Political stability and the fragmentation of online publics in multilingual states
Working paper

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Abstract

In this paper I compare users' interactions on Facebook pages of parties and politicians in four different European multilingual countries: Switzerland, Belgium, Bosnia and Herzegovina and Ukraine. The focus is on measuring the political and linguistic divide of online publics and their association with measures of political stability of the respective countries. The four countries are interesting case studies because although all ethnolinguistic heterogeneous produce very different levels of political stability. In political science literature, fragmentation and polarisation are often read as malaises and possibly facilitated and fomented by Internet communication technologies. As the theory goes, the fragmentation of deliberating publics, or the absence of cross-groups communication channels because of assortative tendencies, might exacerbate polarisation by reducing the exposure to diverse views and moving members of groups towards more extreme positions, reducing political stability and increasing conflictuality. But the results presented in this paper suggest that ethnolinguistic fragmentation is not associated with stability and in fact less politically stable countries might have more integrated online publics.

Keywords: Facebook; Belgium; Ukraine; Switzerland; Bosnia; Online politics; Political stability; Exponential Random Graph Models; Networks

Contents

The massification of information and communication technologies (ICTs) and the growing importance of social networking services in the everyday life of expanding segments of the population has in parallel opened questions on their effects on politics and generated behavioural data unprecedented for scale, density and accessibility.

ICTs are extremely flexible and Internet service providers have demonstrated their capacity to respond to different communicative and informative needs by offering a diverse and evolving set of capabilities to everyday users. But as the capacity to reach out has increased so has the capacity to filter out. This duality have dominated the debate on the impact of ICTs on society. In political terms: Does the Internet give more capacity to ordinary people to communicate, organise and bring about change (which is normatively implied to be good)? Or does it mostly facilitate societal fragmentation and the exclusion of the different (which is instead negative for society)? Theory and evidence have accumulated on both sides and indeed is also unclear to what degree what we observe today is an effect of the massification of ICTs and not instead the continuation of trends and processes that have been diagnosed for decades.

Along with new questions on the impacts of their use, the ICTs have also generated a new class of data to model mass behaviours. The aim of this paper is to leverage on these data generated by hundred of thousands of users in four different countries to understand whether behavioural traces do support the idea that communal fragmentation either along political or ethno-linguistics lines within state boundaries is associated with more political instability.

1. Political and ethnolinguistic fragmentation

In this paper I measure fragmentation on two different dimensions: a political dimensions, using as meter a continuous political spectrum running from left to right, and an ethnolinguistic

dimension, measured by the relative frequency in the use of a particular language. The level of fragmentation is measured by the volume of contacts between and within politically and ethnolinguistically homogeneous groups.

Societal fragmentation is generally perceived as negative for electoral democracies, which derive their resilience from high levels of trust both vertically between citizens and governing institutions and horizontally among citizens. Trust among citizens is important because if this is limited by boundaries (political, ethnic, religious), it could result in a factionalisation of the governing elites, which citizens are responsible to elect. The social contract implies that institutions should not discriminate citizens based on their belonging to any group. But if elites are voted into office exactly because of their group affiliation, the impartiality of government is corrupted. In this sense, fragmentation or the sparseness of contact among societal groups - the existence of which *per se* is not problematic but in fact an essential component of every open society - is negative because trust (and reciprocal understanding) among individuals can exist only in the context of recurrent social interactions.

Political fragmentation has attracted considerable attention especially in the United States and researchers have pointed and measured the extent to which this might result in opinion (and political) polarisation. Polarisation, intended as a process, occurs when the distance and irreconcilability of opinions increases with time (DiMaggio, Evans, & Bryson, 1996). The Internet as network of politicians, commentators and simple citizens connected through postings, reposting and reactions is recurrently described as highly fragmented along political lines and governed by homophily in the formation of new ties (Adamic & Glance, 2005; Conover et al., 2011). And this is perceived to possibly exacerbate polarisation: as people are systematically exposed to less diversity (because of their or algorithms' choices) and restricted to *enclaves* of like minded they might tend to coalesce around the more extreme opinion presented in the group (Sunstein, 2002).

Ethnolinguistic fractionalisation, that is physical segregation among groups, is found to have negative effects on the overall quality of government for at least three reasons: lower trust among groups, threats of secession, and group-based voting (Alesina & Zhuravskaya, 2011).

2. Factionalisation, group grievance and political stability in Belgium, Bosnia and Herzegovina, Ukraine and Switzerland

The analysis of the association between *Political stability* index compiled by the World Bank (2014) and the *Elite factionalisation* and *Group grievances* indices compiled by the The Fund for Peace (2014) indicates a strong correlation (see Figure 1). The index of *Political stability and absence of violence/terrorism* 'measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism'. *Group grievances* measures instead the

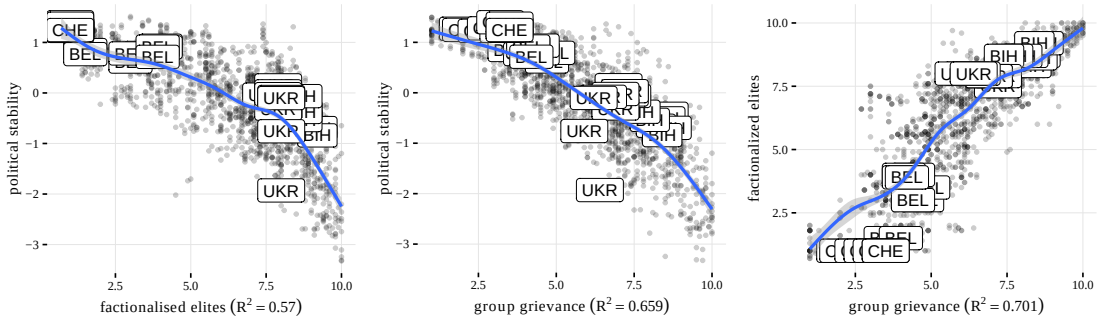
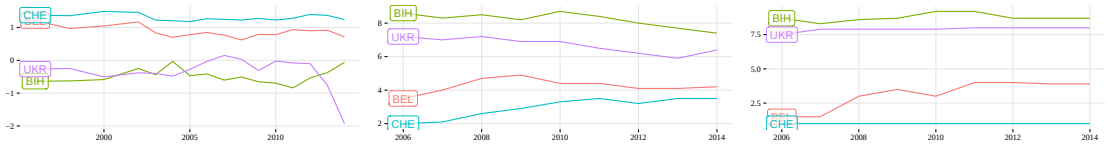


Figure 1: *Correlation between political stability, elite factionalisation and group grievance worldwide*



(a) *Index of political stability* **(b)** *Index of group grievance* **(c)** *Index of elite factionalisation*

Figure 2: *Factionalisation, group grievance and political stability*

tension among communal groups, which might or might no be expressed through violence. *Elite factionalisation* measures the level of 'fragmentation of ruling elites' and can include the '[a]bsence of legitimate leadership widely accepted as representing the entire citizenry'.

Switzerland, Bosnia and Herzegovina, Belgium and Ukraine, although all multilingual perform very differently according to the three indices. Switzerland is the most stable country with corresponding very low level of factionalisation and group grievances. Bosnia, which experienced an inter-ethnic civil war between 1992 and 1995 and suffered 100,000 casualties, and Ukraine, which saw armed conflicts erupting on its territory in 2014, are on the opposite side of the scale with low political stability and corresponding high factionalisation and group grievance. Belgium is slightly less stable than Switzerland and have experienced growing level of elite factionalisation (see Figure 2).

3. Data

3.1. Data collection

The analysis is based on digital traces left by Facebook users in the form of posts, comments and likes over a period of 120 days on public pages linked to parties of four different countries - Belgium (BEL), Bosnia and Herzegovina (BIH), Ukraine (UKR) and Switzerland (CHE) - around the general elections held in 2014 and 2015.

A list of 120 parties, comprehensive of all major parties participating in the elections and

their political position, were compiled using the English, French, Dutch and Ukrainian version of Wikipedia (see Table 2 in the Appendix). To associate each party to at least one official Facebook page I proceeded as following. First, I searched for the official webpage of each party. Second, I scraped each official webpage and automatically searched for links to Facebook pages. Third, in the case of parties for which no webpage or no link from the official webpage to a Facebook page was found, I used the Facebook search engine. Of the 120 parties in the original list, 106 were associated to at least one official webpage and 93 to at least one Facebook page (of which 88 containing at least one comment). In a second step, to enlarge the number of Facebook pages linked to parties, I requested via the Facebook API[1] the list of pages that were liked by the Facebook pages already identified. The 2045 Facebook pages returned from the query were all hand-checked for relevancy and only pages linked to the party - that is, pages of party officials, candidates or branches - were finally included. This resulted in a list of 1423 target Facebook public pages, each uniquely linked to a party, which were used to construct the dataset of posts, comments and likes for the analysis.[2] Table 1 details the dataset.

country	pages	posts	comments	likes	profiles
BEL	864	44,739	116,368	1,254,577	203,263
BIH	206	19,219	42,001	1,011,952	113,231
CHE	214	9,934	25,114	241,327	72,100
UKR	137	16,843	69,325	968,112	121,446

Table 1: *Count statistics of the dataset*

3.2. Country demographics and Facebook adoption

The four countries were selected because of their ethnolinguistic composition which does not assign to any one group a solid majority. Figure 3 shows the distribution and density of the two or three major linguistic groups based on the last available census.[3] For simplicity, the Croatian and Bosnian languages, although officially recognised as distinct languages, are treated in the paper as one language and labelled 'Bosnian'. The choice is mainly justified by the fact that is almost impossible to algorithmically distinguish one to the other.

The rate of adoption of Facebook varies significantly across the four countries and within each linguistic group. Based on data provided by Facebook when defining an audience for an

[1] https://graph.facebook.com/v2.6/{page_id}/likes/

[2] Requests for each page were made to the Facebook API in August 2016 for posts (https://graph.facebook.com/v2.6/{page_id}/feed/), comments to posts and to other comments (https://graph.facebook.com/v2.6/{post_id}/comments/) and likes to posts (https://graph.facebook.com/v2.6/{post_id}/likes/).

[3] The last census for which linguistic data has been made public was conducted in 2000 in Switzerland (http://www.bfs.admin.ch/), in 2013 in Bosnia and Herzegovina (http://www.popis2013.ba/) and in 2001 in Ukraine (http://2001.ukrcensus.gov.ua/). Belgium does not ask any question related to language in its census.

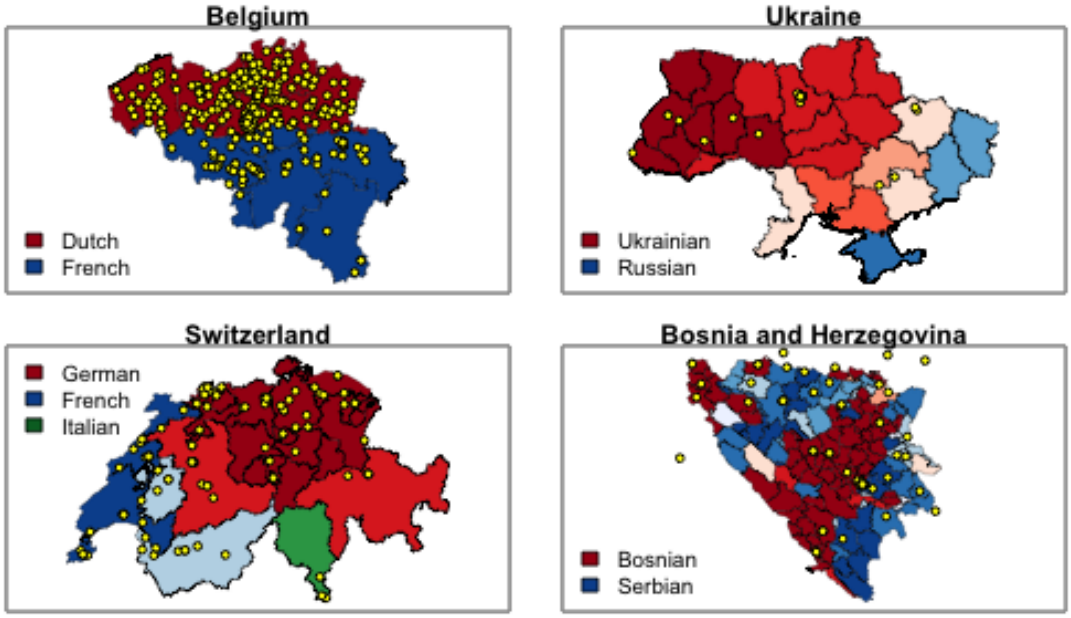


Figure 3: *Density of languages and location of Facebook pages (when available)*

advertising campaign and collected in August 2016, it is possible to quantify the total and daily user base in each country for each linguistic group.

Figure 4 shows the fraction of the total country's population active on Facebook while Figure 5 the ratio between the language groups in terms of total population and representation on Facebook and in the dataset (based on the classification of postings detailed in Section 4). A few comments are already possible. First, the penetration of Facebook within the general population varies significantly across countries; if Belgium, Switzerland and Bosnia have a similar fraction of their population active on Facebook (between 39 and 56%), Ukraine has a significantly lower adoption rate, with only 12% of the population active on Facebook. Second, French-speakers are over-represented among the Facebook user base in Belgium as Russian-speakers are in Ukraine.

3.3. Political position of parties

Figure 6 shows the frequency parties based on their political position in each country as presented on the party's page on Wikipedia. When the English version of Wikipedia did not indicated the political position of the party, either because no page was created or because the information was missing, the French, Dutch and Ukrainian versions of the party's page were consulted. Of the 93 parties under analysis, 62 were coded according to their political position, representing 82% of the posts, 91% of the comments and 91% of the likes. Political positions are coded based on a 5-point scale based with 1 being far-left and 5 far-right (see Table 3 in

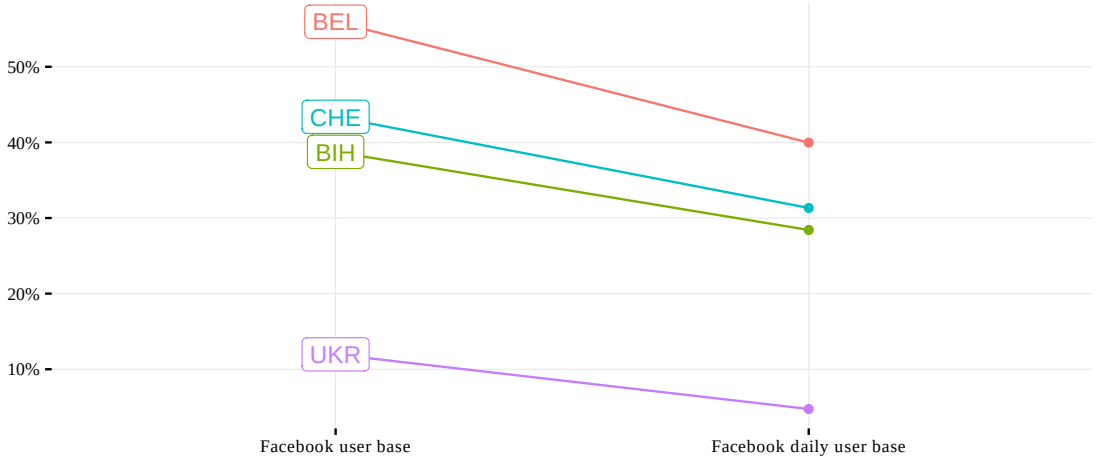


Figure 4: *Facebook user base as fraction of the total population*

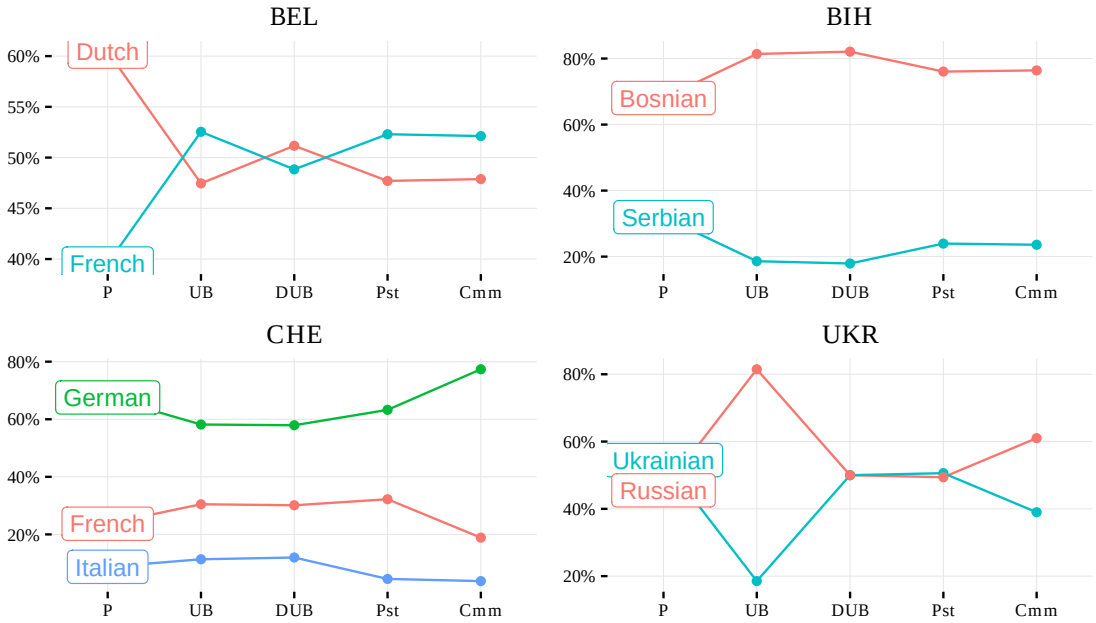


Figure 5: *Ratio between language groups in each country. P = total population; UB = Facebook user base; DUB = Facebook daily user base; Pst = Posts included in the dataset; Cmt = Comments included in the dataset*

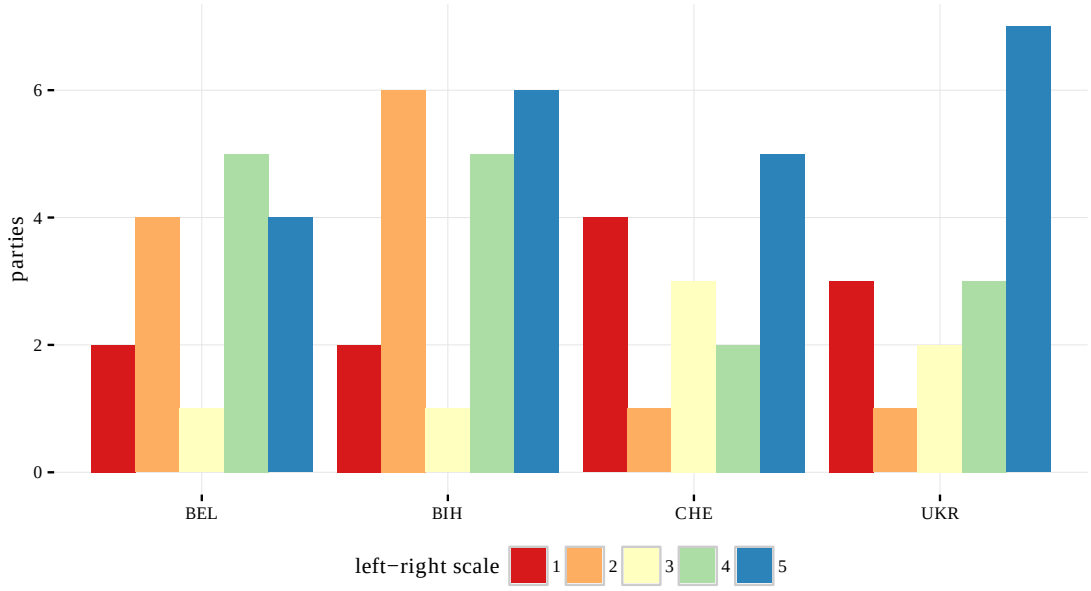


Figure 6: *Party political position (as per Wikipedia description*

the Appendix for the actual numeric mapping). As apparent in Figure 6 the average political position for parties tends slightly towards the right (BEL: 3.31, BIH: 3.35, CHE: 3.2, UKR: 3.62).

3.4. Language composition of parties

Figure 7 shows the relative frequency of comments in the two or three main languages for each country. For each country I calculated a normalised concentration coefficient (the Herfindahl–Hirschman index) indicating whether the use of any language in comments tend to be concentrated in few parties or distributed. Countries show different patterns. Belgium experiences almost complete concentration with only three parties showing significant co-presence of French and Dutch. This is certainly also a consequence of the Belgian political system, in which parties compete within on of the two linguistic communities. Bosnia and Ukraine are significantly less concentrated and both languages tend to appear in pages of every parties.

The plot in Figure 8 maps the linguistic concentration of each party in the four countries for posts and comments. Again we observe the extreme concentration of Belgium, with pages in the other three countries being more linguistically diverse although with different levels of variations. We also observe some difference within countries in the diversity of comments and posts. This could suggest that comments are actually independent from posts.

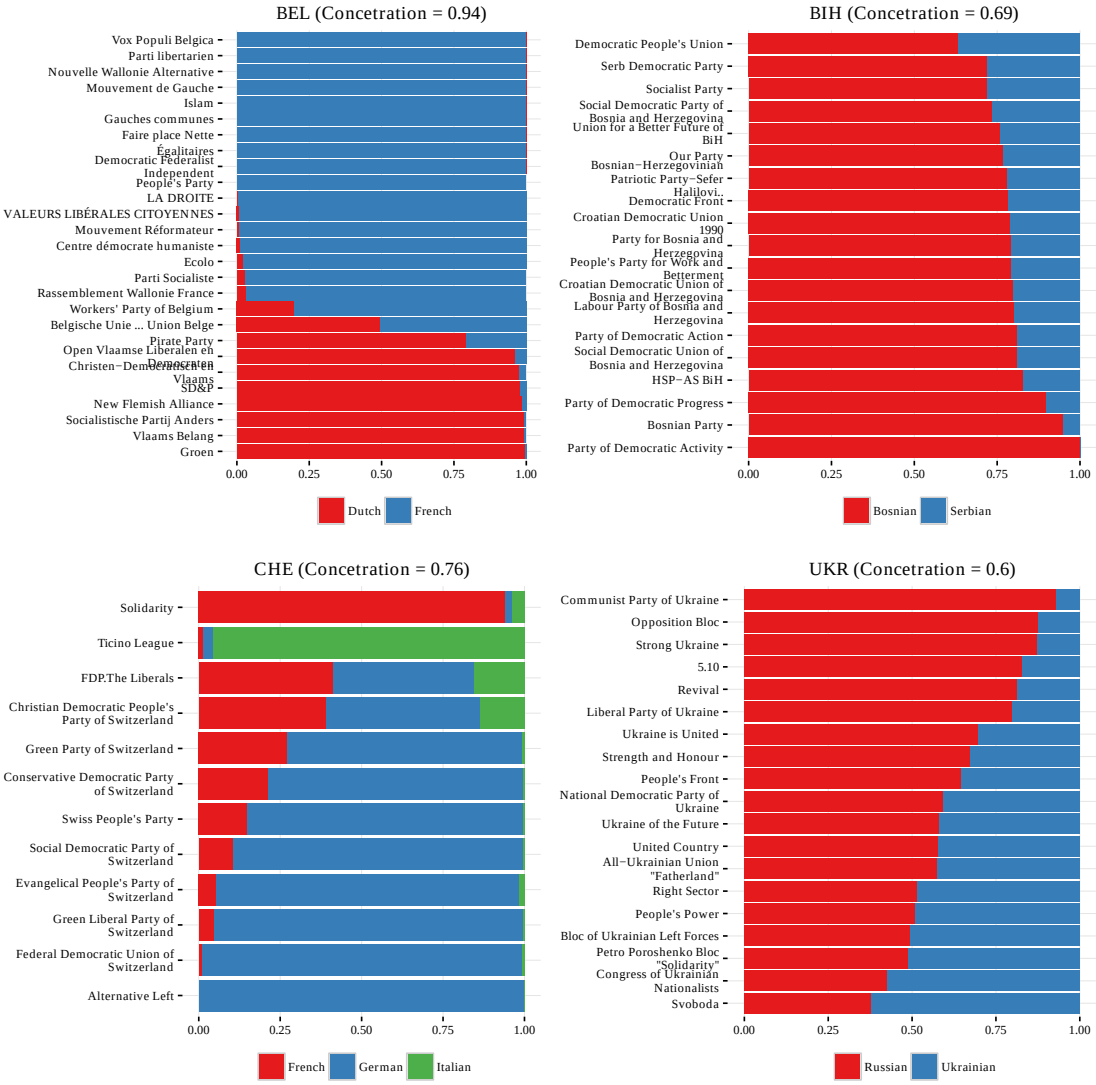


Figure 7: *Languages used in commenting on party pages and Herfindahl-Hirschman concentration coefficient*

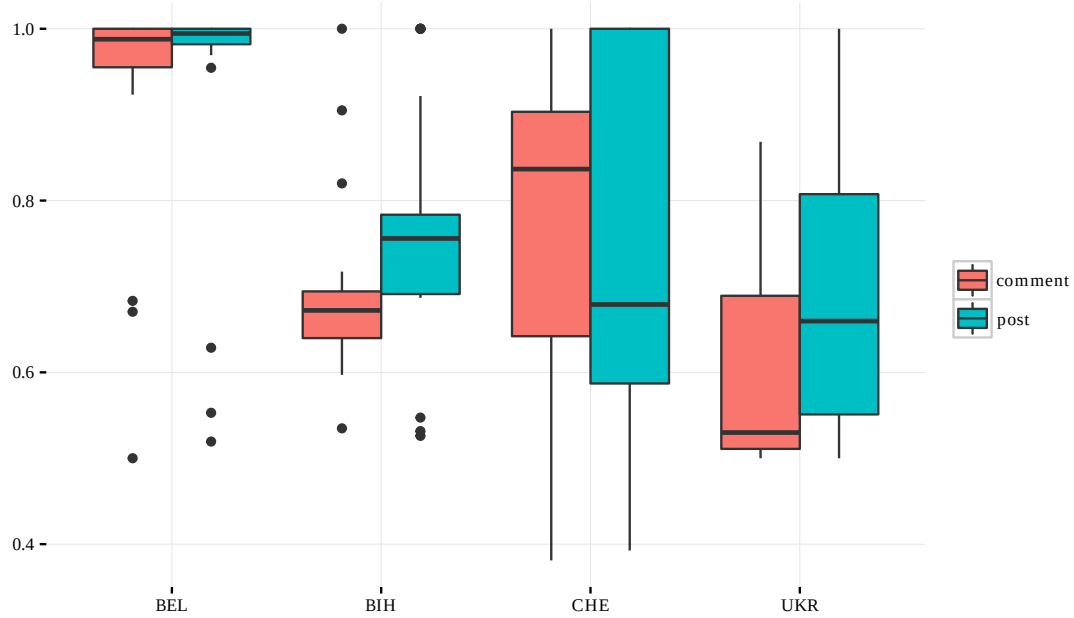


Figure 8: *Concentraion of language use in posts and comments by party*

4. Methods

4.1. Language classification

A language was assigned to each posting (Facebook post or comment) with a N-Gram-Based text categorisation algorithm (Cavnar & Trenkle, 1994) as implemented by the R package `textcat` (Hornik, Rauch, Buchta, & Feinerer, 2016). After the algorithmic categorisation few language categories were merged. Croatian, Bosnian and Slovenian postings - all written with Latin alphabet - were all grouped under the label *Bosnian*. Although Bosnia has officially three languages (Croatian, Bosnian and Serbian) they are all considered variations of Serbo-Croatian (see Greenberg, 2004). Because comments are generally composed only by few words, it is practically impossible to differentiate statistically between Bosnian, Croatian and Slovenian. Serbian and Russian postings - written in Cyrillic alphabet - were also assigned a unique label; the distinction between Russian and Serbian postings was of no concern since they were not co-present as languages in any of the four countries.

Since the interest is in comparing the relative frequency in the use of only the major languages of each country, I assigned a missing value to each language not included in the following list: for Belgium *Dutch* and *French*, for Switzerland *German*, *French* and *Italian*, for Ukraine *Ukrainian* and *Russian/Serbian* and for Bosnia *Bosnian* and *Russian/Serbian*. In total, the percentage of posts and comments mapped to one of the these language labels was respectively 80% and 71% in Belgium, 76% and 84% in Bosnia, 84% and 90% in Ukraine and 91% and 83%

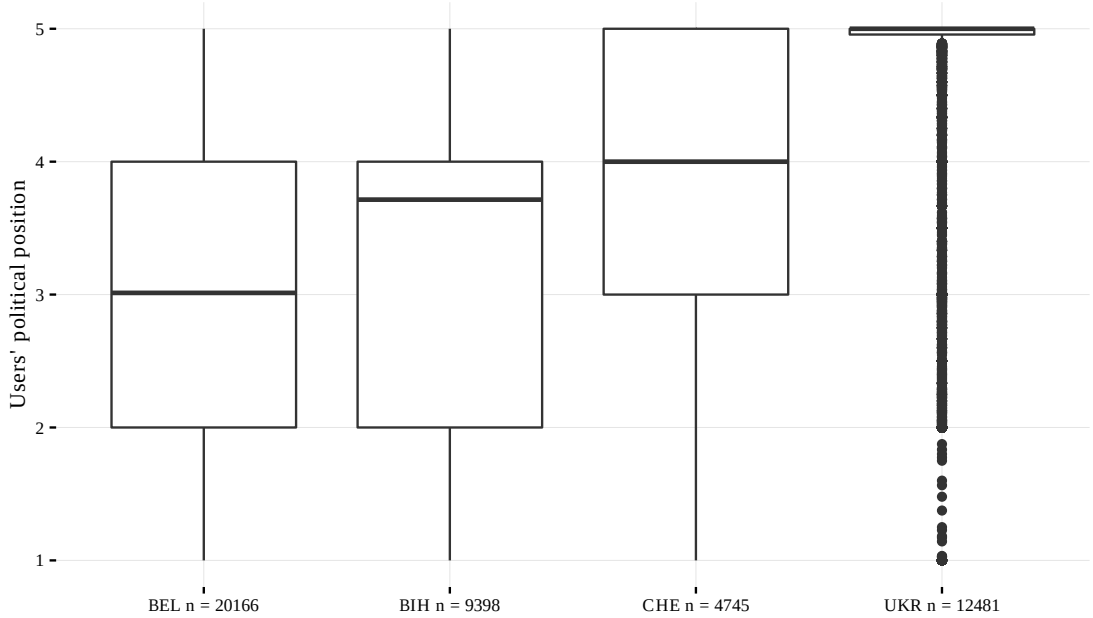


Figure 9: *Political position of users in the direct reply network of each country*

in Switzerland.

For parties and users a variable was created for each language measuring the relative proportion of postings in that language over the total number of postings in any language considered for that country. So, for example, a user who posted 9 times in total, of which 5 times in German, 1 time in French, 1 time in Italian and 2 times in English, on any of the Swiss pages, would be assigned a value of 0.71 for the variable `German` ($\frac{5}{5+1+1}$) and 0.14 for the variables `French` and `Italian` ($\frac{1}{5+1+1}$). For users, language variables were computed based on all postings (that is, Facebook posts or comments) published on any page linked to a party of a country. For parties only comments published on the corresponding pages were considered in computing the language variables.

4.2. Political classification of users

Users were categorised on the same 5-point scale used for parties. Their `political_position` variable was computed by assigning to each like the user expressed to post, the value of the party associated with the page and then averaging them. That is, if a user liked four posts published on two different pages linked to parties with a political position valued respectively as 3 and 4, the user would be assigned a value of 3.5 ($\frac{3+3+4+4}{4}$).

Figure 9 show the distribution of the political position of users included in the direct reply network (see next Subsection) for each country. In Belgium 63% of users active in this network were assigned a political position, 68% in Bosnia, 61% in Ukraine and 61% in Switzerland.

4.3. Party and user networks

In this paper, I use two typologies of networks: a *network of parties* where connections are drawn based on the number of comments received by each pair of party from the same user and a *network of users* where connections represent the number of direct replies exchanged among users.

The network of parties is a projection on parties of a bipartite network (that is, with two types of nodes) of parties and users. The bipartite network includes as nodes all parties and users postings on at least one of the pages linked to a party. By construction, in a bipartite network links only connect nodes of different type. In this case a user is connected to a party with every edge representing a posting the user has published on one of its pages. The projection on parties will transform the network from a *bi*partite into a *mono*partite network, dropping all the nodes representing users and drawing an edge between a pair of parties for each pair of edges that in the bipartite network connected a user to both parties. In other words, in the projected network, parties will have a number of connections that is proportional to the number of postings that they received from a common set of users.

The network of users maps the engagement among users. Nodes represent users that have either received or posted a direct reply. Direct replies are defined as comments that are either directed towards a post (in this case the user posing the comment is link to the user posting the post that was commented) or directed towards another comment. Importantly, in this case the edges of the network have a direction.

In Figures 10, 11, 12 and 13 are plotted the networks of parties of the four countries based on a force-directed layout algorithm, which positions nodes with stronger connections closer. The width of links is proportional to the number of comments that parties received from the same users. For each country, nodes are colour-coded according to the variable `political_position` (left panel) and language (right panel). From a visual analysis of the networks, it is again evident that the Belgium is strongly segregated along linguistic lines, which is instead not apparent in the network of other countries with the possible exception of Switzerland in which however most parties appear as being dominated by German postings.

Since, the network of parties of Belgium and (in a more limited way) Switzerland would suggest a degree of linguistic discrimination, I conduct a simple visual analysis of the density of connections within and among ethnolinguistic communities (which in both countries are quite homogeneous, see Figure 3). Figure 14 shows the connections within and between pages located in Wallonia and Flanders: the volume of connections within each community is much larger than the volume of connections between communities. Figure 15 shows instead the connection within and between Swiss cantons pertaining to the same linguistic community (with the exclusion of the canton of Bern, which hosts the federal government and many parties'

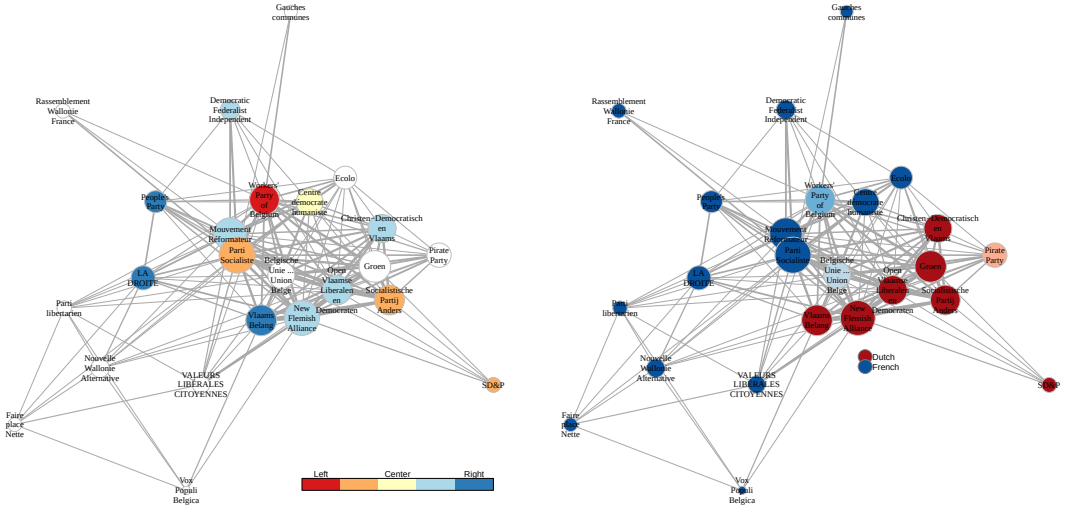


Figure 10: *Network of users' cross-party posting: Belgium*

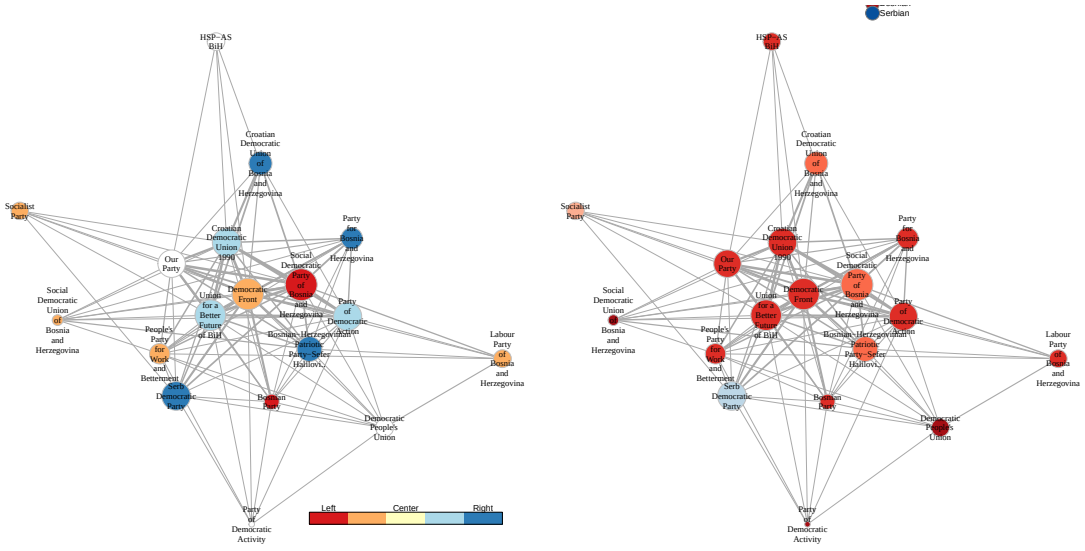


Figure 11: *Network of users' cross-party posting: Bosnia and Herzegovina*

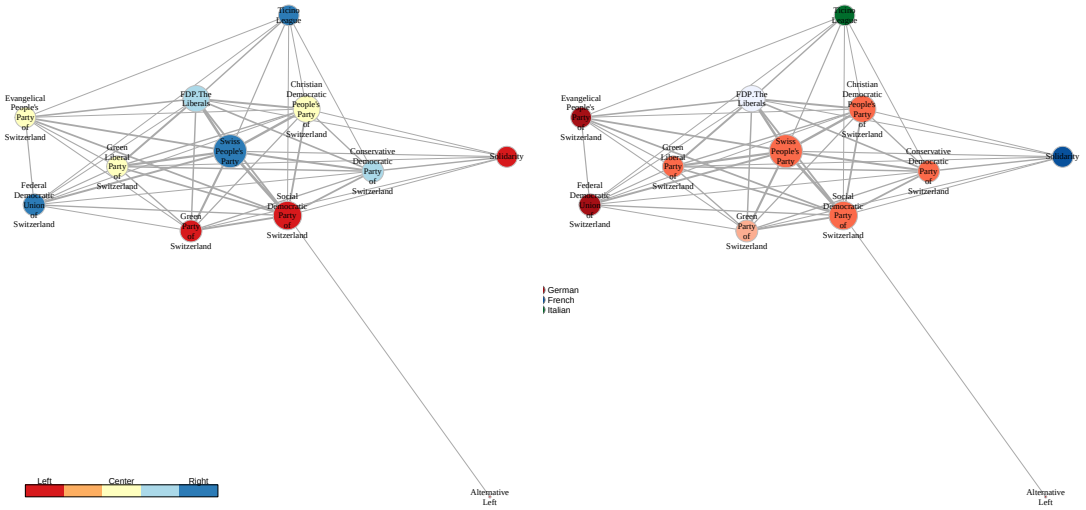


Figure 12: *Network of users' cross-party posting: Switzerland*

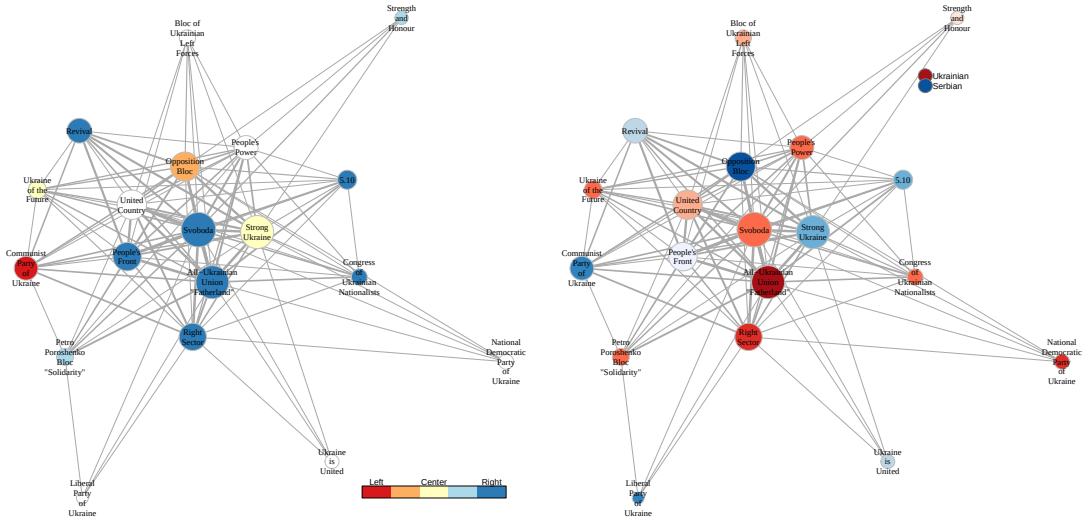
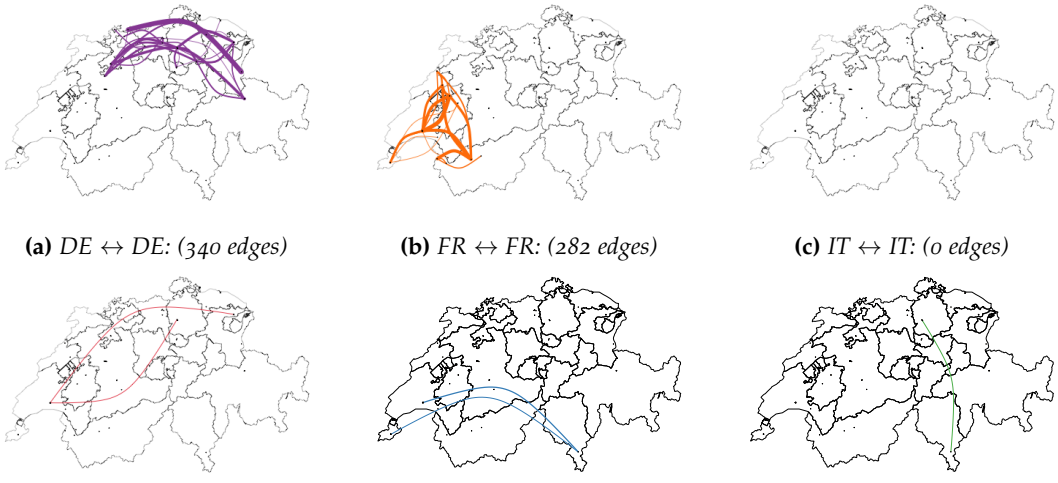


Figure 13: *Network of users' cross-party posting: Ukraine*

(a) *FR ↔ FR: (15,556 edges)* **(b)** *NL ↔ NL: (1,622 edges)* **(c)** *NL ↔ FR: (297 edges)*

Figure 14: *Cross-party users' posting within and among linguistic regions: Belgium*



(a) *DE ↔ DE: (340 edges)* **(b)** *FR ↔ FR: (282 edges)* **(c)** *IT ↔ IT: (0 edges)*

(d) *FR ↔ DE: (2 edges)* **(e)** *FR ↔ IT: (5 edges)* **(f)** *IT ↔ DE: (1 edge)*

Figure 15: *Cross-party users' posting within and among linguistic regions: Switzerland*

headquarters).

4.4. Exponential random graph models

In order to explore whether it is possible to statistically infer any association between languistic profile and political position of networks' nodes (that is, parties and users) and the likelihood of observing the formation of connections between nodes I specify different exponential random graph models (ERGMs) and fit them to data of the four countries. ERGMs simulate a large set of possible network realisations (with the same number of nodes but different combinations of edges) and test their similarity to an observed network, given its structure and features of interest. In so doing, ERGMs are able to drop the assumption of independence among observations (edges), which is highly unrealistic especially in social networks.

Because the networks observed are *dynamic* networks, with edges created at specific points in time within the 121-day window, I model temporality by specifying a temporal exponential random graph model (TERGM) for parties as implemented in the R package (Leifeld, Cranmer,

& Desmarais, 2016) and an ordered series of consecutive ERGMs for users as implemented in the R package (Handcock et al., 2016). There are two reasons for this dual approach. First, a TERGM assumes the same set of nodes across time. If this is reasonable for parties, which are clearly a constant presence in the 121-day period around the election, is less so for users who in most cases appear only once in the dataset. In other words, if it is reasonable to assume that the network of parties at t_1 is equal (in terms of nodes) to the network of parties at t_{121} it is also reasonable to assume that the network of users (who are much more volatile) at t_1 is different even to the network of users at t_2. Second, because TERGM implies a constant set of nodes, modelling a network with tens of thousands of nodes will be computationally extremely demanding.

The series of 121 networks of parties (one for each day) is composed by *simple* networks with the same number of nodes where the relation between any pair of parties is described by the presence or absence of only one edge. That is, whether two parties have one or multiple connections is indifferent. In the case of networks of users, ERGM is fit on simple networks (again, an edge is either present or absent) corresponding to interactions occurring during one day and including only nodes active that day, either because *replying to someone* or *being replied by someone*.

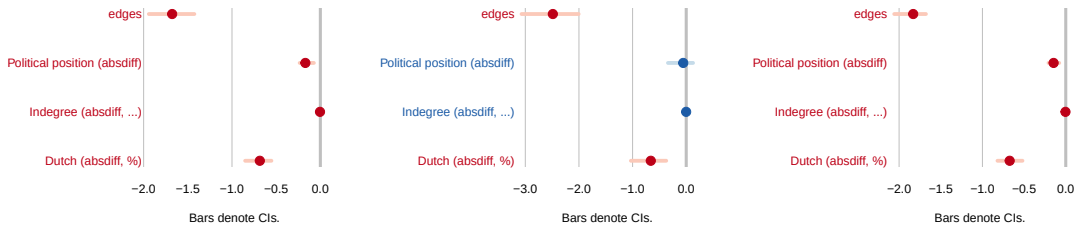
5. Results

5.1. Parties

The results from the TERM of party networks are returned for three periods. Given the 121-day window around the election, with the election being held on t_{91}, I fit a TERGM for the periods $t_1 - t_{91}$, $t_{92} - t_{121}$ and $t_1 - t_{121}$. Results for each countries are plotted from Figure 16 to Figure 16. The networks features that are modelled are the absolute difference in `political_position` among parties, the absolute difference of squared indegree, and the absolute difference in the relative use of the main language, which can vary between 0 and 1 (by construction all language variables are highly correlated and thus only one is added as network feature). The coefficient tables are presented in Appendix.

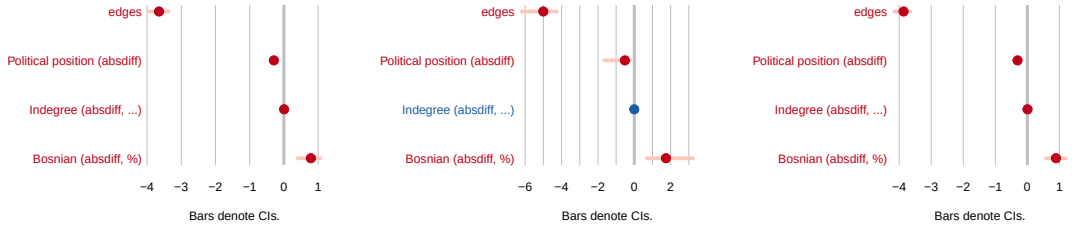
The first result is that the difference in political position is negatively and significantly associated with the likelihood of observing a node between any pair of nodes in any given day in any period (with the only exception of Belgium, limited to the period after the election). This indicates that notwithstanding any degree of inter-ethnic conflictuality, political positioning is a significant predictor of cross-party engagement.

Second, we observe that the difference in language is always associated with *less* engagement only in Belgium and Switzerland, while in Ukraine we observe that it stops being a



(a) *Before election: Belgium* **(b)** *After election: Belgium* **(c)** *Entire period: Belgium*

Figure 16: *Temporal ERGM on cross-party network: Belgium*



(a) *Before election: Bosnia and Herzegovina* **(b)** *After election: Bosnia and Herzegovina* **(c)** *Entire period: Bosnia and Herzegovina*

Figure 17: *Temporal ERGM on cross-party network: Bosnia and Herzegovina*

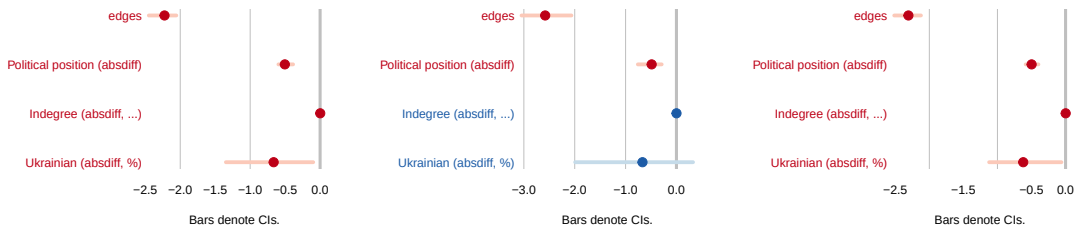
significant predictor for engagement in the period following the election while in Bosnia is always associated with *more* engagement, thus suggesting the presence of heterophily.

5.2. Users

The results of the series of ERGMs also indicate that political distance among users is associated with a lower likelihood of observing engagement across countries and across time. The coefficient for the absolute difference of `political_position` is significantly negative in 98% of the days in Bosnia, 90% in Belgium and Ukraine and 81% in Switzerland.

The relevance of the difference in language among users is instead not similar in the different countries. Belgium confirms again to be the most ethnolinguistically segregated country: difference in language is associated with a significant and negative likelihood to observe a tie among users during 91% of the days. In Switzerland the segregation is less but still strong and with the coefficient being negative and significant in 80% of the daily networks. In Ukraine we observe a negative and significant coefficient only 46% of the times while in Bosnia we do not observe it at all.

Coefficients and its standard errors for the two main variables, along with the number of



(a) *Before election: Ukraine* **(b)** *After election: Ukraine* **(c)** *Entire period: Ukraine*

Figure 18: *Temporal ERGM on cross-party network: Ukraine*

(a) *Before election: Switzerland* **(b)** *After election: Switzerland* **(c)** *Entire period: Switzerland*

Figure 19: *Temporal ERGM on cross-party network: Switzerland*

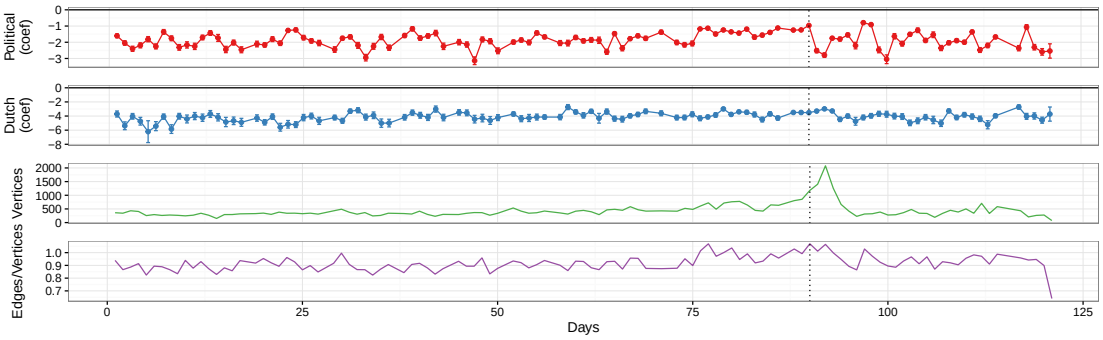


Figure 20: *ERGM on users' direct reply network: Belgium*

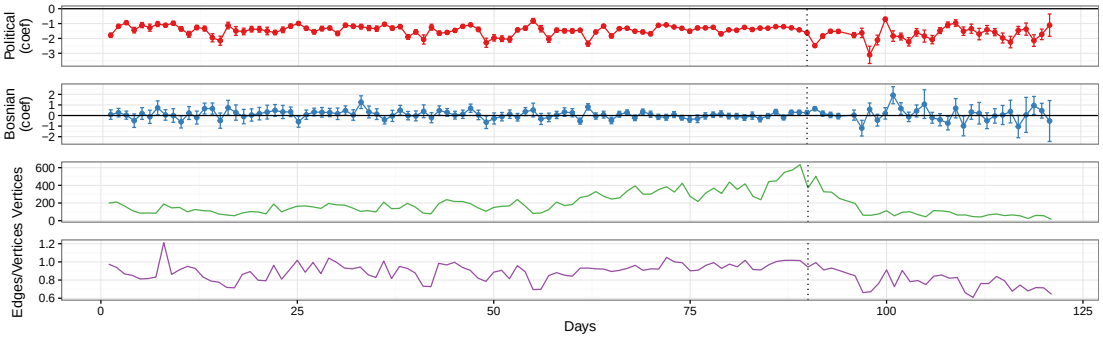


Figure 21: *ERGM on users' direct reply network: Bosnia and Herzegovina*

nodes active in every network and the evolution of the proportion between edges and nodes are plotted from Figure 20 to Figure 23.

5.3. The Ukrainian 2014 crisis

The results presented so far seem to indicate that contrary to what the theory would suggest, segregation along ethnolinguistic lines as measured by user interactions taking place on Facebook is stronger in more stable countries: in Belgium and Switzerland cross-linguistic

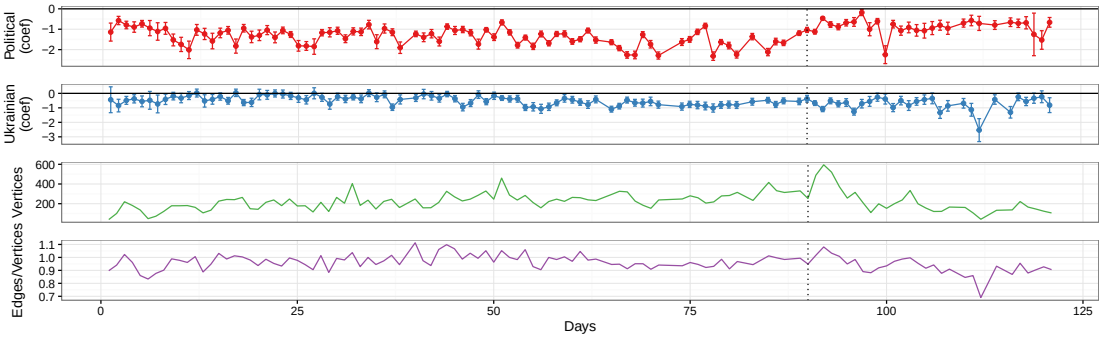


Figure 22: *ERGM on users' direct reply network: Ukraine*

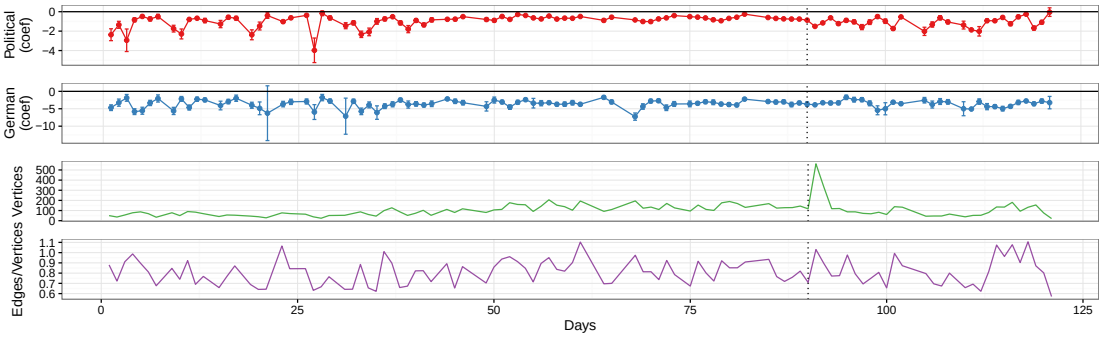


Figure 23: *ERGM on users' direct reply network: Switzerland*

interactions are rare while they are more frequent in Ukraine and Bosnia. There are of course a number of possible explanations for this that do no involve the level of political stability. To cite just two, the specific party system of each country, which as we saw is segregated by design in Belgium, and the multi-linguistic competences of the population: most of the Ukrainian population is bilingual while the languages spoken in Bosnia are extremely close (and some would even suggest that there is in fact only one language). To try to respond to missing-variable issues that necessarily arise in a comparative exercise, I explore whether it is possible to measure different level of linguistic segregation within the same country but at different points in time.

Specifically, since it would appear from these results that more inter-ethnic tension is associated with *more* cross-ethnic engagement, I fit a ERGM model to each of a series of users' networks constructed from user interactions taking place on the same set of Ukrainian pages used in the previous analysis for a period of 182 days, between December 2013 and June 2014. The period covers the beginning of the military crisis in Eastern Ukraine, which escalated following the Russian annexation of Crimea in February 2014.

Figure 24 shows the frequency of comments posted in Russian and Ukrainian during the crisis. Although Russian comments are more numerous, the two series are clearly strongly cross-correlated.

Figure 25 presents as before the coefficients and corresponding standard errors for each ERGM. In order to understand whether the significance of language's difference on tie formation did change across time, I created a binary variable for each day that assumes the value of 1 if the difference in language in significant and negative and 0 if it is either above zero or non significant. I finally calculated the moving average of the variable (with a window of 7 days) that is plotted in the second panel from the top of Figure 25. Accordingly, it appears that the weekly average of the number of days in which differences in language use among users is negative and significant decreases visibly after the Crimea annexation. That is, as the crisis

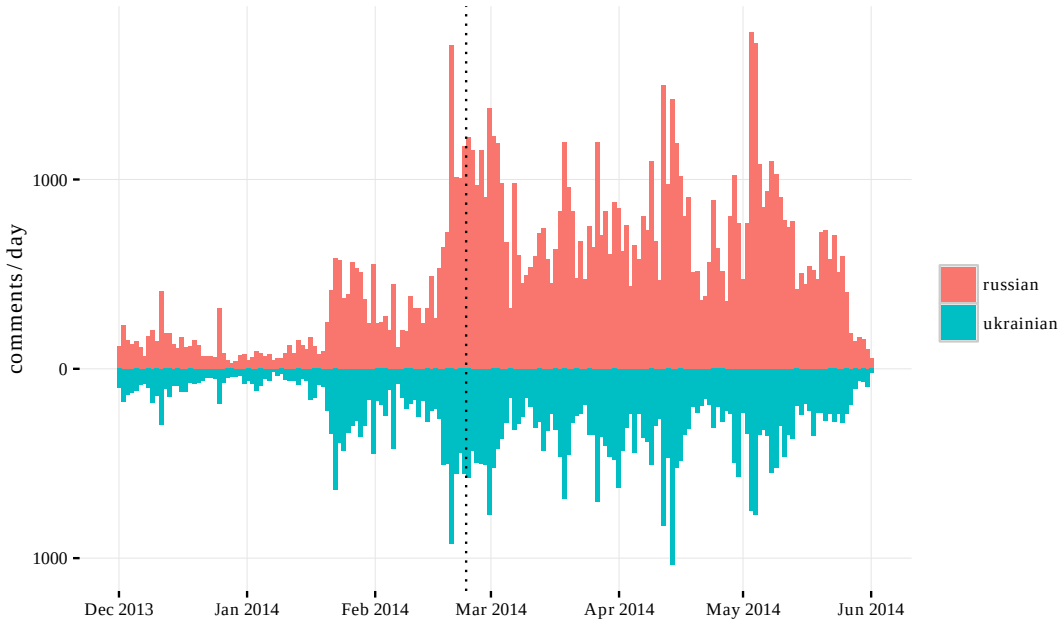


Figure 24: *Fequency of Facebook comments around the 2014 Ukrainian crisis*

escalated the two groups engaged more on Facebook.

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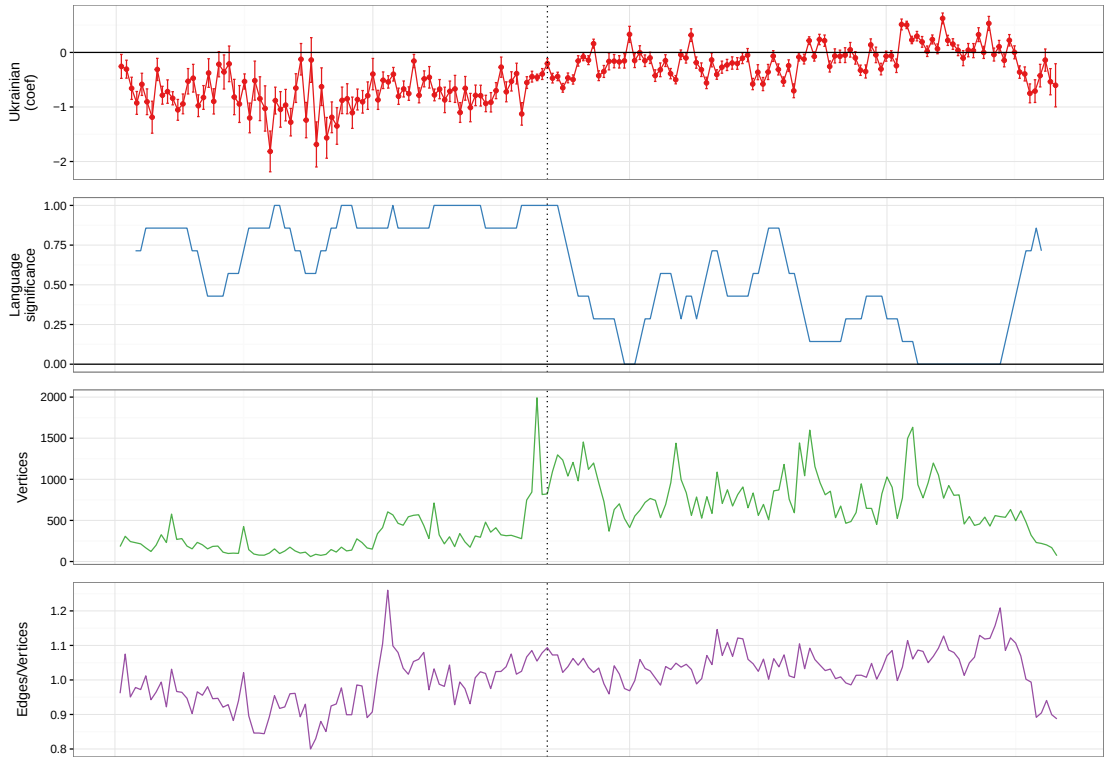

Figure 25: *ERGM on users' direct reply network: 2014 Ukrainian crisis*

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6. Appendix

country	name	political position	homapage(s)	Facebook pages(s)
BEL	Belgische Unie – Union Belge		http://www.belgischeunie.be/, http://www.belgischeunie.be/	399712536898887, 19512934872
BEL	Centre démocrate humaniste	Centre to Centre-left	http://www.lecdh.be/	189649407806135
BEL	Christen-Democratisch en Vlaams	Centre-right	http://www.cdenv.be/	52997544531
BEL	Democratic Federalist Independent	Centre-right	http://www.defi.eu/	173518112695794
BEL	Ecolo		http://www.ecolo.be/	38296327361
BEL	Groen (political party)		http://www.groen.be/	84920854319
BEL	Libertair, Direct, Democratisch		http://www.ldd.be/	
BEL	Mouvement Réformateur	Centre-right	http://www.mr.be/	236330169511
BEL	New Flemish Alliance	Centre-right	http://www.n-va.be/	334361224413
BEL	Open Vlaamse Liberalen en Democraten	Centre-right	http://www.vld.be/	53668151866
BEL	Parti Socialiste (Belgium)	Centre-left	http://www.ps.be/	518402351504731
BEL	People's Party (Belgium)	Right-wing to Far-right	http://www.partipopulaire.be/	482811111771571
BEL	Pirate Party (Belgium)		http://pirateparty.be/	231023945795
BEL	Rassemblement Wallonie France		http://rwf.be/	548897938460111
BEL	ROSSEM		http://www.partijrossem.be/	118170895006747
BEL	Socialistische Partij Anders	Centre-left	http://www.s-p-a.be/	57253967150
BEL	Vlaams Belang	Far-right	http://www.vlaamsbelang.org/	56605856504
BEL	Walloon Rally		http://www.rassemblementwallon.be/	194942273849808
BEL	Workers' Party of Belgium	Far-left	http://www.ptb.be/, http://www.pvda.be/	53838654385, 54970503767
BEL	Gauches communes		http://www.reprenonsnoscommunes.be/	185995984852019
BEL	Islam (parti politique belge)		http://www.islam2012.be/	622450714463135
BEL	Mouvement de Gauche (Belgique)		http://www.lemg.be/	743922312335823
BEL	Mouvement Nation		http://www.nation.be	1602667783297798
BEL	Parti libertarien (Belgique)		http://www.parti-libertarien.be	345703318848516
BEL	PVGW	Centre-left		
BEL	SD&P	Centre-left	http://www.sdenp.be/	261921637307063
BEL	LA DROITE	Right-wing	http://www.la-droite.be/	142363512581362
BEL	LaLutte-DeStrijd	Far-left	https://lalutte.org/	
BEL	Nouvelle Wallonie Alternative			396555960360552
BEL	FW			
BEL	VALEURS LIBÉRALES CITOYENNES		http://www.parti-vlc.be/, http://www.parti-vlc.be/, http://www.parti-vlc.be/	2218885780011782, 461211594005815, 297905810299809
BEL	Wallonie D'abord	Right-wing	http://www.walloniedabord.be/	
BEL	Agora Erasmus		http://www.agora-erasmus.be/	1206234702737108
BEL	Égalitaires			300367176780943
BEL	MOVE		http://www.move-belgium.be/	
BEL	Vox Populi Belgica		http://www.voxpopulibelgica.be/, http://www.voxpopulibelgica.be/	484056401722929, 1428134830768458
BEL	Faire place Nette			629521040459564

BEL	P+		http://www.partiplus.be/	
BEL	Lutte Ouvrière		http://lutte-ouvriere.be/	308951415837958
BEL	MGJOD		http://www.mgjod.org/	
BEL	PP. Parti Pensionnés		http://partidespensionnes.e-monsite.com/	608962265812479
BEL	CIM			
BIH	HSP-AS BiH			218305558329097
BIH	HSP HB		http://hspherceg-bosne.org/	712883838832851
BIH	Alliance of Independent Social Democrats	Centre-left	http://www.snsd.org/	124556640906879
BIH	Bosnian Party	Left-wing	http://www.boss.ba/	662053183871626
BIH	Bosnian-Herzegovinian Patriotic Party-Sefer Halilović	Far-right	http://www.bps-seferhalilovic.ba/	404809152895907
BIH	Croatian Christian Democratic Union (Bosnia and Herzegovina)		http://hkdu.info/	
BIH	Croatian Democratic Union 1990	Center-right	http://www.hdz1990.org/	603715953011065
BIH	Croatian Democratic Union of Bosnia and Herzegovina	Right-wing	http://www.hdzbih.org/	259660607546285
BIH	Croatian Party of Rights of Bosnia and Herzegovina	Far-right	http://hsp-bih.ba/	
BIH	Croatian Peasant Party of Stjepan Radić		http://www.hss-nhi.ba/	
BIH	Democratic Front (Bosnia and Herzegovina)	Centre-left	http://www.demokratskafronta.ba/	472665816139317
BIH	Democratic People's Alliance	Center	http://www.dnsrs.org/	1513366702239552
BIH	Democratic People's Union		http://dnzbih.ba//	343107425781805
BIH	Labour Party of Bosnia and Herzegovina	Center-left	http://laburistibih.ba/	807754219250501
BIH	National Democratic Movement (Bosnia and Herzegovina)		http://www.ndprs.org/	1335475333136186
BIH	Our Party (Bosnia and Herzegovina)		http://www.nasastranka.ba/	493542940657979
BIH	Party for Bosnia and Herzegovina	Right-wing	http://www.zabih.ba/	312287496561
BIH	Party of Democratic Action	Centre-right	http://www.sda.ba/	124556640906879
BIH	Party of Democratic Activity		http://www.asda.ba/	417712971618141
BIH	Party of Democratic Progress	Centre-right	http://www.pdp.rs.ba/	803575396438897
BIH	Party of Justice and Trust	Centre-right	http://www.spp-bih.org/	451935498217297
BIH	People's Party for Work and Betterment	Centre-left	http://www.zaboljitak.ba/	119734424717765
BIH	Serb Democratic Party (Bosnia and Herzegovina)	Right-wing	http://www.sdsrs.com/	48293436089
BIH	Serbian Progressive Party	Centre-right to Right-wing	http://www.sns.org.rs/	
BIH	Social Democratic Party of Bosnia and Herzegovina	Left-wing	http://www.sdp.ba/	429813513718776
BIH	Social Democratic Union of Bosnia and Herzegovina	Centre-left	http://www.sdu.ba/	306450369472227

BIH	Socialist Party (Bosnia and Herzegovina)	Centre-left	http://www.socijalisti.ba/	153324094686816
BIH	Union for a Better Future of BiH	Centre-right	http://www.sbb.ba/	140165172690107
BIH	Social Democratic Union - Union for Us All			
BIH	DSI			
BIH	Communist Party			
BIH	Diaspora Party			
BIH	Tomo Vukić			
BIH	New Movement			
CHE	Alternative Left	Left-wing	http://www.la-gauche.ch/, http://alternative-linke.ch/	378377155573032, 986390828121416
CHE	Christian Democratic People's Party of Switzerland	Centre to Centre-right	http://www.cvp.ch/	169510248558
CHE	Christian Social Party (Switzerland)	Centre-left	http://www.csp-pcs.ch/	
CHE	Conservative Democratic Party of Switzerland	Centre-right	http://www.bdp.info/index.php	128506967229819
CHE	Evangelical People's Party of Switzerland	Centre	http://www.evppev.ch/	110533229026103
CHE	FDP.The Liberals	Centre-right	http://fdp-gr.ch/, http://www.fdp.ch/, http://www.plr.ch/, http://www.plrt.ch/	121293227966720, 15733998334, 18087904183, 176998335660824
CHE	Federal Democratic Union of Switzerland	Right-wing	http://www.edu-schweiz.ch/cms/	216444012216
CHE	Geneva Citizens' Movement	Right-wing	http://www.mcge.ch/	
CHE	Green Liberal Party of Switzerland	Centre	http://www.grunliberale.ch/	126289610761942
CHE	Green Party of Switzerland	Left-wing	http://www.gruene.ch/	194790813901953
CHE	Social Democratic Party of Switzerland	Centre-left to Left-wing	http://www.sp-ps.ch/	97220294896
CHE	Solidarity (Switzerland)	Left-wing to Far-left	http://www.solidarites.ch/	164916837772
CHE	Swiss Democrats	Right-wing	http://www.schweizer-demokraten.ch/	821796194556997
CHE	Swiss People's Party	Right-wing	http://www.svp.ch/, http://www.udc.ch/	1623732872399 57, 212297922293183
CHE	Ticino League	Right-wing	http://www.lega-dei-ticinesi.ch/	172164223821
UKR	5.10	Right-wing	http://510.ua/	15084234760373 16
UKR	All-Ukrainian Union "Fatherland"	Centre-right to Right-wing	http://ba.org.ua/	187313651306746
UKR	Civil Position		http://www.grytsenko.com.ua/	
UKR	Communist Party of Ukraine	Left-Wing to Far-Left	http://kpu.ua/uk	229459093794789
UKR	Congress of Ukrainian Nationalists	Far-right	http://www.cun.org.ua/	129066394139
UKR	Internet Party of Ukraine		http://www.ipu.com.ua/	
UKR	Liberal Party of Ukraine		http://www.lpu.org.ua/	252909531452266
UKR	New Politics (Ukraine)		http://new-politics.org.ua/	
UKR	Opposition Bloc	Centre-left	http://opposition.org.ua/	1558402417714140
UKR	Party of Greens of Ukraine		http://www.greenparty.ua/	
UKR	People's Front (Ukraine)	Right-wing	http://nfront.org.ua/	1551281798438150

UKR	Petro Poroshenko Bloc "Solidarity"	Centre-right	http://solydarnist.org/	832922343451368
UKR	Radical Party of Oleh Lyashko	Left-wing	http://liashko.ua	
UKR	Revival (Ukraine)	Centre-right to Right-wing	http://www.vidrodzhennya.org.ua/	876831272376422
UKR	Right Sector	Far-right	http://pravyysektor.info/	223479324489867
UKR	Self Reliance (political party)	Centre-right	http://samopomich.ua/	
UKR	Strong Ukraine	Centre	http://silnaukraina.com/	136942293004621
UKR	Svoboda (political party)	Far-right	http://www.svoboda.org.ua/	159287674121800
UKR	Ukraine of the Future	Centre	http://um.ua/ua	216633215052014
UKR	Ukrainian Party "Green Planet"		http://www.zelenaplaneta.org.ua/	
UKR	Zastup (political party)		http://zastup.org.ua/	
UKR	Bloc of Ukrainian Left Forces		http://blsu.com.ua/	1523832894514122
UKR	Ukraine is United		http://uayedynakraina.com/ua	1500774780160714
UKR	National Democratic Party of Ukraine		http://ndemocratic.org.ua/	1427618324155716
UKR	Ukrainian Civil Movement		http://gru29.org/	1028887660462036
UKR	Strength and Honour	Centre-right	http://www.sylaichest.org/	300944746733086
UKR	People's Power		http://sylalyudey.org/	585042761520974
UKR	Solidarity of Ukrainian Women	Left-wing	http://www.solidarity.org.ua/	464022056959947
UKR	United Country			1421546604789082

Table 2: *List of political parties*

Centre-left to Left-wing	1
Far-left	1
Left-wing	1
Left-wing to Far-left	1
Centre-left	2
Centre	3
Centre to Centre-left	3
Centre to Centre-right	3
Centre-right	4
Centre-right to Right-wing	5
Far-right	5
Right-wing	5
Right-wing to Far-right	5

Table 3: *Mapping of political positions*

	Before election	After election	Entire period
edges	−1.68*	−2.49*	−1.83*
	[−1.94; −1.43]	[−3.07; −2.01]	[−2.06; −1.68]
Political position (absolute difference)	−0.17*	−0.06	−0.15*
	[−0.23; −0.07]	[−0.34; 0.13]	[−0.21; −0.08]
Indegree (absolute difference, root-squared)	−0.00*	−0.00	−0.00*
	[−0.01; −0.00]	[−0.00; 0.00]	[−0.00; −0.00]
Dutch (absolute difference, percentage points)	−0.69*	−0.66*	−0.67*
	[−0.85; −0.55]	[−1.03; −0.37]	[−0.82; −0.52]
Num. obs.	7020	2262	9360

* o outside the confidence interval

Table 4: *Temporal ERGM on cross-party network: Belgium*

	Before election	After election	Entire period
edges	−3.65*	−5.00*	−3.86*
	[−3.95; −3.37]	[−6.20; −4.26]	[−4.16; −3.66]
Political position (absolute difference)	−0.29*	−0.52*	−0.31*
	[−0.37; −0.23]	[−1.64; −0.21]	[−0.38; −0.24]
Indegree (absolute difference, root-squared)	0.01*	−0.00	0.01*
	[0.00; 0.01]	[−0.02; 0.01]	[0.00; 0.01]
Dutch (absolute difference, percentage points)	0.79*	1.74*	0.89*
	[0.41; 1.07]	[0.69; 3.23]	[0.58; 1.20]
Num. obs.	10800	3480	14400

* o outside the confidence interval

Table 5: *Temporal ERGM on cross-party network: Bosnia and Herzegovina*

	Before election	After election	Entire period
edges	−2.85*	−1.89*	−2.72*
	[−3.29; −2.45]	[−3.03; −0.91]	[−3.15; −2.25]
Political position (absolute difference)	−0.28*	−0.64*	−0.33*
	[−0.40; −0.17]	[−0.95; −0.36]	[−0.47; −0.21]
Indegree (absolute difference, root-squared)	0.01*	0.00	0.01*
	[0.00; 0.01]	[−0.01; 0.02]	[0.00; 0.01]
German (absolute difference, percentage points)	−2.65*	−10.40*	−3.24*
	[−3.85; −1.71]	[−16.70; −5.93]	[−4.69; −2.27]
Num. obs.	5940	1914	7920

* o outside the confidence interval

Table 6: *Temporal ERGM on cross-party network: Switzerland*

	Before election	After election	Entire period
edges	-2.22^*	-2.58^*	-2.31^*
	$[-2.45; -2.06]$	$[-3.05; -2.06]$	$[-2.52; -2.12]$
Political position (absolute difference)	-0.50^*	-0.49^*	-0.50^*
	$[-0.60; -0.39]$	$[-0.76; -0.29]$	$[-0.59; -0.40]$
Indegree (absolute difference, root-squared)	0.00^*	0.00	0.00^*
	[0.00; 0.00]	$[-0.00; 0.00]$	[0.00; 0.00]
Dutch (absolute difference, percentage points)	-0.66^*	-0.67	-0.62^*
	$[-1.35; -0.10]$	$[-1.99; 0.33]$	$[-1.12; -0.06]$
Num. obs.	7020	2262	9360

* o outside the confidence interval

Table 7: *Temporal ERGM on cross-party network: Ukraine*