Chasing the Key Player: a Network Approach to Myanmar Civil War

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Abstract

This work studies the last twenty-six years of civil war in Myanmar. Since the country bears several correlates of war such as poor economic performance, rugged terrain, lack of inclusive institutions, ethnic heterogeneity and richness in natural resources, it represents an ideal ground for understanding their interplay in conflict outbreaks. While empirical and theoretical research on civil conflict have run along independent paths, I use a model to drive the empirical analysis. Namely, I investigate the determinants of conflict occurrences between the Myanmar army and several armed groups over time and space using a game over network approach in the spirit of [Ballester, Calvó-Armengol & Zenou, 2006]. The model yields predictions on which armed group the Myanmar army wishes to remove from the network of alliances and enmities in order to reduce the overall fighting ability of all armed groups in the network. This framework sheds light on why certain armed groups survive over time and why the Myanmar army is unable to commit to maintaining long-lasting ceasefire agreements with others. The empirical analysis follows a two-step procedure. In the first step, I parametrize the model in order to derive predictions. In the second step, I test them using georeferenced dyadic information on violence outbreaks over time.

JEL-Classification: D74,F54,P48,O10,O13, Q34.

Keywords: Civil Conflict, Alliance and Enmity Network, Bargaining Failures, Myanmar, Resource Curse, Ethnicity.

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1 Introduction

Over the last fifteen years economists and political scientists have been increasingly interested in understanding the causes of civil wars. From a theoretical perspective, much has been understood about the causes that lead to war outbreaks ([Fearon, 1995], [Jackson & Morelli, 2009], [Walter, 2009]). On the one hand, theories of conflict show that war is the outcome of bargaining failures among players. Namely, these failures stem from a variety of sources ranging from asymmetric information about the consequences of war, agency problems among leaders and the population, weakness of institutions (or lack of thereof) that can enforce agreements among parties as well as indivisibilities of resources. While scholars agree that these theories point toward the real causes of civil war, a main concern is that they are hard to test empirically (see [Blattman & Miguel, 2010] for a discussion). On the other hand, empirical work finds that income shocks and slow economic growth are robustly linked to civil war ([Blattman & Miguel, 2010], [Fearon & Laitin, 2003]). Since going beyond this simple correlation poses issues of reverse causality, several studies have rigorously shown that income shocks are indeed correlated with violence outbreaks ([Dube & Vargas, 2013], [Miguel, Satyanath & Sergenti, 2004], [Vanden Eynde, 2011]). However, the identification strategies of these papers have been recently challenged as researchers question the validity of the instruments used. For instance, [Sarsons, 2015] analyzes the use of rainfall shocks as an instrument for agricultural income and shows that, in the context of India, the exclusion restriction fails, that is, rainfall variation affects the probability of riots in districts where agricultural production is not affected by rainfall. Similarly, shocks to the price of commodities represent another set of instruments that has been vastly used yielding mixed results. Notwithstanding the vast evidence on income shocks and conflict, most studies are silent about the mechanisms that link them to conflict outbreaks ([Bazzi & Blattman, 2014]). More generally, civil war scholars have not reached a consensus on the role of the so called correlates of war in causing conflict. For example, scholars disagree on the effect of ethnic diversity and the presence of rugged terrain on the incidence of conflict (for instance see [Fearon & Laitin, 2003] and [Hegre & Sambanis, 2006]).

This study focuses on the last twenty six years of the Myanmar civil war. As Myanmar shares several correlates of war such as ethnic diversity, rugged terrain, authoritarian institutions as well as natural resources this research sheds light on the interplay of these factors in conflict outbreaks. Indeed, this work goes one step further as it frames the fighting decision in a theoretical setup that yields empirically testable predictions. Namely, I investigate the determinants and evolution of the Myanmar civil war in the last twenty six years. Figure 1 shows the yearly variation in casualties from the conflict between the Myanmar army, henceforth referred as the Tatmadaw, and the major armed groups in the country. A striking pattern emerging from this figure is that the Tatmadaw...
focuses sequentially on a specific armed group rather than fighting them together. Indeed, the asymmetric balance of power between the Tatmadaw and the rebels is such that the Myanmar civil war can be seen as a process of establishing a monopoly of violence by the Tatmadaw on the ethnic minorities that populate its vast frontier. Indeed, the Myanmar army is also responsible for the violence against civilians whose casualties are measured with the green bars displayed in Figure 2. Moreover, the orange and blue bars in the same figure represent casualties from clashes between rebels’ armies. Even though the Tatmadaw is not directly involved in clashes among rebel armies it plays a key role in determining them. In fact, such clashes only occur after the Tatmadaw army signs a ceasefire with a rebel group so that the ceasefire signatory effectively fights as an “agent” for the Myanmar army. The two figures also show that Myanmar shares regularities with other civil wars around the globe in the fact that it has experienced a persistent stalemated guerrilla conflict [Fearon, 2008]. Indeed, since the late eighties there were more than thirty distinct armed groups with many of these still active today.

Figure 1: **Yearly variation in fighting outbreaks: Myanmar Army vs. Armed Groups**

![Yearly variation in fighting outbreaks: Myanmar Army vs. Armed Groups](source: UCDP 3.0 Georeferenced Event Dataset.)

As explained in Section 2 throughout the civil war two major alliances opposed to the Tatmadaw emerged among rebels’ armies. Generally, armed groups belonged to either of the two (and occasionally to both of them). A model that explains fighting outbreaks over time and space needs to take into account alliances and enmities among the active armed groups. Moreover, the theoretical framework needs to acknowledge the leading role of the Myanmar army in the decision of fighting a group over another. Hence, I use a game over network approach in the spirit of [Ballester et al., 2006] in which every armed group is represented as a node in the country’s network of armed groups. Every armed group has a linear-quadratic interdependent utility function and non-cooperatively chooses its fighting effort. The utility function is characterized by strategic complementarities and
substitutabilities that keep track of alliances and enmities of each armed group. According to results in [Ballester et al., 2006], in this framework each group’s fighting effort is proportional to its centrality in the network of armed groups. That is, the Nash equilibrium action of each armed group is proportional to its Bonacich centrality [Bonacich, 1987]. The importance of alliances and enmities among armed groups is testified by their role in active and past civil conflicts across the globe such as in Mali, Somalia, Congo and Syria just to name a few. Despite the important role of alliances in civil conflicts, there are few studies documenting their relevance in igniting or mitigating conflict. A notable exception is the recent study on the evolution of the Congo civil war by [König, Rohner, Thoenig & Zilibotti, 2015] in which the authors show that the network of alliances and enmities have a key role in determining each group’s fighting effort. However, instead of documenting the importance of alliances in the evolution and escalation of conflict over time and space, I use the model to derive and test predictions on how the social planner (in this case the Tatmadaw) can optimally reduce the overall fighting effort among network nodes given the network structure that it faces at time $t$. That is, I attempt to model the endogenous fighting decision of the Tatmadaw. I therefore analyze the Myanmar army observed choice of conceding ceasefires or fighting a specific armed group under the lens of the armed groups’ network structure within the country.

Figure 2: Violence vs. Civilians and Between Armed Groups

![Violence vs. Civilians and Between Armed Groups](source: UCDP 3.0 Georeferenced Event Dataset.)

The theory generates predictions on the importance of each armed group within the network of rebels. Therefore, these guide the empirical analysis that is organized in two steps. In the first step, 3

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3Note that the peculiar application of the model to civil conflict brings useful insights to open questions in the civil war literature: [Fearon, 2008] tries to explain the survival of small guerrilla groups with little chance of capturing political power in several countries affected by civil war. The above model offers an alternative explanation linked to the relative position that each group occupies in the network of armed groups. In other words, from a social planner’s perspective removing certain “ peripheral” groups from the network does not necessarily change the overall fighting effort ability of rebel groups in the network, and thus, is not optimal.
I derive predictions from the model computing the armed groups’ “importance” given the network structure at time $t$. The second step of the empirical analysis is to use the model’s predictions in order to explain violence outbreaks in Figures 1 and 2. To this extent, I use dyadic information on conflict outbreaks in Myanmar available for the period 1989-2014 from the UCDP Georeferenced Event Dataset [Sundberg & Melander 2013]. I therefore observe the two fighting sides as well as the location where conflict takes place. As I observe counter-insurgency operations that target civilians in areas of influence of specific armed groups, I follow the approach of [Besley & Persson, 2011] and analyze violence against civilians and armed groups together. Given the structure of the data, I use geographical grids over time as units of observations. Since many rebel armies are organized along ethnic lines, I enrich the dataset with information on ethnic and religious identity of the groups living within every grid ([Gordon & Grimes 2005]). Furthermore, I collect data to control for alternative channels that might cause conflict or directly affect the “ranking” of importance between armed groups. Namely, the empirical literature stresses the role of income shocks on the onset, duration and intensity of conflicts (see [Berman & Couttenier 2013], [Berman, Couttenier, Rohner & Thoenig 2015], [Dube & Vargas 2013] for recent accounts on the effect of income shocks on conflict). Therefore, I am collecting information on rainfall that can be used as an instrument for agricultural income. As Myanmar is rich in natural resources, I am currently gathering data on mineral availability and trading routes at a fine geographical level in order to take into account the interplay of these factors and more generally their relevance in explaining conflict over time.

The paper is organized as follows: the next section summarizes the vast literature that analyzed civil wars. Section 2 provides background information on the Myanmar context that helps to understand the choice of the model described in Section 3. Section 4 discusses the empirical steps and Section 5 shows preliminary results.
2 Brief History of Myanmar Civil War

Only the Tatmadaw is mother,
Only the Tatmadaw is father,
Don't believe what the surroundings say,
Whoever tries to split us, we shall never split.
We shall unite forever.\footnote{\text{Tatmadaw slogan appearing on media in the early 1990s.}}

A detailed account of the history of civil conflict in Myanmar since its independence is beyond the scope of this work. In what follows I detail the country’s civil war evolution with a particular focus on the period between 1988 and 2015 as this is the time frame of interest for the empirical analysis.\footnote{\text{There are several authoritative histories of Myanmar, among the many, \text{Smith 1991} and \text{Lintner 1999} provide excellent accounts of what happened in the country from the end of WW II to the end of the twentieth century.}}

Myanmar obtained independence from the British administration at the beginning of 1948. The country is marked by vast ethnic diversity that can be gauged from Figure \ref{fig:languages} where its languages are depicted. The Bamar (or Burmese), depicted in yellow in Figure \ref{fig:languages}, are the country’s major ethnic group making up roughly sixty five per cent of the total population. They mostly occupy the core of the country where paddy rice cultivation is possible. Myanmar hosts more than one hundred and thirty ethnic groups.\footnote{\text{Scott 2009} discusses the difficulties associated with defining ethnic groups in Myanmar.} Actually, warfare in Myanmar never stopped since the Japanese invaded it in 1942 during World War Two (\cite{Callahan 2004}). Throughout its first decade, the country experienced all different forms of intergroup violence. In fact, the Communist Party of Burma (mostly made up of ethnic Bamar) rebelled shortly after independence while ethnic groups revolted a little later in time. Moreover, the country was also invaded by the remnants of Yunnan’s Kuomintang. The continuous threats and the multiplicity of internal and external enemies caused the Tatmadaw’s power to grow up to the point where the army was substituting the elected government of Myanmar. Indeed, after a first coup in 1958, General Ne Win seized power in 1962 and ruled the country until 1988.

Following the coup, the Tatmadaw forced centralization of the state institutions which caused ethnic armed groups to sprawl. Indeed, many border areas were under total control of ethnic armed groups with the Tatmadaw being unable to access them. Occasionally the Tatmadaw was able to control the larger cities and major roads but rural and mountainous areas were under control of armed groups. Figure \ref{fig:areas_control} shows the areas under control of the armed groups in 1989 with each color being associated to a different armed group. A quick comparison with Figure \ref{fig:languages} shows that armed groups’ control areas are strongly related with the presence of non-Bamar ethnic groups.

Throughout this time, two main coalitions opposed the Tatmadaw regime: the Communist Party of Burma and the National Democratic Front (henceforth CPB and NDF). The CPB, as most
Communist parties in South East Asia, was heavily financed by Mao’s China. At the height of its power the CPB controlled the entire border between Myanmar and China until it suffered a military defeat by the Tatmadaw in 1986. Armed groups belonging to the NDF were organized along ethnic lines and fought for federal representation (i.e. not to secede from Myanmar). Armed groups in both blocs were politically motivated and, until the mid-seventies, they fought each other on top of fighting against the Tatmadaw. However, In the mid eighties some members of the NDF launched joint operations together with CPB’s brigades against the Tatmadaw.

Figure 3: Main Spoken Languages of Myanmar

During the period between 1988 and 1990 two distinct and unrelated events shaped the history of
Myanmar. In March 1988, following the worsening economic conditions in the country, students and civilians in the main urban centers protested against the military. After a violent crackdown that left thousand protesters dead, General Ne Win resigned and elections were scheduled for 1990. In the meantime the Tatmadaw retained the power conceding party formation and some freedom of the press. Among the several parties, Aung San Suu Kyi National League for Democracy (hereinafter NLD) gained popularity among the Bamar ethnic group.

Figure 4: **Network of Armed Groups at the end of 1989**

Coincidentally, in March 1989 the CPB, who was suffering from lack of Chinese financial support, collapsed and splintered in smaller armies organized along ethnic lines. Following these events, the network of armed groups in the country, as well as their alliances and enmities relations is depicted in Figure 4. Yellow nodes represent NDF members while red ones represent former CPB members. A blue bridge between nodes labels an alliance while a red bridge signals the presence of an enmity between groups. The green node in the bottom right of the figure does not belong to any alliance but had informal agreements with some groups based on geographic proximity. Alliances in Figure 4 are inferred from historical sources and have an important role in shaping the fighting decisions of the Tatmadaw which is discussed more in depth in the next section.

*Source:* [Lintner, 1999], [Smith, 1991].
In the wake of the NLD overwhelming victory, the Tatmadaw invalidated the elections and arrested as many political and civilian activists as possible. During the biennium 1988-1990, an estimated ten thousand students and young civilians fled to the border areas in order to receive military training and weapons from NDF members. This exodus of potential fighters alarmed the Tatmadaw which signed ceasefires with some armed groups in order to go after those more sympathetic to the students and political activists.

During the nineties, the Tatmadaw attacked different ethnic groups as depicted in Figure 1. Namely, these armed groups have been attacked through “scorched earth campaigns” against the population that supported them. Indeed, the Tatmadaw applied its famous “four cuts strategy” which aimed at removing armed groups’ support by the population and their allies. In fact, the seemingly “low conflict intensity” in Figure 1 is misleading as violence against ethnic armed groups has to be compounded with violence against civilians operated by the Tatmadaw as well as violence between armed groups (depicted in Figure 2). Figure 2 does not show conclusive evidence because data are represented as annual averages. Since the data are georeferenced I can actually identify the targeted population and its associated ethnic armed group.

Figure 5: Areas under Control of Armed Groups in 1989

Source: Lintner 1999
3 Theoretical Framework

In order to take into account the importance of alliances and enmities in shaping the importance of each armed group, I use the simple framework of [Ballester et al., 2006]. The role of externalities in conflict has recently been stressed by [König et al., 2015] analysis of the great Congo war. The authors embed the [Ballester et al., 2006] framework together with a contest success function ([Skaperdas, 1996]) to show that each group fighting effort is affected by its alliances and enmities. Differently from their framework, I look at the key player analysis as the Tatmadaw is not a node of the network as it has the scope and power of changing the network structure by conceding ceasefires to some groups and fighting others. The model is static in the sense that at every period the social planner looks at the identity of the key player without planning in advance i.e. without thinking that attacking a group today might cause other groups to thrive. Network formation among armed groups is taken as given, this assumption is justified by the fact that groups are geographically constrained in their ethnic homeland and cannot freely move across space as the country is heavily militarized. Moreover, the value of allies is given by their geographical proximity as they can help when trading with neighboring countries or fighting against the Tatmadaw. For the sake of simplicity, I defer the Tatmadaw choice of conceding ceasefires to some groups for now but I am going to explain such choices in a later version of the model. As the key player analysis of [Ballester et al., 2006] differs from the one of [König et al., 2015] I also plan to compute the identity of the key layer using the latter one for robustness in the near future. The intuition underlying the model is that it yields a ranking of destructive capacity by the armed groups in the country.

With the exception of the Tatmadaw, every armed group is considered a player \( i = 1, ..., n \) in the non-cooperative game in which it chooses army size \( x_i \geq 0 \) in order to maximize the following linear quadratic payoff function:

\[
U_i(x_i, ..., x_n) = \alpha_i x_i + \frac{1}{2} \rho x_i^2 + \sum_{j \neq i} \sigma_{ij} x_i x_j
\]

(1)

Where \( \alpha_i \) is the size of the ethnic group that the armed group represents. Alternatively, \( \alpha_i \) can also be interpreted as the economic value of the ethnic homeland. \( \rho < 0 \) is a concavity parameter that prevents a group to expand indefinitely its army, it also has the intuitive interpretation that the greater the armed group the easier is going to be detectable by the Tatmadaw or other enemies. \( \sigma_{ij} \) captures bilateral influences across armed groups: the sign of \( \sigma_{ij} \) determines whether armed group \( j \) is allied with \( i \) (\( \sigma_{ij} > 0 \), strategic complements) or an enemy (\( \sigma_{ij} < 0 \), strategic substitutes).

Let \( \Sigma \) be the \( n \times n \) matrix of cross effects, [Ballester et al., 2006] show that the above game can be rewritten as follows:

\[
\Sigma = -\beta I_n - \gamma U + \lambda G
\]
Let $\sigma = \min \{\sigma_{ij} | i \neq j\}$ and $\bar{\sigma} = \max \{\sigma_{ij} | i \neq j\}$, $\gamma = -\min \{\sigma, 0\} \geq 0$, with $\beta = -\rho - \gamma > 0$ and $\lambda = \gamma + \bar{\sigma} > 0$. $\beta$ measures the concavity of payoffs with respect to player $i$’s $x_i$. Net Self-Substitutability $-\gamma U$ is uniform across agents and captures global substituabilities. $\lambda$ denotes the strength of local interactions and captures Local Complementarity. These transformations guarantee that $g_{ij} = (\sigma_{ij} + \gamma)/\lambda$ the entries of $G$ are such that $0 \leq g_{ij} \leq 1$, i.e. the matrix $G$ is well defined and nonnegative.

Theorem 3.1. (This is Theorem 1 in [Ballester et al., 2006]). Let the matrix of Bonacich centralities vectors $[\beta I_n - \lambda G]^{-1}$ be well defined and nonnegative $\iff \beta \geq \lambda \mu_1(G)$. Then the game $\Sigma$ has a unique N.E. which is interior and is given by the vector $x^*(\Sigma)$

$$x^*(\Sigma) = \frac{[\beta I_n - \lambda G]^{-1} \times \alpha}{\beta + \gamma \sum_i b(g, \lambda/\beta)}$$

$$\frac{x_i^*(\Sigma)}{\sum_i x_i^*(\Sigma)} = \frac{\alpha_i \times b_i(g, \lambda/\beta)}{\sum_i b(g, \lambda/\beta)}$$

In particular each player’s payoff is proportional to its centrality in the network so that more central groups have bigger armies in equilibrium.

From the social planner’s perspective knowing the network structure $\Sigma$ allows to identify the “key player”, that is, the army whose removal from the network has the biggest reduction on the overall level of armed militias’ in the country (measured with $x^*(\Sigma)$).

Indeed, [Ballester et al., 2006] show that the following problem admits a solution. Consider the social planner’s problem: $\min \{x^*(\Sigma^{-i}) | i = 1, ..., n\}$

This problem aims at identifying the player $i$ whose removal from the network described by $g$ has the highest reduction in $x^*(\Sigma)$. A simple intuition for this problem is that the social planner is identifying the player with the highest cross-contribution in the network.

Let $c_i(g, \lambda/\beta) = \frac{b_i(g, \lambda/\beta)^2}{m_{ii}(g, \lambda/\beta)}$ be the intercentrality parameter.

Theorem 3.2. (This is Theorem 3 in [Ballester et al., 2006]). Under the condition $\beta \geq \lambda \mu_1(G)$, the key player $i^*$ that solves $\min \{x^*(\Sigma^{-i}) | i = 1, ..., n\}$ is the one that has the highest intercentrality parameter within the network $g$.

Note that the social planner might also choose to increase the equilibrium level of $x^*(\Sigma)$ in which case it can choose to remove the group with the smallest intercentrality parameter from the
network.
Data and Empirical Strategy

The data used in this work come from a variety of sources. Dyadic information on conflict comes from UCDP/PRIO database. Every event in the database is located within Myanmar and assigned a date as well as flags for precision. Importantly the structure of the dataset is dyadic allowing for identification of the actors involved in conflict. I collected information on mines’ location and mineral extracted within Myanmar. As many commodities extracted in Myanmar are not traded, I am currently collecting prices for jadeite, rubies, secular teak wood, sapphires and other rare earth materials. These data are crucial to identify (potential) exogenous shift within key players as $\alpha_i$ can be considered as the economic value of the ethnic homeland.

4.1 Parametrization and Model’s Prediction

In order to obtain predictions from the model I assign parameters and compute the intercentrality measure over time. The intercentrality of the $N$ groups is a function of the elements of equation ??, that is, $\sigma_{ij}$ (network ties among the groups) as well as the group’s $\alpha_i$ and the concavity parameter $\rho$.

The sign of $\sigma_{ij}$ comes from historical sources reporting armed groups alliances and enmities (Smith 1991, Lintner 1999, Oo & Min 2007). The absolute value of $\sigma_{ij}$ weights the importance of the externalities among armed groups and is given by $\frac{1}{1 + \sqrt{Dist_{ij}}}$ where $Dist_{ij}$ is the geodesic distance (in kilometers) between the areas under control of the armed groups. This choice is similar to Acemoglu, Garcia-Jimeno & Robinson 2015 who estimate ties between historical Colombian municipalities using geographical distance adjusting for elevation change among them. In order to compute these values, I collect and depict maps of armed groups’ presence over time (Figure 5 is an example for year 1989).

$\alpha_i$ is the “value” of the area under control of the ethnic armed group. I am currently collecting population density as well as natural resource location in order to better approximate $\alpha_i$. Currently, I am using the ethnic population size available from the Ethnologue (Gordon & Grimes 2005). $\rho$ is set to satisfy the conditions for the Theorems 3.1 and 3.2 stated above. Importantly, whenever a group signs a ceasefire with the Tatmadaw I assign $\sigma_{ij} = 0$ if groups $i$ and $j$ were allied before the ceasefire and are not located on contiguous territory. This is because ceasefire agreements involve the formation of demarcated areas outside which signatory armed groups cannot freely move without breaking the ceasefire. Therefore, for the non signatory groups the payoff function suffers from having to face the Tatmadaw without one or more allies. If groups $i$ and $j$ were enemies before the ceasefire their relation is unchanged as the Tatmadaw and the ceasefire signatory can fight against their communal foe.

Figure 6 shows how the intercentrality parameter changed from 1989 to 1991 for the three armed groups with the highest intercentrality parameter. While the top group stays unchanged
(the KNU depicted in green), the KIO (green line) becomes less important as many of its allies sign ceasefires with the Tatmadaw.

Figure 6: **Change in Intercentrality among the top three groups (1989-1991)**

![Graph showing change in intercentrality among top three groups from 1989 to 1991. The KNU is represented by green diamonds, the KIO by red diamonds, and the MTA by blue diamonds. The graph demonstrates an increase in centrality for the KNU and MTA over the years, while the KIO shows a decrease.](image-url)
5 Preliminary Results

Figure 7 shows the number of casualties from clashes between the Tatmadaw and the top three armed groups for which the Intercentrality parameter was plotted in Figure 6. It is evident that, at least for the period considered, the army choice of attacking the groups is linked to the parameter of the model i.e. to the group’s influence over its allies.

Figure 7: Yearly Casualties in clashes between the Tatmadaw and the top three groups (1989-1991)

In order to provide additional evidence on the importance of the intercentrality parameter in the fighting decisions of the Tatmadaw, I use the cross-sectional and time variation of this parameter among the armed groups as the main explanatory variable in a regression framework to predict the probability of conflict outbreak. Namely, for each cell-year \( i \) among the territories controlled by armed group \( s \) in a given month \( m \) and year \( t \), \( y_{ist} = 1 \) if conflict is registered in the UCDP-PRIO database and zero otherwise. This strategy leaves out all the territories that are fully under control of the Tatmadaw in which political violence outbreaks are less likely to occur.\(^7\)

\[
y_{ist} = \alpha + \beta_{\text{Intercentrality},ist} + \#\text{Mines} + \text{Drug Cultivation} + year_t + \epsilon_{ist} \tag{4}
\]

Following normalization of the Intercentrality variable, I estimated equation 4 with different models, results are reported in Table 1 below. The first column reports the standardized coefficients.\(^7\)

\(^7\)Indeed the main form of violence within the areas under control of the Tatmadaw is violence against civilians which is not linked to any of the activities of the armed groups in the border areas.
estimated through OLS. That is, a one standard deviation increase in the Intercentrality parameter yields a one per cent increase in the predicted probability of conflict in a given cell. Column two reports marginal effects at the mean from a Probit estimation of equation 4. The last column reports results using a Logit model, where a one unit increase in the intercentrality of the group occupying a given cell causes a 1.05 increase in the log odds of conflict. Overall the evidence in Table 1 shows that the Intercentrality parameter affects the probability of conflict outbreaks for the period 1989-1992.

Table 1: Correlation between Conflict and Intercentrality

<table>
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<tr>
<th>Dependent Variable: Dummy for Conflict Outbreaks</th>
<th>(1) OLS</th>
<th>(2) Probit</th>
<th>(3) Logit</th>
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<td>Intercentrality</td>
<td>0.010***</td>
<td>0.0079***</td>
<td>1.056***</td>
</tr>
<tr>
<td>(0.001)</td>
<td>(0.036)</td>
<td>(0.114)</td>
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<tr>
<td>Total Roads in KM</td>
<td>0.000</td>
<td>0.002</td>
<td>0.007</td>
</tr>
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<td>(0.002)</td>
<td>(0.004)</td>
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<tr>
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<td>0.0051***</td>
<td>0.656***</td>
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<tr>
<td>(0.002)</td>
<td>(0.065)</td>
<td>(0.191)</td>
<td></td>
</tr>
<tr>
<td>Dummy for drug cultiv.</td>
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<td>0.031</td>
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<tr>
<td>(0.001)</td>
<td>(0.065)</td>
<td>(0.181)</td>
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<td>Mean Slope</td>
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<td>-0.00075**</td>
<td>-0.119*</td>
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<td>(0.000)</td>
<td>(0.024)</td>
<td>(0.063)</td>
<td></td>
</tr>
<tr>
<td>Year F.E.</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Adj. R-Sq.</td>
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The coefficients shown are respectively: Standardized $\beta$ in column (1), Marginal Effects at the mean in column (2) Marginal effects on Log Odds in column (3). Robust Standard Errors in parentheses. Estimation period: monthly data from January 1989 to December 1992.

Figure 8 below shows two distinct scatterplots. The right panel plots the number of casualties and the intercentrality for each group for the years 1989-1991. This panel confirms that being a key player (i.e. having a high intercentrality parameter) increases the likelihood of being attacked by the Tatmadaw. As one might be concerned that the intercentrality parameter might simply be a proxy for armed group size, I plot the relationship between casualties from clashes with the Tatmadaw and army size in the left panel of Figure 8. The comparison between the two panels shows that intercentrality is a much better predictor of violence than army size as conjectured by
the model.

Figure 8: Armed Group Size and Intercentrality

6 Conclusion
**References**


