Affinity Communities in United Nations Voting: Implications for Democracy, Cooperation, and Conflict

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Abstract

A network oriented examination of the co-voting network of the United Nations (UN) provides powerful insights into the international alignment of states, as well as normatively important processes such as democracy, defensive cooperation, and armed conflict. Here, we investigate the UN co-voting network using the tools of community detection and inductively identify "affinity communities" in which states articulate similar policy preferences through their voting patterns. Analysis of these communities reveals that there is more information contained in UN voting and co-voting patterns than has previously been thought. Affinity communities have complex relationships with some of the most normatively important international outcomes: they reflect transitions to democracy, have a feedback loop with the formation of defensive alliances, and actively help states avoid armed conflict.

Keywords:
United Nations, International Politics, Spectral Clustering, Conflict, Alliances, Democracy

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1. Introduction

Actions arising from social processes depend crucially on both properties of the actors as well as network features. But, it is rare to directly observe the dynamics that shape these actions - the data we can collect is almost always a dim reflection of an underlying process. Our primary goal in this paper is to demonstrate the use of network construction and analysis from such data to tease out features of the obscured process. Our particular setting is that of the General Assembly of the United Nations, where we have data on member states' votes on resolutions before the UN. We use these data as a proxy for the underlying dynamics of multi-lateral diplomatic engagement to investigate the role of the UN in international politics.

The United Nations is designed as a forum in which states can come together to make international policy collectively and settle disputes without resorting to violence. Yet many, including prominent politicians and heads of state, have openly doubted the extent to which the UN succeeds in its mission. Our secondary goal in this work is to study the function of the UN and the extent to which it is successful in its mission. Our findings with respect to conflict, detailed below, constitute the first quantitative evidence that the UN actually functions as intended, though the mechanism by which it functions seems to be somewhat different than designed.

The United Nations General Assembly (UNGA) is the primary deliberative body of the UN and offers special insight into the alignment of international preferences because it is the only body in which all member states are represented and have equal status. In expressing their international policy preferences – either sincerely, strategically, or by some combination of the two – on a large number of UN resolutions, states provide information not only on their positions relative to certain issues, but their positions relative to one another.

Despite the richness of these data, they are under-used in international politics, perhaps due to their indirect measurement of diplomatic processes. Existing research on UNGA voting tends to either consider patterns descriptively [1, 2, 3] or address whether foreign aid contributions affect UN votes [4, 5, 6, 7]. The closest the literature has come to our approach is work by Gartzke [8], who used correlations in UNGA votes as a proxy for bilateral similarity in international policy preferences. Our work is a substantial departure from these studies as it considers the established finding that UNGA votes reflect developments in international politics against the alternative hypothesis that membership in communities of similarly-oriented states directly affects some of the most normatively important international processes, including the spread of democracy, defensive cooperation, and armed conflict. Our work is also a substantial departure from work that has examined how international connections foster peace [9] and cooperation [10, 11]. While we do examine network effects on peace and cooperation, the key distinction is that our approach infers connections based on a weak-data system (i.e.

co-voting in the UN is a low cost signal and does not require active partnership between states) whereas other studies have examined network effects in strong-data systems (i.e. memberships in IGOs and defensive military alliances always require adoptions of charters specifying the nature of the cooperation and often require ratification by national legislative bodies). As such, our analysis is a stronger test of hypothesized network effects than has been seen previously because it relies on much weaker data.

We approach this question in three steps. First, we use the tools of community detection in complex networks to identify macro and micro clusters of states with similar policy preferences based on the co-voting network in the General Assembly, we call these clusters "affinity communities." We then check the validity of our measure to see if it recovers the known patterns that the major division in the UN is not east-west, but north-south with occasional episodes of the United States versus the world. Finally, we probe the inferred clusters and their relationships with important geopolitical phenomena to show that (a) there is a relationship between exposure to democracies within an affinity community and autocratic transitions to democracy, but the temporal dynamics of this relationship suggest it is reflective of changes in regime type rather than causal of it; (b) co-membership in affinity communities corresponds to increased probabilities of defensive cooperation between states with temporal dynamics suggesting a complex feedback process; and (c) co-membership in affinity communities is a powerful suppressor of international conflict with temporal dynamics suggesting a causal relationship.

This last, strongest, result points to the success of the United Nations in its primary role – resolving disagreements and avoiding conflict. Although weaker, the results for defensive alliance formation provide some evidence that the UN plays a role in the formation of defensive pacts, but likely one that is tempered by external processes. Last, the negative temporal results for democratization with affinity communities provide evidence that the UN does not function to facilitate long term state re-alignments. Taken together, these results have a temporal component – the UN seems most effective in addressing short term crises rather than affecting long term processes. This temporal wrinkle to the UN story is interesting because it is at odds with well established neo-functionalist arguments suggesting that the sort of institution building and socialization that occurs within the UN should lead to deeper long-term cooperation [12, 13].

2. Theoretical foundations

That voting in the UNGA reflects developments and national positions in international politics is both intuitive and convincingly demonstrated by the literature [8]. The established perspective treats UNGA votes as signals of preferences on international issues, including conflict and cooperation, rather than drivers of those processes. But might member states use the UNGA for means other than signaling? We describe the mechanism by which such an alternative process might work and consider these competing perspectives with respect to three of the most normatively important outcomes in international politics: the spread of democracy, defensive cooperation in the form of defensive alliances, and international armed conflict.

Diplomats in the UN – through self-selection into the diplomatic corps rather than, say, the military – tend to share common values and goals; they prefer, for example, international communication, cooperation, and negotiated settlements to isolationism and conflict. Coupled with a forum for repeated interaction around issues of mutual interest, these form an *epistemic community*, a "cross-national collective[s] of individuals with common interests and institutionalized mechanisms for communication" [14, p. 56]. While such a forum alone provides the context for cooperation and the resolution of conflicts, more closely tied sub-groups, which we call *affinity communities*, provide the basis for coalition building and higher levels of cooperation. We are partially motivated by the literature on the evolution of cooperation in social settings. Among the five rules [15] that help determine how cooperation can arise within social systems, two are most relevant to our notion of affinity communities: indirect [16] and network reciprocity [17]. The first deals with the ability of reputation, built up over time via different mechanisms, to spark higher levels of cooperation, while the second encodes the effect interaction heterogeneities in locally promoting cooperation. From this point of view, affinity communities provide a signal for within-group cooperation, a context for the development and communication of reputation, and a mechanism by which states can limit their universe of possible interactions. We will focus on three areas of cooperation we can measure empirically, detailed below, namely conflict resolution, defensive alliance formation, and democratization. To identify candidates for affinity communities, we isolate groups of members with similar positions on issues before the UNGA.

Affinity communities, and the epistemic community at work around them, provide trustworthy communication channels, facilitating international political actions. Co-membership, by definition, implies shared positions, making membership in an affinity community, though informal, a coherent external signal. These affinity communities of diplomats can capitalize on these commonalities to enhance cooperation in areas of mutual interest.

Changing from autocracy to democracy is a dramatic, often messy, transformation of a state's political system. Regimes can change in response to internal forces such as revolutions or external ones, like the end of conflicts or colonial domination. While we expect such a regime change to signal similarly dramatic change in policy preferences, we do not see a major role for the UNGA as the forces involved are almost completely external to the body. Thus, we hypothesize that co-membership will reflect impacts of regime change but that it is not a significant factor in the spread of democracy.

After World War II, defensive alliances became much less transient and more formalized as institutions that exist in times of peace as well as war. While forming alliances requires high levels of diplomatic engagement, the work is done between primarily diplomats of the nations party to the alliance outside of the UN. While affinity community co-membership is an asset at the beginning of such engagements, the effect of higher initial levels of trust would simply shorten the process of negotiation and not have a great effect on their maintenance. Moreover, the process of forming an alliances can bring some previously distinct policy preferences of participating states into alignment as issues of mutual interest are ironed out in the diplomatic process. Consequently, we expect affinity community co-membership and alliances to be related to one another but that their effects are intertwined - co-membership facilitates the initial stages of negotiation while negotiation towards alliance impacts the similarity between policy preferences.

Historically, the international community designed the UN and its predecessor, the League of Nations, as a mechanism for avoiding wars. The last of Wilson's fourteen points, which became the foundation for the League of Nations and carried on to the UN, is explicit [18], "A general association of nations must be formed under specific covenants for the purpose of affording mutual guarantees of political independence and territorial integrity to great and small states alike." While largely failing in this respect as an institution, we expect that member states see the UN as a potential avenue for diplomatic resolution of disagreements. Removed from institutional mechanisms, co-membership in an affinity community produces in-group effects on members, building trust through a history of cooperative work. This, in turn, more tightly binds the epistemic community together, facilitating faster and more transparent communication. Fast and transparent communication is essential to resolving crises peacefully: if states could see each other's full utility functions – including each others preferences, determination, and willingness to bear costs – wars would not occur between rational actors because a settlement that costs less than war for the eventual loser would be reached before war broke out [19]. In other words, wars occur because of information asymmetries and incentives to misrepresent. Consequently, we hypothesize that co-membership in an affinity community reduces the probability of conflict in a pair of states and that the stronger the affinity community, the lower is the probability of conflict.

3. Identifying affinity communities

We estimate affinity communities from roll call data by constructing a similarity network based on voting commonalities between members, and then clustering to find community candidates. From year to year, we expect affinity communities to evolve quickly as different issues arise. But over longer time periods, we expect more stable affinity communities, as the preferences of member states are generally slower to change.

3.1. Similarity networks from voting data

We first construct a network of states where links indicate similarities in their articulated policy preferences. To do so, we use Strezhnev and Voeten's UN roll call data [20, 21] as a proxy measure for policy preferences. In each session, we arrange votes in an $n \times m$ voting matrix, V, where n is the number of members and m is the number of votes, letting V_{il} be 1 for a yea vote, -1 for nay, 0 for abstention, and 9 if the member was absent.

From V, we construct a similarity matrix of the voting profiles of the member countries. The entry of the matrix, P_{ij}, is the percentage of votes that member i and member j have in common,

$$P_{ij} = \frac{\#\{l | V_{il} = V_{jl}, V_{il}, V_{jl} \neq 9\}}{\#\{l | V_{il}, V_{jl} \neq 9\}}.$$

We then construct the symmetrized 5-nearest neighbor network of the countries via the adjacency matrix A where $A_{ij} = 1$ if either i is one of the five nearest neighbors of j or vice versa, and is zero otherwise.

—INSERT FIGURE 1 ABOUT HERE —

Figure 1: (A) The image shows micro-clusters evolving over time. Colors indicate micro-cluster membership with colors persisting over time for micro-clusters with substantial retention in membership. Black indicates that the country was not a member in that year. Static macro-clusters are indicated by the large red and blue boxes. (B) The top row shows *orbit plots* for the years 1955-65 while the bottom shows 1996-2006. In each plot for a given session, the red circle shows the representative cluster for $\mathcal{M}_1$ and the blue circle shows the representative cluster for $\mathcal{M}_2$. In cases where representative clusters coincide, a single purple cluster is shown in the center. Other micro-clusters with members in a macro-cluster are shown by circles of different colors in "orbit" of the representative cluster where $C_{\star,1}$ and $C_{\star,2}$ are depicted with the same color. Sizes of the circles reflect their sizes and the proximity of the orbiting micro-clusters to the representative cluster as well as the distance between the representative clusters reflect the degree of similarity in their voting profiles. (C) A visualization of the symmetrized five nearest neighbor network for the 10^{th} Session (1955). Colors indicate different micro-clusters. The shape of the nodes indicates static macro-cluster membership - circles for macro-cluster 1 and squares for macro-cluster 2. A labeled version is included in the SI.

3.2. Affinity communities

We break the state actors into communities with high voting similarity, yielding our candidates for affinity communities. We use *spectral clustering* [22], an algorithm which solves a relaxed version of the *N-Cut problem*. For each cluster, C_γ, the voting vector $\mathcal{V}_\gamma$, where $\mathcal{V}_\gamma(l) = mean_{i \in C_\gamma} V_{il}$, provides a description of the positions taken by the group. From this data, we construct *member resspresentations* as weighted sums of the cluster voting vectors, $R_j = \sum_{\gamma=1}^{\alpha} w_{j\gamma} \mathcal{V}_\gamma$, where we compute the weights by solving $\begin{pmatrix} \mathcal{V}_1 & \dots & \mathcal{V}_\alpha \end{pmatrix} w = V$ using least squares. We use the representations to give estimates of the member's votes based on their relationships to the clusters:

$$\bar{V}_{jl} = \begin{cases} sign(R_j(l)) & \text{if } |R_j(l)| > 0.05 \\ 0 \text{ otherwise} \end{cases}$$

While there are numerous techniques for parameter estimation and/or model selection [23], we use a training/testing paradigm to estimate model parameters. We randomly choose 10% of the votes in a given session (excluding missing data) to hold out, and create a training data set from the remaining data where the held out data is treated as missing. We calculate the out of sample error by comparing $\bar{V}$ to V for the held out votes. Then, we isolate model parameters which provide the best median out-of-sample performance over 25 trials. While we could also use the training/testing scheme to estimate the other parameters in the model - the number of neighbors in the nearest neighbor network and the threshold used in computing $\bar{V}$ - we found the results were robust to small changes in these parameters and hence left them fixed.

3.3. Micro- and macro-clusters

As expected, the communities fluctuate from year to year as different issues take prominence in the UNGA. However, looking over the entire time series reveals that clusters generally group into two large static aggregate clusters, $\mathcal{M}_1, \mathcal{M}_2$ (see Figure 1A for a visualization). In terms of the UN Regional Groups [24], $\mathcal{M}_2$ is essentially the Western European and Others Group together with Japan and some Eastern European countries while $\mathcal{M}_1$ contains the balance of the UN members. This is a first validation of our new measure as the north-south polarization in the UN has been commented upon before [1]. To distinguish between the scales, we henceforth refer to the clusters as *micro-clusters* and the $\mathcal{M}_i$ as *macro-clusters*. Within the macro-clusters, we see micro-clusters transform continually as different issues bind different state actors together. To illuminate this dynamic, we call the micro-cluster which contains the largest number of members of $\mathcal{M}_i$ compared to other micro-clusters the *representative cluster* for $\mathcal{M}_i$.

3.4. Dyadic statistics

To track the evolution of the micro-clusters against the background macro-clusters, we define two binary variables, $m(i,j)$ and $c(i,j)$. If i and j are not in the same macro-cluster or are not in the same micro-cluster, both variables are zero. On the other hand, if i and j are in the representative cluster for the macro-cluster then $m(i,j) = 1$ and $c(i,j) = 0$. If they are in the same micro-cluster (which is not the representative cluster), then $m(i,j) = 0$ and $c(i,j) = 1$. These two variables encode whether the dyad shares the same micro-cluster filtered through the lens of the static macro-clusters. So, m indicates the extent to which the dyad takes positions consistent with those of the static macro-cluster to which they belong while c indicates similar positions for the dyad that are, in some dimension, different from those of their macro-cluster.

We put forward two hypotheses. First, as nonzero c indicates short term dyad position coherence which contrasts with the broader macro-cluster, for short term processes we expect both m and c play a role, with c having a greater contribution than m. Second, for longer term processes, m should have greater impact than c as nonzero m indicates dyadic position taking consistent with the static macro-cluster. For both of these hypotheses, we can consider a short-term process to be those where a change in status tends to develop fairly rapidly and then revert relatively quickly to its modal state. For example, serious military conflicts often develop rapidly, though tensions may have existed for some time, and tend to end quickly enough that war cannot be said to represent the usual state of relationship between countries. Long-term processes can be defined as those in which a change in status tends to last and can be said to reflect the usual state of the nation/relationship. (e.g. unallied to allied and autocracy to democracy).

These hypotheses allow us to quantify aspects of our theoretically motivated hypotheses above. As alliances often form on longer time frames, we expect m, but not necessarily c, to have a positive association with alliance formation. For conflict, we expect both m and c to have suppressive effects as they indicate long and short-term co-membership respectively. We also note that this disaggregated approach to processes based on their temporality is novel in the literature that considers the effect of international structures on conflict and cooperation.

4. Statistical models for applications to political action

The statistical models we apply below in our applications are well established, but for completeness we provide a very brief overview of the temporal exponential random graph model as well as the Markov switching model. For more detail, see the SM Appendix.

4.1. Temporal Exponential Random Graph Model (TERGM)

The temporal ERGM is a straightforward extension of the ERGM to accommodate longitudinally observed networks. The ERGM is specified as

$$\mathcal{P}(N, \boldsymbol{\theta}) = \frac{\exp\{\boldsymbol{\theta}' \boldsymbol{\Gamma}(N)\}}{c(\boldsymbol{\theta}, N)}$$

where $\boldsymbol{\Gamma}$ can capture virtually any form of interdependence among the edges + covariates by including these dependencies as sums of subgraph products, and where $c(\boldsymbol{\theta}, N)$ is a normalizing constant computed as $c(\boldsymbol{\theta}, N) = \sum_{N^* \in \mathcal{N}} \exp\{\boldsymbol{\theta}' \boldsymbol{\Gamma}(N^*)\}$, with $\mathcal{N}$ representing the set of all possible permutations of N with the same number of vertices.

The ERGM is extended to the temporal ERGM (TERGM) by considering the probability of observing N^t with K-order temporal dependencies:

$$\mathcal{P}(N^t|N^{t-K},\ldots,N^{t-1},\boldsymbol{\theta}) = \\ \frac{1}{c(\boldsymbol{\theta},N^{t-K},\ldots,N^{t-1})}\exp\{\boldsymbol{\theta}'\boldsymbol{\Gamma}(N^t,N^{t-1},\ldots,N^{t-K})\}.$$

The joint probability of observing the networks between times $T-K$ and T is then established by taking the product of the probabilities of the individual networks given the others:

$$\mathcal{P}(N^{K+1},N^{K+2},\ldots,N^T|N^1,\ldots,N^K,\boldsymbol{\theta}) = \\ \prod_{t=K+1}^{T}\mathcal{P}(N^t|N^{t-K},\ldots,N^{t-1},\boldsymbol{\theta})$$

Thus, we can account for arbitrary order time dependence in a single network or over an arbitrary number of networks. See Cranmer and Desmarais [25] for a more detailed review of the ERGM and TERGM, and see Desmarais and Cranmer [26] for details on the bootstrapped pseudolikelihood technique with which the model is estimated.

4.2. Markov Switching Model

We specify a first-order transition model that captures not only changes in democratic status, but the persistence of democratic and autocratic status. Specifically, transitions correspond to a transition matrix

$$\begin{pmatrix} p_{\text{Autoc.}\to\text{Autoc.}} & p_{\text{Autoc.}\to\text{Democ.}} \\ p_{\text{Democ.}\to\text{Autoc.}} & p_{\text{Democ.}\to\text{Democ.}} \end{pmatrix}$$

Both $p_{\text{Autoc.}\to\text{Autoc.}}$ and $p_{\text{Democ.}\to\text{Autoc.}}$ can be estimated with a regression and, because the rows must sum to one, the full matrix can be recovered from these quantities. The probabilities $p_{\text{Autoc.}\to\text{Autoc.}}$ and $p_{\text{Democ.}\to\text{Autoc.}}$ can be modeled as

$$\begin{aligned} p(y_t = 1|y_{t-1} = 0) &= Probit^{-1}[\mathbf{x}_t\beta] \\ p(y_t = 1|y_{t-1} = 1) &= Probit^{-1}[\mathbf{x}_t\gamma], \end{aligned} \tag{1}$$

which can be written more compactly as

$$P(y_{it} = 1|y_{i,t-1},\mathbf{x}_{it}) = Probit^{-1}\left[\mathbf{x}_{it}^T\beta + y_{i,t-1}\mathbf{x}_{it}^T\alpha\right],$$

where $\gamma = \alpha + \beta$ and the variance of γ is given by $Var(\alpha) + Var(\beta) + 2Cov(\alpha, \beta)$. As suggested by the above equations, we use a probit transition model (though logit would work as well) estimated by maximum likelihood. See Gleditsch and Ward [27, 28] for a more detailed review.

5. Results

While we have developed an innovative and original means by which to identify and interpret communities of states by their voting patterns, it is not yet clear that this technique is useful in the sense that provides insight into global politics or helps us explain important international political phenomena.

5.1. Descriptive Results and Validity Check

The identification of representative clusters for the macro-clusters yields our first result. There are 15 sessions where a single micro-cluster is representative for both macro-clusters: 1949, 1956-8, 1961-2, 1971, 1975, 1978, 1991-2, 2003, 2005, 2009-10. But why should the majority of the macro-clusters come together if, over the entire time period, they are distinct? We posit two possibilities. First, the votes during the session are pitting a smaller group of members against the rest of the world. Votes can be engineered to highlight individual member's positions on volatile topics, for example the repeated votes on the on-going Palestinian-Israeli conflict engineered by Palestine's supporters to publicize the position of Israel and her allies. If these votes dominate the session, we expect the macro-clusters to merge and the remaining small micro-clusters are defined in terms of these controversial votes. Second, we expect that major political realignment, when coupled with salient UN votes, create periods with many relatively large micro-clusters which migrate membership as the realignments sort themselves out. During such a period, as the macro-clusters fracture and reform, we expect there to be some sessions where the representative clusters coincide. In the sessions identified above, we find examples of both types of behavior.

Most of the examples are of the first type, where the United States and a few close allies are members of a small micro-clusters, divided from the rest of the world by a collection of divisive votes. This observation is broadly in line with Voeten's work [3] demonstrating the increasing isolation of the United States from the rest of the world, serving as a second validation of our new measure. The bottom row of Figure 1B shows a typical example between the years of 1995-05 where representative clusters are stable and large, usually with small complementary micro-clusters within the macro-clusters. When we see the macro-clusters collapse in 2002 and 2004, the micro-cluster containing the United States is distinguished from essentially the rest of the members through votes related to conflict in the Middle East and Human Rights.

More interesting are examples of the second type in 1957-8, 61-2, and 91-2. These realignments arise as member countries emerge from external influences - the independence of colonial African nations in the former periods and the consequences of the dissolution of the USSR in the latter. In the 50s and 60s, votes on colonialism, coupled with the political upheaval of de-colonialization, set up numerous factions among the member states leading to multiple micro-clusters that which evolved continuously for more than a decade. The top row of Figure 1B illustrates this for the period 1953-63, where we see myriad micro-clusters forming and collapsing as the liberation of colonial nations plays out in the context of votes on different aspects of colonialism. Figure 1C gives a visualization of the nearest-neighbor network for the 10^{th} Session, with different micro-clusters shown in colors given by those in Figure 1B. Static macro-cluster membership is denoted by the shape of the node (circle=1, square=2).

5.2. The Spread of Democracy

We hypothesized that transitions to democracy should be the strongest case of UNGA voting reflecting changes in policy preferences rather than causing regime transitions. To test this, we measure not co-membership, but the number and proportion, respectively, of democracies in the same macro- and micro-clusters as the focal state, as regime type is not a relational outcome. The distinction between the number of democracies in the same macro/micro-cluster as the focal state and the proportion is non-trivial: if the relationship were causal, measuring the raw count of democracies assumes that only democracies exert "contagion" pressure on their neighbors in the voting network. Conversely, the proportion assumes that both democracies and autocracies exert contagion pressure.

A pattern of results arises from a combination of bivariate analysis and a full statistical model with controls: neither the raw count of democracies in the macro-cluster or micro-cluster have a robust effect on democratic-to-autocratic transitions for the focal state, but both contribute strongly and statistically reliably to transitions from autocracy to democracy. Figure 2

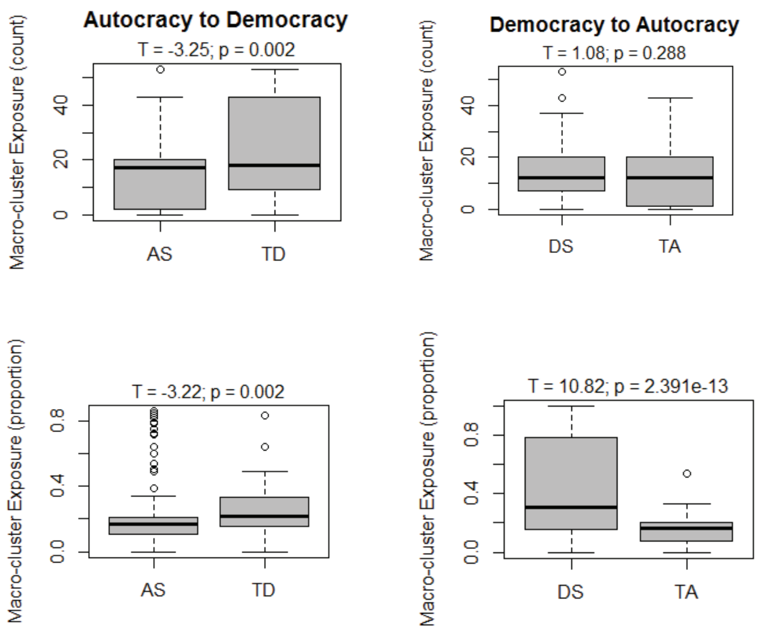

Figure 2: Transitions to democracy (TD) (left column) and autocracy (TA) (right column) by democratic exposure computed as a count (top row) and as a proportion of democracies in the macro-cluster (bottom row). DS=Democratic Stability, AS=Autocratic Stability.

shows regime type stability and change in both directions for exposure to the representative macro-cluster. Transitions from autocracy to democracy seem to be consistently related by democratic exposure in the macro-cluster of both types. The results are mixed for transitions from democracy to autocracy: the proportion of democracies in the macro-cluster would seem to matter, while the number would not. None of these bivariate effects are statistically reliable when considering the micro-cluster, save the effect of democratic exposure by proportion on transitions from democracy to autocracy.

We also used the state-of-the-literature model in [28]: a Markov switching model (probit) that controls for well established predictors of the spread of democracy [29, 28]. Because the Markov switching model models the probability of democratic/autocratic transition as well as autocratic/democratic stability, one can recover any probability in the transition matrix. Here we find that democratic exposure based on the number of democracies within the macro- (-0.01 (0.00)) and micro-clusters (-0.05 (0.02)) decrease the odds of autocratic stability. We also find a strong effect for democratic exposure based on the proportion of democracies in the macro-cluster (-0.94 (0.39)), but the effect for the proportion of democracies in the micro-cluster is not statistically reliable. We further find that effects for any type of democratic exposure, whether in the macro- or micro-cluster, are never statistically reliable. See Figure 3 for visualizations of the marginal effects of increase democratic exposure.

Unlike our other applications, we do not assess out-of-sample predictive performance as most of the training windows and testing data had no transitions. To test our causal hypotheses, we modified models by replacing the exposure variables with versions lagged by 1-5 years (see the SM Appendix for details and full results). We find that only a lag of one year for autocratic stability had any significant results (macro-cluster exposure proportion, with coefficient of -1.39, $p = 0.0002$). We interpret this result as evidence of the echoes of regime change in realigning policy preferences. The formal change in government, reflected in the UN, often lags behind processes driving regime change. Consequently, we often witness realignment of policy preferences that move transitioning states quickly into more democratically oriented affinity communities slightly ahead of official change. The fact that we do not observe evidence of community co-membership driving democratization, but rather the other way around, stands in contrast to existing work on the diffusion of democracy based on similar national preferences [30, 31, 32]. Identifying causal effects in such observational systems is difficult, but the fact that our more detailed temporal analysis suggest a temporal dynamic opposite conventional findings may stand as call to re-evaluate the established relationship between national preferences and democratization.

The results tell a compelling story about the relationship between UN voting communities and the regime type of states. Both the number and proportion of democracies that are co-members of the representative cluster with the focal state are significantly associated with a decrease in the likelihood that autocratic focal states will endure. In other words, the likelihood of a transition from Autocracy to Democracy increases as the number of both the number (Table I Model 1) and proportion (Table I Model 2) of democracies in the same representative cluster and micro-cluster (though note the lack of a statistically reliable effect for the micro-cluster proportion) increase. However, we see that there are no statistically reliable effects of either the number or proportion of democracies in the same macro-/micro-cluster on transitions from democracy to autocracy. That is to say, neither of these

	Model 1		Model 2	
	Dem → Aut	Aut Stability	Dem → Aut	Aut Stability
Macro-cluster Dem Exposure (count)	−0.01 (0.01)	**−0.01 (0.00)**		
Cluster Dem Exposure (count)	−0.01 (0.03)	**−0.05 (0.02)**		
Macro-cluster Dem Exposure (prop)			−1.60 (0.87)	**−0.94 (0.39)**
Cluster Dem Exposure (prop)			0.62 (0.95)	−0.27 (0.51)
log(Lagged Per Capita GDP)	**−0.44 (0.13)**	−0.08 (0.07)	**−0.38 (0.13)**	−0.07 (0.07)
Prop. of Neighboring Democracies	−0.53 (0.33)	**−0.84 (0.23)**	−0.53 (0.33)	**−0.78 (0.23)**
Civil War	**0.56 (0.25)**	0.04 (0.17)	**0.52 (0.25)**	0.00 (0.17)
Years of Peace at Territory	0.00 (0.00)	**0.00 (0.00)**	0.00 (0.00)	**0.00 (0.00)**
Economic Growth	**−0.03 (0.01)**	0.00 (0.01)	**−0.03 (0.01)**	0.00 (0.01)
Global Prop. of Democracies	−1.35 (1.21)	**−2.13 (0.77)**	−1.81 (1.25)	**−2.47 (0.74)**
Neighboring Trans. to Dem.	0.26 (0.29)	**−0.36 (0.16)**	0.28 (0.29)	**−0.41 (0.15)**
Time as Democracy	−0.02 (0.01)		−0.02 (0.01)	
Time as Autocracy		0.00 (0.00)		0.00 (0.00)
(Intercept)	**2.52 (1.12)**	**4.10 (0.63)**	**2.33 (1.16)**	**4.07 (0.64)**
AIC	244.18	533.25	242.34	536.37
BIC	303.41	599.88	301.57	603.00
Num. obs.	1611	3156	1611	3156

Figures in **bold** indicates statistical significance at or above the 95% level.

Table 1: Markov switching models (probit) of regime type with democratic exposure as a count (Model 1) and as a proportion of cluster membership (Model 2), 1968-1998

factors affect the endurance of democracy. Together with the lagged variable analysis results, we conclude that state exposure to democracies in its stable macro-cluster is a strong witnesses to the effects of regime transition rather than a driver of it.

5.3. Defensive Alliance Structure

Figure 4 (top row) shows the bivariate relationship between macro- and micro-cluster co-membership and the presence of defensive alliances. In

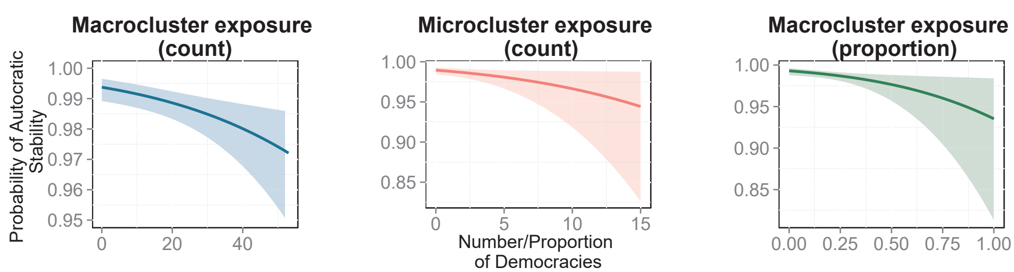

Figure 3: Predicted probabilities of year-to-year autocratic stability as the number of democratic states in the same macro-cluster (left) and micro-cluster (middle) increase; as well as the proportion of democracies in the same macro-cluster (right).

both cases, states sharing the same cluster are more likely to be allied. Yet bivariate relationships can be misleading, or at least incomplete, particularly in this case. Clustering can project a number of factors onto a single category, potentially confounding the analysis. For this reason, we conducted an analysis of the alliance network using temporal exponential random graph models (TERGM), which can accommodate the set of control variables standard in the conflict literature along with our indicators for macro- and micro-cluster co-membership. Our bivariate results are largely robust in the presence of standard controls, with models indicating that common cluster membership increases the probability of being allied for both macro- ($0.75, 95\%\text{CI} = [0.19;\ 1.29]$) and micro-clusters ($-0.72, 95\%\text{CI} = [-1.76;\ 0.22]$) (Table 2). Our models contain standard controls, see the SM Appendix for details.

We assess out-of-sample predictive accuracy against a baseline model, training models on a five year window of data and predicting the next. Over all such windows, the median of the difference between the area under the precision-recall curves for the full alliance model and the baseline model is 0.06. Thus, we find a small but significant predictive improvement with the inclusion of our cluster variables.

Our causal hypotheses for alliance formation are weak among our applications - affinity communities may influence alliances and vice versa. Analysis of these modified models with lagged cluster variables point to the expected ambiguity as only one of the lagged variables hold significant predictive power - meta-cluster co-membership lagged by one year. We interpret this as evidence that as negotiation of an alliance reaches its end, new commonalities appear in the affinity structures in advance of treaty formalization.

As alliances are generally temporally stable and are therefore both difficult to establish or dissolve, we should see a greater impact from macro-cluster than cluster co-membership and the results bear this out. Co-membership in the representative macro-cluster increases the likelihood of two states sharing an alliance tie. In other words, two states that vote similarly and in line with their macro-cluster have a higher probability of being allied. It is not clear however whether this relationship exists because states that are allied are more likely to vote together or because voting together makes states more likely to ally. Indeed, our lagged variable analysis highlights this, showing that similar voting in the past has no predictive power for alliance formation in the present.

Interestingly, there is no statistically discernible effect in the analysis with controls for co-membership. States that vote together, but not in a manner that closely parallels the voting behavior of the stable macro-cluster, are no more or less likely to ally. This makes sense as many defensive alliances are multilateral and tend to reflect a major consensus on the security status quo in a given region. As such, states that vote similarly to each other, but differently from most states in their macro-cluster likely have less common ground on which to form an alliance than states whose expressed policy preferences more closely track their macro-cluster.

These results are consistent with our theoretical discussion - co-membership in stable affinity communities can positively effect the process of alliance formation, but the process of allying can also bring states into closer policy alignment.

5.4. International Conflict

Last, we investigate the role of affinity communities in the suppression of conflict, where our alternative theoretical framework is most compelling. Considering first the bivariate relationship between our key variables, we find interestingly nuanced results. Figure 4 (bottom row) shows that there are, statistically reliably, more wars (mutual military conflict with more than 1,000 battle deaths) between states that are co-members of a macro-cluster than between states that are members of this cluster and those that are not. However, when we consider not only wars, but all militarized disputes that involve the intentional use of violence (including wars), no statistically discernible result exists at the bivariate level (not presented). Examining wars occurring between members of the same micro-cluster, we find that not a single such war occurred during our period of observation. However, due to the thin cells of the contingency table, the differentiation of the odds ratio from one is not statistically reliable.

TERGM analysis with standard controls reveals statistically reliable suppressive effects of macro-cluster co-membership ($-0.30, 95\%\text{CI} = [-0.44;\ -0.17]$) and micro-cluster co-membership ($-0.50, 95\%\text{CI} = [-0.91;\ -0.16]$) on serious international conflicts (Table 3). As with alliances, our models contain standard controls used in the political science literature, see the SM Appendix for details. While both effects are statistically reliable, the effect of c is substantially stronger than that for m. These results are consistent with our hypotheses on$m$ and c, namely that for the temporally short-term onset of conflict, c has a more pronounced effect.

Our out-of-sample predictive analysis, conducted as described above for alliances, finds a small but significant gain in accuracy when including cluster-based variables, with a median gain of 0.06 in the area under the precision-recall curves for the full conflict model vs. the baseline model. The lagged model analysis yields strong and unambiguous results, with coefficients similar in magnitude to the original model and all but one reaching statistical significance.

The implications of these results are powerful. Our results suggest that agreement on UN votes, indicative of similar articulated policy preferences, reduce the probability of conflict between any given pair of states. However, we find co-membership in the micro-cluster have an even lower likelihood of conflict. One implication is straightforward: states with similar policy preferences are less likely to fight. The larger absolute magnitude of the micro-cluster effect suggests that states with similar articulated preferences *that differ substantially from those of the representative macro-cluster* are even less likely to fight. This could indicate of even closer policy agreement because membership in micro-clusters is smaller and reflects rarer preferences. Or, it may suggest that the trustworthy and rapid channels of communication established within the epistemic affinity communities allow co-members to quickly and nonviolently resolve disputes. Indications that past co-membership suppresses conflict in the present, as suggested by our lag analysis, provide support for the latter.

6. Conclusions

Our network-based approach to identifying communities of states that have similar articulated policy preferences as judged by their voting patterns in the UN General Assembly yields a number of insights into shifting political alignments and their relationships to normatively important geopolitical phenomena. Our validity checks found that the divide between developed and less developed countries is a persistent pattern in international position taking, one broken only occasionally when the rest of the world stands against the United States. More importantly, we have been able to provide the first test of the alternative hypothesis that co-voting communities in the UNGA might drive important international outcomes against the established hypothesis that UNGA voting patterns reflect national positions but do not create them.

In examining these candidate explanatory frameworks, we found that (a), while exposure to democracies in both macro and micro-cluster is associated with increases in the probability of autocratic states transitioning to democracy, it seems this association follows changes in regime type and neither is associated with the probability of democracies transitioning to autocracies. What is more, (b) the more temporary nature of conflict and the longer-standing nature of defensive alliances is born out by the fact that we find stronger effects for macro-cluster co-membership for defensive alliances and a stronger effect for micro-cluster membership for conflict (though both macro and micro-cluster membership were statistically significant for conflict). This relationship, it would seem, involves a feedback loop between affinity communities and defensive alliances; community membership is largely reflective of alliances, but seems to facilitate their formation. Lastly, (c) we found a strong relationship between affinity community membership and international armed conflict. Although all of our applications witness the role of micro and macro-clusters in international relations, we found evidence in only one case - conflict resolution - that co-membership in the past impacts the present. Thus, while the UNGA and the communities within it have the potential to facilitate many types of interactions, member states use the UN as originally intended, to avoid armed conflict. The affinity structure likely both facilitates and bears witness to the results of the processes driving either alliance formation or autocratic stability. This is an interesting result in that it seems that the UN achieves its purpose of preventing conflict, at least within the affinity communities, though not in the manner intended.

Our analysis has revealed more nuance in UNGA voting than was previously thought to exist. We hope that additional studies probing the network structure of UNGA votes will reveal additional insights into the structure of international political alignments and important geopolitical processes.

7. Acknowledgments

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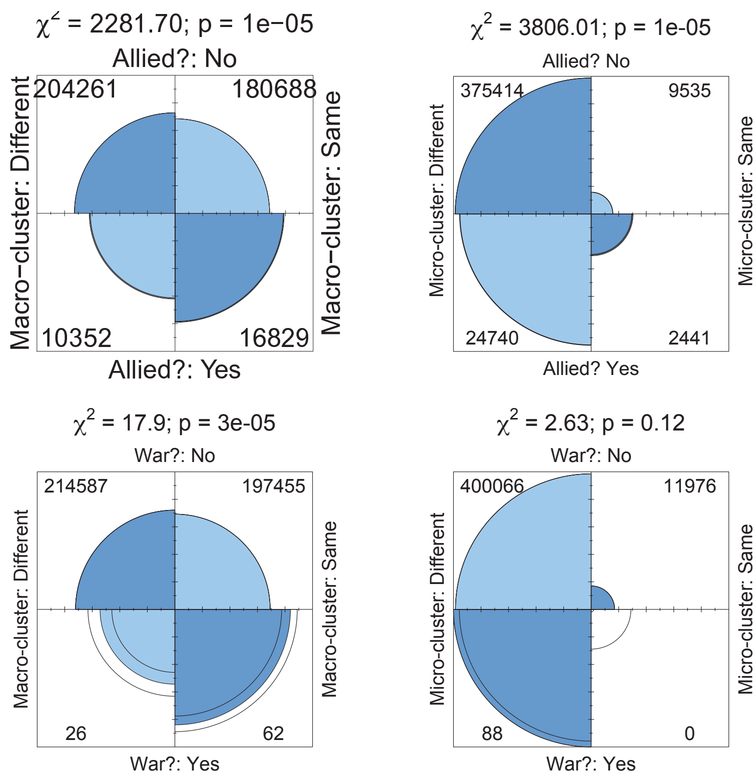

Figure 4: The relationship between defensive alliances and common macro- and micro-cluster membership (top row) and between war and common macro- and micro-cluster membership (bottom row). The areas of the quarter circles in these four-fold plots are proportional to the cell frequency of the corresponding contingency table, after being standardized by rows in order to make the effect of interest clear. The difference in areas between a pair of diagonally opposite cells and the pair reflecting the opposite direction is captured by the difference in their sizes. The confidence rings reflect a 95% confidence level. Thus, a lack of overlap between the confidence bands indicates a statistically reliable deviation of the odds ratio from one [33].

	Model 1	Model 2
Macro-cluster		**0.75**
		[0.19; 1.29]
Micro-cluster		-0.72
		[-1.76; 0.22]
Edges	**$-$11.44**	**$-$11.82**
	[-13.23; -10.11]	[-13.67; -10.45]
Alternating k-stars (2)	-0.20	-0.20
	[-0.40; 0.01]	[-0.40; 0.04]
GWESP (1.5)	**2.70**	**2.68**
	[2.26; 3.15]	[2.26; 3.19]
Joint Democracy	0.12	0.14
	[-0.81; 0.97]	[-0.74; 0.92]
Direct Contiguity	**1.49**	**1.48**
	[1.16; 1.84]	[1.11; 1.84]
Capability Ratio	**0.20**	**0.23**
	[0.10; 0.31]	[0.14; 0.32]
Trade Dependence	**0.40**	**0.45**
	[0.14; 0.60]	[0.23; 0.62]
Security IGO Dependence	**$-$0.90**	**$-$0.95**
	[-1.27; -0.54]	[-1.35; -0.60]
Economic IGO Dependence	-0.05	-0.05
	[-0.12; 0.01]	[-0.12; 0.01]
Lagged Alliance Network (AR)	**13.62**	**13.73**
	[11.65; 16.19]	[11.79; 16.52]

Table 2: TERGMs for 1965-2000. Defensive alliances in one-year intervals. Figures in **bold** indicates statistical significance at or above the 95% level.

	Model 1	Model 2
Macro-cluster		**−0.30**
		[−0.44; −0.17]
Micro-cluster		**−0.50**
		[−0.91; −0.16]
Edges	**−7.87**	**−7.75**
	[−8.07; −7.66]	[−7.97; −7.54]
Alternating k-stars (2)	**1.00**	**1.00**
	[0.85; 1.13]	[0.86; 1.13]
4-cycles	**0.59**	**0.60**
	[0.49; 1.24]	[0.50; 1.24]
GWESP (0)	**−0.31**	**−0.31**
	[−0.56; −0.09]	[−0.59; −0.10]
Joint Democracy	**−0.52**	**−0.56**
	[−0.94; −0.20]	[−0.99; −0.26]
Direct Contiguity	**3.81**	**3.84**
	[3.57; 4.10]	[3.58; 4.11]
Capabilities Ratio	**−0.14**	**−0.14**
	[−0.19; −0.09]	[−0.19; −0.09]
Direct Trade Dependence	**−0.21**	**−0.20**
	[−0.56; −0.04]	[−0.58; −0.04]
Security IGO Dependence	**−0.16**	**−0.12**
	[−0.27; −0.07]	[−0.24; −0.04]
Economic IGO Dependence	0.01	0.01
	[−0.01; 0.03]	[−0.01; 0.03]
Lagged Conflict Network (AR)	**2.71**	**2.69**
	[2.46; 2.97]	[2.40; 2.96]

Table 3: TERGMs for 1965–2000. Violent conflict onset in one-year intervals. Figures in **bold** indicates statistical significance at or above the 95% level.

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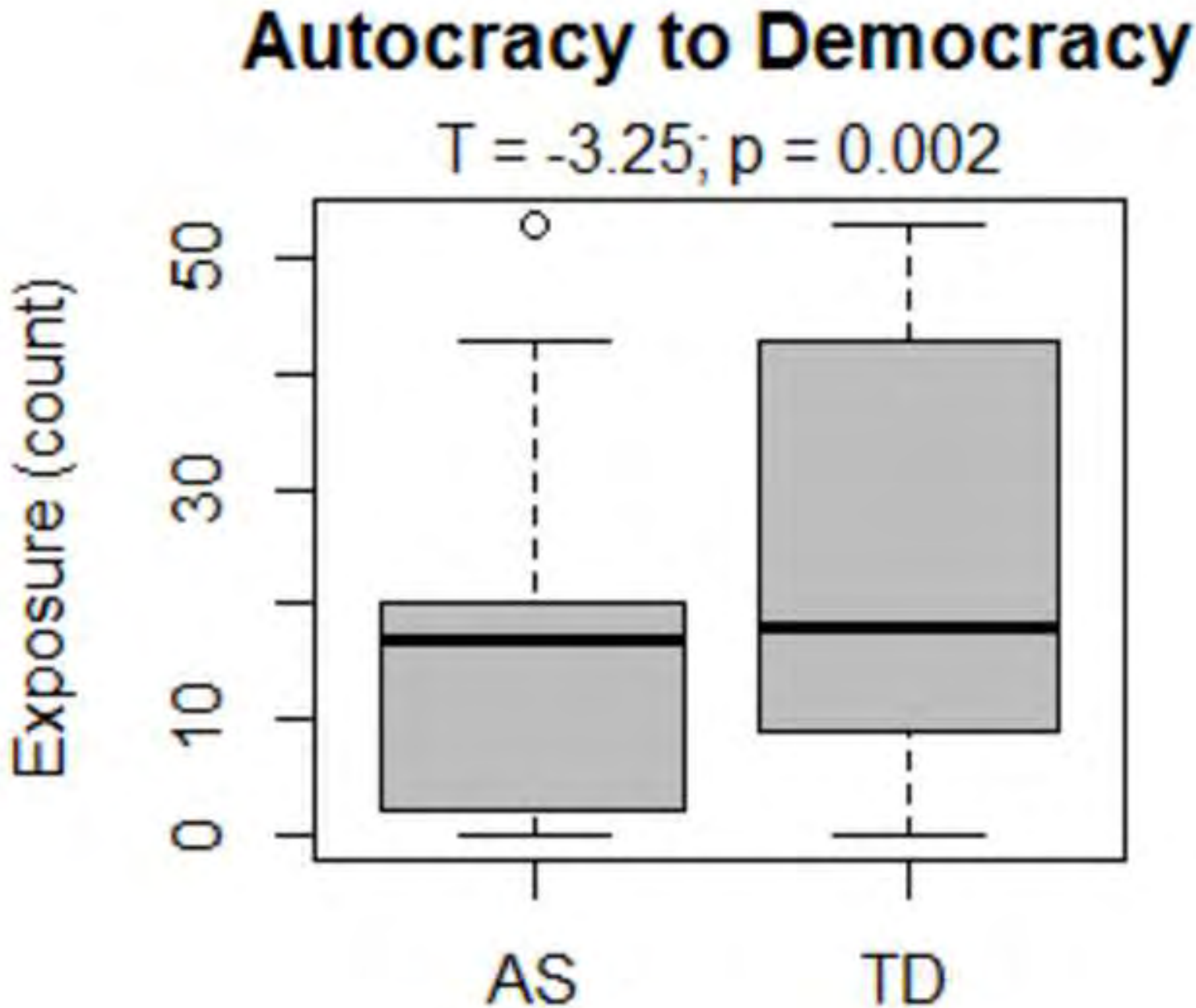

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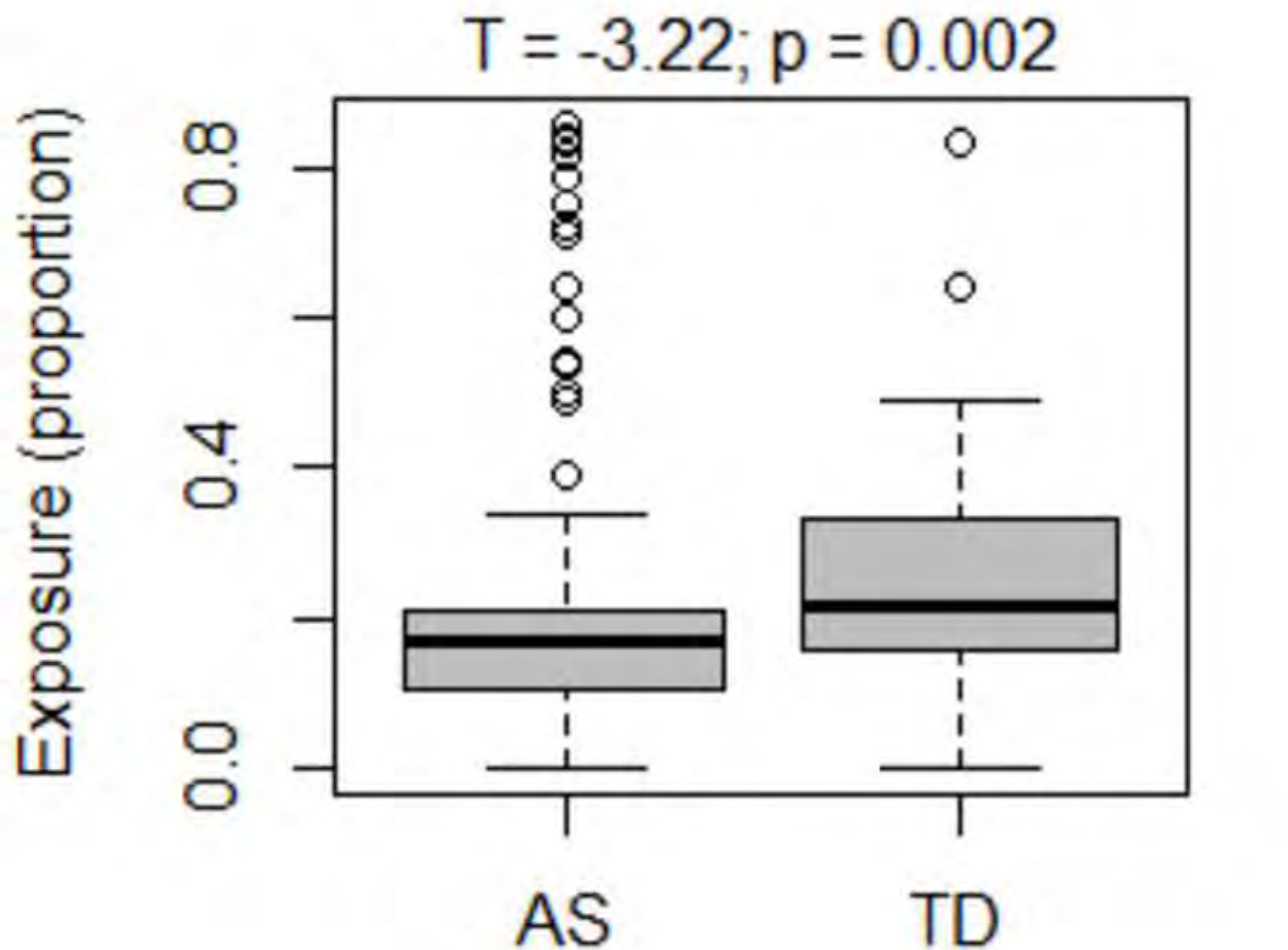

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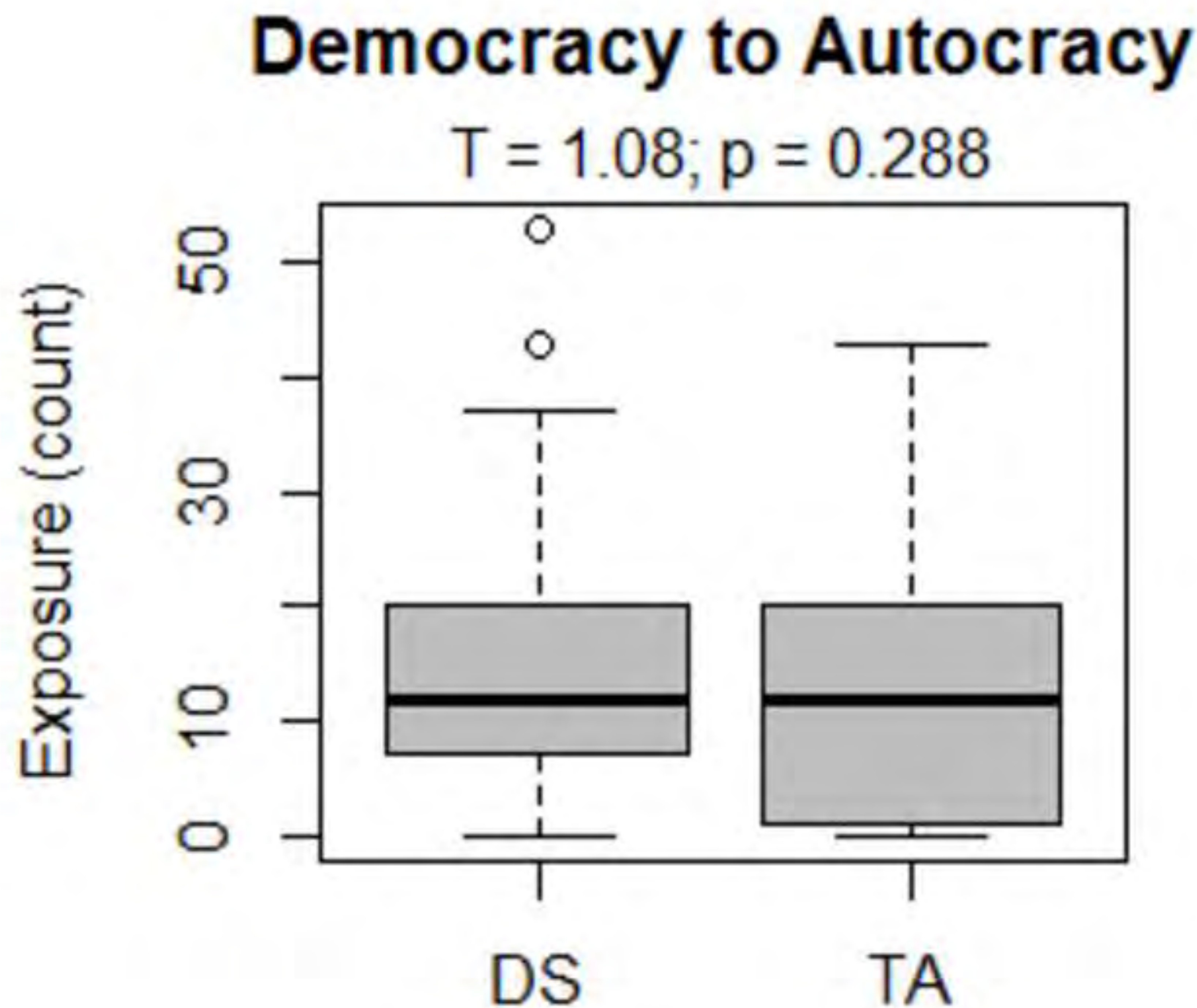

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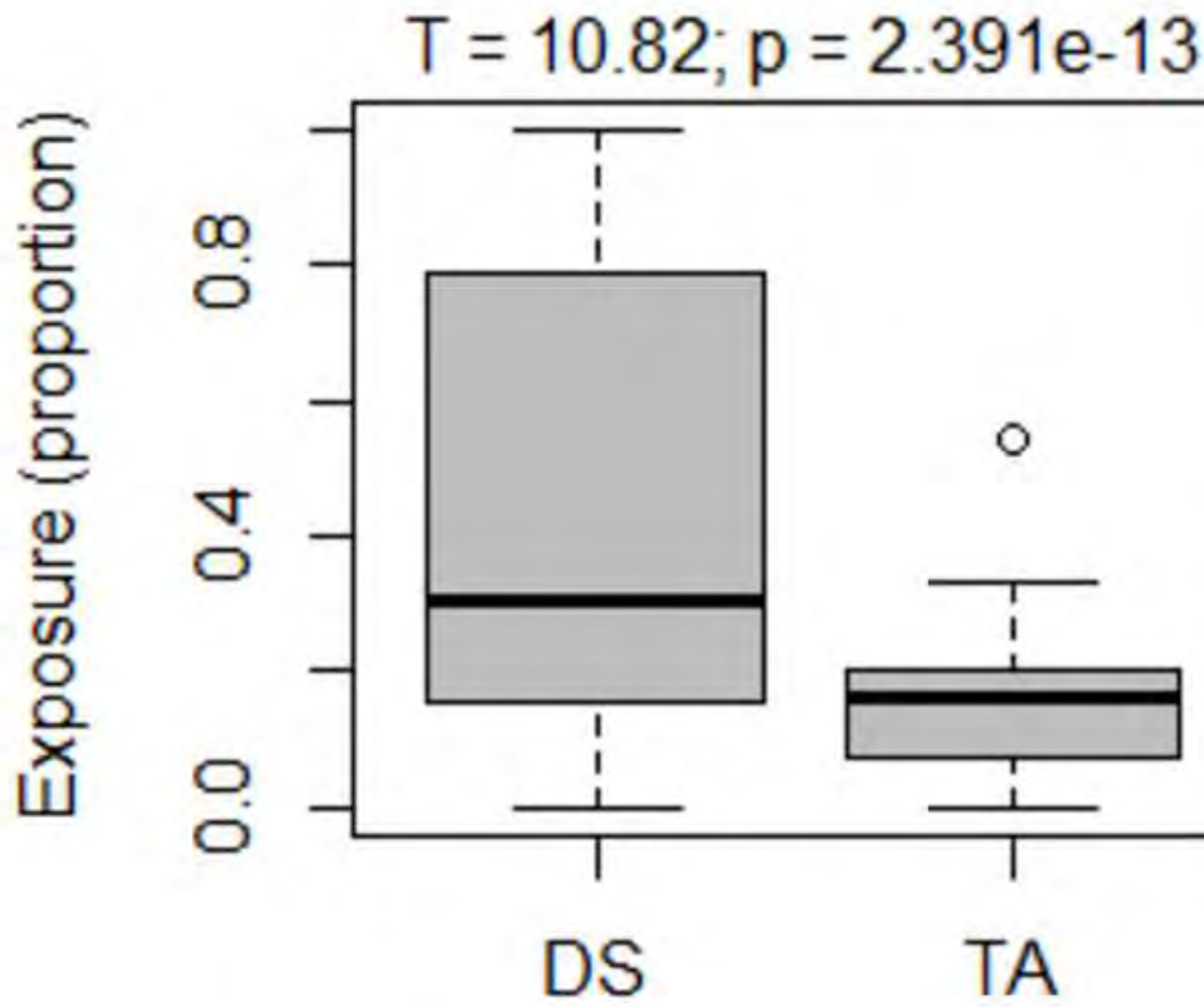

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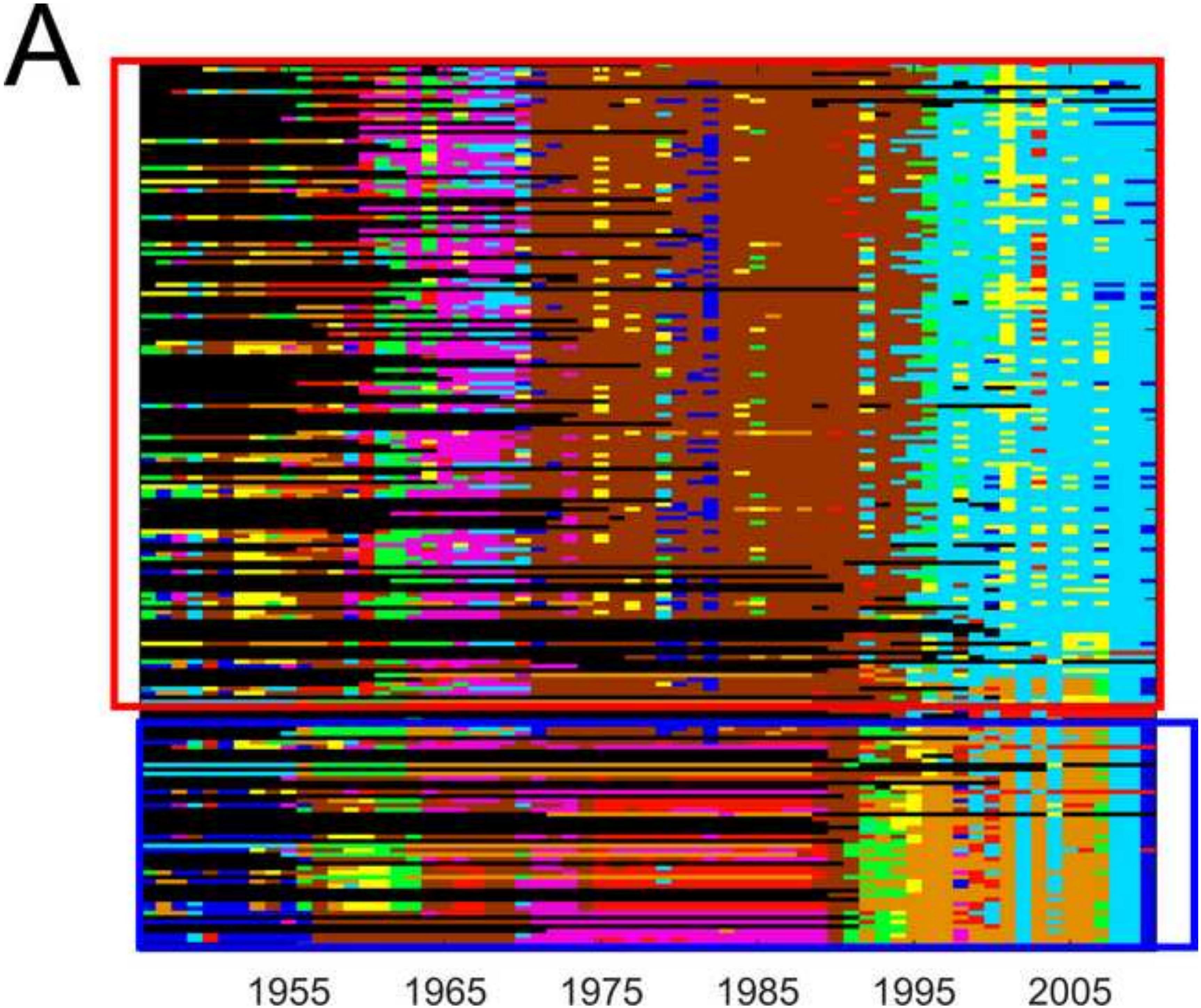

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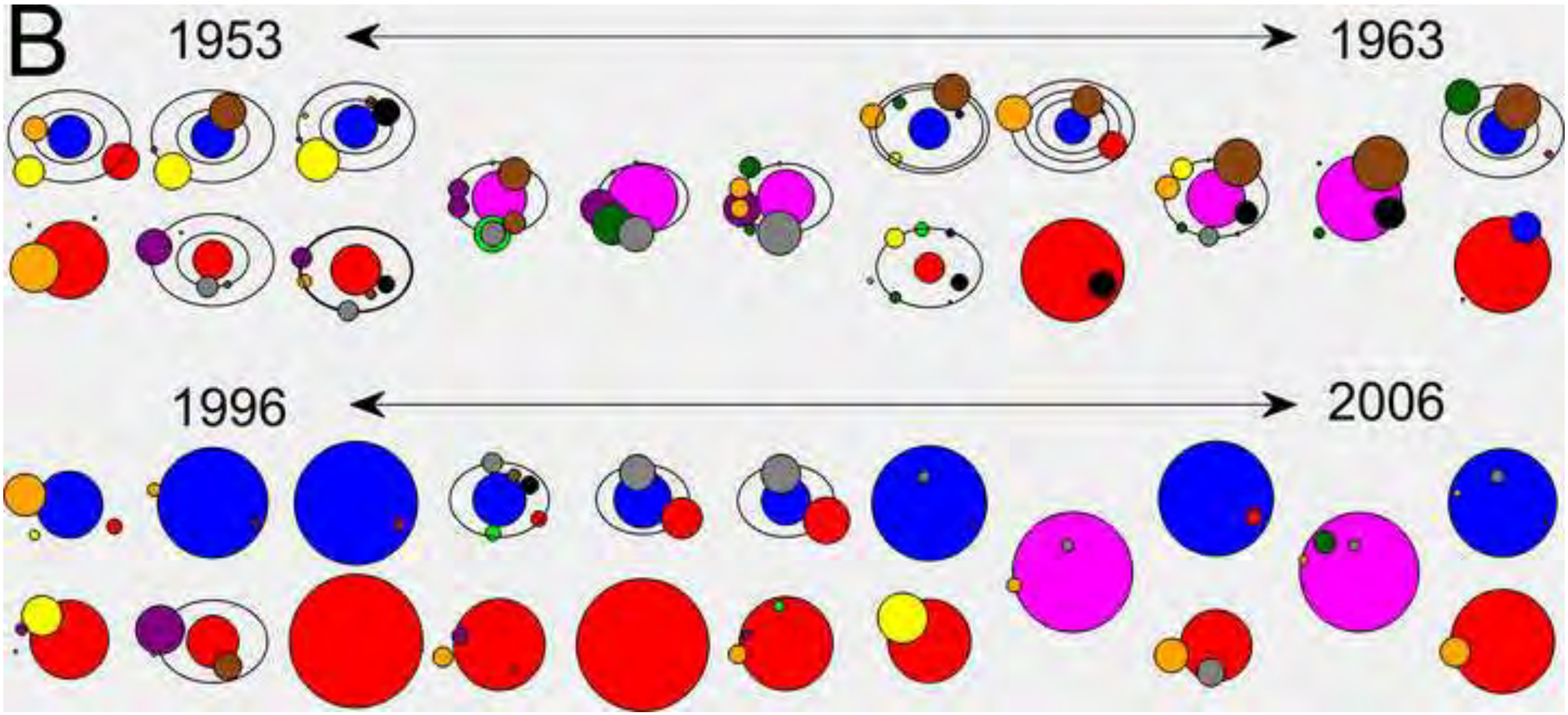

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