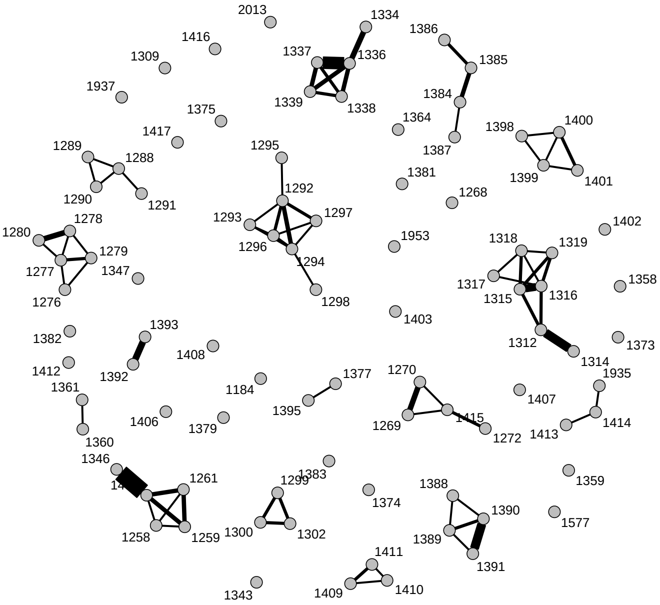
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Who joins and who fights? Explaining Coalition Behavior Among Civil War Actors

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- Civil conflicts typically involve several rebel groups (e.g. Cunningham, 2006).
- Rebel groups form coalitions to fight the government (e.g. Christia, 2012).
- Coalitions splinter, leading to continued fighting (e.g. Bakke et al, 2012).

Problems

- Conflicts with more actors are harder to resolve (Cunningham 2006).
- Existing theoretical & empirical models of civil war typically only look at dyadic interactions.

⇒ Need to explain why coalitions form and break up.

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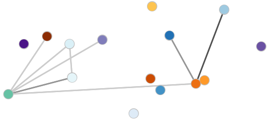
$\Rightarrow$ Need to explain why coalitions form and break up.

Actors and their Interactions

Theoretical advances and empirical limitations

Monadic analysis → Dyadic analysis → Network analysis



Collier and Hoeffler (2000)
Fearon and Laitin (2003)
Bates et al. (2005)
Cunningham (2006)
Gleditsch et al. (2002)
Hegre et al. (2001)

Cunningham et al. (2009)
Wucherpfennig et al. (2012)
Bapat and Bond (2012)
Walter (2009)
Bakke et al. (2012)
Steinwand (2011)
Cunningham (2013)

Metternich et al. (2012)
Metternich and Wucherpfennig

Coalitions and Civil War

Research questions:

Who joins? Who fights?

Approach

- Formal model of coalition formation
- Test hypotheses using network framework

Argument

Coalition behavior is affected by

- distribution of power
- complementarities
- BUT: Most importantly, rebels join if complementarities exist in an otherwise heterogenous environment

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A Model of Coalition Formation under Conflict

- Coalition formation as coordination problem: Normal form game.

  Binding coalitions, members agree to join (Ray 2007)

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- *n* groups, players propose a coalition κ_i. Coalition is realized if all other members choose the same κ.
- **Probability of winning**

$$P_{k_i} = \frac{\left(\sum_{j \in k_i} a_j\right)^{1/(k-1)\sum_{j \in k_i} \alpha_{i,j}}}{\sum_{k \in \pi}\left(\sum_{j \in k} a_j\right)^{1/(k-1)\sum_{j \in k} \alpha_{i,j}}}.$$

Contest Game (Esteban & Ray 1999, Tan & Wang 2010)

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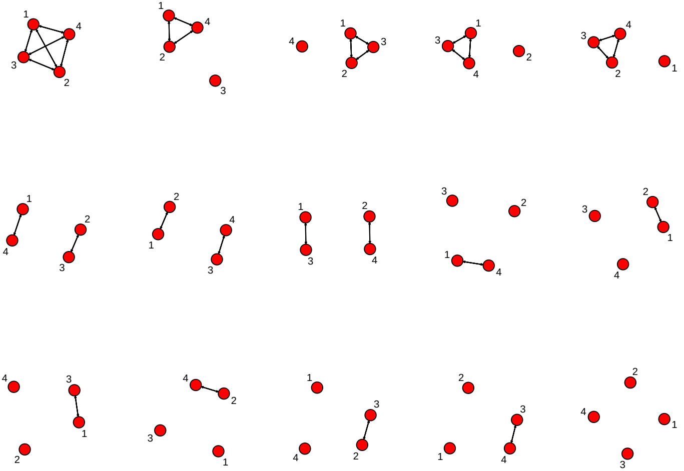
- **Payoffs**

$$U_i(k_i, k_{-i}) = P_{k_i}\frac{a_i}{\sum_{j\in k_i} a_j}$$

Predicting Coalition Formation

Equilibrium Profiles, Unequal distribution of power

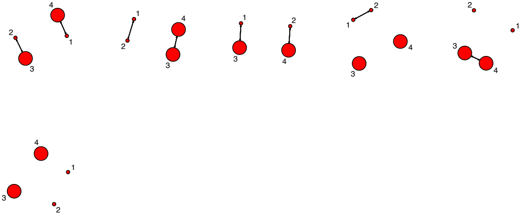
(2.5, 2.5, 2.5, 2.5)



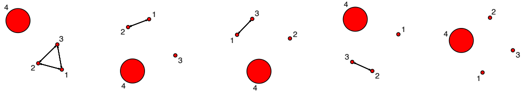
Predicting Coalition Formation

Equilibrium Profiles, Unequal distribution of power

(0.1, 0.1, 0.4, 0.4)

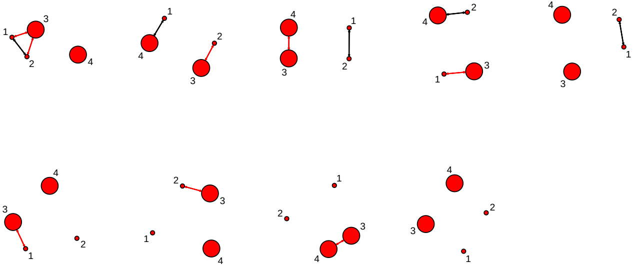


(0.1, 0.1, 0.1, 0.7)

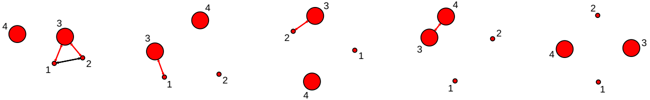


Hypothesis 1: With greater concentration of power, fewer coalitions survive.

$\alpha = 1.3$ for 3 dyads & singletons, $\alpha = 1.43$ for 3 dyads



$\alpha = 1.17$ for 3 dyads, $\alpha = 1.3$ for singletons, $\alpha = 1.43$ for 3 dyads



Hypothesis 2: With increasing discrepancies in complementarities, pairs of actors that enjoy greater complementarities become more likely to be part of a coalition.

Generalized Bilinear Mixed Effects model (GBME)

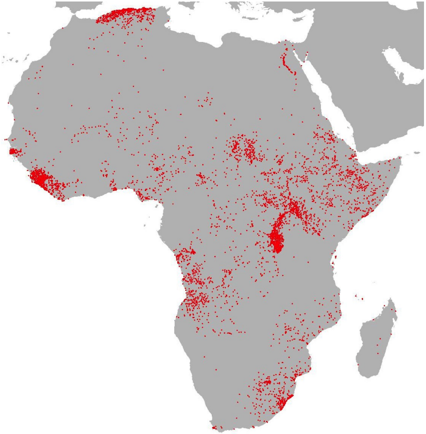
The latent space model (Hoff, 2003) incorporates third-order network effects.

$$y_{i,j} = \beta_d' x_{i,j} + \beta_s' x_i + a_i + \gamma_{i,j} + u_i' v_j,$$

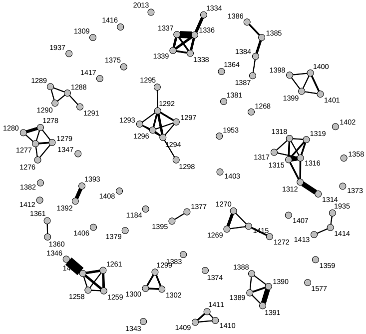
where

$$\begin{aligned}
\beta_d' x_{i,j} &= x_{i,j} \in \{\text{dyadic covariates}\} \\
\beta_s' x_i &= x_i \in \{\text{actor covariates}\} \\
a_i &= \text{random effect of actor} \\
\gamma_{i,j} &= \text{dyadic error term} \\
u_{i,k}' v_{j,k} &= \text{k-dimensional latent variables for sender and receiver}
\end{aligned}$$

Original UCDP-GED event data.

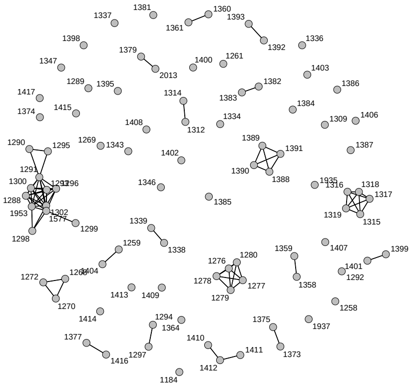


Extracted coalition behavior.



Ethnic linkages between rebel organization

based on ACD-EPR. UCDP ActorID next to nodes. An ethnic linkage exists if rebel organization *i* and *j* recruit or fight in behalf of the same ethnic group.

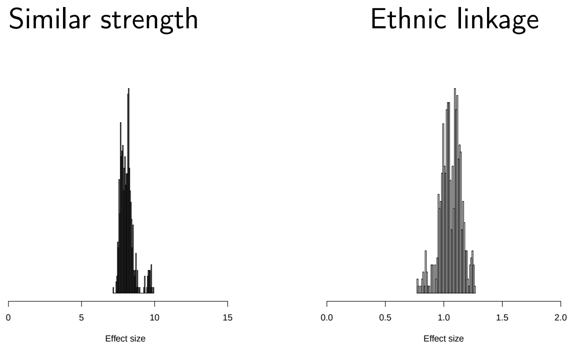


Rebel organization's mean fighting location
based on UCDP-GED

Poisson GBME estimates

		Estimate	2.5 %	97.5 %
Dyad Effects	Similar strength	8.118	7.491	9.643
	Number of months common existence	0.577	0.555	0.607
	Inverse distance	47.639	38.782	57.435
	Ethnic linkages	1.060	0.845	1.236
Actor Effects	Constant	6.554	-44.991	53.165
	Rebel Level			
	Strength	-14.384	-21.510	-6.910
	Conflict Level			
	St. dev. common ethnic linkages	5.328	3.503	7.179
	Country Level			
	GDP per capita	-1.378	-3.190	0.631
	Pop	-0.118	-1.325	1.100
	Polity	-0.015	-0.318	0.290
Random Effects	Actor random effect	38.210	28.412	52.672
	Error Variance	0.001	0.000	0.003
	Variance of latent dimensions σ_z^2	0.225	0.151	0.318
	Variance of inner product $\sigma_{z'z}^2$	0.090	0.056	0.138

GBME estimated dyadic effects



Conclusion

Take away

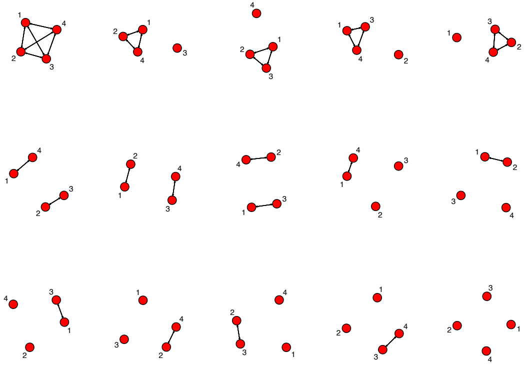
- Analyzing coalition formation requires paying attention to strategic incentives across entire networks of actors.
- Factors that increase coalition stability – also important for stability of peace agreements?
- Complementarities form exciting new research agenda: Ethnicity, geographic proximity not only possible factors.

The way forward

- Do patterns hold up in $n = 5$ player games? Computational burden!
- Selection stage, k-adic version of GBME.

Equilibrium Profiles, Equal Distribution of Power

(.25, .25, .25, .25)



Number of Equilibrium Profiles, homogenous α

Distribution of Power	α 1.3	2.5	3.5
Distribution even			
0.25, 0.25, 0.25, 0.25	15	15	15
One weak actor			
0.20, 0.267, 0.267, 0.267	14	14	14
0.1, 0.3, 0.3, 0.3	14	14	14
0.05, 0.317, 0.317, 0.317	14	14	14
0.02, 0.327, 0.327, 0.327	14	14	14
0.01, 0.33, 0.33, 0.33	11	14	14
Two weak, two strong			
0.2, 0.2, 0.3, 0.3	14	12	12
0.1, 0.1, 0.4, 0.4	6	12	12
0.05, 0.05, 0.45, 0.45	4	12	12
0.02, 0.02, 0.48, 0.48	4	12	12
0.01, 0.01, 0.49, 0.49	4	12	12
One strong actor			
0.2, 0.2, 0.2, 0.4	8	8	8
0.1, 0.1, 0.1, 0.7	5	5	5
0.05, 0.05, 0.05, 0.85	5	5	5
0.02, 0.02, 0.02, 0.94	5	5	5
0.01, 0.01, 0.01, 0.97	5	5	5

Number of Equilibrium Profiles, heterogeneous α

Distribution of Power	α: 6×1.3	α: 3×1.43, 3×1.3	α: 3×1.43, 3×1.17
Distribution even			
0.25, 0.25, 0.25, 0.25	15	15	8
One weak actor			
0.20, 0.267, 0.267, 0.267	14	14	7
0.1, 0.3, 0.3, 0.3	14	14	7
0.05, 0.317, 0.317, 0.317	14	14	7
0.02, 0.327, 0.327, 0.327	14	14	7
0.01, 0.33, 0.33, 0.33	11	12	7
Two weak, two strong			
0.2, 0.2, 0.3, 0.3	14	14	7
0.1, 0.1, 0.4, 0.4	6	9	5
0.05, 0.05, 0.45, 0.45	4	9	5
0.02, 0.02, 0.48, 0.48	4	7	7
0.01, 0.01, 0.49, 0.49	4	7	7
One strong actor			
0.2, 0.2, 0.2, 0.4	8	9	5
0.1, 0.1, 0.1, 0.7	5	7	5
0.05, 0.05, 0.05, 0.85	5	5	4
0.02, 0.02, 0.02, 0.94	5	5	5
0.01, 0.01, 0.01, 0.97	5	5	5