries had just emerged from conflict (Nepal in 2006 and Indonesia in 2005). In contrast, the most recent armed conflict in the sample of low-risk countries ended more than ten years ago, in 1998 (Cambodia).

Figure 2. Estimated risk of armed intrastate conflict in Asia by country
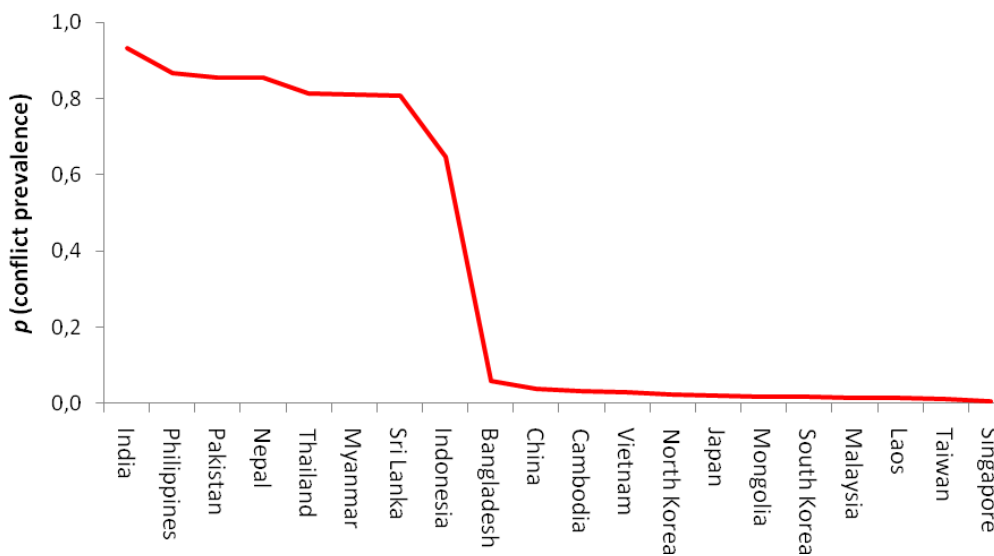
This country-level analysis has shown that time-varying factors can indeed complement the robustly significant but largely static measures of political, economic, and geographic features in explaining the prevalence of intrastate armed conflict. Both ethno-political power configurations and irregular regime changes exhibit considerable influence on conflict. In the case of China, the predicted probability of observing conflict within the next year more than doubles (from 4% to 9%) if an irregular regime change occurs; for Indonesia, the change is measured at 18 percentage points (from 64% to 82%). As a means of forecasting outbreak of new armed conflict, assassination of a state leader or a military coup appears to serve as a good early warning indicator.

The prediction scores of Figure 2 can also be illustrated by means of a map (Map 1). The bimodal pattern of estimated conflict likelihood is again apparent, with no observations in the middle range (light green to light orange color) of the probability distribution. However, while such a map effectively highlights countries of high concern, it can be misleading. Or, to put it differently: it underscores the limitation of country-level conflict analysis. Most contemporary armed conflicts in Asia (and the world) are quite limited in geographic extent. This means that for large high-risk countries such as India, Indonesia, and Thailand, the majority of the territories are unaffected by the violence and may not be considered particularly exposed. Important conflict-promoting factors (poverty, political exclusion) also vary considerably within country boundaries. From a policy or practitioner's perspective, *knowing where, within these countries, conflict is more likely is crucial* -- hence our desire to go subnational.

Map 1. Risk map of armed intrastate conflict in contemporary Asia
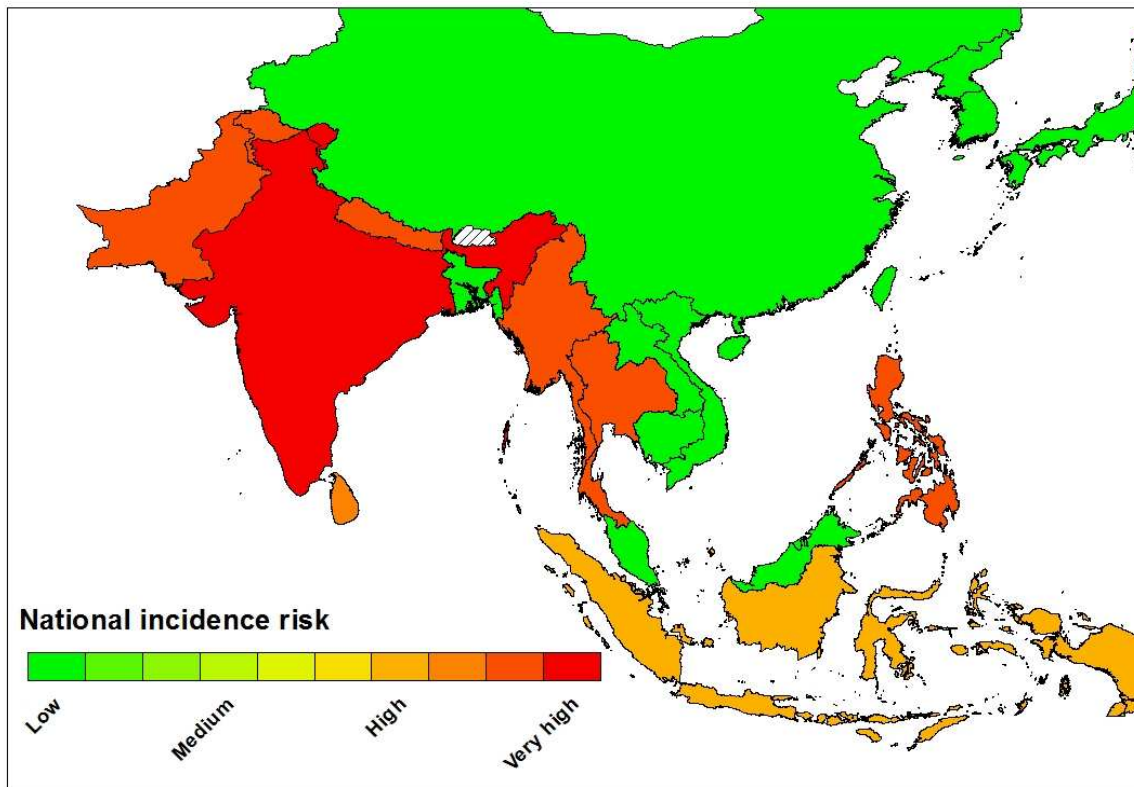
Predicting conflict in Asia II: Subnational assessment

We have seen that the predicted risk of armed conflict among countries in Asia varies greatly. Some countries appear extremely unlikely to undergo severe civil disturbances (e.g. Singapore). But the region also includes a handful of countries that are almost certain to experience conflict within the next year (e.g. India). Yet, as alluded to above, we know that there are large inter-regional differences in conflict propensity within countries (Buhaug & Rød 2006; Rustad et al. 2008), and conflict-ridden states are rarely completely engulfed by the conflict. For example, the separatist insurgency in southern Thailand shapes everyday life in the Pattani region, but has no perceptible impact on Bangkok and other core areas. The same goes for the rural rebellions in northeastern India and the Muslim uprising in Mindanao in the Philippines.

The main reason why we see this intrastate heterogeneity in conflict risk is, of course, that there are similar (if not always overlapping) economical, social, ethnic, and political cleavages within most countries. By breaking countries of interest into subnational entities, we follow a

recent trend in the civil war scholarship of disaggregation. But what is the suitable research design? Several alternatives exist. First, we could apply a grid structure on Asia and let each individual grid cell constitute the unit of analysis (see Buhaug & Rød 2006). The advantage of this design is that it can be applied without consideration of differences in political and demographic patterns across space and time, as opposed to studying politically defined provinces. Yet, the grid approach is unintuitive and fails to capture important societal cleavages that follow subnational boundaries. Alternatively, we might choose social groups as our units of analysis (e.g. Buhaug, Cederman & Rød, 2008). This option is analytically attractive as groups, not grid cells, are the agents engaged in the conduct of violence in civil war. Yet, with the sole exception of ethnicity (the GREG project, see Weidmann, Rød & Cederman 2009), we are aware of no available geo-referenced data on politically relevant segments of the population, and limiting our analysis to ethnic groups implicitly implies limiting the scope of the project to ethnic conflict. Consequently, we opted for a third form of geographic disaggregation, studying the first-order administrative entities (provinces, districts) within countries (see Østby, Nordås & Rød, 2009). The main weakness of this approach is the lack of unit consistency across time: subnational political boundaries frequently change and provinces are sometimes merged or split up. Getting good socioeconomic data (and maps) reflecting old political delimitations can be challenging. For this prediction project, however, we consider that a trivial limitation as we are primarily focusing on the contemporary world.

By predicting conflict risk at the province level, this study seeks to identify local hotspots: critical areas with a high (latent) conflict propensity. However, the value of such an exercise can never be better than the quality of the underlying data. This fact becomes all the more apparent when the usual unit of analysis, the country, is replaced with subnational regions. For some countries in our study region, crucial socioeconomic and demographic data are unavailable or inconsistent (e.g. China, Myanmar, North Korea). In addition, a high-resolution risk assessment was deemed irrelevant for geographically small countries (Brunei, East Timor, Singapore) and for consolidated democracies with no recent history of armed conflict (Japan, South Korea). The subnational assessment of intrastate conflict risk in Asia is thus limited to twelve countries: Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Nepal, Pakistan, the Philippines, Sri Lanka, Thailand, and Vietnam.

So, what explains the location of civil war? Empirical research on local determinants of civil conflict is still in its infancy, although theories of civil war often contain elements of location (e.g. Gurr (1970) on relative deprivation, Fearon & Laitin (2003) on characteristics conducive to insurgency, Herbst (2000) and Toft (2003) on settlement patterns, and Cederman & Girardin (2007) on ethno-political exclusion). In general, quantitative civil war models seem better at predicting insurgencies and separatist rebellions than coups, revolutions, and other governmental upheavals. For example, Buhaug & Rød (2006) report that territorial (separatist) conflict is more likely in peripheral, rural areas, and along the national boundaries, while Buhaug, Cederman & Rød (2008) find very strong support for their expectation that ethnic conflict is more likely in mountainous areas, far from the capital, and inhabited by a large, politically excluded ethnic group. In addition, Østby, Nordås & Rød (2009) find some evidence that relatively deprived regions are more likely to host a rebellion.

Our prediction model is heavily influenced by these studies. In the following, we provide details on the construction of a subnational index of risk that contains five components likely to affect the probability of observing violence: population, socioeconomic status, ethno-political exclusion, distance from the capital, and conflict history. A number of country-specific sources (such as national bureaus of statistics and Human Development Reports), as well as international data providers (e.g. CIESIN, Columbia University), were consulted before creating the indices.

Population

One of the most robust findings in civil war studies is that large populations increase the risk of conflict (Hegre & Sambanis 2006). Disaggregated studies, too, suggest that conflict is more likely near urban centers (e.g. Hegre & Raleigh 2006). Since the average size of the provinces varies substantially between countries, we decided to use a relative measure of population within each country that is standardized across the sample. We use CIESIN's Gridded Population of the World (GPW) data to calculate the percentage of the national population living in each province.[4] We then measured the deviation (in standard deviations) from the province containing the capital city, from which we create a five-point scale where 1 indicates low population and 5 indicates high population.

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[4] This and most data operations described below were conducted using the geographic information systems (GIS) software *ArcGIS*.

Socioeconomic status

Hegre & Sambanis (2006) find that low per capita income and slow economic growth are among the strongest predictors of conflict on national level. This appears corroborated subnationally by Østby, Nordås & Rød (2009) and Buhaug et al. (2009). To capture this effect, we created a province-level indicator of socioeconomic status consisting of 4-5 variables (depending on data availability). Due to variation in available data from one country to the next, the specific factors included differ between some countries. However, most of the country indices contain local estimates of GDP per capita, infant mortality, and HDI scores from national Human Development Index reports.[5]

The underlying components in the socioeconomic index were created by first measuring the difference in absolute values between each district and the district with the highest score on the given factor (this is normally the capital district, but not always). Each factor variable was then transformed into a five-point scale, based on standard deviation. Provinces with a HDI score less than one standard deviation different from the reference unit receives a value of 1 (i.e. relatively well off), while 1--2 standard deviations is assigned a score of 2 and so on. On all components, provinces with scores exceeding 4 standard deviations from the reference value are assigned the maximum score (5). Finally, the socioeconomic variables are added together and standardized to a five-point scale to create the socioeconomic status index. Accordingly, the index is expressed in relative terms (i.e. relative to the district scoring highest) and thus captures elements of horizontal inequality (Østby 2008; Murshed & Gates 2006; Stewart 2002).

Ethno-political exclusion

The relationship between ethnicity and civil war remains highly disputed, and various indices of ethnic diversity at best appear associated with low-intensity conflicts only (cf. Hegre & Sambanis 2006). Recent advances in identifying the location of ethnic groups now makes it possible to study the ethnicity-conflict dynamics at a more appropriate group level, while explicitly accounting for important geographic factors (Weidmann, Rød & Cederman 2009). In the first true large-N comparative study of ethnic groups' propensity to rebellion, Buhaug, Cederman & Rød (2008) find that the risk of conflict increases with the size of the politically excluded group

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[5] The sources and characteristics of the specific socioeconomic indicators can be found in the appendix

relative to the group(s) in power, the distance from the capital to the excluded group's home territory, and the amount of rough terrain in the groups settlement area.

In this paper, we adopt the notion of ethno-political exclusion and use the same geo-coded ethnicity data – the Geo-Referencing of Ethnic Group data, GREG (Weidmann, Rød & Cederman 2009). Using *ArcGIS*, we identified the dominant ethnic group in each subnational region under study and also calculated the share of the population in the region belonging to the largest ethnic group. From this, we coded whether the dominant ethnic group has access to national power (i.e. being considered part of the EGIP – the ethnic group(s) in power) and the share of the local population with access to national power, also taking into account smaller groups in the region. We code this based on information in the unpublished Ethnic Power Relations (EPR) database at ETH Zurich). The ethno-political exclusion index is then constructed by summing the two components: 2 points if locally dominant group is excluded, 0 if not; and between 1 and 3 points depending on the distribution of EGIP vs. excluded populations in the province (higher score implies higher share of excluded populations). Taken together, these two components make a five-point scale, where 1 indicates a region dominated by one large ethnic group who is part of EGIP, while 5 implies local dominance of an ethnic group that is excluded from national power.

Conflict history

Armed conflicts exhibit considerable inertia. Countries just emerging from a civil war has a much higher probability of reverting to conflict than similar countries with a peaceful recent past. This is sometimes referred to as serial correlation or duration dependence in statistics (see Beck, Katz & Tucker 1998). To account for the conflict history at the region level, we use geo-coded conflict polygon data (Rustad et al. 2008) to create a six-point scale indicating whether the region has experienced conflict and when. If the region has never experience conflict, it receives a 0; the rest of the scale is divided as follow: 1 = 1946–1989, 2 = 1990–1997, 3 = 1998–2002, 4 = 2003–2006, 5 = 2007.

Geographic location

The last factor we include is an indicator of the relative geographic location of the district. Earlier studies (e.g. Buhaug & Rød 2006) have found a significant positive relationship between the distance to capital and risk of civil conflict, and a similar effect is found between conflict risk and

proximity to the border. This supports a state capacity argument where the government is less able to exert full authority and monitor the local population in distant areas (Boulding 1962), although it is also consistent with peripheral regions being more prone to economic and cultural discrimination.

To capture the effect of relative location, we created an indicator of center vs. periphery, consisting of two dichotomous variables that jointly form a 3-point scale (0–2): first, a dummy variable indicating whether the sub-national region is situated further away from the capital city than the average distance for all sub-national regions in country (1 if further away than the average; 0 otherwise); second, a dummy variable indicating whether the sub-national region is situated on a different island than the capital city or along an international border (1 if yes, 0 otherwise).

Sub-national conflict risk index

From these five indicators a relative conflict risk index is constructed. The first four components (population, socioeconomic status, conflict history, and ethno-political exclusion) are assigned equal weight (all have maximum values of 5) while the fourth component, geographic location, is considered less important (the maximum value is 2).[6] A summarized relative risk index of the five components ranges between 3 and 22.

Since the index for each country is relative to the capital region the risk is primarily suited for comparing with other districts in the same country. To offer a more objective, cross-sectional consistent indicator of conflict risk, we join the local risk scores with the country-level conflict incidence risk estimated from Table 1. However, to maintain reasonable sub-national variation within countries, we multiply the national conflict incidence risk by 10 for those regions that score higher than 4 standard deviations above the minimum value on the sub-national hazard index[7], and then multiply the national conflict incidence risk by the sub-national risk. By multiplying the national risk with the highest subnational scores only, we avoid inflating the local

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[6] The relative importance of these components may differ between countries; the presented methodology can be modified to account for this.

[7] We found when we calculated the socio-economic hazard that a difference of four standard deviations between the best-off region and the other regions often was a suitable cut-off point; we therefore use the same here.

risk for regions in conflict-ridden countries that do well on the sub-national indicators (e.g. central Thailand).

Map 2 visually presents the results and provides a more nuanced picture of where armed conflict is more likely, especially compared to the cross-national analysis presented in Map 1. Most of the twelve countries have considerable sub-national variation in conflict likelihood. India, in particular, displays high internal variation in conflict risk, with violence being very likely in the northwest and northeast but much less so in the central parts of the country. This reflects the long-lasting separatist conflicts in Kashmir, Assam, Manipur, and Nagaland, as well as the Naxalite rebellion around Chhattisgarh, Jharkhand, and Andhra Pradesh. Recent conflict history, peripheral location, and local dominance of minority groups also explain the high likelihood of violence in the predominantly Muslim southern provinces of Thailand. In Nepal, the conflict hazard is highest in the border districts, most of which are economically marginalized and contain politically excluded populations. In Indonesia and Sri Lanka, too, periphery, poverty, ethnicity, and earlier violence all overlap, thus leading to considerable sub-national variations in estimated likelihood of armed conflict.

Map 2. Sub-national distribution of conflict risk
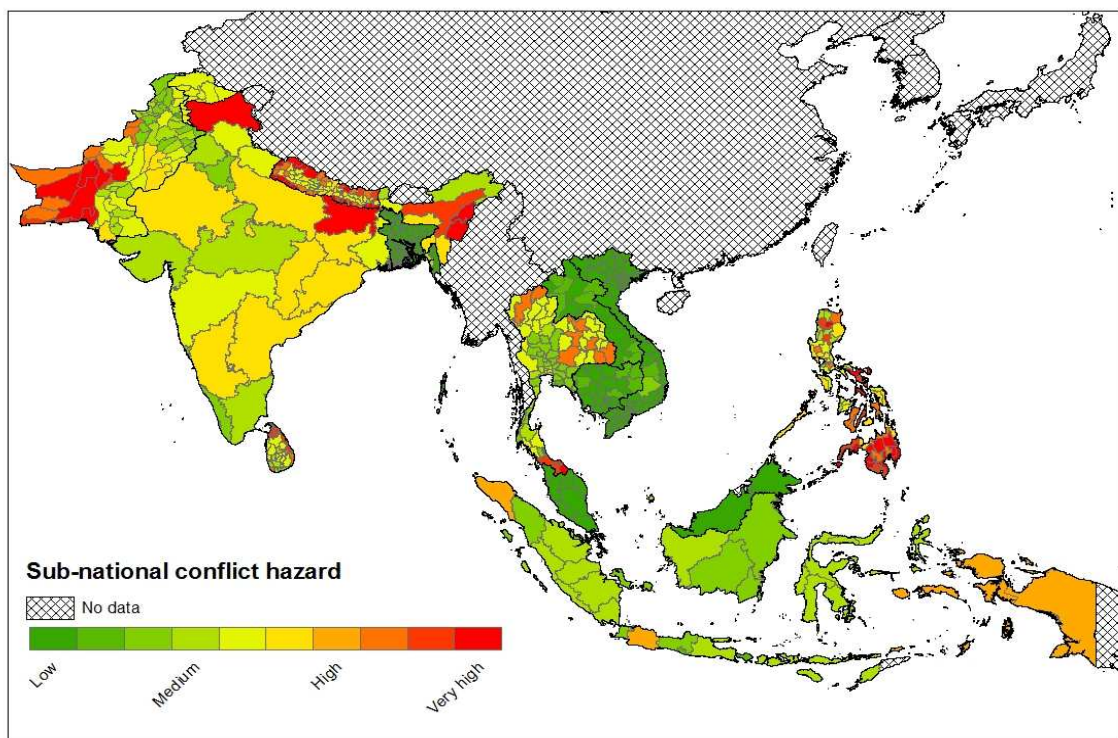
Map 2 clearly gives us an indication of where we should expect to find conflict in the coming year. The relative nature of the subnational risk nonetheless implies that some caution should be exercised when comparing maps for different countries. For example, we see that most districts in northern Pakistan (except Kashmir) come out with a lower latent risk than central parts of India. This is partly due to low inter-regional differences in northern Pakistan, while states in central India have a higher average deviation from the best-off region on the different factors in the index. But it also reflects the fact that India as a whole has a higher estimated probability of armed conflict than any other country in the region, including Pakistan (Figure 2).

To provide further details on the results of this analysis, we look specifically at two cases: Nepal and the Philippines. Both countries range high in terms of predicted risk of armed civil conflict (Figure 2) and both display considerable internal variance in the distribution of conflict risk.

Nepal

Nepal is a poor, landlocked, ethnically diverse and conflict ridden country, and exemplifies a case with a high – although declining – conflict risk in the cross-national analysis (Figure 2) and a very high risk of conflict in several areas in the sub-national analysis (Map 2). While low socioeconomic development and demographic characteristics have some effect on Nepal's national conflict risk, prior conflict history stands out as the primary factor explaining this country's high propensity for renewed armed conflict.

A ten-year long civil war started in Nepal in 1996, when the Communist Party of Nepal-Maoist (CPN-M, also known simply as the Maoists) launched a violent insurgency against the government of Nepal. Justified by an ideology defining political armed struggle as an expansion of class warfare, the Maoists declared a 'People's War' in Nepal, and rapidly gained control over areas where a vacuum of government prevailed. As illustrated in Map 3, the civil war began in the Maoist strongholds of Rolpa and Rukum in the Mid-Western region of Nepal, but the conflict increased in scope and intensity over time (Do & Lakshmi 2006). During the last years of the war, the Maoists operated in 68 of the country's 75 districts, and few areas were left unaffected by the fighting.

Map 3: Maoist influence and initial conflict areas in Nepal
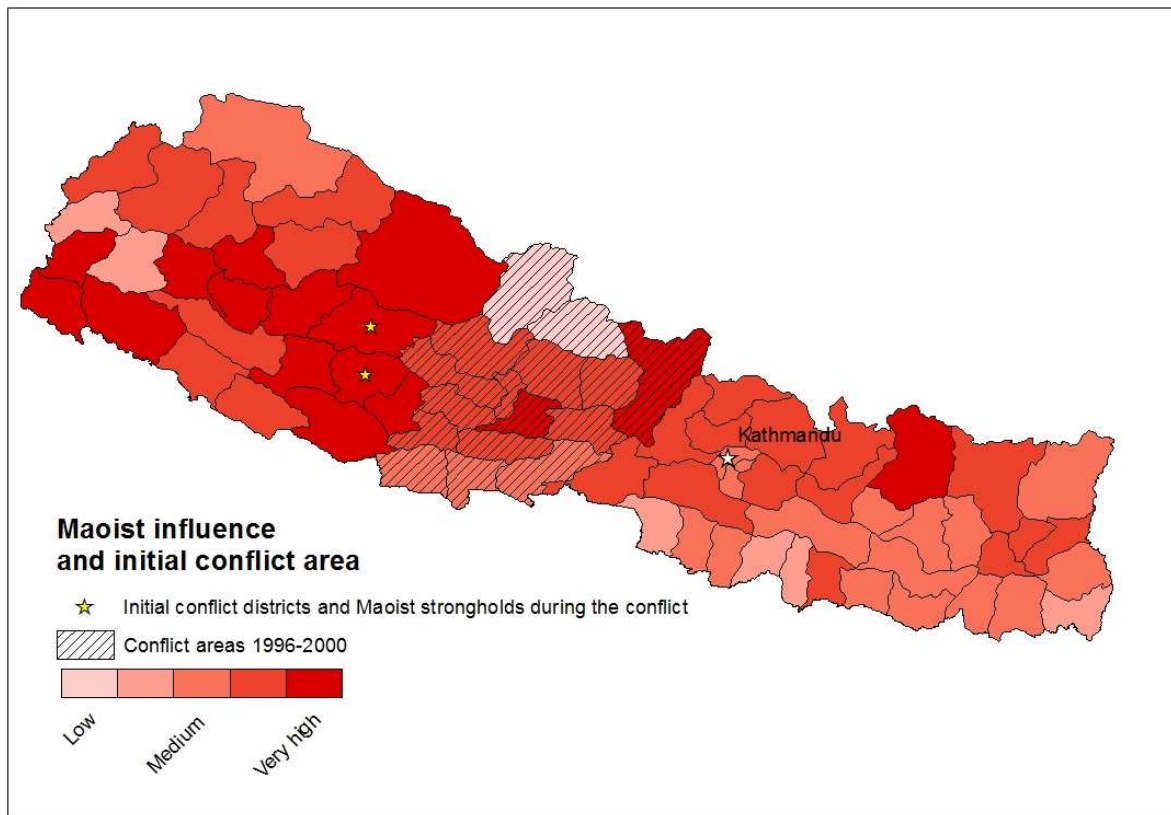
The conflict between the Maoists and the government concluded with the signing of the Comprehensive Peace Agreement (CPA) in November 2006. Since the signing of the CPA, Nepal has experienced considerable positive political change, first with a successful transition period with shared power between the traditional political parties and the Maoists, followed by the democratic election of a new Constituent Assembly in April 2008, and finally the inauguration of a Maoist-led government in August 2008 (Falch & Miklian 2008). Although the end of the civil war has brought about improvements in security, infrastructure, and an increase in tourism, which has pushed Nepal's growth rate up to 4% in 2008 (CIA 2009), the country remains one of the world's most economically disadvantaged. During the past two years, Nepal has also been plagued by repercussions of the civil war with nationwide thuggery by the youth branch of the former Maoist rebel group (the Youth Communist League, YCL), as well as localized instability and violence in the southern part of the country. Altogether, these factors contribute to the explanation of Nepal's high overall risk of future conflict.

Map 4 shows Nepal's predicted sub-national distribution of conflict risk. While no districts are free from risk of armed conflict, most rural border areas have a relatively higher likelihood of experiencing conflict than the interior areas. Some of these border districts, particularly in the southern belt of the country (Terai), are also among the areas that have experienced instability over the past two years. In 2007, violent clashes broke out between the Nepalese army and Madhesi ethnic groups[8] in the populous and fertile low-lands of Terai, when the latter began agitating for autonomy and more access to political power. Although this violence has ebbed somewhat after the government endorsed the Madhesis' ultimatum of increased autonomy to the southern parts of the country in 2008, the Terai region is still unstable and a potential source of future conflict. This is also reflected in map 4, showing a high conflict probability for the majority of the southern Terai districts.

Map 4: Sub-national distribution of conflict risk in Nepal

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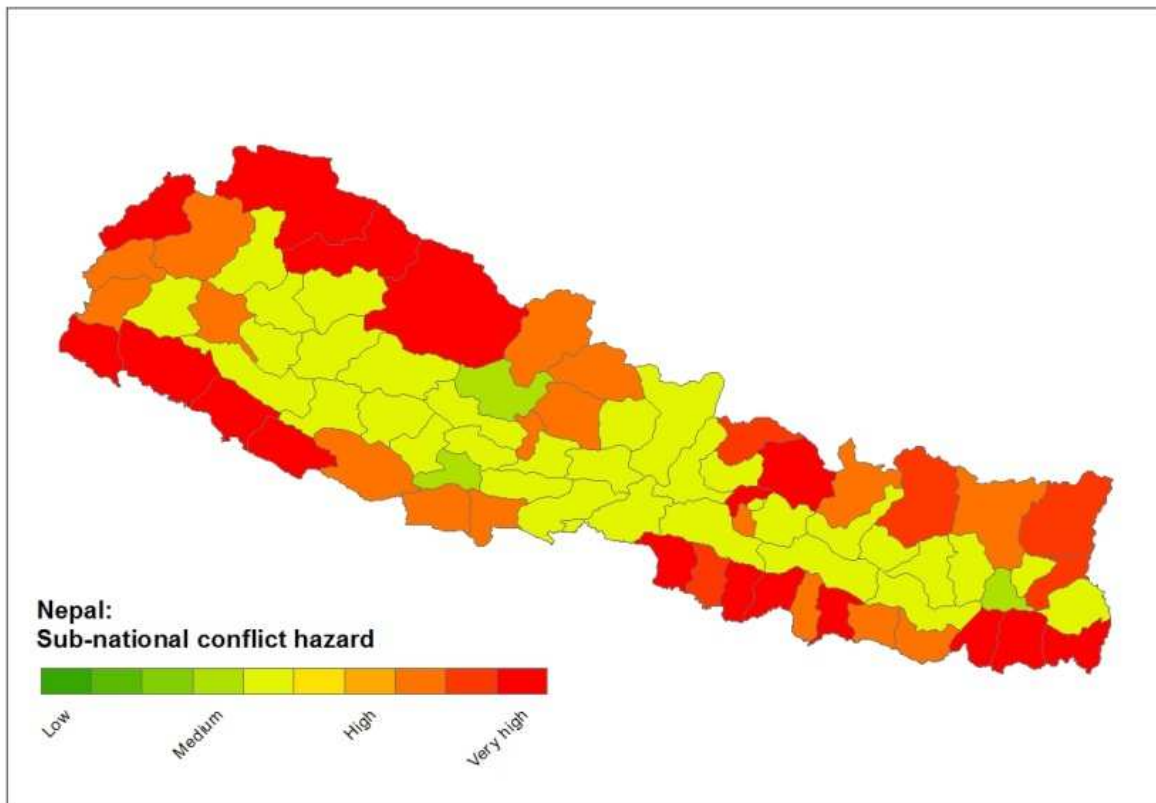
[8] Primarily the Madhesi Janadhikar Forum (MJF) and the several factions of the Jantantrik Terai Mukti Morcha (JTMM).

Several Northern Himalayan districts are also marked with a high conflict risk in our sub-national analysis. However, since the end of the civil war in 2006, these areas have not been subject to any major violent incidents, and particularly the districts in the North-West[9] are characterized by a very low population density, with only 5-24 persons per km² (CIESIN 2005). In sum, it is mainly the overlapping peripheral location, low socioeconomic status (compared to other districts of Nepal), and exclusion of major ethnic groups (Tibetans) from local and national power that contribute to the high predicted likelihood of renewed violence in these districts. One should, however, not exclude the possibility of this indicating a 'false positive,' given the relative calm and scarce population in these areas.

The Philippines

Since the end of World War II, the Philippines has been haunted by political turbulence, with repeated armed conflicts and violence. Two active conflicts in the central[10] and southern[11] parts of the archipelago explain why the country has a very high conflict risk in 2009, second only to India (Figure 2). In addition, the Philippines has a history of political instability, with a conflict over governmental power predating the communist insurgency,[12] and several violent coup attempts over the years.

Numerous attempts at peace negotiations with the rebel groups notwithstanding, the government's talks with the rebel movements (CPP, ASG, and MILF) have stalled, and the Philippines continues to be plagued by violence and conflict (UCDP 2008; ICG 2008). Economically, the Philippines has experienced significant progress during the last eight years, with growth averaging 5 % (due to high government spending, a resilient service sector and a high income from remittances from Filipinos working abroad (CIA 2009)). In spite of this progress, poverty and high geographic disparities in income still prevail (Balisacan et al. 2009).These factors together with the political instability brought about by the persistent armed conflicts contribute to the country's high national risk for future conflict.

[9] The districts of Humla, Mugu, Dolpa, Mustang and Manang.

[10] The armed wing of the Communist Party of the Philippines (CPP), the National Peoples' Army (NPA).

[11] Primarily the Abu Sayyaf Group (ASG) and the Moro Islamic Liberation Front (MILF).

[12] The Hukbalahap (Huk) rebellion, which was led by activists within the Filipino Communist Party, in 1946-1954.

Map 5 displays the geographic distribution of the internal conflicts in the Philippines. As illustrated, most parts of the county have been affected by one or two of the armed conflicts, with the territorial conflict between the Government and the several Muslim separatist groups[13] being concentrated to Mindanao and the Sulu Archipelago in the South, and the conflict between the government and the CPP has been more widespread throughout the country.[14]

**Map 5: Sub-national distribution of armed conflict in the Philippines, 1971–2006**

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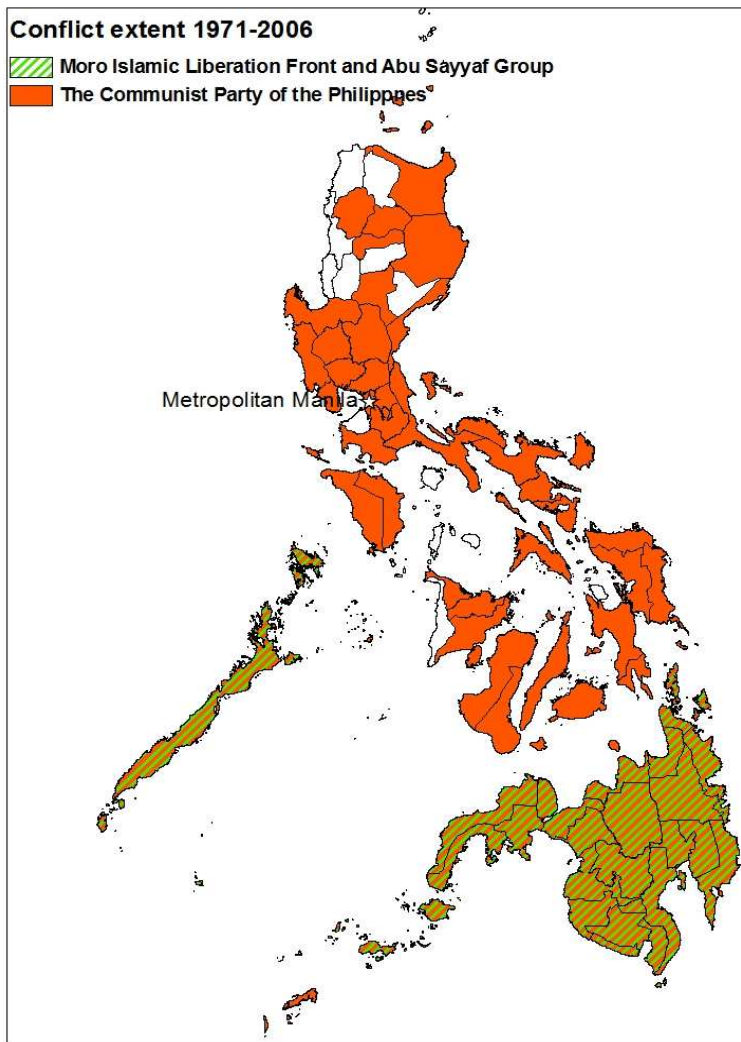
[13] Mainly the MILF, the ASG, Mindenao Independence Movement (MIM), and the Moro National Liberation Front (MNLF).

[14] In 2006, the NPA was active in 69 of the Philippines' 79 provinces (UCDP 2008).

Although the Philippines is predicted to have a high national conflict risk, our sub-national analysis reveals that the country has a considerable geographical variation in the risk of conflict (Map 6). Like in Nepal, no area is exempt from risk of armed conflict, and some provinces are predicted to have a much higher likelihood of experiencing violence than others. Not surprisingly, Mindanao and the Sulu Archipelago are among the areas with the highest estimated risk of conflict. Since the Moro National Liberation Front (MNLF) in Mindanao made its first offensive against the government in the early 1970s, this region has been the stage of constant violent clashes and unrest (UCDP 2008). Mindanao and the Sulu Archipelago are also among Philippines' poorest regions and along with their peripheral location vis-à-vis Manila these are contributing factors to the explanation of the areas' high estimated conflict risk.

Map 6: Sub-national distribution of conflict risk in the Philippines
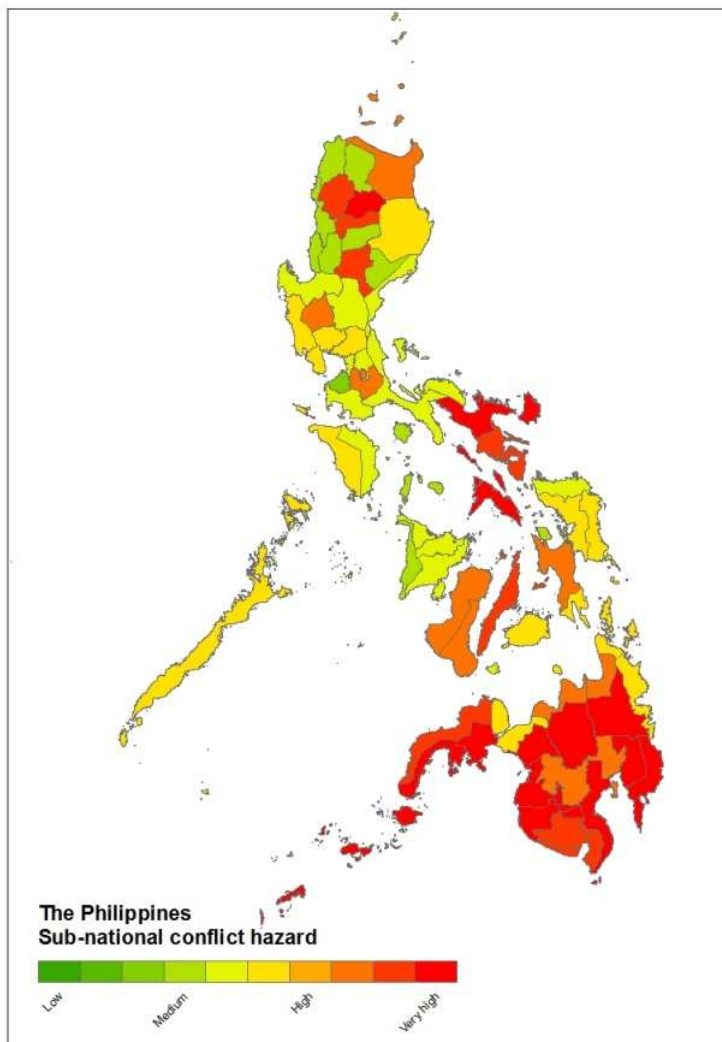
The mountainous Cordilleras region in the Northern region of Luzon is another area with a very high conflict risk. Although not directly affected by armed conflict in recent years, this area has a history of persistent protest, starting in the 1970s when the government's exploitation of the region's natural resources brought tribal groups (Igorots) residing in the Cordilleras into conflict with the Government and lowland Filipinos (MAR 2005). The Cordilleras is scarcely populated, but the low socioeconomic status of this area, along with prior conflict history and the systematic political exclusion of the Igorots may explain its high estimated probability for future conflict.

Cebu Island in Central Visayas is a third area that perhaps somewhat surprisingly is predicted to have a high likelihood of conflict. Compared to other areas of the country, Cebu is not as socioeconomically disadvantaged, and the island has not been directly affected by armed conflict over the last three years. Our sub-national data reveal that Cebu's high risk of conflict primarily comes from its high population density, peripheral distance from Manila and former conflict history. The possibility of renewed fighting in this area does, however, not seem to be imminent, and the likelihood this being another 'false positive' conflict-prone area should hence not be rejected. What our analysis does tell us is that these areas exhibit latent conflict, when and whether they manifest themselves is much more difficult to determine.

Conclusion

The aggregation of information at the yearly and/or country level can lead to faulty forecasts. Indeed, most attempts to model the risk of conflict, including efforts at forecasting suffer from this problem. Such analyses also tend to ignore time-varying parameters and focus instead on factors that vary more cross-sectionally. Our geo-referenced subnational data allow us to remedy the spatial aggregation problem. These indicators are particularly valuable for identifying the incidence of economic, social, and political exclusion. Our model does a good job of identifying the location of latent conflict. We are less successful in addressing the temporal aggregation problem. At the national level we are able to identify some factors that can change quickly and may trigger conflict – events such as coups and elections.

At the subnational level, political exclusion (or inclusion) can change quickly and frequently. Changes in the degree of exclusion may increase or decrease the chances of armed civil conflict. The complex nature of the relationship between natural disasters and civil conflict is still poorly

understood. Some recent natural disasters seem to indicate that armed conflict affect the social vulnerability to natural disasters. Conflict seems to have contributed to high death tolls in Myanmar (the 2008 tropical storm Nargis), Indonesia and Sri Lanka (the 2004 Indian Ocean tsunumi), and Pakistan (the 2005 Kashmir earthquake) (OCHA 2009: 28). Less well understood is the impact of natural disaster on civil conflict. A single natural disaster, the 2004 Indian Ocean tsunumi seems to have induced peace in Acheh in Indonesia and only heightened the violence in the violence in Sri Lanka. More work is needed in identifying the way these and other events precipitate conflict. We need to better understand the micro-level mechanisms that link these events to the strategic decisions made by state and rebel leaders, which in turn determine the nature of conflict and cooperation in a country. Disaggregated theories and data offer great promise for predicting where and when armed conflict will occur.

References

Balisacan, Arsenio M.; Hal Hill, & Sharon Faye Piza, 2009. 'Spatial Disparities and development policy in the Philippines.' In Yukon Huang and Alessandro Magnoli Bocchi (eds.). *Reshaping Economic Geography in East Asia*. Washington DC: The International Bank for Reconstruction and Development/The World Bank.

Beck, Nathaniel, Jonathan N. Katz, and Richard Tucker. 1998. Taking Time Seriously: Time-Series–Cross-Section Analysis with a Binary Dependent Variable. *American Journal of Political Science* 42 (October): 1260–1288.

Boulding, Kenneth. 1962. *Conflict and Defense*. New York: Harper and Row. Brancati, Dawn, 2007. 'Political Aftershocks: The Impact of Earthquakes on Intrastate Conflict', *Journal of Conflict Resolution* 51(5): 715-743.

Buhaug, Halvard; Lars-Erik Cederman & Jan Ketil Rød, 2008. 'Disaggregating Ethno-Nationalist Civil Wars: A Dyadic Test of Exclusion Theory', *International Organization* 62(3): 531–551.

Buhaug, Halvard; Kristian S. Gleditsch, Helge Holtermann & Gudrun Østby, 2009. 'Poverty, Inequality, and Conflict: Using Within-Country Variation to Evaluate Competing

Hypotheses', paper presented to the 50th Annual Convention of the International Studies Association, New York City, NY, 15–18 February.

Buhaug, Halvard; Scott Gates & Päivi Lujala, 2009. 'Geography, Rebel Capacity, and the Duration of Civil Conflict', under journal review.

Buhaug, Halvard & Jan Ketil Rød, 2006. 'Local Determinants of African Civil Wars, 1970–2001', *Political Geography* 25(3): 315–335.

Cederman, Lars-Erik & Luc Girardin, 2007. 'Beyond Fractionalization: Mapping Ethnicity onto Nationalist Insurgencies', *American Political Science Review*, 101(1): 173-185

Center for International Earth Science Information Network (CIESIN), 2005. 'Gridded Population of the World', Columbia University; Available at: http://sedac.ciesin.columbia.edu/gpw/index.jsp (last accessed 2 February, 2009).

CIA World Factbook, 2009. Available at https://www.cia.gov/library/publications/the-world-factbook/ (last accessed 2 February, 2009).

Collier, Paul; V.L. Elliott, Håvard Hegre, Anke Hoeffler, Marta Reynal-Querol, & Nicholas Sambanis, 2003. *Breaking the Conflict Trap: Civil War and Development Policy.* Washington DC: World Bank and Oxford University Press.

Collier, Paul & Anke Hoeffler, 2004. 'Greed and Grievance in Civil War', *Oxford Economic Papers* 56: 563-595.

Do, Quy-Toan & Iyer Lakshmi, 2006. 'An Empirical Analysis of Civil Conflict in Nepal,' Institute of Governmental Studies, Paper WP2006-14. Available at: http://repositories.cdlib.org/igs/WP2006-14 (last accessed, 2 February, 2009).

Falch, Åshild & Jason Miklian, 2008. 'A Transitional Success Story: The Nepali Experience with Power-Sharing,' *CSCW Policy Brief*. Oslo: PRIO.

Fearon, James D. & David D. Laitin, 2003. 'Ethnicity, Insurgency, and Civil War', *American Political Science Review* 97(1): 75-90.

Gates, Scott, Håvard Hegre, Mark Jones & Håvard Strand. 2006. 'Institutional Inconsistency and Political Instability: Polity Duration, 1800–2000', *American Journal of Political Science* 50(4): 893–908.

Gleditsch, Kristian Skrede, 2002. 'Expanded Trade and GDP data', *Journal of Conflict Resolution* 46(5): 712-724

Gleditsch, Nils Petter, Peter Wallensteen, Mikael Eriksson, Margareta Sollenberg & Håvard Strand, 2002. 'Armed Conflict 1946–2001: A New Dataset', *Journal of Peace Research* 39(5): 615–637.

Goemans, H.E., Kristian S. Gleditsch & Giacomo Chiozza. 2008. 'The Empirical Study of Political Leaders: Introducing the Archigos Data', *Journal of Peace Research* 45: forthcoming.

Hegre, Håvard, Tanja Ellingsen, Scott Gates, & Nils Petter Gleditsch, 2001. 'Toward a Democratic Civil Peace? Democracy, Political Change, and Civil War, 1816-1992', *The American Political Science Review* 95(1): 33-48.

Hegre, Håvard & Nicholas Sambanis, 2006. 'Sensitivity Analysis of Empirical Results on Civil War Onset', *Journal of Conflict Resolution* 50(4): 508–536.

Hegre, Håvard & Clionadh Raleigh, 2006. 'Population size, concentration, and civil war. A geographically disaggregated analysis', paper presented at the 47th Annual Convention of the International Studies Association, San Diego, CA, 22-26 March.

Hegre, Håvard; Håvard Strand & Henrik Urdal, 2008. 'The Future of Armed Conflict: Predicting the Incidence of Conflict, 2007–2050', paper presented at the 49th Annual Convention of the International Studies Association, San Francisco, CA, 26–29 March.

Herbst, Jeffrey, 2000. *States and Power in Africa: Comparative Lessons in Authority and Control*. Princeton, NJ: Princeton University Press.

International Crisis Group, 2008. 'The Collapse of Peace in Mindanao.' Asia Briefing No. 83. Jakarta/Brussels, 23 October.

Minorities at Risk (MAR) Project, 2005. 'Minorities at Risk Dataset.' College Park, MD: Center for International Development and Conflict Management. Available at: http://www.cidcm.umd.edu/mar/ (last accessed 2 February, 2009).

Murshed, S. Mansoob & Scott Gates, 2006. 'Spatial Horizontal Inequality and Maoist Insurgency in Nepal.' *Review of Development Economics* 9(1): 121—134.

Nel, Philip & Marjolein Righarts, 2008. 'Natural Disasters and the Risk of Violent Civil Conflict', *International Studies Quarterly* 52(1):159-185.

Østby, Gudrun, 2008. 'Polarization, Horizontal Inequalities and Violent Civil Conflict', *Journal of Peace Research* 45(2): 143–162.

Østby, Gudrun; Ragnhild Nordås & Jan Ketil Rød, 2009. 'Regional Inequalities and Civil Conflict in 21 Sub-Saharan Countries, 1986-2004', *International Studies Quarterly*, forthcoming.

Raleigh, Clionadh & Henrik Urdal, 2007. 'Climate Change, Environmental Degradation and Armed Conflict', *Political Geography* 26(6): 674–694.

Rustad, Siri Aas, Jan Ketil Rød, Wenche Larsen & Nils Petter Gleditsch, 2008. 'Foliage and Fighting: Forest Resources and the Onset, Duration, and Location of Civil War', *Political Geography* 27(7): 761–782.

Stewart, Frances. 2002. Horizontal Inequalities: A Neglected Dimension of Development, Queen Elizabeth House Working Paper Series 81, University of Oxford, http://www.qeh.ox.ac.uk/pdf/qehwp/qehwps81.pdf.

Strand, Håvard, 2007. *Political Regimes and Civil War Revisited*. PhD Thesis, Department of Political Science, University of Oslo.

Toft, Monica. 2003. *The Geography of Ethnic Violence: Identity, Interests, and the Indivisibility of Territory*. Princeton, NJ: Princeton University Press.

Uppsala Conflict Data Program, 2008. *UCDP Database.* Uppsala University, Department of Peace and Conflict Research. Available at: www.ucdp.uu.se/database (last accessed, 2 February, 2009).

Vreeland, James Raymond, 2008. 'The Effect of Political Regime on Civil War: Unpacking Anocracy', *Journal of Conflict Resolution* 52(3): 401–425.

Weidmann, Nils; Jan Ketil Rød & Lars-Erik Cederman, 2009. 'Representing Ethnic Groups in Space: A New Dataset', under journal review.