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van Vliet, L.; Törnberg, P.; Uitermark, J.

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Political Systems and Political Networks: The Structure of Parliamentarians' Retweet Networks in 19 Countries

LIVIA VAN VLIET[1]
PETTER TÖRNBERG
JUSTUS UITERMARK
University of Amsterdam, The Netherlands

Social scientists have long studied international differences in political culture and communication. An influential strand of theory within political science argues that different types of political systems generate different parliamentary cultures: Systems with proportional representation generate cross-party cohesion, whereas majoritarian systems generate division. To contribute to this long-standing discussion, we study parliamentarian retweets across party lines using a database of 2.3 million retweets by 4,018 incumbent parliamentarians across 19 countries during 2018. We find that there is at most a tenuous relationship between democratic systems and cross-party retweeting: Majoritarian systems are not unequivocally more divisive than proportional systems. Moreover, we find important qualitative differences: Countries are not only more or less divisive, but they are cohesive and divisive in different ways. To capture this complexity, we complement our quantitative analysis with Visual Network Analysis to identify four types of network structures: divided, bipolar, fringe party, and cohesive.

Keywords: Twitter; elite political behavior; politicians; political systems; social media; political communication

Political scientists, communication scientists, and political sociologists have long studied international differences in political culture and communication (e.g., Armingeon, 2002; Lehmbruch, 1974; Lijphart, 2012). We focus on a long-standing discussion about the relationship between democratic systems and elite political cooperation. The notion that the type of democracy affects the political climate can be traced back to the work of Arend Lijphart (1999), who argued that systems based on power sharing—such as proportional representation (PR) systems—"have the potential of making an initially adversarial culture less adversarial and more consensual" (p. 307). The idea is that proportional

Livia van Vliet: l.s.vanvliet@uva.nl
Petter Törnberg: pettert@chalmers.se
Justus Uitermark: J.L.Uitermark@uva.nl
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representation systems—varyingly conceptualized as consociational, consensus, or proportional democracies—have a less abrasive political culture and exhibit "kinder, gentler" traits compared with majoritarian systems (Lijphart, 2012, p. 274). It has been extended in work by scholars like Eric Nordlinger (1972), Gerhard Lehmbruch (1974), Klaus Armingeon (2002), and others, and today constitutes one of the most well-known propositions within political science.

A central challenge for this research has been the lack of methods and data to measure and compare political culture and communication (Burgess & Bruns, 2012). Twitter provides terrific resources for such comparative analyses, but existing comparative studies using Twitter data have so far generally been limited to a few countries (e.g., Barberá, 2015). This article speaks to comparative political communication literature (Lijphart, 1999; Norris, 2008) by proposing a comparative, relational approach to examine differences in networks of politicians on Twitter across 19 countries by using retweet data. In the political realm, retweets can generally be seen as endorsements (cf. Calais Guerra, Veloso, Meira, & Almeida, 2011; Conover, Gonçalves, Ratkiewicz, Flammini, & Menczer, 2011; Kim & Yoo, 2012; Metaxas et al., 2015; Wong, Tan, Sen, & Chiang, 2016), which allows them to be used to predict political leanings and preferences with high accuracy (Calais Guerra et al., 2011; Conover et al., 2011; Wong et al., 2016). We hence use retweets to create social networks that reveal the structure of support relations among parliamentarians (Decuypere, 2019).

We ask: Do proportional systems foster more cross-party endorsement among parliamentarians than majoritarian systems do? To answer this question, we rely on a mixture of quantitative and qualitative indicators that aid in examining the nature of divisions and alliances among parliamentarians on Twitter. We use a database of parliamentarian tweets, which enabled the analysis of 2.3 million retweets between 4,018 incumbent parliamentarians over the entirety of 2018 (van Vliet, Törnberg, & Uitermark, 2020). To study this data, we use a combination of statistical methods, such as the E-I index measure of network homophily (Crossley et al., 2015; Domínguez & Hollstein, 2014) and Visual Network Analysis, a qualitative approach to study the structure of social networks (Decuypere, 2019; Gamper, Schönhuth, & Kronenwett, 2012).

This article fills multiple lacunae in the literature. Firstly, most research into Twitter and politics focuses on how politicians use social media to communicate with journalists (e.g., Dogu & Mat, 2019; Garcia-Perdomo, 2017; Sinha, 2018); there is much less about the use of Twitter for discussion among politicians (Lietz, Wagner, Bleier, & Strohmaier, 2014; Weaver et al., 2018). Thus, we fill a gap in the literature through examining how politicians use social media to engage with one another. Secondly, we develop an approach that allows for the systematic comparison of politician retweet networks among different countries on Twitter—a considerable improvement over current Twitter studies that lack clear standardization in (1) what constitutes "political elite" (e.g., Flores, 2018, p. 312; Weaver et al., 2018, p. 133), (2) measures and analytical techniques (Cihon & Yasseri, 2016; Jungherr, 2016; Zimmer & Proferes, 2014), and (3) sampling methods, whereby snowball sampling is often used, starting with a preselected set of hashtags, followed by selecting profiles based on who used those tags (see Cihon & Yasseri, 2016). We consequently demonstrate standardization in data collection and measurements that does not currently exist to this scale in social media research. Thirdly, digital trace data research has been criticized for being limited to primarily "proof-of-concept" studies, in the sense that they are lacking connection to existing theory (Cihon & Yasseri, 2016). This article exemplifies how such data can be used to explicitly

link to and develop existing theoretical work (e.g., Jungherr, 2015). The key aims of this article are twofold: firstly, to develop a systematic method that allows comparison of Twitter networks across countries, and secondly, to study the differences across political systems and elite cooperation.

In the remainder of this article, we first outline the different types of democratic systems and their hypothesized effects on patterns of cohesion and division among parliamentarians. We then discuss the benefits of using a network analysis approach to studying political communication, ending with a description of network structures we would expect to find based on the different democratic systems. We use a combination of Visual Network Analysis and network measures to identify four archetypical network structures, and discuss the implications of our findings.

Network Patterns in Politician Retweets

The democratic system is thought to play a key role in either fostering cohesion or driving division among parliamentarians. Some argue that proportional representation (PR) systems produce cooperation (Lijphart, 1999, 2012), while others suggest that PR systems encourage divisions (Cox, 1990; Horowitz, 1992; Reilly, 2001; Reilly & Reynolds, 1999). To begin to answer the research question, we consider the distribution of power in the different types of democracies. We then present how the type of democracy can affect divides or cohesion among politicians. Following that, we consider the placement and role of fringe parties. Lastly, we introduce our approach to studying parliamentarians' networks on Twitter.

Types of Democracies and Cooperation in Politics

Although there are multiple institutional factors determining the power distribution within a democratic system, "electoral rules represent perhaps the most powerful of the instruments which undergird power-sharing arrangements" (Norris, 2008, p. 117). The types of democracies in our data set are PR, mixed PR, and majoritarian. In both PR and mixed PR systems, there is usually a mix of large and small parties, and ruling governments are likely to be composed of more than one party—either in a coalition or through support agreements (Norris, 2008). Majoritarian systems, on the other hand, are likely to have two large parties, with one of them possessing ruling power.

The democratic system can nurture division or cohesion among political elites (Stadelmann, Portmann, & Eichenberger, 2016). The assumption is that proportional systems foster endorsements across party lines, as parties need to work together in coalitions (Armingeon, 2002; Lijphart, 1999). Majoritarian systems do not need parties to work together as they are based on a "majority rules" principle, and are thus expected to have less cooperative communication among parliamentarians representing different parties (Norris, 2008, p. 24).

According to scholars following Lijphart, PR systems foster cross-cutting ties through political cleavages, and encourage elite cooperation among distinct groups (Lijphart, 1999). This is because for a functioning government in PR systems, cooperation is necessary to form coalitions or agreements between parties (Lijphart, 2012). This cooperation can be seen in the endorsements of politicians where support is

shown across parties, as they may be potential coalition partners for governing power. Other scholars, however, argue that PR systems are prone to division, as these systems tend to have many parties (Horowitz, 1992; Reilly, 2001; Reilly & Reynolds, 1999). The parties may form relatively permanent blocks, which can reintroduce political divisions (Cox, 1990; Stadelmann et al., 2016). More importantly, PR systems generally have low electoral thresholds, allowing access to fringe parties[2] that oppose mainstream parties (Norris, 2008). In this understanding, divisions within PR systems are contingent on the composition of parliament and take a different form than in majoritarian systems: They are not between two major parties but among blocks of parties and/or between mainstream parties and fringe parties. Whereas Lijphart and others suggest that PR systems are generally more consensual, in this understanding it is possible that PR systems can instead exhibit patterns of division. This means that we should not only test whether parliamentarians retweet across party lines but also study the broader topology of their networks. We therefore combine quantitative and qualitative analyses of parliamentarians' networks.

Network Analysis: Taking a Relational Approach to Political Communication

Network analysis techniques have become increasingly popular within social science during recent years, as they provide powerful ways to study the structure of social systems (Gastner & Newman, 2006). Networks model social systems as a set of interconnected nodes and employ mathematical and computational methods to study their structural properties. In this case, we can use network models to visualize and quantify the relationships among parliamentary members with different democratic systems (Decuypere, 2019). Parliamentary cohesion would be governed by centripetal forces, exhibited by many cross-party retweets, bringing the nodes together, whereas division would show a lack thereof, and thus be governed by centrifugal forces that push the nodes apart.

For a long time, a challenge with using social network analysis to study relations among politicians has been the availability of data. This has changed fundamentally with the growth of social media, which are often organized precisely around the notion of social networks. This has particularly been the case when it comes to studying the social interaction among politicians. Previous studies have used voting records of elected politicians (Dal Maso, Pompa, Puliga, Riotta, & Chessa, 2014; Hix & Noury, 2010; Spirling & McLean, 2006; Waugh, Pei, Fowler, Mucha, & Porter, 2009) or their legislative speeches (e.g., Beauchamp, 2011; Lauderdale & Herzog, 2016) to examine politicians' interactions. Through looking at parliamentarian Twitter interactions, we are able to see coalitions and divisions that would not be visible based solely on voting records or party affiliation. While there are many single case studies, some recent studies have looked at political Twitter networks from a comparative perspective (e.g., Lietz et al., 2014; Smyrnaios & Ratinaud, 2017; Urman, 2020; Vaccari et al., 2016; Vergeer, 2017; Weaver et al., 2018).

Following these studies, we use Twitter retweet data to compare the extent and structure of online endorsements among politicians. In these networks, the nodes are politicians, and the ties between

[2] Related terms include "non-established," "niche," "minor," or "marginal" (Arzheimer, 2010, p. 640). We choose "fringe" since we use network measures to detect their position on the fringes of parliamentarians' network.

them are retweets, with the weight of the ties being determined by the number of retweets. Cooperative patterns will be clearly visible in the network through many ties between the different parties. Retweet networks can be related to political structure, as the structure is reflected through which politicians endorse one another. Cooperative behavior among different political parties is therefore expected to exhibit different network structures than those that lack cooperation or communication among parties.

Methods

To address the key aims of the article, we developed a systematic method that allows comparison of Twitter networks across countries. We constructed a database that gathers tweets from incumbent parliamentarians in the lower houses of parliament (van Vliet et al., 2020), since this is where open debate, contentions, and coalitions are most likely to be seen.[3] Hence, the population under study further addresses our second aim of studying elite cooperation across political systems.

The database is freely available (http://twitterpolitiicans.org). When constructing the database, all the European Free Trade Economic Area countries and all majority English-speaking countries were checked for the number of parliamentarians that were on Twitter. These accounts were manually validated to verify that they were not parody, campaigning, or private accounts, and to make certain that the selected accounts indeed belonged to members of parliament. Those that had more than 45% of their members on Twitter were included in the database, and with at least 50 nodes in the retweet network.[4] The sample comprises 19 countries in total. Data were gathered through the Twitter streaming API and collated in a MySQL database. For the type of electoral system, we rely on the classifications from the Electoral System Design Database (International Institute for Democracy and Electoral Assistance, 2019). Several of the selected nations are relatively understudied and provide a mix of democratic systems. A full list of the countries in the study, along with their type of democracy, is shown in Table 1.

[3] We recognize that in some systems the lower chambers are less involved in the legislative division, but to be able to make relative comparisons between countries, we have chosen the comparisons that made most sense across the board.

[4] The lack of nodes indicates that the parliamentarians were not using Twitter to retweet other parliamentarians.

Table 1. An Overview of Attributes per Country, Including Democratic System, Network Measures, and E-I Index.

Country	Democratic system	Nodes	Unique edges	Total RTs	E-I
Australia	M	117	1,830	12,825	−0.91
Belgium	PR	102	372	31,455	−0.54
Canada	M	312	8,726	92,448	−0.67
Denmark	PR	121	1,099	1,593	−0.68
Finland	PR	140	1,547	22,950	−0.59
Germany	Mixed PR	405	5,621	60,318	−0.61
Ireland	PR	78	775	32,859	−0.92
Italy	Mixed PR	333	2,692	169,047	−0.47
Malta	PR	51	512	23,12	−0.91
The Netherlands	PR	136	1,585	147,393	−0.72
New Zealand	Mixed PR	87	751	1,917	−0.84
Norway	PR	72	268	2,403	−0.57
Poland	PR	223	4,288	75,276	−0.91
Spain	PR	199	3,286	189,054	−0.78
Sweden	PR	117	438	19,818	−0.34
Switzerland	PR	92	658	7,992	−0.64
Turkey	PR	437	6,763	867,753	−0.80
United States	M	545	20,596	295,110	−0.850
United Kingdom	M	390	4,436	168,966	−0.719

Country	Type	Louvain modularity	Louvain clusters (*N*)	Average clustering coefficient	Cramer's V
Australia	2	0.595	7	0.399	0.79
Belgium	1	0.775	10	0.398	0.82
Canada	1	0.55	9	0.451	0.83
Denmark	4	0.53	8	0.326	0.64
Finland	3	0.433	7	0.342	0.61
Germany	1, 3	0.508	9	0.352	0.84
Ireland	2	0.54	6	0.5	0.71
Italy	1	0.655	25	0.348	0.72
Malta	2	0.461	5	0.594	1.00
The Netherlands	3	0.623	7	0.396	0.69
New Zealand	2	0.576	5	0.402	0.65
Norway	4	0.587	8	0.212	0.53
Poland	2	0.529	8	0.47	0.61
Spain	1	0.665	7	0.471	0.84
Sweden	2	0.688	10	0.277	0.79
Switzerland	4	0.522	9	0.331	0.50
Turkey	1	0.663	14	0.274	0.95
United States	2	0.484	9	0.328	0.56
United Kingdom	2	0.537	16	0.281	0.79

For our analysis, if a country had an election during 2018, we took the parliamentary period that was the longest sitting. For example, if there was an election on June 16, we used retweets from the previous parliamentary period, rather than the newest. Overall, our analysis includes a total of 4,018 politicians (max = 545; min = 36; mean = 200) and 2,360,043 retweets between them (max = 867,753; min = 513; mean = 117,473; *SD* = 190,144). This translates to an average of 6,465 retweets per day, or 323 retweets per country per day. Information on the number of retweets per country is shown in Table 1. Quote retweets (i.e., those where the sender is adding an additional comment to the original tweet), are not included as retweets, since they are not as certain to be considered endorsements (Garimella, Weber, & De Choudhury, 2016; Molyneux & Mourão, 2019).

Quantifying Cohesion

As we are trying to measure the degree of cohesion in a network, we are most interested in cross-party retweets, which are indicative of cohesion among parties (Metaxas et al., 2015). The more that parliamentarians endorse others from parties that are not their own, the more cohesive the network will be overall. Likewise, if parliamentarians primarily retweet within their parties, this would indicate division. To determine the strength of endorsement that a party has within itself compared with external parties, we use the E-I index (Crossley et al., 2015; Domínguez & Hollstein, 2014). It is defined as follows:

E-I = (Number of retweets across party lines − Number of retweets within party lines) / (Number of retweets across party lines + Number of retweets within party lines)

It results in a number within [−1, 1] which shows the level of connections that goes across party lines (Domínguez & Hollstein, 2014). An E-I index of −1 would mean that there are only internal retweets, with no retweets to external parties, whereas an E-I of 1 implies that all the retweets are external to the parties. If the E-I index is zero, the politicians are just as likely to retweet other politicians who are independent of their party affiliation. This measure can show the proportion of cross-party retweeting, and the normalized figures can be compared across the parliamentarian networks of various sizes.

We use additional measures to compare the networks, including modularity, average clustering coefficient and Cramer's V. The modularity and average clustering coefficient indicate the strength of the division of the network into distinct clusters. We also use Cramer's V to measure the association between cluster and party membership: Divided networks are expected to have a stronger relationship among party-cluster memberships, whereas weak relationships would indicate more overall cohesion in the network.[5]

[5] We have chosen not to use measures that largely depend on the number of nodes and amount of activity—such as density—as these factors are not equal across all networks and therefore cannot be used comparatively.

Visual Network Analysis

Qualitative approaches to network analysis offer more open, flexible, and descriptive methodologies when compared with the more formalistic methods based on quantitative measures (Gamper et al., 2012). They are therefore useful and complementary to quantitative measures when used together with the E-I index for interpreting network structures. Visual Network Analysis (VNA) is an established method that uses the visualization of a network through an algorithm that positions nodes and edges as a function of the strength of connections (Decuypere, 2019). These algorithms tend to locate strongly connected nodes close together, and weakly connected nodes further apart.

In this study, we employ the force-directed algorithm *ForceAtlas2* (Jacomy, Venturini, Heymann, & Bastian, 2014) for generating the network visualization, which creates a simulation of a physical system to spatialize the network. This physical system implements two physical laws, one centripetal and one centrifugal: Hooke's law and Coulomb's law respectively. Coulomb's law means that the nodes act like particles with equal charge, creating a force of repulsion between the nodes, whereas Hooke's law attracts connected nodes as if the edges were springs. Over time, these counteracting forces will lead to convergence to an equilibrium state, which in an intuitive way reveals the structure of connections of the network. This allows us to use the visualizations as powerful and flexible ways to analyze the structure of relations within and among parties, as well as the different types of structures that may emerge. The networks were visualized in Gephi.

Results

We aim to examine whether there is a link between type of democracy and politician retweet behavior. We use the E-I index to look at the ratio of internal to external retweets, which can be seen in Table 1, along with a country's associated electoral system. Figure 1 shows a visual overview of the E-I values.

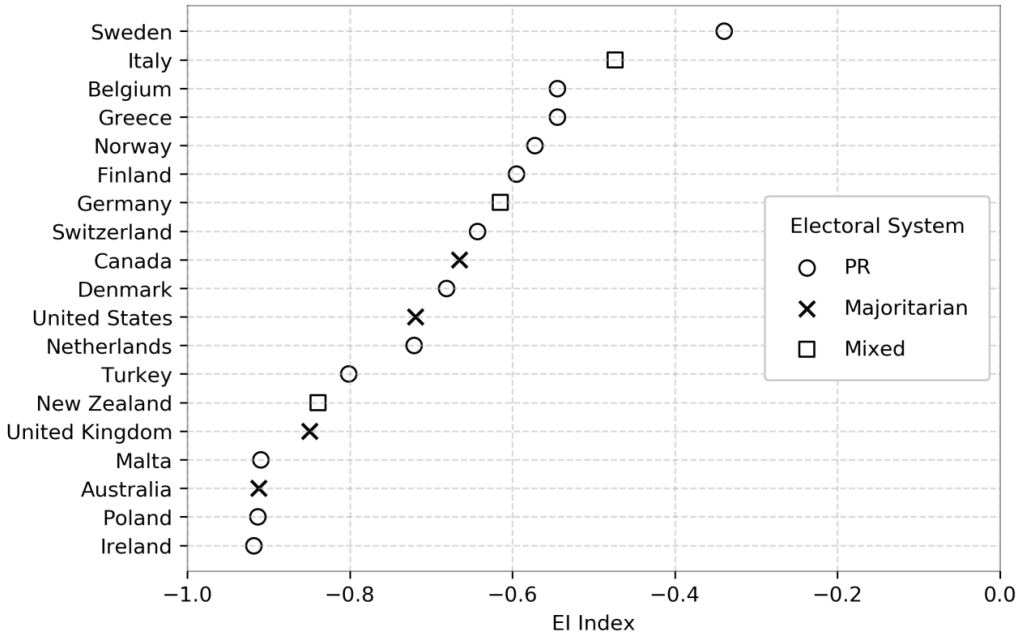

Figure 1. Overview of the E-I index of the included countries, categorized according to electoral system.

The E-I index shows that across all countries, retweets are largely within parties, as all E-I values lie below zero. However, we are most interested in how far below zero these values lie; the closer to −1, the higher the amount of intraparty retweeting. The results tentatively suggest that there is a link between democratic system and cohesion, where majoritarian democracies tend to retweet within parties more. This is shown in their E-I values, which are lower than −0.6. Moreover, we see consensual democracies like Sweden and Belgium with higher E-I values (> −0.6), indicating more external retweets than majoritarian systems. These patterns are not consistent, however, as a number of countries with PR systems have a lower E-I index than some majoritarian countries. In sum, support for the idea that PR systems foster cross-party cooperation is limited. Since the distinction between PR and majoritarian systems do not seem to account for the considerable variation we see between and within the different types of democracies, we turn to the qualitative approach of VNA (Decuypere, 2019).

A Typology of Network Structures

The VNA reveals that the networks display different structural patterns, which capture some interlinked properties of the networks. The nodes represent individual politicians and are sized by in-degree, meaning nodes of highly retweeted politicians will appear larger. As can be seen, there is little variance in the number of retweets received by most politicians, despite some belonging to smaller parties (and would thus be thought to be retweeted less). As revealed by the E-I index, politicians are generally fiercely loyal to their party: They mostly retweet fellow party members. This is clearly seen in Figure 2, where the nodes are colored by party membership. However, there are also important variations among the countries, allowing for

a comparison between network topologies, which may help cast light on underlying differences in political culture, and ongoing processes of elite conflict and cooperation. Through studying the various forms of structures of the networks, we identified four distinct types of political network structures (see Figure 2).

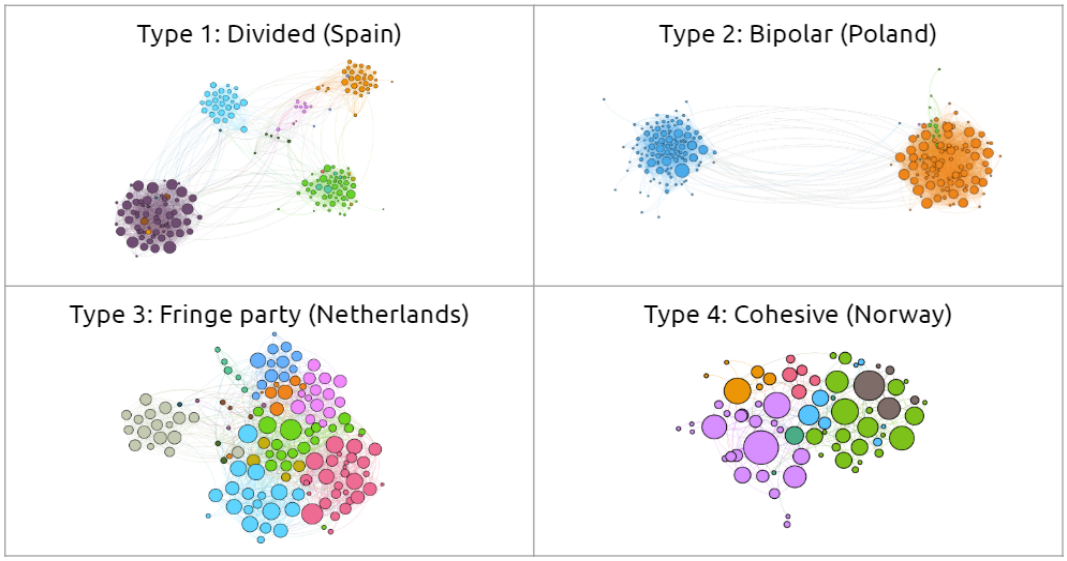

Figure 2. The archetypes of the parliamentarian retweet networks, which reveal the key differences in endorsement patterns. The nodes are colored by party affiliation.

Type 1—Divided

Using a visual description to classify the networks, we see that Type 1 networks show a highly divided structure. "Divided," here, refers to a structure with clear divisions between clusters and very few (if any) cross-cutting ties. Type 2 networks lean toward a bipolar configuration, showing two large clusters that have dense connections among themselves and fewer external ties. Type 3 networks show a large, densely connected cluster with an outlying party that is weakly connected to the other parties. Lastly, Type 4 structures exhibit one large cluster of dense connections, with retweets crossing party lines.

Type 1 networks exhibit few to no ties among parties, with visible distances between them. This indicates that there are far more internal ties within that party, and far fewer with others (see Figure 3). For these networks, the nodes that are grouped closely together by the visualization algorithm belong almost exclusively to the same party. It also occurs in some cases that a smaller party is assimilated into the cluster of one larger party, indicating a strong alliance among those parties. We primarily see this occur in Italy.

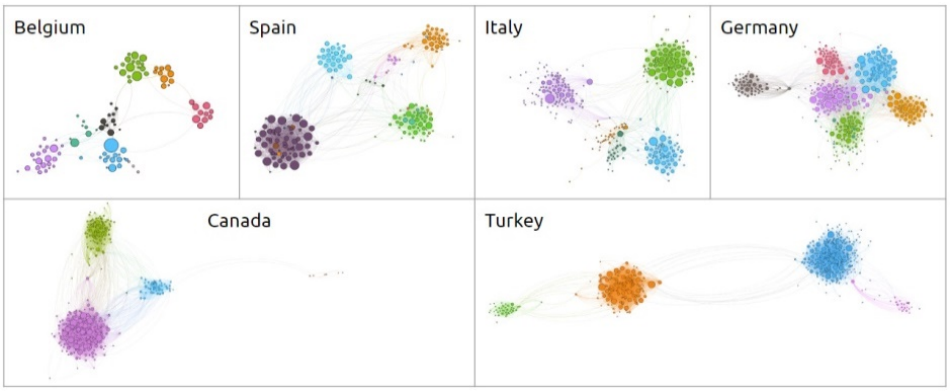

Figure 3. Type 1 networks have a divided structure. The nodes are colored by party affiliation.

Type 2—Bipolar

Type 2 networks are characterized by two large groups of parties that are at opposing ends of the network (see Figure 4). The key difference between bipolar and divided networks is that more than one party can form a large cluster (e.g., Sweden, Australia, Poland, New Zealand), whereas in divided networks the clusters tend to be much smaller and almost exclusively formed by the same party members. These groups of parties tend to be strongly connected to one another, thus forming a multiparty block, but largely lack connections to parties outside their block. Among these, we find two-party systems with weakly linked parties, such as in the United States. These systems are poorly captured by the E-I index, as the parties in the two groups often have many external ties between them. This results in a relatively high E-I index, despite the fact that the network structure reveals potentially strong divisions between blocks of parties.

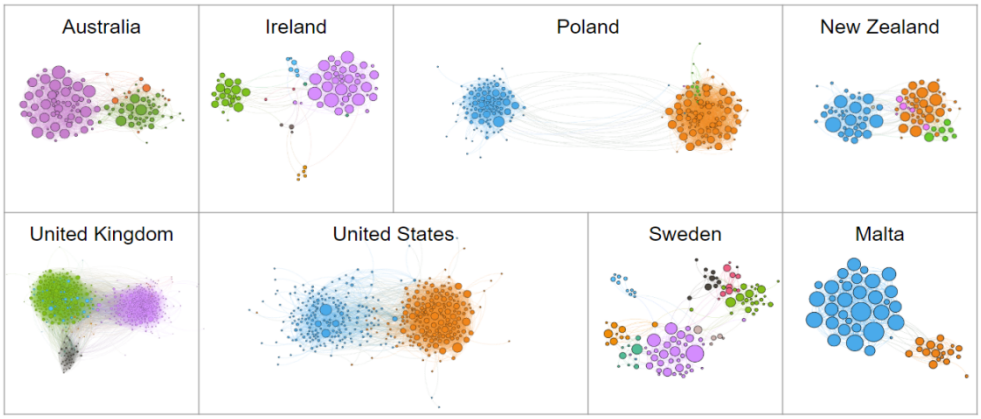

Figure 4. Type 2 networks have a bipolar structure. The nodes are colored by party affiliation.

A good example is Sweden, which is the country with the highest E-I index. Despite this, the network is clearly split between the left and the right parties, with the radical right party (the Sweden

Democrats) forming a separate cluster of nodes, with some connections to the right-wing cluster. In the case of the United Kingdom, there are clearly two major parties in contention with one another, with the third party (the Scottish National Party) having close ties to Labour. There is a clear separation between Labour and the Conservatives, although there are still many retweets occurring among them. Hence, VNA adds to the analysis and interpretation of the network patterns that goes beyond what is captured with the E-I index.

Type 3—Fringe Parties

Type 3 networks show a large cluster composed of multiple parties relatively close to one another, with one or two parties that are distanced from this larger cluster (see Figure 5). This means that the majority of parliamentarians retweet across party lines, with the exception of the outlying party. While these distanced parties do not necessarily match perfectly to the notion of "fringe" parties as used in the literature, they do allow capturing parties that have the relational role of being excluded from a consensus structure. This exclusion can be seen as a relational representation of the concept of "fringe" parties, as it shows how other parties—the "mainstream"—are avoiding connections with the smaller party.

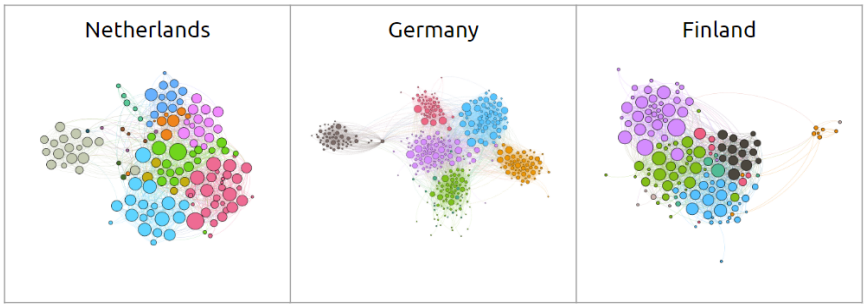

Figure 5. Type 3 networks have a fringe party. In such a network, the majority of parties tend to endorse one another, aside from one (or more) smaller, outlying parties. The nodes are colored by party affiliation.

Fringe parties tend to not retweet other parties, and other parties tend to avoid retweeting them. Generally, fringe parties have high internal density, showing fierce loyalty among party members relative to other parties. This loyalty results in the party being weakly connected to the rest of the network (who are commonly retweeting across party lines), and being located far from the other parties in the network visualizations. In some cases, however, the fringe parties are occasionally using retweets to attempt to form bonds with other parties, but generally finding little reciprocation.

Germany is an example of a mix of network types and has been classified as both divided and with a fringe party. While it is seen as divided due to sparse retweeting between parties, there are some connections between parties with the exception of the far-right AfD party, which sits on the fringe and is not retweeted by a majority of other parties.

Type 4—Cohesive

Type 4 networks show one large, closely connected structure that comprises all the different parties, where parliamentarians retweet so frequently across party lines that visually no clear groupings of parties emerge (see Figure 6). As parties in these party systems tend to retweet beyond their lines, there seems to be reciprocal consensus among parliamentarians in that country.

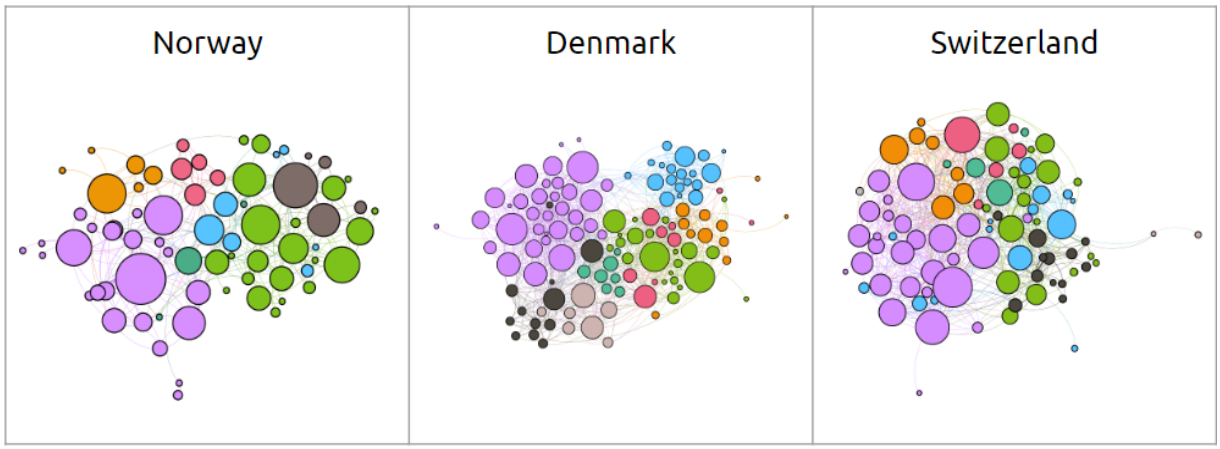

Figure 6. Type 4 networks have a cohesive structure, indicating that members of that parliament endorse internally and externally to their party. The nodes are colored by party affiliation.

Table 1 shows the network measures of modularity and average clustering coefficient. We find that Type 1 networks tend to have higher modularity, as well as a greater number of clusters than other networks. This indicates a higher division of the network, as the parties tend to cluster with one another, which is in line with the reasoning that proportional systems can cause greater division of a network (Cox, 1990). Type 3 networks, on the other hand, tend to have fewer clusters than the other network types, indicating that there is cohesion in the network, with the exception of the fringe party. This would indicate that to an extent some PR systems are more cohesive than others (Lijphart, 2012). Type 1 and 2 networks tend to have higher clustering coefficients, indicating lack of endorsement between parties, whereas Type 4 networks have lower clustering coefficients, indicating more endorsement across party lines.

We also look at the relationship between party and cluster membership using χ^2 and Cramer's V measures, wherein Cramer's V shows the strength of that relationship, thereby indicating how neatly the networks cluster based on party. For brevity, we only report the Cramer's V value for all significant relationships in Table 1. We see that Type 1 networks have much stronger relationships between party and cluster membership than Type 4 networks do. Therefore, it is clear that Type 4 networks retweet more frequently across party lines in comparison with other network types.

The typology uncovers two results in line with Lijphart's (1999) expectations; majoritarian systems tend to retweet members of their own party, and PR systems are the only ones who engage in a

lot of cross-party retweets, suggesting that PR systems *can* foster cohesion. However, some results deviate from this, where some PR systems form divided networks, and some historically consensual countries are challenged by fringe parties.

Analysis and Discussion

Do proportional systems foster more cross-party endorsement among parliamentarians than majoritarian systems? Having presented the findings of the E-I indexes and the network structures, we now revisit the question of how types of democracies relate to patterns of cooperation and division as seen through retweet networks. Looking at the majoritarian systems—Australia, Canada, United Kingdom, and the United States—we see that they are mostly bipolar systems with high negative E-I index values. In relation to Lijphart's (1999) argument, it appears that majoritarian systems tend to have lower E-I values than those with PR systems, meaning that there are fewer cross-party retweets, and therefore less endorsement across party lines. Hence, for the most part, majoritarian systems do have fewer cross-party endorsements than PR systems. The outlying majoritarian country is Canada, which has a relatively high E-I index, implying that it has a fair number of cross-party links, and is also classified as a divided structure. Thus, there is a relationship between democratic system and network structure, although the systems do not neatly categorize into one type of structure per system.

While the results seem to imply that majoritarian systems tend to lean toward more divided political climates, our findings do not completely support the idea that PR systems will necessarily result in frequent cross-cutting endorsements (Lijphart, 2012). We do, however, find that the cohesive networks—Norway, Denmark, and Switzerland—are all associated with PR systems. They have relatively weaker relationships between party and cluster memberships, and lower clustering coefficients. Therefore, there is some evidence to suggest that PR systems lead to more endorsements across parties than majoritarian systems.

On the other hand, PR countries such as Poland, Ireland, and Malta are among those with the lowest E-I and highest average clustering coefficients, implying extremely low cross-party retweeting. This clearly contradicts the notion of PR systems fostering cross-cutting ties. Interestingly, Poland and Malta have two or three parties in their network. Additionally, the suggestion that PR systems are prone to division because of the number of parties (Horowitz, 1992; Reilly, 2001; Reilly & Reynolds, 1999) does not explain some of the networks at the extreme ends of the E-I scale, where Ireland is an exception with seven parties. This may be due to the change from a two and a half party system in 2011, which caused a rise in support for other, smaller parties (Breen, Courtney, McMenamin, O'Malley, & Rafter, 2019). Hence, while some PR systems appear very divided, they generally have few parties, and may therefore be driven by the same centrifugal forces seen in majoritarian systems, where larger parties tend to retweet only within their party, thus driving the parties apart in the network visualizations.

Conversely, The Netherlands, which appears relatively cohesive, exhibits a relatively low E-I index (−0.72), and a moderately high Cramer's V (0.69). These values indicate that that not only is the network less cohesive than it appears but also that the presence of a fringe party may skew the measures due to one or two parties that may be almost exclusively retweeting within their party. Moreover, the

apparent exclusion of a fringe party may be bidirectional—where they only retweet among themselves, and simultaneously are not retweeted by other parties. Hence, the fringe party networks that we see are more complex than those that are simply divided or consensual, and can skew measures that would normally indicate increased division when visually we see that the division is only between the "mainstream" and "fringe" parties.

Sweden's network provides an interesting observation for fringe parties that may be in kingmaker roles. Often highlighted as an ideal case of a consensus democracy (Lewin, 1998), Sweden has the highest E-I index of any country (−0.34), but is split between two blocks—the left and the right—with the radical right party acting as a separate fringe cluster. This result shows how block formation may drive PR systems to lose their capacity to support more consensual political climates, as conflict lines emerge among blocks of parties (Norris, 2008). Moreover, in this case we see that the radical right party is put into an influential role, as the larger parties are unlikely to cooperate across block lines (Norris, 1997).

Limitations

We do, however, recognize that while the analysis shows the potential of the presented approach, there are limitations. We recognize nuances in the way that conflicts can be expressed within and among systems. For instance, lack of retweeting may not indicate conflict between parties, but rather a lack of support. Thus, while we demonstrate that there are important variations in political culture between countries with proportional representation, retweets alone may not adequately capture conflicts between parties.

Moreover, there remains a lack of clarity over whether or not there is indeed a causal connection between the type of democratic system and the patterns of endorsement, as PR systems can result in both fragmented and cohesive network structures. Therefore, it is clear that political cooperation is linked to many more aspects of the electoral system than those we have looked at. The structure of communication may link not only to the type of democracy but also to other factors of the electoral system, such as the electoral threshold, the rules around political campaigns, and the voting list system, but also to the specific histories and political situations of the different countries, which can be subjected to further study.

Conclusion

We have taken a new spin on an old question within political science: Do proportional systems foster more cross-party endorsement among parliamentarians than majoritarian systems? This article has contributed new data to this question by taking a relational perspective enabled by social network analysis. Using a large Twitter data set of parliamentarian tweets from 19 countries, we used the structure of retweet networks to study the endorsement behavior of the parliamentarians. This data allowed us to demonstrate how computational methods may help to contribute to long-standing debates surrounding proportional systems and elite political cooperation, using digital trace data.

We began by analyzing these networks using the E-I index to quantify the number of cross-party retweets. However, this quantitative approach was shown to be limited in identifying political splits, as tight cooperation between a subset of parties in a highly polarized system may be misidentified as a cohesive political climate. This motivated taking a qualitative approach in the form of VNA. Using VNA to study these retweet networks, we uncovered four distinct types of political network structures. These types may have emerged due to differences in democratic systems, or in elite political culture, where Type 4 networks show an overall more coalescent political culture, and Type 1 and 2 networks may have a more adversarial political culture. Clustering measures support the visual structures found within these networks.

When compared with existing research on politician Twitter networks, these networks bear striking resemblances to previous research, despite being conducted across a different time frame. For instance, research into British parliamentarian retweets during the 2016 Brexit referendum vote also shows the same bipolar structure (Weaver et al., 2018). Our structures can also be compared with other parliamentarian network research, such as that of the German parliament during campaigning before the entrance of a new party, the AfD (Lietz et al., 2014). Hence, our research updates, and is complementary to, the small but growing body of literature looking exclusively at politician retweet networks.

The approach has furthermore revealed multiple possible avenues for future research. One such avenue is to study the impact of elections in restructuring of political networks. Another is to look at how new emerging parties are brought into a political system, depending on the structure of the political system. Do fringe parties tend to become more integrated into the system over time, and what determines the way that this occurs? Future research can also examine interactions and overlaps among parties, through natural language processing of tweets among and within parties in various countries. This can help reveal discussions that either enable cooperation or trigger polarization within various countries.

Overall, we uncovered four distinct types of political network structures that contribute to the comparative political systems literature. In line with the argument that proportional systems result in increased consensus (Lijphart, 1999, 2012; Lijphart & Aitkin, 1994), we find that the only cohesive networks (Type 4) are those with PR electoral systems. This tallies with the expectation that PR systems foster greater endorsement across parties. However, there are also PR systems with divided networks, which shows that PR systems can also result in divided networks due to lack of endorsement between parties. We also find that it is possible to identify fringe parties through looking at retweet data, as these parties seemingly behave differently to mainstream or more established parties. We find that there is a tenuous relationship between democratic systems and cross-party retweeting: Majoritarian systems are not unequivocally more divisive than proportional systems. Moreover, we find important qualitative differences: Countries are cohesive and divisive in different ways. To conclude, retweet networks among politicians on Twitter constitute only a small part of political life, but arguably offer fascinating insight into patterns of support among political elites, making it possible to use newly available digital data to address long-standing questions in sociology, communication, and political sciences.

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