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Violence and the Changing Ethnic Map: The Endogeneity of Territory and Conflict in Bosnia

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Abstract: This paper addresses the endogeneity of ethnic settlement patterns and conflict, that is, how settlement patterns affect conflict, and how conflict in turn changes the ethnic map. I argue that the application of violence during conflict is driven by the territorial aspirations of ethnic groups. Locations where territorial claims clash should see more violence as groups struggle for control of a unit. More precisely, in an attempt to secure control over these locations, there should be more violent confrontations between the group's military forces. For the same reason, these locations should also experience more one-sided violence against civilians. The effect of conflict on territory should be such that by means of moving populations, it decreases the level of contestation across all units. I study the dynamics of group geography and conflict in Bosnia using data on ethnic population shares at the municipality level, both from before and after the war. These data are combined with information on conflict events from the Armed Conflict Location and Events Dataset (ACLED). I construct a spatial indicator measuring the degree to which the territorial claims of ethnic groups clash at a particular location. I find support for higher levels of violence at these contested locations. Furthermore, post-war contestation scores are significantly lower, which points to a pattern of strategic ethnic unmixing during conflict. However, my results only partly support the impact of local violence as a trigger of this unmixing.

1 Introduction

War makes states, and vice versa.
—Charles Tilly (1992, p.67)

In the context of interstate disputes, we know that territory and conflict are intimately related. As much as territorial configurations trigger violent interactions between states, these conflicts in turn have an impact on the layout of the international system and oftentimes change the geographic shape of states. It is this territorial logic that Charles Tilly alludes to in his famous quote. In this paper, I examine the endogeneity of territory and conflict in an intra-state setting. More precisely, I study (i) how fuzzy inter-ethnic boundaries trigger ethnic violence, and (ii) how these boundaries change as a result of conflict.

In the study of civil war, geography has mostly been examined as an exogenous factor. For example, we know how rough terrain (Fearon and Laitin 2003), the occurrence of diamonds and oil (Lujala, Gleditsch and Gilmore 2005; Lujala, Rød and Thieme 2007), or the distance to a border (Buhaug and Rød 2006) affect the likelihood of conflict. This approach is unproblematic as long as we deal with fairly constant geographic features – it is obvious that even though, for example, rough terrain favors insurgencies, there will be no reverse effect. However, as soon as we deal with varying aspects of geography, we need to pay attention to the potential problem of endogeneity. This caveat holds for aspects of human geography in particular. For example, it has been suggested that geographic group concentration increases the risk of a group being involved in conflict (Toft 2002, 2003). If, however, group concentration is also the result of conflict, there is a possible endogeneity problem that could make it difficult to test the causal effect of concentration on conflict. In general, when examining group geography only as a cause of political violence, we miss a crucial part of the full picture: Conflict might itself trigger massive changes in the spatial distribution of groups.

To my knowledge, so far there has been no systematic attempt to study the micro-mechanisms between geographic group configurations and violence in ethnic conflicts. This is surprising, given that there is both a theoretical and practical need for research. Theoretically, much attention has been given to the causes of ethnic conflict, but much less to where it actually occurs. If the geographic pat-

tern of violence is not random – which is what this paper argues – studying the location of ethnic violence is key to understanding the strategic motives of actors in these conflicts. Just as states as the main actors in international conflicts, ethnic groups might follow strategic considerations in deciding where to fight.

These theoretical insights are relevant for practical reasons. On the one hand, intervention strategies – whether military or not – would benefit from geographic risk assessments. If certain locations are considered at risk due to their strategic position on the ethnic map, particular measures could be taken to prevent or mitigate conflict at these locations. On the other hand, there is the question of territorial "solutions" for ethnic conflict. For example, Kaufmann (1996) advocates ethnic partition as a possible solution to intractable ethnic hostilities. Lim, Metzler and Bar-Yam (2007) even go as far as to suggest that "regions of width less than 10km or greater than 100km may provide sufficient mixing or isolation to reduce the chance of violence" (p. 1544). These recommendations have generally been met with criticism (Sambanis 2000; Laitin 2004). Most importantly, however, without a detailed understanding of the micro-level processes leading to changes in the ethnic distribution during conflicts, it is difficult to predict if externally imposed partitions can lead to a mitigation or even termination of hostilities.

This paper aims to fill this theoretical and empirical gap in the literature. Section 2 introduces the theory. I argue that competing territorial aspirations can explain both the location of violence and the changes of inter-ethnic boundaries during ethnic conflict. Violence will occur if a particular location is claimed by more than one group as part of their greater territory. The clashing claims that ethnic groups make over a location is what I call "ethnic contestation" at that location, and it constitutes my key explanation for the effect of group geography on violence. I then turn to the consequences of violence. If groups can only partly achieve their aim of creating ethnically pure territories, the effect of violence should be a strategic unmixing of the system, such that there are less competing territorial claims of ethnic groups after the conflict. However, the fact that such an unmixing process occurs in times of conflict does not yet tell us much about the particular role that violence plays in triggering population changes on the ground. Here, I distinguish between the role of two-sided violence between the groups' armed forces, and one-sided violence against civilians. I argue that

the former is used as a means of establishing control over territory. Once this has been achieved, one-sided violence against civilians will be applied as a strategy to enforce migration, or even worse, to perform ethnic cleansing by extermination of people.

Section 3 presents an empirical test of these theoretical considerations on the civil war in Bosnia. For a detailed analysis of the micro-level dynamics of inter-ethnic boundary formation and violence, I employ a disaggregated approach, breaking down geography and violence along three dimensions: geographically, by examining the local ethnic composition and occurrence of violence; temporally, by observing changes in ethnic composition before and after the conflict; and conceptually, by distinguishing between different types of violence and its strategic objectives. This approach helps me single out the underlying patterns and relationships between geography and violence that one would otherwise fail to grasp.

2   Territory as Cause and Effect of Ethnic Violence

At first glance, territory does not feature prominently in existing explanations of ethnic conflict. Emotion-based approaches (Petersen 2002) emphasize the role of individual emotions towards another group as crucial in explaining intergroup hostility. Elite-manipulation theories (Gagnon 2004) argue that violence between groups is the result of leaders that mobilize along ethnic lines for their own political survival. However, almost all theories about ethnic conflict assume the presence of inter-ethnic boundaries, and these boundaries are intimately related to group territory. It is not so much the extrinsic value of territory (Hensel 2000), i.e. the possibility to extract resources, which is of importance to groups, but rather its subjective value. For an ethnic group, the territory where it settles is an integral part of its identity, in other words, there is no ethnic group without its territory (Smith 1986). In fact, the control of a "homeland", as Monica Toft (2003) emphasizes, is crucial for the survival of a group. Consequently, ethnic groups situated within another state are unlikely to only partly give up control over their territory, which triggers violent conflict (Toft 2003; Fearon 1995).

The indivisibility of territory can lead to two different forms of ethnic conflict,

which I label "asymmetric" and "symmetric". For the former, the setting is such that the ethnic homeland is situated within another state. The government of this state exerts some authority over the group's territory, which is challenged by the group. I label this type of ethnic conflict "asymmetric", since it pits a comparably small and weak ethnic minority group against government forces backed by the entire state. In this type of ethnic conflict, it is not the *extent* of the "homeland" of the group that is under dispute, but the *control* over it. Consider for example the conflict in Georgia. Both the Abkhaz and South Ossetian minorities live in "their" administrative units, the borders of which are reasonably well defined. The conflict between these minorities and the Georgian government is mainly about the control of these units.

There is, however, also a "symmetric" type of ethnic civil war, which corresponds to what Posen (1993) has framed as an ethnic security dilemma situation. During periods of state failure when there is no central authority guaranteeing peaceful co-existence of groups, the groups themselves are responsible for their own security. Other groups will be perceived as a threat, and measures will be taken to react to that threat. This symmetric type of ethnic conflict resembles an "all against all" situation with equal actors. In such a setting, the territorial logic is different from the aforementioned asymmetric type of conflict. In the absence of a strong state that guarantees the inter-ethnic boundaries, the definition, securing and defense of these boundaries is likely to become an issue of high priority for groups. This is especially problematic in cases where group territories are not clearly demarcated: Then, groups will fight about the very *extent* of territory, rather than *control* over it.

It is the process of the violent formation of inter-ethnic boundaries in symmetric ethnic conflicts that is the focus of this paper. More precisely, I examine two questions: In a security dilemma condition of "all against all", (i) what locations do ethnic groups choose to fight for? and (ii) what adjustments of the inter-ethnic boundaries does this lead to? Security dilemma conflicts occur during the breakup of multi-ethnic states, and groups fight with the prospect of eventually creating new state entities from their territories. During this process, the question is what the spatial extent of these entities will be. Key to the understanding of ethnic boundary formation is an assumption that might seem tautological at first:

Ethnic groups recognize "their" territory by the location of their ethnic kin. Consequently, groups will try to align a territory that extends to all locations where the members of their group live. This strategy can be easily implemented as long as we deal with cases where ethnic regions are clearly separated but is likely to prove difficult in ethnically mixed areas. What if an area is inhabited by more than one group? Since more than one group will claim the territory as theirs, disputes over the ownership of the territory are likely to arise.

2.1 Clashing Territorial Claims and the Occurrence of Violence

The first general question my paper examines is how these clashing territorial claims relate to the occurrence of violence. In a security dilemma situation, ethnic conflict occurs with the goal of creating ethnically pure successor states. However, for these states to be viable, their spatial extent has to follow some basic principles, the most important of which is that the territory be contiguous. It is obvious that a state with territorially isolated enclaves will face enormous difficulties in defending them (Posen 1993; Kaufmann 1996). Also, a contiguous territory assures economic benefits because of uninterrupted communication and transportation routes (Melander 2007). For that reason, groups will take into account the position of a location relative to the larger group territory. Consider a province with a high share of a particular group A. If this province is situated close to a larger region where group A is clearly dominant, A will be more likely to claim that province than if the province was surrounded by mixed areas and thus could not easily be added to A's larger territory. Consequently, when making the decision which of its populations to include in the state to be created, an ethnic group should tend to favor those that constitute a core territory, and those that are close to it. This condition will not lead to disputes if only one group raises claims to a particular location. However, if there are two (or more) groups demanding control over a unit, this might trigger the process of violent conquest and cleansing I described above. What I call *ethnic contestation* at a location is the degree to which two or more groups consider a location to be part of the territory they aspire to occupy.

How does ethnic contestation trigger violence? For each of the groups laying claim to a particular location, the goal is to eventually add that location to their greater territory. To this end, two steps are necessary. First, one group has to establish control over the unit, and second, the winning group has to cleanse the unit from the enemy group population. At each of these stages we are likely to see a different type of violence. The first stage will be characterized by violence between armed groups. If groups disagree as regards the ownership of a unit, both sides are likely to bring in their military forces to take over the unit. The first stage of these violent confrontations about territory therefore resembles interstate conflicts, with armed forces trying to advance territorial control (Holsti 1991; Huth 2000). Consequently, in locations where group demands clash, we should see two-sided violence between armed forces.

However, when control of a location has been established, the process of ethnic cleansing begins (Bell-Fialkoff 1993). Groups will try to set the boundaries of their territory such that they include all of their kin, but at the same time as low an alien population as possible. Ethnic cleansing strategies will be employed to achieve the latter. The cleansing of populations from an area can take a variety of forms, from active discrimination of single persons – short of physical violence – to the genocidal extermination of entire populations (Mann 2005, p.12). Yet, violence plays a crucial role in ethnic cleansing. In contrast to two-sided violence which is likely to occur during the conquest of a location, the violence at this stage is one-sided, perpetrated by the armed forces of the dominant group against the civilian population of the group to be expelled.

We can now state the relationship between ethnic contestation and the two types of violence I described above. First, ethnic contestation should lead to two-sided violence, since the groups that consider a location as valuable for them will try to secure control over it. As I have outlined, this should lead to violent interactions between the groups' armed forces. Therefore,

>   H1: The occurrence of two-sided violence should be higher at locations with a high degree of ethnic contestation.

A similar relationship should hold for one-sided violence. Ethnic cleansing is not the only purpose for which civilians are targeted, however, in general, groups

will try to employ this sort of violence at locations that are of strategic importance to them. In other words,

> H2: The higher the degree of ethnic contestation at a location, the more one-sided violence we should see.

2.2 Conflict and Territorial Changes

So far, I have described the first causal link this paper examines – the impact of group geography on the location of ethnic violence. I now turn to the reverse direction: How does conflict change the spatial distribution of ethnic groups? As mentioned above, groups seek to create an ethnically homogenous territory. In mixed regions, however, this is not possible without population adjustments, so the strategy of ethnic groups will be to remove the alien group from the territory they consider to be theirs. This can happen by means of different strategies, from non-violent cultural suppression over forced migration to the killing of entire populations (Mann 2005, p.12). During ethnic conflict, we typically observe the whole spectrum of forceful cleansing. We can think of this as a segregation process, where populations separate into more homogenous clusters – similar to what Schelling (1971) described in this famous model of neighborhood segregation. The effect of these population changes should reduce the conflict susceptibility of the system. For this to happen, we should expect that ethnic contestation be systematically reduced. I therefore expect that

> H3: Conflict leads to a system with lower ethnic contestation.

The previous hypothesis examines the system-wide effects of conflict on ethnic distribution. However, what explains the local changes towards less territorial contestation on the ground? As argued above, overall ethnic contestation decreases because of a strategic unmixing of group populations. Although violence is not the only way to induce ethnic cleansing, ethnic configuration changes can be due to strategically employed violence. As described above, we need to distinguish between the effect of two-sided violence as a means to gain control over a unit, and one-sided violence to cleanse the unit of the alien population. The

occurrence of two-sided violence indicates the struggle between groups for control of a unit. Repeated military confrontations between groups should indicate that control over a unit has not been established, because fighting should stop if one group takes over the unit. Without clearly established control of a unit, we should expect that fewer systematic attempts will be made by a group to ethnically cleanse the unit, which results in a smaller decrease in ethnic contestation. I therefore hypothesize that

> H4: The decrease in ethnic contestation should be lower at locations
> with a high occurrence of two-sided violence.

One-sided violence, however, should have the opposite effect on population changes. We can assume that violent cleansing strategies are among the most effective ones to create ethnically "pure" territories. One-sided violence against civilians is the most extreme manifestation of a group's attempt to achieve ethnic homogeneity, so we should assume that high occurrences of one-sided violence should be related to higher changes towards ethnic homogeneity, and correspondingly, low ethnic contestation. In short,

> H5: The decrease in ethnic contestation should be higher at locations
> with more one-sided violence.

According to the theoretical perspective I have presented in this section, the territorial configurations of ethnic groups are both the cause and the consequence of conflict. I described a process that leads from critical territorial configurations to violence and then to changes in the spatial configuration. In short, this process works as follows. In a security dilemma situation, ethnic groups aim to create ethnically pure territories that include all their ethnic kin. This causes territorial ethnic contestation if two groups claim a location to be part of their territory. Ethnic contestation leads to violent military confrontations between groups in their attempts to secure control over the unit (H1). Similarly, ethnic contestation favors violence against civilians as means to cleanse the unit (H2). If these attempts are only partly effective, conflict reduces the ethnic contestation in the system (H3). Local population changes toward lower ethnic contestation should occur where

one group has taken control. Many military confrontations between groups indicate that no group has taken over, and are therefore related to a lesser decrease in ethnic contestation (H4). Violence against civilians, however, should be an indicator of forceful cleansing and therefore be related to a higher decrease in ethnic contestation (H5). The next section subjects the hypotheses to empirical scrutiny.

3 Ethnic Contestation and Conflict in Bosnia

3.1 Case Selection and Data

For my empirical analysis, I selected the conflict in Bosnia from 1992-1995 for two reasons. First, the conflict is a prime example of a territorial ethnic conflict of "all against all", with three major groups fighting for territorial gains in the absence of a powerful central authority. The second reason for selecting Bosnia is data availability. In order to examine changes in the ethnic map, my analysis requires both pre- and post-conflict data on the spatial ethnic distribution. Many existing datasets on ethnicity do not deal with the spatial dimension at all and provide only demographic figures about groups, mostly at the national level (Fearon 2003). The *Minorities at Risk* dataset (Gurr 1993) contains a few geographic variables of groups, which are not sufficiently detailed to allow for an analysis of inter-ethnic boundary formation. To date, the dataset on ethnic groups with the most precise geographic information is the recent GREG dataset (Cederman, Rød and Weidmann 2007). However, GREG lacks a time dimension, making it unusable for the study of changes in the spatial ethnic distribution.

Data on Bosnia's *pre-war* ethnic distribution is available from the last census in the Republic of Yugoslavia in 1991. For each of the 109 municipalities ("opštinas") in Bosnia, the census lists the number of people for the three major groups: the Bosniaks or Bosnian Muslims, the Croats and the Serbs. These 109 municipalities from the 1991 census constitute the unit of observation throughout my study. They allow for the analysis of conflict dynamics at a high level of resolution: Whereas most quantitative work on internal conflict employs state-level measures, using the Bosnia data we can narrow the focus down to municipalities of (on average) 20 by 20 kilometers. The *post-war* distribution of ethnic groups

in a municipality is taken from Caspersen (2004). Here, election results from 2000 were used to approximate the number of people of a particular ethnicity in a unit. Since after the war, many of the old municipalities were split, I aggregate the post-war population data to the pre-war municipalities. This is done using pre-war and post-war maps to identify which of the new units belonged to a former unit according to the 1991 census.

Estimates for the conflict activity in a particular unit were obtained from ACLED, the "Armed Conflict Locations and Events Dataset" (Raleigh and Hegre 2005). This dataset lists reported confrontations between the fighting parties in a civil war, along with the date and the spatial coordinates of the event. ACLED distinguishes between different types of events. Type 1–3 includes confrontations between armed groups, both with or without territorial transfers. I used events of these categories to compute my variable for two-sided violence. Type 7 in ACLED codes events of one-sided violence, perpetrated by armed forces against non-combatants. The events of this category constitute the basis for my one-sided violence variable. Using GIS software, I counted the number of events for each municipality in order to obtain a measure for one- and two-sided violence. For the former, the number ranges from 0 to 31, with a mean of about 1.1. The latter ranges from 0 to 34 with a mean of 3.7.

3.2 Computing an Indicator of Ethnic Contestation

Strategic ethnic contestation arises if two ethnic groups lay claim to a region because they consider it to be part of their greater territory. Thus, the computation of an indicator for ethnic contestation consists of two steps: First, we need to measure the strategic importance of a unit for each of the ethnic groups. This number should indicate how well the given unit would fit into the larger territory of the group. Second, we need to combine the measures of the importance to individual groups into a single indicator for strategic ethnic contestation in a unit. This indicator should detect if group demands clash, i.e. if more than one group has strategic claims to this unit.

I first turn to the question of how to measure the strategic importance of a unit to a particular group. A unit has strategic importance to group A if it can

easily be added to A's larger group territory. This is only the case if (i) there are other significant populations of A living nearby to which the respective unit can be added, and (ii) if the unit itself has a sufficiently large population of A. On the contrary, the unit should have lower importance to A if it is primarily surrounded by populations of some other group B, or the unit itself has a high share of B. I therefore measure the strategic importance of a unit to A by the multiplication of two factors: First, the average of A's shares in the unit's neighbors, and second, the share of A in the unit itself. This measure is computed for each unit and each of the three ethnic groups in the sample. As we would have expected, the priority levels we obtain for the three groups are negatively correlated. Serb and Croat claims correlate at -0.40, Muslim and Croat claims at -0.38, and Serb and Muslim claims at -0.48. These correlations indicate that on average, the claims of groups do not correspond: if a unit has a high priority for one group, it gets a low priority for the other groups. The scatter plots in Figure 1 plot the importance scores of groups against each other. Municipalities that get high scores for two groups at the same time indicate clashing territorial claims. The plots reveal that the number of contested provinces varies for different group constellations: Whereas there are many units with mutual claims by Serbs and Muslims (upper left panel), this number is much smaller for Croats and Muslims, and Croats and Serbs. These figures suggest, at least initially, that most conflict potential was present between Serbs and Muslims. In general, however, the scatter plots show that there is a substantive amount of units where there is no perfect disagreement in group claims. I now turn to the calculation of an aggregate indicator measuring this territorial contestation.

The importance scores need to be combined into a single indicator of clashing claims. A unit should be under dispute if it has a high importance to more than one group. For that reason, I select the two highest importance scores for a unit across all ethnic groups, and use the product of these two scores as my indicator of strategic ethnic contestation. High values of this variable suggest that there are two ethnic groups that consider the respective unit to be part of their territory. The strategic contestation indicator ranges from close to 0 to 0.06, with a mean of about 0.02.

A short example illustrates the logic behind the strategic contestation indicator.
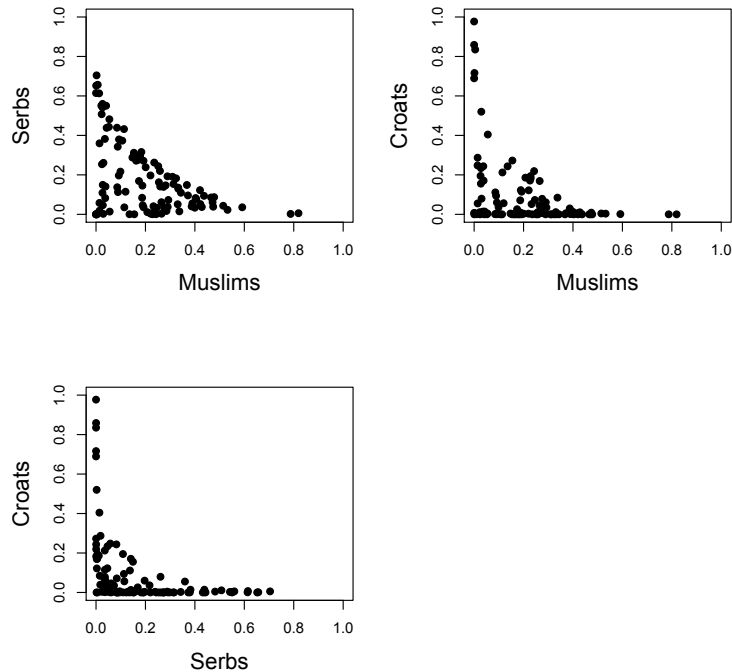
Figure 1: Scatter plots of the strategic importance scores of the municipalities for 1991. Dots toward the center of the coordinate system indicate the unit is considered important by two groups, and should therefore be contested.

The municipality of Zvornik in Eastern Bosnia was one of the first locations to see violence between Serbs and Muslims during the Bosnia war in early April 1992 (Burg and Shoup 1999, p.129). Zvornik has 8 neighboring municipalities in Bosnia (see Figure 2). Since some of these have high population shares of Serbs (e.g. Bijelina and Sekovici), and Zvornik itself has a Serb share of almost 0.5, the municipality is of high importance to the Serbs (importance score 0.19). At the same time, Zvornik also borders some Muslim-dominated municipalities (e.g. Kalesija and Bratunac) and has a high share of Muslims (slightly more than 0.5). For that reason, it is likely to be claimed also by this ethnic group (importance score 0.29). The multiplication of the Serb and Muslim importance scores for Zvornik results in a strategic contestation value of 0.056 and is among the ten highest scores in the sample.

The following sections present the tests of my hypotheses on the Bosnia data.
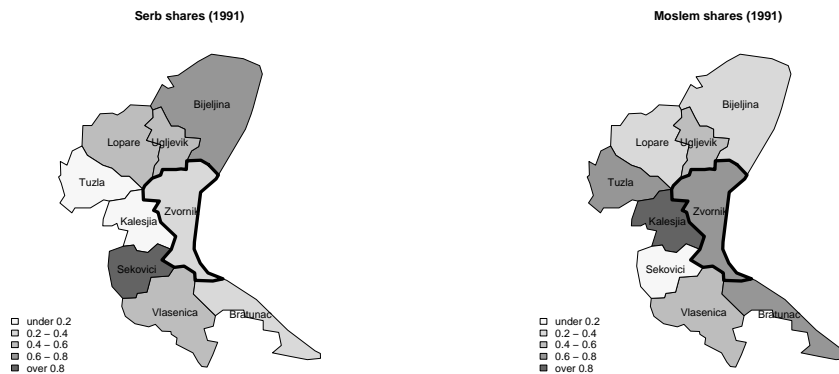
Figure 2: Example for the computation of the strategic contestation indicator. The color shading indicates the proportion of the respective group in a municipality, for Serbs (left) and Muslims (right).

4 Results

4.1 H1: Ethnic Contestation and Two-sided Violence

According to the theoretical discussion presented above, we should see more two-sided violence in units with higher ethnic contestation. For a first visual inspection, Figure 3 shows the geographic distribution of the contestation scores, with an overlay of the two-sided conflict events from ACLED. Darker colors correspond to greater ethnic contestation in a municipality. According to H1, we should observe a higher likelihood of two-sided violence in units with darker colors. This expectation seems to be confirmed by Figure 3, which shows that most of the units with high contestation (dark) show more conflict activity.

In order to provide a more thorough test of H1, I employ regression analysis with the number of events in a unit as the dependent variable.[1] This variable is likely to show overdispersion, so a negative binomial model should be preferred over a Poisson model. I control for the effect of the local ethnic configuration of a municipality in 1991 by including a measure of ethnic diversity computed using the ethno-linguistic fractionalization index ELF (Taylor and Hudson 1972).

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[1] All models estimated using R 2.7.1 and the *Zelig* package (Imai, King and Lau 2006).
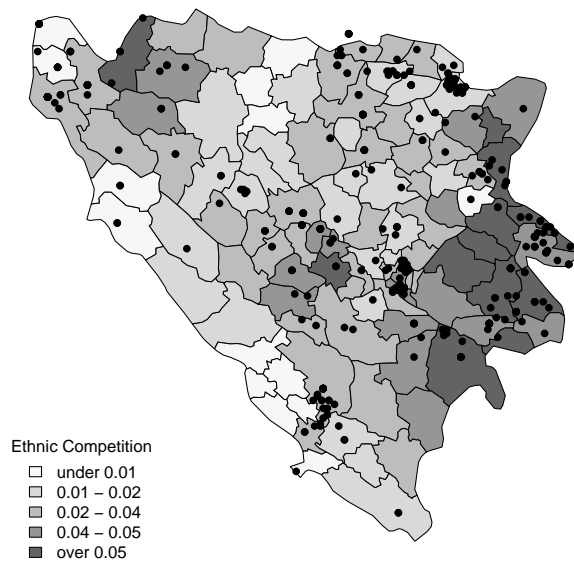
Figure 3: Ethnic contestation scores for 1991. Darker colors correspond to higher scores. The dots indicate the location of two-sided conflict events from ACLED.

My expectation is that ethnic diversity should have a positive effect on two-sided violence. I also control for whether a municipality borders regions outside Bosnia, since direct proximity to either Serb or Croat territory might increase the conflict propensity of a municipality. Furthermore, we should expect that conflict is more likely in more populous units, so I include the logged unit population in 1991 as an additional independent variable. A further issue needs to be addressed in the analysis. We must assume that conflict is spatially dependent, i.e. the number of conflict events in a unit is to a certain degree determined by the number of events in its neighboring units. The solution to deal with this dependence is to include a spatial lag in the model (Ward and Gleditsch 2008). The spatial lag in my model is computed as the average conflict count of a unit's direct neighbors. Figure 1 reports the results.

The regression analysis confirms my initial expectations. Units with a higher degree of contestation show significantly more conflict activity. When increasing ethnic contestation from the empirical minimum (0.00) to the maximum (0.062), the expected number of two-sided conflict events increases by about 4. However, the occurrence of two-sided violence also depends to a large degree on the local

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	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	−7.73	1.76	−4.40	0.00
Ethnic contestation	16.06	8.35	1.92	0.05
Local ethnic diversity	2.99	0.96	3.10	0.00
Border unit	0.57	0.28	2.08	0.04
Population (log)	0.60	0.17	3.51	0.00
Spatial lag of DV	0.12	0.05	2.64	0.01

Table 1: Negative binomial regression results. Dependent variable: Number of two-sided violence events (N=109).

ethnic make-up, with more diverse units experiencing more violence. Municipalities at the border of Bosnia have a higher likelihood of conflict, and the same holds for more populous municipalities. We also see that conflict exhibits a high degree of spatial correlation: The coefficient for the spatial lagged dependent variable is positive and strongly significant.

As the map in Figure 3 shows, the dependent variable in this analysis has a high proportion of zeros, which might bias the results of the negative binomial model. In order to test for that, I also estimate a zero-inflated negative binomial model (results not shown). [2] I do not observe a change in the direction or significance level of any effect, with the exception that the border unit variable is only significant at the 0.1 level.

4.2   H2: Ethnic Contestation and One-sided Violence

For a test of H2, I repeat the above analysis with the one-sided violence count as the dependent variable. Again, I start with a visual inspection of the data. Figure 4 shows the geographic distribution of strategic ethnic contestation, again with an overlay of the one-sided conflict events in ACLED.

According to H2, high levels of contestation should be related to more one-sided violence. Visually, this relationship seems to be supported; we see a lower activity of one-sided violence in areas with light shading. I employ regression analysis to provide a more reliable test of this relationship. Again, I use a negative

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[2]Model estimated using R 2.7.1 and the *pscl* package (Zeilis, Kleiber and Jackman 2007)
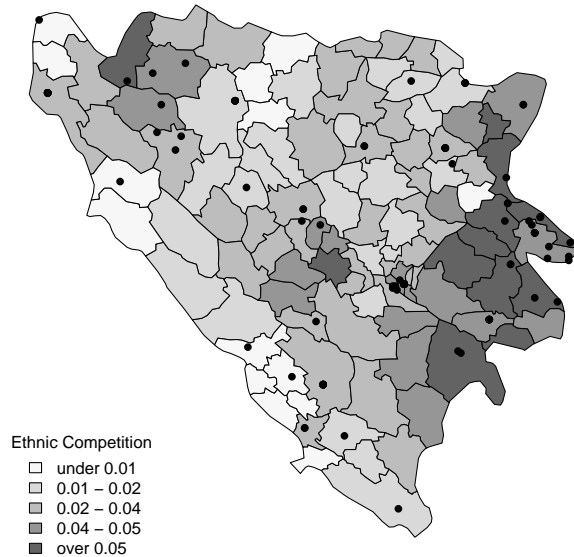
Figure 4: Ethnic contestation scores for 1991. Darker colors correspond to higher scores. The dots indicate the location of one-sided conflict events from ACLED.

binomial model with the one-sided event count as the dependent variable, and a spatially lagged dependent variable to control for spatial dependence. Table 2 presents the results.

	Estimate	Std. Error	z value	Pr($>$|z|)
(Intercept)	-20.29	3.21	-6.32	0.00
Ethnic contestation	29.06	14.14	2.06	0.04
Local ethnic diversity	-0.69	1.58	-0.44	0.66
Border unit	0.56	0.41	1.37	0.17
Population (log)	1.78	0.31	5.82	0.00
Spatial lag of DV	0.30	0.15	2.08	0.04

Table 2: Negative binomial regression results. Dependent variable: Number of one-sided violence events (N=109).

The model shows two major results. First, in line with H2, ethnic contestation is positively and significantly related to one-sided violence, so units with high contestation as captured by my indicator show significantly higher levels of vio-

lence against civilians. The maximum effect of ethnic contestation corresponds to an expected increase by roughly 2 conflict events. The second finding pertains to the impact of the local measure of ethnic diversity. As I have shown above, ethnic diversity leads to a higher occurrence of two-sided violence. In other words, besides the strategic ambitions of groups as captured by my contestation indicator, the local ethnic configuration explains a great deal of variance in two-sided violence. This stands in stark contrast to one-sided violence. Here, local ethnic diversity turns out to have no discernible relationship to the occurrence of one-sided violence, whereas ethnic contestation is a strong predictor. This result is a first indication of the strategic nature of civilian targeting: If a unit is of strategic importance, the group will make an attempt to induce population changes in that unit. Violent military confrontations, however, seem to be driven by strategic aims, but also by the local ethnic diversity of a municipality.

Again, I repeat this analysis also with a zero-inflated negative binomial model. It confirms the findings on the above presented model; the only difference I observe is that the ethnic contestation variable is now significant only at the 0.05 level.

4.3 H3: Conflict Reduces the Contestation in the System

As shown above, ethnic contestation increases the likelihood of both one- and two-sided violence. Correspondingly, if conflict in general was successful as a means to resolve territorial issues, we should see decreasing ethnic contestation during the conflict. In order to test for this, I compared pre- and post-conflict ethnic contestation scores. Post-conflict strategic ethnic contestation is computed as described above, but using the 2000 population data. Before looking at the overall distribution of contestation, I again do a pairwise comparison of the importance score, similar to Figure 1. Figure 5 shows pairwise plots of the group's importance scores for the Bosnian municipalities. Post-war (2000) scores are shown as solid black dots, and grey dots indicate the pre-war scores for easier comparison. The plot shows that the number of contested units (the ones closer to the center of the coordinate system) has decreased significantly.

For a test of H3, I compare the overall distribution of ethnic contestation scores
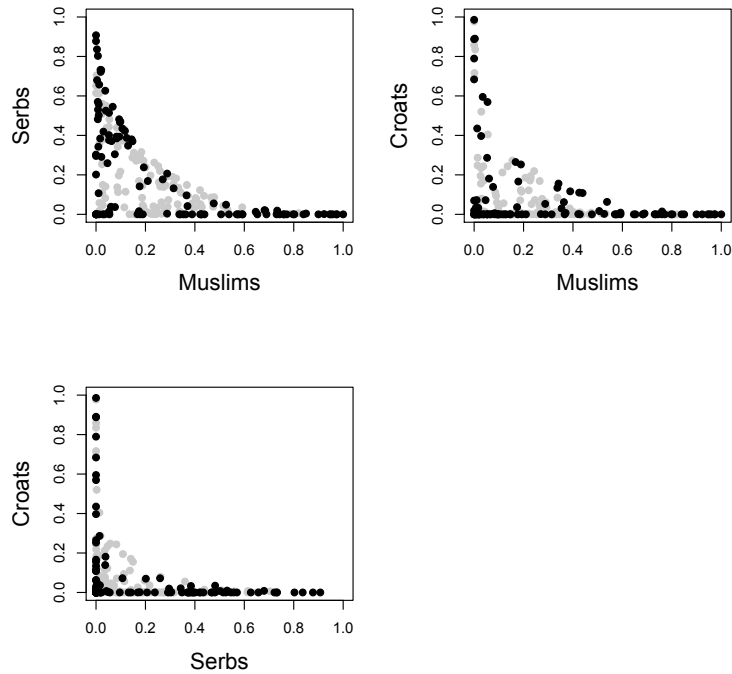
Figure 5: Scatter plots of the strategic importance scores for 2000 (black solid dots), compared to the 1991 scores (grey dots). Again, dots towards the center of the coordinate system are contested units. The plot shows that the number of contested units compared to 1991 has decreased significantly.

before the war to the one after the war. According to H3, post-war ethnic contestation should be significantly lower than before the war. Figure 6 shows kernel density estimates for the contestation score before the war (solid line) and after the war (dashed line). Clearly, the ethnic contestation in the system decreases: The pre-war mean is 0.028, as compared to a post-war mean contestation of 0.018. A paired t-test shows that the post-war scores are significantly lower than the pre-war ones (t-value 7.88, df 108, p-value 0.00).
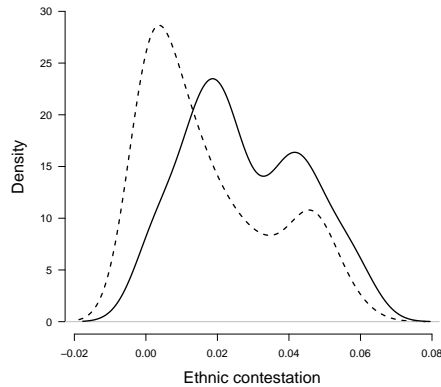
Figure 6: Kernel density estimates for the pre-war (solid line) and post-war (dashed line) distribution of ethnic contestation in Bosnia. After the war, ethnic contestation scores are significantly lower.

4.4 H4 and H5: Local Violence and Decreasing Ethnic Contestation

In the previous paragraph, I have shown that during the course of the war, the overall ethnic contestation in the system decreased significantly. How does this change at the systemic level relate to the local occurrence of violence? I conduct a regression analysis of the relationship between one- and two-sided violence and the change in the ethnic contestation of a province. More precisely, the dependent variable is the difference between the 1991 and the 2000 score in ethnic contestation, as measured by the indicator introduced above. This variable ranges from -0.02 to 0.042, with a mean of 0.01. Clearly, as I have shown already in the previous paragraph, during conflict there is a general trend towards lower scores of ethnic contestation, which explains the (on average) positive difference between the 1991 and 2000 scores. The main independent variables are the number of events of one-sided and two-sided violence and are included in a square root transformation because of their highly skewed distribution. Two-sided violence is expected to have a negative effect, in other words, a high number of two-sided violence events should be related to a lower difference in ethnic contestation (H4). According to H5, we should expect one-sided violence to have a positive effect.

The control variables are largely the same as above. As shown above, the system moves towards a lower degree of mixing, so more contested units should experience more drastic decreases in ethnic competition. I control for this by including the 1991 level of contestation as an independent variable. Border units should see greater changes, because their strategic position favors addition to the outside group's territory. Lastly, I expect that the population of a unit should be negatively related to the degree of change: In populous units, it should be more difficult to induce changes in the proportion of groups, because many more people need to be "moved" as compared to a unit with a small population. Again, the observations of the dependent variable are likely to be spatially correlated. Rather than using an OLS model with a spatial lag, I employ a spatial simultaneous autoregressive lag model (Ward and Gleditsch 2008, p.43) that can deal with the simultaneity of observations.[3] The coefficient ρ in this model is the coefficient of the spatially lagged dependent variable. The number of one-sided and two-sided violence events is highly correlated in the sample (0.73), so I test the two independent variables in separate models. Table 3 reports the results with two-sided violence as an independent variable, and Table 4 for one-sided violence.

	Estimate	Std. Error	z value	Pr($>$|z|)
(Intercept)	-0.45	1.55	-0.29	0.77
Two-sided violence (sqrt)	-0.17	0.09	-1.80	0.07
Pre-war ethnic contestation	21.21	7.25	2.92	0.00
Border unit	0.00	0.24	0.02	0.98
Population (logged)	0.07	0.15	0.44	0.66
ρ	0.43	0.12	3.76	0.00

Table 3: Spatial simultaneous autoregressive lag model. Dependent variable: Decrease in ethnic contestation 1991-2000, multiplied by 100 to ensure better readability (N=109).

In line with H4, two-sided violence has a negative effect on the decrease in ethnic contestation in a municipality (Table 3): Units with more military confrontations tend to decrease less in their ethnic contestation score. However, the

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[3]Models estimated using R 2.7.1 and the *spdep* package.

	Estimate	Std. Error	z value	Pr($>$|z|)
(Intercept)	−0.20	1.66	−0.12	0.92
One-sided violence (sqrt)	−0.13	0.14	−0.91	0.36
Pre-war ethnic contestation	18.68	7.13	2.62	0.01
Border unit	−0.05	0.24	−0.21	0.83
Population (logged)	0.03	0.16	0.22	0.83
ρ		0.43	0.12	3.71	0.00

Table 4: Spatial simultaneous autoregressive lag model. Dependent variable: Decrease in ethnic contestation 1991-2000, multiplied by 100 to ensure better readability (N=109).

effect is not very strong: Increasing the two-sided event count by one, there is a decrease in contestation by .001, corresponding to 3% of the empirical range in contestation. Not surprisingly, pre-war ethnic contestation is strongly and positively associated with the amount of decrease. This is a consequence of the general tendency towards lower ethnic contestation in the system, which causes the largest drops in contestation to occur in the units with high pre-war scores. Border units do not seem to decrease more in contestation, and there is also no discernible effect of population. We see that changes in the ethnic makeup are highly spatially dependent, the coefficient ρ of the spatial lag is positive and strongly significant.

The results in Table 4 provide no empirical support for my final hypothesis. Counter to H5, the effect of one-sided violence is negative and not significant. The control variables and the spatial lag retain their signs and significance levels as compared to the previous model. In general, this suggests that one-sided violence has no direct impact on the triggering of population changes on the ground. Why is this the case? One answer to this question might result from the great differences in the strategies that can be used for ethnic cleansing. As Mann (2005, p. 12) shows, types of cleansing range from active discrimination over cultural repression to violent strategies such as forced replacement, pogroms or genocide. However, in the analysis I presented above we fail to observe these attempts unless they reach a level of violence sufficient for classifying them as one-sided violence, and thus for inclusion in ACLED. If the majority of population changes in Bosnia was indeed induced by non-violent attempts, it is no surprise that one-sided vio-

lence has no effect in the above model. A second alternative explanation can be found in the more general pattern of population transfers during the Bosnia war. In my theoretical discussion above, I made the assumption that people generally want to stay where they live, unless there is a direct threat of violence. In reality, however, this might be different. Burg and Shoup (1999, p. 172) mention the completely opposite approaches that leaders pursued during the Bosnia war. Whereas Muslim leaders encouraged their group to stay in their villages as a strategy to protect the territorial integrity of Bosnia, Serb and Croat leaders tried to convince people to leave their homes and migrate to ethnically homogenous areas. This was done in an attempt to make a future partition more likely. As a result, however, my analysis fails to identity the latter cases, since migration was induced by reasons other than violence.

5   Conclusion

My analysis of the Bosnian civil war suggests that ethnic conflicts follow a logic that relates violence to the territorial aspirations of ethnic groups. Units with a high level of ethnic contestation tend to see more confrontations between armed forces as groups struggle for control of a unit, but are also more susceptible to one-sided violence against civilians. The effect of conflict is such that it decreases the level of contestation across all units, corresponding to a pattern of strategic ethnic unmixing during times of war. Whereas frequent confrontations between military forces at a unit seem to be associated with lower degrees of unmixing, there is no discernible effect of one-sided violence on changes in the ethnic map. Rather, the trend towards ethnic homogeneity occurs as a by-product of conflict, but does not seem to be directly induced by the local application of violence. In summary, violence and territory in internal conflict are endogenous: fuzzy territorial boundaries explain where fighting occurs, and conflict in general leads to an adjustment of these boundaries.

These findings support Kaufmann's (1996) observation that during ethnic conflict, we frequently observe an ethnic unmixing of the population. And still, this should not lead us to accept the territorial separation of groups as a remedy to conflict, as he suggests. My paper gives at least two reasons why this solution might

not work. First, territorial separation requires that groups be physically separated. If the resulting configuration should be peaceful, this requires that there is a territorial division accepted by all groups. However, how could such a division be found, and who is to establish it in the first place? The results I presented point to the high importance of inter-ethnic boundaries, such that people are willing to fight even for minimal adjustments. Therefore, an artificial territorial division is unlikely to be agreed on by all groups in a peaceful process. Second, my analysis tries to explain the *location* of violence, given that a civil war has already started. The onset of the civil war itself might be unrelated to the degree of inter-ethnic mixing, so as long as we don't know the determinants of civil war onset, it is difficult to estimate the importance of settlement pattern adjustments in order to prevent conflict in the first place. If the underlying conflict issue is not addressed, the drawing of new territorial boundaries will not have the desired effect.

However, even though the onset of conflict might not be directly related to fuzzy ethnic boundaries, my analysis shows that the application of violence follows a territorial pattern, led by the groups' strategic objectives. Once a civil war has started, it thus becomes feasible to predict the spatial progress of an ethnic war. Which municipalities are at a particularly high risk of being affected by violence? Oftentimes, this is the question that third-party military operations face when making decisions on where to intervene. During these operations, the protection of the civilian population might be of particular priority. My study helps to single out locations where non-combatants are most likely to be attacked, and can therefore provide guidance as to precisely where precautionary measures are required.

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