Transnational Dimensions of Civil War[1]

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Abstract

Existing research has tended to relate civil war to country-specific factors or processes within individual states. Many contemporary civil wars, however, display a transnational character, where key actors, resources, and events span national boundaries. In this paper, I examine how interaction and processes between states influence the risk of conflict within states. Previous research has shown that the risk of conflict is strongly influenced by conflicts in a state's regional context, but has not distinguished between different transnational linkages that may underlie geographic contagion and failed to consider the potential influences of domestic attributes. In this paper, I evaluate a series of hypotheses on how transnational factors influence the risk of conflict and the prospects for maintaining peace. I evaluate these external influences in a model with country specific factors often associated with civil wars. The empirical findings indicate that transnational linkages between states and regional factors strongly influence the risk of conflict. Some commonly inferred effects of state attributes on conflict appear to change once linkages between states are considered. The proposed model is successful at classifying conflicts in the estimation sample, and displays good predictive ability in an out of sample forecast.

1 Introduction

Many of the contemporary conflicts in the international system involve combinations of formally recognized states and less clearcut types on non-state actors. Consider, for example, the conflict in Bosnia. This was nominally a civil war between ethnic Serb and Croat and the central government of the newly independent Republic of Bosnia-Hercegovina. The conflict nonetheless had a clear transnational character, as the Serb and Croat units fighting in Bosnia received various kinds of support from ethnic kin in Croatia as well as the remaining Federal Republic of Yugoslavia. The conflict emerged over concerns among different ethnic groups within the country on the status of an independent Bosnia and their desires to secede or to be unified with neighboring national states. The influence of actors outside the boundaries of Bosnia itself strongly influenced outcomes on the battlefield and the relative powers of the actors.

Researchers have tended to draw a sharp distinction between conflict among states and conflict within states, and the two types of conflict have generally been studied in separation of one another. Cases such as Bosnia, however, attest to the problems involved in imposing a strict separation between "civil" wars within states and interstate wars. The international implications of such transnational conflicts highlight how research on international violence cannot ignore wars where the two main antagonists are not nation states. Similarly, studies of civil war cannot limit themselves exclusively to factors contained within individual states, but must consider how influences from other states alter the likelihood that antagonistic groups will resort to violence.

In this paper, I examine how interaction and processes between states influence the likelihood of conflict within states. Consistent with arguments about transnational contagion between states, I find that the presence of conflict in other states strongly influences the risk of civil war. I examine a number of linkages between states that have been hypothesized to increase both the risk of conflict and prospect for peace, and provide empirical support for that many of such linkages between states alter the risk of conflict. Finally, many of the commonly inferred effects of attributes of individual states appear to change once we include linkages between states in an empirical model of conflict.

2 Civil and transnational wars

The field of international relations has tended to focus almost exclusively on interstate conflict or disputes taking place among parties that are formally sovereign states. Relations between states are often held to be fundamentally different from relations within formally sovereign states due to the condition of anarchy and absence of formal authority in the international system. In this perspective, it is simply assumed that sovereignty is effective within nations, thereby making civil war qualitatively different from interstate conflict. Yet, sovereignty is obviously less than fully effective within many existing states, and the problems of enforcement and commitment often attributed to anarchy can obtain within states as well. When relating "Warre" to anarchy, Hobbes had relations within states in mind, not the international system.

Empirically, conflict between states is in many ways a relatively limited share of the conflicts involving nation states in the contemporary international system. According to one account (Wallensteen and Sollenberg 1999, 593), only six out of 103 armed conflicts in the period 1989-97 were interstate conflicts (see also Holsti 1996). Many argue that the ratio of "international" to "civil" conflict has been increasing over the 20th century (Pfetsch and Rohloff 2000, 381-3). Even though the reliability of such conflict proportions over time is questionable,[1] this result still seems counterintuitive given the large increase in sovereign nation states over the period. Presumably, the proliferation of new states should increase the opportunities for previous intrastate conflicts to become interstate wars.

Although it is possible that internal and external conflicts are analytically distinct, it is in practice often problematic to restrict analyses to conflicts classified as interstate wars only. Upon closer scrutiny, most lists of interstate wars appear to cover only a subset of what observers typically perceive as global armed conflict and seek to make generalizations about. To determine whether a given conflict is "interstate" or "intrastate" is less straightforward than often assumed. The Correlates of War (COW) project has tried to classify civil and interstate conflict as mutually exclusive categories.[2] This distinction is in practice often difficult to apply. Some conflicts have switched categories between updates of the COW war data.[3] Similar ambiguities are found in applied research. Mansfield and Snyder's (1995) work on democratization and war, for example, repeatedly invokes conflicts in the former Soviet Union and Yugoslavia to illustrate their argument. These conflicts, however, are not considered international wars and not included in the empirical data they rely on in their analyses. As a conflict could include many antagonists, civil and interstate wars need not be mutually exclusive. Many wars that occur fully within states have participation by "external" actors outside a state's border. The conflict in Kashmir has a transnational dimension even if the Pakistani government is not directly involved at a particular point in time. Similarly, the conflict does not necessarily cease being a civil war if the Pakistani government intervenes in the conflict.

3 International dimensions of civil war

Whereas research on interstate war has tended to disregard the transnational aspects of wars between states and non-state actors, most studies of civil war focus on how economic and social attributes make individual states more prone to civil wars and largely neglected the role of actors outside the boundaries of the affected state. This is problematic as the risk of civil war of may be influenced by participants and processes outside the boundaries of the nation state.

In this section, I first review existing empirical evidence suggesting that dependence and interaction between states influence the risk of conflict. In the subsequent section, I examine in more detail some of the possible linkages between states that may affect the risk of civil war.

[1] Coding biases and media exposure probably understate the amount of civil war and conflict outside the Central European state system in earlier time periods.

[2] See Sarkees (2000) for the most recent overview of the COW war data.

[3] The First Kashmir war was classified as an extra-systemic war in India in the 1994 release of the COW war data, without any Pakistani participation, but is now considered an interstate war between India and Pakistan. Nagorno-Karabakh was initially classified as an interstate war, but has now been reclassified as a civil war in Azerbaijan. See Gleditsch (2001) for an overview of some of the differences between versions of the COW war data.

A wealth of empirical evidence attests to the importance of diffusion for interstate wars (see Siverson and Starr 1991). Spatial proximity increases the opportunity for conflictual and cooperative interactions between states as well as the willingness of leaders to engage in interactions. Most wars are fought between neighboring states. Similarly, trade tends to be high between geographically proximate states.

Whereas the importance of geographical diffusion for interstate war is well established, it has received little attention in research on intrastate conflict. Recent work, however, indicates that civil wars also display spatial patterns of spill-over and contagion. Ward and Gleditsch (2002) examined conflict as an autologistic process, where the likelihood of conflict in one country is held to be conditional on the presence of conflict on other states. Their empirical results – based primarily on civil wars – indicated that the risk of war in an individual country is strongly influenced by the presence of wars in other countries. Whereas most models of conflict are unable to predict conflict with a probability above 0.5, the model examined in Ward and Gleditsch produced probabilities above this level for many conflicts in the estimation data. Moreover, the model performs well in an out of sample prediction test. A forecast based on the empirical results for 1988 identified about half of the wars in the subsequent decade. The model did not predict too many conflicts that failed to occur and missed a reasonably small number of actual conflicts.

The good predictive results for the model indicate that a conditional model of conflict appears to pick up structural factors influencing the likelihood of conflict, and do not simply reflect idiosyncratic features of the sample used to estimate the model. However, the autologistic model in Ward and Gleditsch was based only on data for a single year (1988) and was almost entirely spatial. It did not include any internal country specific covariates other than level of democracy, and essentially ignored many other domestic factors commonly thought to influence the likelihood of civil war (see the comprehensive reviews in Sambanis 2002; Gates 2002). Ward and Gleditsch (2002) moreover did not try to identify what specific linkages may underlie geographical contagion of conflict in any detail.

Accordingly, even though the Ward and Gleditsch (2002) study suggests strong international influences on the likelihood of civil conflict, there is a risk that the empirical results may reflect the effects of spatially clustered country attributes that influence the likelihood of war rather than processes and interaction between countries *per se*. I have shown elsewhere that many of the economic and political country attributes that existing research has related civil war, such as GDP per capita and democracy, also display geographical clustering (Gleditsch 2002*a*). Moreover, since conflict and peace cluster geographically over time, what is attributed to geography may reflect time dependence not accounted for in the model.

In this paper, I develop an empirical model that examines a larger number of internal country specific attributes and differentiates between the various international factors that may influence the risk of civil war.

4 Civil war and transnational linkages

In this section, I develop hypotheses on various external factors that can increase the likelihood of a state experiencing a conflict within its boundaries. Previous research has demonstrated contagion or spatial correlation in the sense that wars in one state make war more likely in other states. In this paper, I try to identify different transnational linkages and regional differences that may underlie the overall spatial correlation of conflict. Before looking at the different types of transnational factors, I first need to identify the relations that tie states together and where we may see such external factors exerting an influence on conflict.

The basic argument advanced in this paper is that the likelihood that a state i will be involved in a conflict at time t is very much dependent on the processes taking place in other states. Assuming that all states are connected to one another, however, provides no indication of why some regions appear to be more conflict prone than others, and tends to lead to intractable empirical models.

Dependence among states stems from interaction and differences in their relations. Although a single state i may interact with all of the remaining $N-i$ states in the international system, not all of these possible relationships between states are likely to be equally relevant. Since distance is such a powerful modifier of the opportunities for interaction, closer states are generally more relevant. Hence, we can get a handle on the most important relationships between states by assuming that most of the dependence between states is of a regional character or determined by geographically proximate actors.

One useful simple spatial dependence structure is to assume a local Markov random field. For a set of N spatial units, $Pr(y_i \mid y_j, j \neq i)$ depends only on y_j if and only if j is a neighbor of i (Ripley 1988). A Markov random field can be seen as a spatial analogy to a first-order Markov property in time.[4] Substantively, local dependence means that the likelihood of a civil war in the Democratic Republic of Congo or former Zaire may be influenced by proximate states such as Rwanda, but does not depend on whether distant states such as Colombia experience a civil war. The structure of dependence or influences can be modeled through an $N \times N$ connectivity matrix $\mathbf{W}$ based on the geographical distance among the N units in the system. The entries $w_{i,j}$ of $\mathbf{W}$ acquire non-zero values if units i and j are connected or geographical "neighbors" (Harary, Norman and Cartright 1965). We will make use of $\mathbf{W}$ later to create measures of conflict spill-inn and regional linkages.

4.1 Transnational conflict linkages

The likelihood of civil war is directly increased by the presence of wars in connected states. The consequences of conflict in one state can induce spill-over effects and alter the prospects for violent conflict in other states. There are multiple different mechanisms by which this may occur.

Many civil wars become internationalized through direct intervention from neighboring states. Third parties may intervene directly in civil wars. Gartzke and Gleditsch (2001) suggest that third parties may intervene to *bandwagon* or shorten an ongoing conflict through increasing the likelihood of victory or settlement, or to they may intervene to *balance* to promote outcomes or settlements that are relatively more favorable to one of the parties.

[4] A Markov chain specifies the probability distribution of some discrete variable $y_{i,t}$ at time t as a function of the state of observation i at previous time periods and a $J \times J$ matrix of transition probabilities between the various J possible states that the variable y_i may acquire. A chain is said to be first-order Markov if the transition probabilities depend only on the state at the preceding time period $y_{i,t-1}$ and are independent of the state at previous T time periods $y_{i,t-2}, y_{i,t-2}, ..., y_{i,t-T}$ (Harary, Norman and Cartright 1965).

States may also intervene in indirect ways by providing support to one of the parties in a conflict that may escalate to violence. The presence of conflict in one state may also decrease the relative costs for insurgents in other states, as arms and sources of material support become available at a lower price (Collier and Hoeffler 1998).

It is difficult to discriminate between the different causal linkages that may underlie cross border contagion of conflict without more disaggregated data. If such linkages apply, however, we would expect to observe a higher likelihood of conflict in state if neighboring states are involved in either civil or interstate wars.

4.2 Transnational political linkages

Although leaders can have incentives to intervene directly or indirectly in ongoing conflicts in neighboring states, other institutions may constrain their opportunities to do so. Democracy is often defined in terms of institutions that have potential power to constrain executives. Research on the democratic peace suggest that leaders in political institutions with a high degree of popular participation may face greater difficulties in intervening if involvement is opposed by other political actors (see, for example, Gleditsch 2002*a*; Tures 2001; Schultz 1998).

The political context prevailing in a region contains information about the incentives for violent conflict in adjacent states as well as the prospects for leaders to become involved. The more constrained political leaders in a region, the stronger the expected barriers against direct involvement in civil wars in neighboring states (Gleditsch 2002*a*). Accordingly, more democratic regions surrounding a state should decrease the risk that conflicts will escalate to violence.

4.3 Transnational ethnic linkages

Many civil wars involve ethnic groups who try to attain autonomy or secede from existing states. External intervention in conflicts are often motivated by states seeking to support members of similar ethnic groups in adjacent states. Similar, ethnic kin and diasporas in other states have often played an important role in financing insurgencies. Collier and Hoeffler (1998) demonstrate a positive relationships between the size of diasporas and the risk of civil conflict. Moore and Davis (1997) show that the presence of the same ethnic groups in two countries affect their propensity for violent conflict. All else equal, we would expect that the risk of civil wars would be higher in a situation where more of the same ethnic groups are found on both sides of international borders.

4.4 Transnational economic linkages

A wealth of recent research suggest that higher economic interdependence between states decreased the likelihood of interstate war. Greater levels of interdependence between states may lead to greater costs of conflict, since conflicts would disrupt economic relations between states (e.g., Russett and Oneal 2001). Alternatively, interdependence may provide states with avenues to substitute military forms of conflict with non-military types (e.g., Gartzke, Li and Boehmer 2001).

Interdependence can similarly have a limiting effect on conflict between states. Actors in more integrated and complex economies have greater interests in maintaining peaceful relations and face greater costs in resorting to conflict. Economic interdependence may exert a conflict dampening role even when potential rebel groups are only marginally integrated in the formal economy. In a situation where levels of interdependence are high and conflict would be costly to many actors, affected interests will have an incentive to lobby governments for solutions to accommodate aggrieved groups and limit disruption. Such pressure for finding settlements for non-violent conflict may occur both within states or between states. Although trade is not a perfect indicator of integration between states, it has the advantage that data are relatively easy to obtain. In Gleditsch (2002*a*), I found that greater levels of trade integration between states in a region decreased the likelihood of civil conflict. On the basis of these arguments, I hypothesize that the more integration among actors in a region, the more avenues for mediation and settling conflicts in non-violent ways, and the lower the risk of violent conflict.

4.5 Central domestic factors in civil wars

To evaluate whether international influences exert some effect on the likelihood that a country will experience a civil war requires a reasonable baseline model of conflict taking into account domestic factors commonly thought to be associated with conflict.

Many researchers claim that a state's level of development alters the prospects for civil war (e.g., Collier and Hoeffler 1998). Greater levels of material wealth may reduce the intensity of conflict between groups. Wealthier societies tend to have more capable states that are better able to find political solutions to address grievances which may lead to conflict, or alternatively, have more means to effectively repress domestic dissent.

A large body of research has hypothesized that type of political system influences the risk of civil war. Civil wars should be relatively less likely in democracies, as these provide greater opportunities for groups to pursue their objectives by peaceful means. However, the prospects for civil war are not necessarily high in strict autocracies. Despite a closed political system, many autocratic states are sufficiently repressive to quite effectively deter political dissent. Many scholars have argued that the risk of civil war should be highest in anocracies that combine features of both autocracy and democracy (e.g., Muller and Weede 1990; Hegre, Ellingsen, Gates and Gleditsch 2001). These states have a combination of sufficient grievances and opportunities that make resort to violence feasible and more attractive. The political system is sufficiently closed that groups may be unable to exert influence through other political means, yet not repressive enough to successfully deter conflict. This is sometimes referred to as the inverted U-curve hypothesis.

5 Model, data, and estimation

In this section, I detail a model to test the hypotheses set forward in the previous sections, as well as the data and estimation techniques used to estimate the model.

5.1 Conflict and war data

By far the most frequently used data on civil war are the data compiled by the Correlates of War (COW) project. The COW project requires that a conflict must involve at least 1000 battle deaths in a given calender year to be counted as a civil war. This is a relatively high threshold, which may exclude many major civil conflicts. A disadvantage of a high conflict threshold is that coding of conflict onset and termination can become somewhat arbitrary, as wars with lover intensity may drop in and out the sample depending on whether they claim one thousand casualties in any given year. The Kashmir conflict, for example, only reaches 1000 battle deaths in certain years during the 1980s and 1990s (e.g., Wallensteen and Sollenberg 1999).

A team of researchers at PRIO/Uppsala have compiled a more comprehensive data set on conflict going back to 1945 (Gleditsch, Wallensteen, Erikson and Strand 2001).[5] In addition to wars with at least 1000 casualties, these data include minor armed conflicts with more than 25 deaths in a year. For this study, I will rely on the low level threshold in the PRIO/Uppsala data to construct a dichotomous indicator of whether a state experiences a conflict in any given year.

For the purposes of this paper, all conflicts are relevant, and it is not essential whether conflicts are classified as intrastate or interstate. In the empirical analysis below, I will use a composite conflict variable that encompasses both interstate and "civil" conflicts, denoted $y^c_{i,t}$. Since there are relatively few intrastate conflicts in these data, the civil wars vastly dominate in the composite variable.[6]

5.2 Country specific covariates

I measure the wealth of states by data on real GDP per capita in constant 1985 dollars taken from Gleditsch (2002*b*). These data are based on the Penn World Tables (PWT) with additional estimates for many developing and socialist states not in PWT, based on other available sources such as the *CIA World Factbook* . The effect of GDP per capita of conflict is unlikely to be fully linear, as an increase in one dollar matters more when states are relatively poor. I thus use the natural logarithm of real GDP per capita. This variable will be denoted g^r.

The type of political system is here operationalized using the composite Polity democracy, which ranges from -10 to 10. This variable will be denoted d. Values closer to -10 indicate more autocratic polities, whereas a score closer to 10 indicates more democratic polities. Gurr and Jaggers (1995) suggest a tri-partite typology of democracies (a score of six or above on the composite scale), anocracies (between -5 and 5), and autocracies (minus six or below), which can be used to test the U-curve hypothesis.

Much of the literature on conflict has argued that ethnic heterogeneity increases the risk of war within societies. There is little concensus on what aspects of heterogeneity would matter most. Whereas some focus on ethnic fragmentation or having a large number of heterogeneous groups, others argue that the likelihood of conflict is greater when a

[5]These data are available at http://www.prio.no/cwp/armedconflict/.

[6]I have also used a more restricted civil conflict variable $y^{cw}_{i,t}$ that does not include observations defined as interstate by war by the Uppsala data project. Whether the full composite variable or the more restrictive civil war variable appears not to make much of a difference for the empirical results.

dominant majority suppresses minorities. I address the potential for conflict in ethnically heterogeneous society by a measure of ethnic dispersion given by 100 - percentage share of the largest ethnic group, based on data provided by Vanhanen (2001). This will be denoted $e_{i,t}$.

5.3 Regional covariates

I measure regional linkages between states by a new data set indicating the minimum distances between the outer boundaries of states (Gleditsch and Ward 2001). I use a threshold of 950 km to determine whether states are connected to one another. Given the linkages between states in the connectivity matrix $\mathbf{W}$, we can define a variety of regional covariates reflecting the factors hypothesized to increase the likelihood of conflict in a given state.

The first factor is the presence of conflict in other proximate states. Given the distribution of civil and interstate wars y_t^c we can define an indicator of conflict in states connected to 1 as $r_{i,t}^c = \left(w_{(i,\cdot)} y_t^c\right)\#$, where # indicates the Boolean product of the row vector. This variable will acquire a value of 1 if one (or more) of the j states connected to i are involved in a civil or interstate war at time t.[7]

The second regional factor hypothesized to influence the likelihood of conflict pertains to the regime types of other connected states. We can define a variable indicating average level of democracy among states in a region surrounding a country i at time t as $d_{i,t}^r = w_{i,\cdot}^s d_t$, where the superscript i indicates a row-standardized connectivity matrix $\mathbf{W}^s$ where all the entries in each row sum to 1.

The third regional factor hypothesized to affect the likelihood of civil war is the level of economic integration. This is defined as $i_{i,t} = \frac{W_{i,t} T_{i,j,t}}{g^{cp}} \forall j = \{1, ..., N\}$ or the sum of country i's trade T in current prices with all adjacent countries J as defined by $\mathbf{W}$, relative to a country's GDP in current prices g^{cp}.

The fourth regional factor hypothesized to affect the risk of civil conflict is the number of ethnic groups that span national borders. I operationalize this using data from the Minorities at Risk project.[8] More specifically, I rely on an indicator of the number of groups in a state that also exist in adjacent countries. This will be denoted e^r.

5.4 Dependence in time

Ward and Gleditsch (2002) applied the autologistic model to data for a single year to avoid the added complications of dependence in time. Since conflict is a rare event, however, a sample based on a single year is unlikely to include many conflicts, and samples from different years may be erratic and differ considerably from one another. In this paper, I use data for every year from 1950 to 1999 to gather as much information as possible.

[7] It is of course also to define separate variables for civil war and interstate war in adjecent countries. As will become clearer later, it is difficult to apply a Gibbs sampler to a model with separate terms for adjacent interstate and civil wars, since the predictions of the model do not yield a separate civil war vector and a separate interstate war vector to condition on for the sampling. Results conditioning on interstate and civil war separately were not dramatically different when estimated by the Maximum Pseudo-Likelihood method to be described later.

[8] These data are available at http://www.cidcm.umd.edu/inscr/mar/data.htm.

The pooled structure of the data in time makes it difficult to assume that the observations are independent over time. Many point out the risk of conflict in an individual country depends upon its prior history of conflict. The risk of recurrent civil war is high immediately after previous conflict, but the stability of peace between parties generally increases with additional years of peace between the parties. Beck et al. (1998) and Raknerud and Hegre (1997) suggest taking into account the influence of a country's prior conflict history by a count of the years a country has remained at peace py, either since its last conflict or since the first data point. This is often referred to as a "peaceyears" variable. Beck et al. suggested modeling time dependence through a non-parametric approach. As additional years are unlikely to contribute much to the stability of peace in countries that have remained at peace for an extended period of time, Raknerud and Hegre suggested an exponential function where a country's time at peace decays relative to a half time parameter α, i.e., $e^{[-py/\alpha]}$. For models of conflict with cross-national data, the two approaches in practice tend to yield substantive similar results.

In this paper, I include an exponential function of py as a covariate in the model to control for the effects of time dependence, primarily because it is easier to interpret than a non-parametric approach. Trial and error suggested that $\alpha = 4$ provides a reasonable fit to these data. This implies that the risk of recurrent conflict is halved about every five years.[9]

5.5 Domestic and regional factors in civil war

Given the above hypotheses, we can estimate the probability of conflict for a given state i at time t conditional on presence/absence of conflict in adjacent states, as well as a function of various country specific attributes and regional attributes, as

$$Pr(y_i = 1|r^c_{i,t}) = \frac{e^{\alpha+\beta_1 e^{(-py_{i,t-1}/\alpha)}+\beta_2 d_{i,t}+\beta_3 g^r_{i,t}+\beta_4 e_{i,t}+\lambda_1 d^r_{i,t}+\lambda_2 i_{i,t}+\gamma r^c_{i,t}}}{1+e^{\alpha+\beta_1 e^{(-py_{i,t-1}/\alpha)}+\beta_2 d_{i,t}+\beta_3 g^r_{i,t}+\beta_4 e_{i,t}+\lambda_1 d^r_{i,t}+\lambda_2 i_{i,t}+\gamma r^c_{i,t}}},$$

all the variables as defined above.

This model is similar to the logit model, but conflict appears on both sides of the model in the sense that conflicts in adjacent states influence conflict in i through the γ parameter. The individual observations are conditional on one another and cannot be treated as independent. The autologistic simplifies to a standard logit if $\gamma = 0$. If the γ parameter is not zero, then the risk of conflict for i at t cannot be fully accounted for by variation in country specific attributes (i.e., β) and regional differences (i.e., λ terms).

5.6 Estimation methods

The autologistic model for $Pr(y_i = 1|r^c_{i,t})$ above has a complicated likelihood function since the conflict observations y_i are conditionally dependent the value of y in connected states. The autologistic model can easily be estimated by the so-called maximum pseudolikelihood (MPL) approach, that considers only a limited set of dependencies between observations and

[9]Transition models provide another alternative to dealing with time dependence (e.g., Beck, Epstein, Jackman and O'Halloran 2001). This is an attractive approach on theoretical grounds, as the effects on conflict settlement may not be mirror images of those on conflict onset, but for simplicity I leave the issue of generalizing to an autologistic transition model to future research.

and assumes that all other observations are independent and exchangeable (see Ripley 1988). MPL has been shown to have reasonable asymptotic properties. The major disadvantage of MPL is that it tends to be inefficient, and more so the stronger the spatial interaction processes (Huffer and Wu 1998).

Another alternative to address the intractable likelihood function is to use Markov Chain Monte Carlo (MCMC) simulation methods to approximate the full likelihood function (Besag 1974; Cressie 1991; Ward and Gleditsch 2002). Geyer and Thompson (1992) suggest one approach to MCMC estimation based on importance sampling. They demonstrate that their procedure recovers the maximum likelihood parameter estimates. The basic idea is that a map from autologistic model can be defined by the parameters $\theta = (\alpha, \beta_k, \gamma)$ and the sufficient statistics[10], $s(y) = \left(\sum_{i=1}^{n} y_i, \sum_{i=1}^{n} X_i y_i\right)$. Based on a set of parameters ψ as estimates for θ, one generates a large number of samples of y_i by a Gibbs sampler, and then calculates the sufficient statistics for these samples. Based on the sufficient statistics from the simulated samples, the Markov Chain Monte Carlo maximum likelihood estimates for θ can be found by solving the score equation by Newton-Raphson iteration

$$\frac{\sum_{j=1}^{m} s(y_m) e^{(\hat{\theta}-\psi)' s(y_m)}}{\sum_{j=1}^{m} e^{(\hat{\theta}-\psi)' s(y_m)}} = s(y),$$

where m is the number of sampled simulated maps and $s()$ is the vector of sufficient statistics. Note that the term for conflict in other states, $r_{i,t}^{c}$, must be updated as the y_m generated by the model changes. See Geyer and Thompson (1992) and Ward and Gleditsch (2002) for further details on estimation.

The MPL estimates are normally used as initial values ψ. In some cases, however, the MPL can be a bad value for ψ and lead to a Monte Carlo sample $s(y_1), s(y_2), , ..., s(y_m)$ which does not contain the observed $s(y)$ within its convex hull. For these samples, the MCMC MLE do not exist, and Newton-Raphson iteration leads to a sequence $\theta_1, \theta_2, \theta_3$... that drifts towards infinity. Wu and Huffer (1998) note that this can happen when the spatial component γ is large. They suggest using the estimates θ_1 from the first iteration to generate another Monte Carlo sample from these parameters. Although *ad hoc*, this approach normally leads to well behaved MCMC maximum likelihood estimates.

For the analyses reported in this paper, the Gibbs sampler was run with an initial burn in period of 100 samples, and 1000 subsequent samples, gathering sufficient statistics at every second sample. Given the specific model and the data, ψ turned out not to be a good starting value. The initial MPL estimates ψ were thus replaced by the θ_1 from the first 1000 samples. An additional 5000 samples were generated before finding the MCMC parameter estimates $\hat{\theta}$.

6 Empirical results

The results of the autologistic model for conflict with more than 25 deaths are displayed in Table 1. The two leftmost columns display the MPL coefficient estimates and standard

[10]A sufficient statistic $T(X)$ for y contains all the information about y that is available in the observed data X.

errors. The third displays the MCMC coefficient estimates. The fourth column displays approximate "standard errors" for the MCMC estimates.[11]

Table 1: Estimates for autologistic model

	MPL estimates		MCMC estimates	
Covariate	Coefficient estimate	Standard error	Coefficient estimate	Standard error
(Intercept)	-4.797	0.568	-4.288	0.482
Conflict history	4.702	0.161	4.719	0.139
Transborder groups	0.041	0.015	0.045	0.013
Democracy	0.012	0.009	0.009	0.008
Regional democracy	-0.030	0.016	-0.033	0.013
Share of largest minority	0.0074	0.0036	0.008	0.003
ln GDP per capita	-0.009	0.067	-0.033	0.057
Regional trade	–2.058	0.809	-1.928	0.683
Adjacent conflict	0.867	0.168	0.396	0.110
Model fit (MCMC estimates)	N = 5070		LR-χ^2= 2455.875, df=9	

Even though the approach is very different, the MPL and the MCMC estimates are generally quite similar. However, the MPL estimate for the spatial term γ is substantially higher than the MCMC estimate. Moreover, the MCMC estimates for the other coefficients are generally larger or more consistent with expectations than the MPL estimates. In this section, I will focus on the substantive implications of the MCMC estimates for the model and the hypotheses on transnational dimensions of civil war. I will then return to evaluate the relative merits of the MCMC and the MPL estimates in the subsequent section.

Most of the expectations about transnational linkages are strongly borne out by the empirical results. Presence of either civil or interstate war in adjacent countries increases substantially the risk of conflict. This provides strong evidence for spatial clustering in conflict, and is consistent with conflict in one state having spill-over effects for other adjacent states. The other hypothesized regional influences are consistent with the expectations. More democratic regions are less likely to experience conflict. Countries with higher interregional trade are also significantly less likely to experience civil wars. Higher numbers of ethnic groups that cross state boundaries increase the risk of conflict. Similar to Ellingsen (2000), the results suggest that the larger the second largest ethnic group, the higher the likelihood of civil war.

The effects of the other country specific variables, however, are somewhat less consistent with expectations and previous studies. Larger GDP per capita decreases the risk of civil war, but the coefficient estimate is not statistically significant. More surprising is the apparent positive effect of democracy. These results do not seem to be an artifact of democracy not having a linear effect on civil conflict, as the alternative specification a the tri-partite typology yielded no evidence for the hypothesized inverted u-curve. Instead, the estimated coefficient for democracy was higher than that for anocracies, although the coefficient estimates are not statistically significant. This should not be taken to imply

[11] These are based on the diagonal elements of the inverse of the Fisher information matrix to estimate the variances of the MCMC parameter estimates.

that democracy tends to increase the risk of civil war. The coefficient estimate for regional democracy is of substantially greater magnitude than that of country specific democracy. Given the strong geographical clustering of democracy, most democracies will tend to be located in regional contexts where the neighboring states are consistently democratic. The net effect of the two terms will then imply a lower likelihood of civil war. The positive term for democracy in individual states once the regional context is taken into account may reflect a residual increased likelihood of civil war for democracies located among non-democracies. Similarly, the seeming evidence for the inverted u-curve and higer risk of civil wars in anocracies found in previous studies may stem from unmeasured transnational linkages from neighboring states in less democratic regions rather than effects of institutions per se.

Figures 1-3 display the marginal effects of changes in the covariates, by a three dimensional surface plot as well as a countor plot of the predicted probabilities. The other variables are held at their mean or median values as appropriate. All the figures assume a country that does not experience conflict in adjacent countries. The surface of predicted probabilities for a case with adjacent conflicts would have roughly the same shape, but much higher absolute predicted probabilities.

Figure 1 indicates that the effects of differences on the regional democracy variables seem to be of much greater magnitude than the differences following changes in country specific differences. Although the insignificant positive coefficient estimate suggests that democracies *ceteris paribus* seem more likely to experience civil war, Figure 1 demonstrates that the risk of civil war is nonetheless very small for democracies located in more democratic regional contexts. All states located in regions of many non-democracies have a much higher predicted probabilities of conflict, irrespective of their regime attributes.

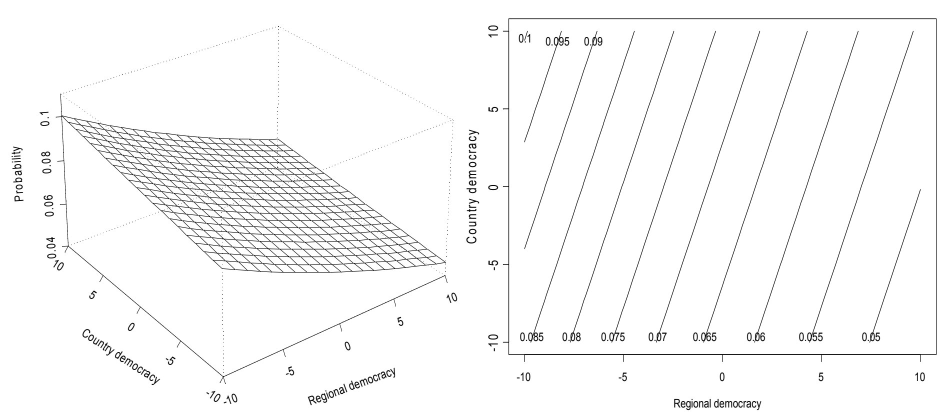

Figure 1: Marginal effects of political factors

Figure 2 displays the marginal effects of the size of the domestic economy and external economic linkages. As can be seen, regional trade integration is associated with large differences in the predicted probabilities of conflict. Once differences in regional trade integration are taken into account, differences in the GDP per capita appear to yield only minor differences in the likelihood of conflict, as can be seen in the flat curvature of the predicted probabilities over the left axis in Figure 2. Again, these results indicate that regional trade integration is a better discrimnator between conflict prone and more peaceful countries than country specific attributes such as GDP per capita.

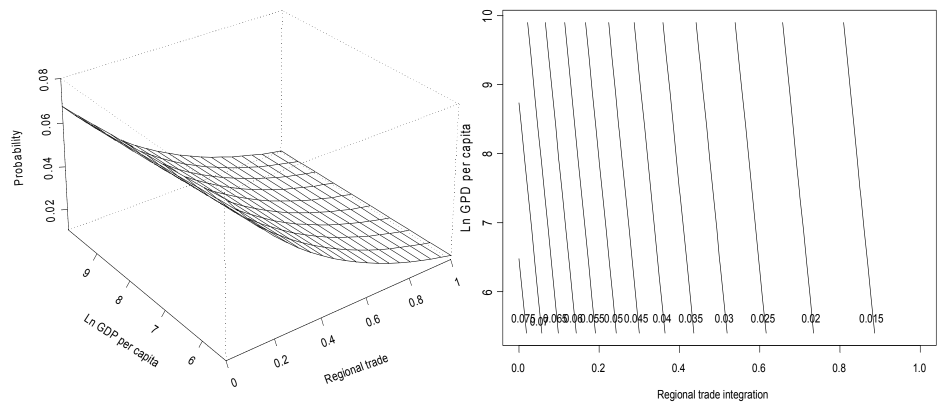

Figure 2: Marginal effects of economic factors

Figure 3 displayes the marginal effects for the ethnic variables. In this case, both the number of transborder ethnic linkages and ethnic dispersion strongly increase the risk of conflict. Although ethnic heterogenity seems to be associated with a higher risk of civil war, linkages between states also appear to be very important for whether conflicts escalate. The two variables do not have a comparable metric, but the difference between the first and the third quartile of the variables yield changes in the predicted probabilities of roughly the same magnitude. As such, regional ethnic linkages seem to have effects on the likelihood of conflict of a magnitude at least as large as country specific ethnic attributes.

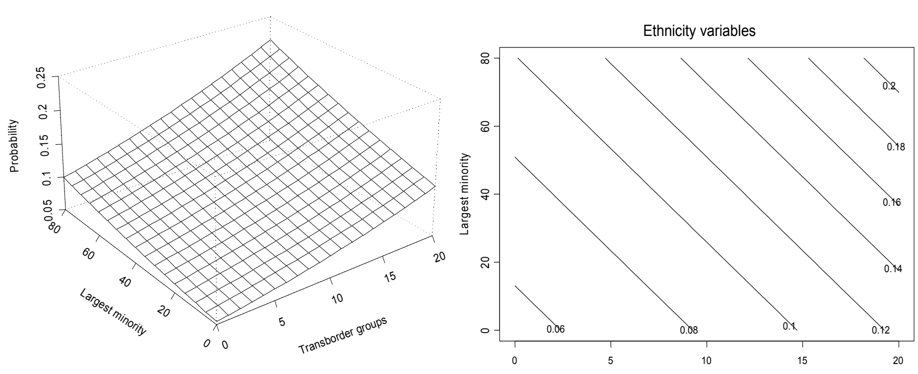

Figure 3: Marginal effects of ethnic factors

Although the marginal impact of each of these variables cannot put a case where all the other variables have values around the mean or median above the 0.5 level, we would expect many of these variables to covary and go together in real world cases. In a heterogeneous world, undemocratic regions and low integration tend to go together, often in zones of protracted hostilities. The idea of integrated security communities as an avenue to stable peace similarly points to situations where many of these factors go together (for a more extended discussion, see Gleditsch 2002*a*). When the effects of a large number of variables increasing the likelihood of conflict are combined we see much more dramatic effects. Added together, the predicted probabilities can exceed the 0.5 level. The likelihood of civil war in an extremely unfavorable region would be several hundred percent higher than the risk of conflict in very favorable neighborhoods. The attributes of individual countries cannot fully account for the fundamental differences in the risk of civil war between countries in an "unfortunate" region and countries in a relative benign regional context. This provides strong evidence in support of transnational linkages as important influences on the likelihood of civil wars.

6.1 Model evaluation

I have already noted that the MCMC estimates are generally quite similar to the MPL estimates. If the two are not dramatically different and given the difficulties in generating the MCMC estimates, why should we believe that the MCMC estimates are substantially better than the MPL estimates? Is there any evidence that the MCMC estimates perform significantly better than the MPL estimates?

The first thing to note in Table 1 is that the MCMC estimate for the spatial term is considerably smaller than the MPL estimate. One possibility is that the direct spatial contagion part may be overestimated by the less efficient MPL estimation method. Since the autologistic model is conditional, the errors may propagate and induce bias in the other coefficient estimates. As we will see later, this appears to be reflected in the actual predictive abilities of the two models.

Second, the MCMC coefficient estimates for the covariates tend to more consistent with the hypothesized effects. In general, the consistent coefficient estimates tend to be larger than the MPL estimates. The coefficient estimates that have unexpected signs, such as the positive term for country specific democracy, are generally closer to 0 for the MCMC estimates than in the MPL estimates. If this is the case, hypothesis testing based on MPL estimates may be problematic for data with strong spatial dependence.

Third, it turns out that the predictions based on the MCMC estimates of the autologistic model are more accurate than the MPL estimates. A simple way to evalute predictive ability is to examine the classification table of the observed outcomes versus the predictions of the model given the observed data and the coefficient estimates. This is displayed in Table 3. Overall, the estimated autologistic model is quite successful in postdicting conflict and peace for the annual observations. Of all the 1113 conflict years in the model, 904 are successfully predicted to have conflict with a probability greater than 0.5 based on the MCMC estimates. The MCMC estimates also successfully predicts peace in 3687 of the 3957 annual observations without conflict. In addition to the correctly classified cases the MCMC estimates incorrectly predict conflict in 277 country years and miss 204 actual conflict years.[12] The overall share of observations correctly predicted is 89%. Among

[12]Given the relatively low violence threshold in the data, conflict is not such a rare event, and occurs in

the conflict years, 79% are correctly classified. Table 3 indicates that the MCMC estimates yield better predictions than the MPL estimates. This is consistent with the conjecture that the MPL estimates of the model overestimate the impact of direct spatial contagion and underestimate the importance of the covariates reflecting the ethnic, political, and economic transnational linkages. Since the autologistic model is conditional and predictions for one observation i is conditional on the predictions for the other $N - i$ observations, errors in the prediction for one observation can propagate and yield poorer overall predictions.

Table 2: Model classification, annual observations

	MPL Predicted		MCMC Predicted	
Observed	No	Yes	No	Yes
No	3682	275	3687	270
Yes	231	882	209	904

6.2 Internal and external factors

To recap, the statistical results lend support to that the international factors discussed here seem to influence the likelihood of civil wars, even when we take into account domestic attributes believed to be associated with civil war. However, the time component clearly emerges as the single most important predictor of conflict at time t. Hence, one might question whether adding the transnational dimensions improve notably on the model once conflict history is taken into account.

To answer this question requires some standard for evaluating whether transnational factors contribute significantly to our knowledge about outbreaks of civil wars beyond a model with only domestic factors and time. Although the inidividual coefficient estimates for the transnational components are statistically significant, it is often argued that statistical significance is an inapropriate yardstick for substantial importance in these type of data (e.g., McCloskey and Ziliak 1996). Even marginal differences are likely to be statistically significant when sample sizes are large. Raftery (1995) suggests that a more informative approach to evaluate the merits of two distinct models is to look at their Bayes factors, or the ratio of the posterior odds for one of the models against the other model. He develops a simple Bayesian Information Criterion (BIC) approximation to the Bayes factor that has gained widespread use. For some model M_k, the BIC can be found as

$$BIC_k^{'} = -\chi^2_{l0} + p_k ln(n).$$

where χ^2_0 is the likelihood ratio test statistic likelihood ratio statistic for testing the null model M0 against Mk, p_k is the number of degrees of freedom, and n is the number of observations. The Bayes factor approximation is simply the difference between the BIC for

about 22 percent of all the country years in the sample. Alternative models focusing only on the major conflicts or wars with more than 1000 battledeaths are not shown here due to lack of space, but the results are generally not very different from those with the more comprehensive conflict variable.

the two models. If we denote the smaller model with purely domestic covariates as model M1 and the larger model with the transnational dimensions as model M2, we find BIC'_{M1} = -4691.73 and $BIC'_{M2} = 4852.032$. The difference between BIC'_{M1} and BIC'_{M2} (160.302) is well above the threshold of 10 that Raftery (1995) characterizes as providing very strong evidence for the superiority of the model with the more negative BIC value.

This indicates that the model with the transnational factors performs significantly better than the model with purely domestic covariates, and again provides strong evidence that the transnational dimensions are important influences on civil conflicts. Even when prior history of conflict is taken into account, civil wars in one state cannot be fully accounted for by attributes of individual states. Rather, transborder interactions and activities in adjacent states influence he risk of violent conflict in fundamental ways.

7 Forecasting conflict in 2000

The results in the previous section indicate that the model is quite successful in classifying conflict based on the observed data. This is strictly speaking a "postdiction" rather than a prediction, as it is based on coefficient estimates fitted to the same data which the model is subsequently used to predict. The classification may thus conceivably pick up on idiosyncracies in the estimation sample rather than any causal structure that have some degree of permanence over space and time. Moreover, the ability to classify cases in the observed estimation data based on the model parameters is not an entirely realistic assessment of the model's predictive ability in an out of sample forecast. The problem lies in that we allow the model to use information about the actual occurences of conflict in all other states y_{-i} when making predictions about the risk of conflict for individual states i. In a real situation where we try to forecast future conflict, we cannot assume knowledge about conflicts taking place elsewhere in the international system.

One way to examine whether the model reflects some general structural relationships rather than simply fitting the sample is to use the coefficient estimates to predict conflict out of sample. More specifically, I use the estimated results and observed 1999 data to see how well the model can classify the Uppsala conflict data for 2000 that have now become available. In these predictions, I condition on conflicts predicted from the 1999 data. A comparison of the predictions to the observed conflicts in 2000 indicates that the model is quite successful in identifying cases of wars out of sample. As can be seen from Table 3, the model correctly predicts 20 of the actual conflicts over the period. The model predicts conflicts in 4 states that failed to occur, and misses 12 cases of conflict.

Table 3: 2000 predictions based on 1999 data

	Predicted	
Observed	No	Yes
No	113	12
Yes	4	20

An examination of the conflicts identified and missed in 2000 by the model listed in

Table 4 illuminates some of the shortcomings of the existing data. Many cases of conflicts in the PRIO/Uppsala data appear to be cases where states participate in civil wars not occurring on their core territory. Canada, for example, is held to be involved in a major civil war in 1998 and 1999. The risk of spatial contagion stems from the location where conflict occurs, not conflict participation. The Kosovo conflict may well have consequences for Macedonia, but we would not expect, say, Canadian participation in a peacekeeping operation to increase the likelihood of civil war in the USA. Similar problems arise for large countries that experience conflict only on certain parts of their territory. The conflict in Chechnya, for example, entails significant transnational dimensions and risks of contagion for other states in the Caucasus region. At the same time, the conflict does not affect the entire territory of the Russian federation. Neighboring states far from the Caucasus such as Finland and Norway are not necessarily affected by the conflict or exposed to spill-overs. Without further information about the conflicts in the Uppsala data it is difficult to ascertain what states should be assumed to be connected or at risk.

Most available measures of conflict focus on participation rather than the location where conflict occurs. States can choose whether to intervene in conflicts in far away location, but may not be able to insulate themselves from spill-over effects from regional conflicts. Hypotheses about spatial contagion are best evaluated with data that contains geographical information about the conflict. In further research, I will be able to take advantage of new data incorporating geographical information for the incidents in the Uppsala conflict data as this becomes available (see Buhaug and Gates 2002).

Table 4: Predicted and missed civil wars in 2000, based on 1999 data

Correct predictions	Missed conflict
Afghanistan	Iran
Algeria	Liberia
Angola	Russia
Burundi	Uzbekistan
Chad	
Colombia	
Ethiopia	
India	
Indonesia	
Israel	
Myanmar	
Pakistan	
Philippines	
Rwanda	
Senegal	
Sierra Leone	
Sri Lanka	
Sudan	
Turkmenistan	
Uganda	

8 Conclusion

Most research on civil wars has focused exclusively on attributes within states and treated civil wars in one state as independent of conflicts in other states. This paper has demonstrated that civil wars seem to be strongly influenced by interactions and processes that cross national boundaries. To understand the dynamics of civil wars and the prospects for their resolution we need to consider potential causes of civil wars both in processes within states and interaction between states. This paper has shown how spatial statistical techniques can be used to capture such linkages between states and differences in the regional environment different states face. The shortcomings of the model and data notwithstanding, a relatively high rate of successful to unsuccessful predictions strongly indicates that the regional factors examined here reflect important aspects of civil war.

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