Tweeting the campaign: Evaluation of the Strategies performed by Spanish Political Parties on Twitter for the 2011 National Elections

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Abstract

Social networks have become repositories of Big Data that can be mined and analyzed to gain insights into the activities and preferences of Internet users. The present research relies on a large dataset from Twitter to examine emotional content, activity patterns and interaction networks of political parties and politically active users during the campaign for the Spanish national elections of November 2011.

Our results show remarkable differences in political parties according to the diffusion and communication dynamics within the microblogging network. The study of the networks generated by the main parties allows us to identify different strategies depending on the characteristics of the analyzed parties in the offline word. Furthermore, we discuss the adaptation of the political structures of the parties to this new communication and organizational paradigm emerged from Internet and online social networks.

Introduction

The role of social media in electoral campaigns has begun to take importance in recent years. The presence of millions of users exchanging messages in microblogging networks represents a new mass communication channel to be exploited. The new functionalities provided by these technologies range from their use as a platform for spreading propaganda to their opportunities for generating spaces of debate between politicians and / or citizens.

In Spain, the law determines the appearance of political contents in traditional mass-media during electoral campaigns. As explained below, the greater access to media by political parties with greater representation becomes an obstacle to minority and new

parties. The absence of laws that establish clear conditions of use related to social media makes social networking a free communication channel for political purposes. Therefore, one would expect different strategies in such parties to take advantage of new opportunities offered by social networks in order to acquire voters.

Microblogging networks, particularly Twitter, bring new types of communication between users in comparison with other social networks such as Facebook, Hi5 and Tuenti. On Twitter most of the contents are public, even outside the network. Users are able to interact with each other without prior agreements as friend requests. This design encourages message exchange between users and converts these networks to large spaces of debate. Because of the novelty of microblogging networks in Spain, there are not standardized best practices for political communication yet. Therefore, the analysis of interactions between members of political parties allows us to characterize the existing communication on these platforms and the adaptation of the traditional political structures in the offline world to a new paradigm in a network-based online system.

The organization of the paper is as follows. Next section introduces the background and system of the Spanish election. Then, we analyze the related work to dynamics on Internet and online social networks during electoral campaigns. We continue with the research questions of the study, the specification of collection of the dataset and a brief description of the methodology. Next, we present the results of the evolution of the number of tweets and the affective content, the hashtags usage, the diffusion and communication dynamics, and the comparison between the elections results and Twitter engagement. We conclude with the discussion of the results, further research and references.

Background on the Spanish election

The transition from the Francoist authoritarian dictatorship to the current democratic system started in 1975. The first elections, in 1979, were held to form the constituent assembly that drafted the Constitution ratified by referendum in 1978. The first legislative elections took place in 1979 with the victory of the centrist party Unión de Centro Democrático (UCD), disbanded in 1983. The next elections were held in 1982 with the victory of Partido Socialista Obrero Español (PSOE). Since then, PSOE and Partido Popular (PP) have become the two major national parties alternating electoral victories and, therefore, the Government of Spain. The third national political party according to the legislative representation is Izquierda Unida, whose core is formed by the Communist Party of Spain. So far, it has not formed part of any national

government. During the democratic period, peripheral nationalist and regionalist parties have emerged. Their results in some elections, mostly in districts located in Catalonia and Basque Country, have allowed them to purchase certain power because of the need of pacts by PP and PSOE governments to achieve legislative majorities[1].

The 2011 Spanish national elections to the Congress and the Senate were celebrated on November 20th, after the 9th legislature presided by José Luis Rodríguez Zapatero, leader of PSOE. This mandate was marked by the global economic crisis with a larger effect in Spain due to the housing bubble and the high rate of unemployment. In fact, although the existence of other topics of interest such as the cessation of armed activity by the terrorist group ETA, the legislature and the electoral campaign focused mainly on issues related to economic topics.

Earlier in 2011, on May 22nd, there were also regional and municipal elections which led an important success of PP, the main opposition party at that time, which won in most regions and cities. The week prior to these elections, the protest movement 15M was born, also known as Indignados movement or Spanish Revolution. One of the central characteristics of this movement, without ties to political parties or trade unions, is the criticism of the social cuts; the political corruption; and the bipartisan electoral system which, according to the 15M movement, favors PSOE and PP. Its origin represented the convergence of several collectives and associations of citizens like Democracia Real YA! (Real Democracy NOW!); ATTAC (Association for the Taxation of Financial Transactions and for Citizens' Action); Anonymous; Juventud Sin Futuro (Youth without a Future); and #NoLesVotes (Don't vote for them), campaign to refuse to vote for PSOE, PP and Convergència i Unió (CiU) because of their support to a provision in Spain's Sustainable Economy Act (Sinde Law). The controversy of this law is the creation of a new commission to examine claims from copyright holders to websites considered as infringers of their copyright.

Because of the influence of the Arab Spring and unlike previous Spanish citizen initiatives, 15M movement was pioneer in the generation of diffusion and communication dynamics over the Internet and online social networks. The 15M movement communication networks on Twitter revealed a self-organized structure with a relative large number of information sources and abundant geo-centered, ideological and fame-related modules (Borge-Holthoefer, Rivero, García, Cauhé, Ferrer, et al. 2011; González-Bailón, Borge-Holthoefer, Rivero, and Moreno, 2011).

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[1] We denote national parties those with candidates in most Spanish districts. We denote nationalist parties those with candidates just in the districts corresponding to the specific peripheral nationalism and / or regionalism.

Spanish election system

The national elections determine the representatives in the Congress of Deputies, who finally decide the President of the Government, and the Senate. Although the Spanish legislative system is bicameral, the effective power of the Congress of Deputies is significantly higher than the power of the Senate. The Congress is composed of 350 deputies elected on the basis of proportional geographical representation with closed lists. The Spanish Constitution states that “the law distributes the total number of deputies, assigning a minimum initial representation to each district and the remainder is distributed in proportion to the population”. Currently, there are 52 districts whose minimum initial representation is fixed to two deputies, except for the autonomous cities Ceuta and Melilla where is fixed to one deputy. The parties that obtain a seat in the Congress must get at least 3% of the votes in the specific district they represent. This system has been continuously criticized by national parties with low representation and the ones that participate for the first time. The complaints are based on the fact that the system favors nationalist parties that concentrate their lists on a small set of districts and, specially, the two major parties, PP and PSOE, whose final representation is oversized according to the percentage of votes obtained globally.

The electoral law in Spain regulates the budget of political parties for the campaign. In particular, the law fixes: grants for the campaign of each party according to the results in the previous elections, thresholds to private donations, and prohibitions of donations from outside Spain. The electoral law also establishes an Electoral Board that regulates the media coverage during the campaign with respect to the principles of pluralism, equality, proportionality and neutrality of information. However, some under-represented parties claimed lack of coverage during the campaign. Some of these complaints were criticisms of holding a debate exclusively between the leaders of PSOE and PP on November 7th. Two days later another debate was held among members of 5 parties: PSOE, PP, IU, CiU and PNV. However, several other parties complained about their absence in it and the participation of representatives of PSOE and PP instead of the real candidates.

Related work

Internet and social media for electoral campaigns have been used intensively in recent years (Selnow, 1998; Davis, 1999; Webster, 2001; Klotz, 2004; Hendricks, and Kaid, 2010). The importance of social media, e.g. the microblogging network Twitter, as a communication and diffusion platforms was essential in the 2008 United States

presidential election. Its usage by Barack Obama, winning candidate, was decisive according to certain studies (Hendricks, and Denton 2010; Williams, and Gulati 2008). Later, an important number of academic studies have been conducted in electoral events (Burns, and Eltham 2009; Ammann, 2010; Jungherr, 2010; Holotescu, Gutu, Grosseck, and Bran, 2011). The activity and the networks generated within Twitter during electoral campaigns are also studied to validate their reliability as data sources for predicting elections results (O'Connor, Balasubramanya , Routledge, and Smith, 2010; Tumasjan, Sprenger, Sandner, and Welpe, 2010; Livne, Simmons, Adar, and Adamic, 2011; Bermingham, and Smeaton, 2011; Skoric, Poor, Achanuparp, Lim, and Jiang, 2012; Tjong Kim Sang, and Bos, 2012). However, there is also a sector of the academy that doubts about the results published so far (Jungherr, Jurgen, and Schoen, 2011; Metaxas, Mustafaraj, and Gayo-Avello, 2011).

In Spain, the emergence of the usage of social media in electoral campaigns occurred with certain delay. The first studies were conducted in the 2008 national elections, with blogs and online social networks like Facebook and Youtube as main platforms. (Peytibi, Gutiérrez-Rodríguez, and Ruby, 2008; Dader, 2009). The first studies focused on Twitter did not appear until the 2010 Catalan elections (Congosto, Fernandez, and Moro, 2011).

Research questions

Our study aims to address different questions about the use of Twitter during the campaign. Electoral campaigns contain events that produce peaks of activity in online social networks. The first objective of this study is to identify these peaks and to examine the degree of sensitivity of users who belong to political parties. We assume the hypothesis that emotions vary during the campaign. In this study we also analyze whether members of political parties show significant variations of the emotional load and when they occur. We are also interested on tracing evidence of political marketing techniques through hashtag usage. Moreover, we intend to evaluate the performance of these techniques in different political parties.

We take into consideration the statement that "the process of formation and exercise of power relationships is decisively transformed in the new organizational and technological context derived from the rise of global digital networks of communication as the fundamental symbol-processing system of our time" (Castells, 2009). Our study aims to show how the limits of the appearance of parties in traditional media during campaigns regulated by the Spanish electoral law forces parties with low parliamentary representation into alternative digital strategies. More exactly: the ratio of media

presence of each party is prioritized by the votes received in the previous election. Consequently, one would expect that parties with low parliamentary representation and first-time participants in the elections use social networks as a legislation-free platform for broadcasting messages and engaging future voters to overcome these limitations. The architecture of Twitter provides diffusion mechanisms, e.g. retweets. We intend to acquire a deeper understanding of the diffusion dynamics of different types of parties through the topological patterns of their propagation networks based on retweets.

We consider social networks not only as a space to spread propaganda, but also a mass self-communication channel: "it is also self-generated in content, self-directed in emission, and self-selected in reception by many who communicate with many" (Castells, 2009). We intend to characterize the communication dynamics between members of political parties though replies. We aim to identify if there is real and active debate between parties on Twitter or if "a significant share of this form of mass self-communication is closer to electronic autism than to actual communication" (Castells, 2009).

Data collection and methodology

We collected 3,074,312 political tweets published by 380,164 distinct users between November 4th and November 24th, 2011. Tweets were selected if they:

(1) contained a hashtag linked to the campaign, for example:

- Descriptives: #20n, #elecciones20n, #debate, #eldebate, #debate2011, #caraacara, #debattv3, #jornadadereflexion.
- Parties' slogans: #votapsoe, #peleaporloquequieres, #votapp, #sumatealcambio, #votaiu, #20nupyd, #votaequo, #ciu, #jobosch.
- Citizens' slogans: #15m, #nolesvotes, #seacaboelcirco, #ppsoe, #spanishrevolution[2].

(2) were written by a user previously identified as a member of the following political parties:

- PSOE (Partido Socialista Obrero Español): Social-democratic. Governing party in 1982-1996 and 2004-2011. Affiliated to the Party of European Socialists.

[2] Translation of hashtags: #caracara (face to face, debate between PSOE and PP candidates), #debattv3 (debate in Catalan TV3 channel), #jornadadereflexion (reflection day), #peleaporloquequieres (fight for what you want, PSOE slogan), #sumatealcambio (join the change, PP slogan), #jobosch (me - Alfred Bosch, ERC slogan) #seacaboelcirco (the circus is over), #ppsoe (PP and PSOE).

- PP (Partido Popular): Conservative. Governing party in 1996-2004 and since 2011. Affiliated to the European People's Party.
- IU (Izquierda Unida): Political coalition formed by leftists, greens, left-wing socialists and republican groups; with a preponderance of the Communist Party of Spain. Affiliated to Party of the European Left.
- UPyD (Unión Progreso y Democracia): Progressivist and social liberal party founded in 2007 by members of associations against peripheral nationalist and regionalist movements. No European affiliation.
- EQUO (Proyecto eQuo): Green political party founded in 2011 by members of non-governmental environmental organizations and other political parties, mostly from Izquierda Unida. No European affiliation but, according to its founders, inspired by the European Green Party.
- CiU (Convergència i Unió): Catalan nationalist political coalition formed by centre liberal and christian democrat parties (CDC and UDC respectively). CDC is affiliated to European Liberal Democrat and Reform Party and UDC is affiliated to European People's Party.
- ERC (Esquerra Republicana de Catalunya): Left wing Catalan independentist political party. Affiliated to European Free Alliance.
- Compromís (Coalició Compromís), PA (Partido Andalucista), FAC (Foro Asturias), BNG (Bloque Nacionalista Galego), EAJ-PNV (Euzko Alderdi Jeltzalea-Partido Nacionalista Vasco), PIRATA (Partido Pirata), NaBai (Nafarroa Bai), CHA (Chunta Aragonesista), CC (Coalición Canaria), UPN (Unión del Pueblo Navarro) and PAR (Partido Aragonés): nationalist except for PIRATA. As we observe in Table 1, their presence in Twitter is considerably lower. Therefore, we collected their tweets but we did not take them into account in the analysis by party.

(3) were written by a user previously identified as an activist, journalist, radio/television program, mass media channel focused on the campaign.

(4) mentioned the following political party/candidate profiles:

- PSOE: @PSOE, @conRubalcaba
- PP: @PPopular, @marianorajoy
- IU: @iunida, @cayo_lara
- UPyD: @UPyD
- EQUO: @ProyectoEquo, @juralde
- CiU: @ciu, @ciuduran2011
- ERC: @Esquerra_ERC, @AlfredBosch

We frequently supervised the hashtags related to the campaign in order to update the values of the first criteria and, therefore, increase the coverage of collected tweets.

category	number of users	number of tweets
psoe	888	103257
pp	489	63650
upyd	235	60738
erc	544	36197
iunida	188	24037
ciu	331	19829
equo	50	13558
compromis	83	4752
pa	36	2636
fac	17	1981
bng	13	1767
eaj-pnv	29	1424
ppirata	12	1414
na-bai	12	1346
cha	13	1275
cc	10	924
upn	10	247
par	9	130
activist	408	109281
journalist	226	46039
mass media channel	97	52375
radio/tv program	38	10220

Table 1: Number of users and tweets in the parties and categories established for the data collection.

In this study we analyze the volume of tweets per day and, with an annotated corpus of words (Redondo, Fraga, Padrón, and Comesaña, 2007), the emotional content of the tweets posted by members of the two major national parties. We also study the usage of hashtags by the two major parties during the debate on November 7th. Furthermore, we build networks of retweets between users who were manually identified as members of political parties. For each of the seven most active parties we analyze the corresponding sub-networks separately to characterize the organizational strategies for spreading political messages. Additionally, we build similar networks based on replies for assessing the communication strategies performed by political parties. We apply graph theoretical measures to identify and compare topological patterns and top-users in the networks. The data structures, methodology and metrics used in this study are explained in detail in the corresponding results section.

Results

In this section we present the results of the evolution of the number of tweets and affective content, the hashtags usage, the dynamics of diffusion and communication, and the comparison between the election results and the engagement on Twitter.

Evolution of the number of tweets

The volume of activity in microblogging networks is strongly conditioned by the existence of events in the offline world (Lehmann, Gonçalves, Ramasco, and Cattuto, 2012). Some studies already showed that, during electoral campaigns, peaks of activity occurred during the election debates (Bruns, and Burgess, 2011). This section analyzes the volume of tweets per day to find the events that led to a relevant variation of the activity on Twitter. Once found, we study the specific activity of the selected parties to evaluate their performance in these events. Figure 1 shows the daily volume of tweets in the dataset from 4th to 24th November 2011. We observe that the day of the debate between the two leading candidates, Mariano Rajoy (PP) and Alfredo Perez Rubalcaba (PSOE), issued more than 500K tweets, which corresponds to 18.92% of the dataset. The day with the second largest activity, according to the volume of tweets, is November 20th, the Election Day, with more than 400K tweets, which represents the 13.99% of the dataset. The third major peak occurred in November 18th, the closing day of electoral campaign. These results are similar to the ones obtained by other studies of the 2011 Spanish national electoral campaign on Twitter (Barberá, and Rivero, 2012; Congosto, and Aragón 2012).

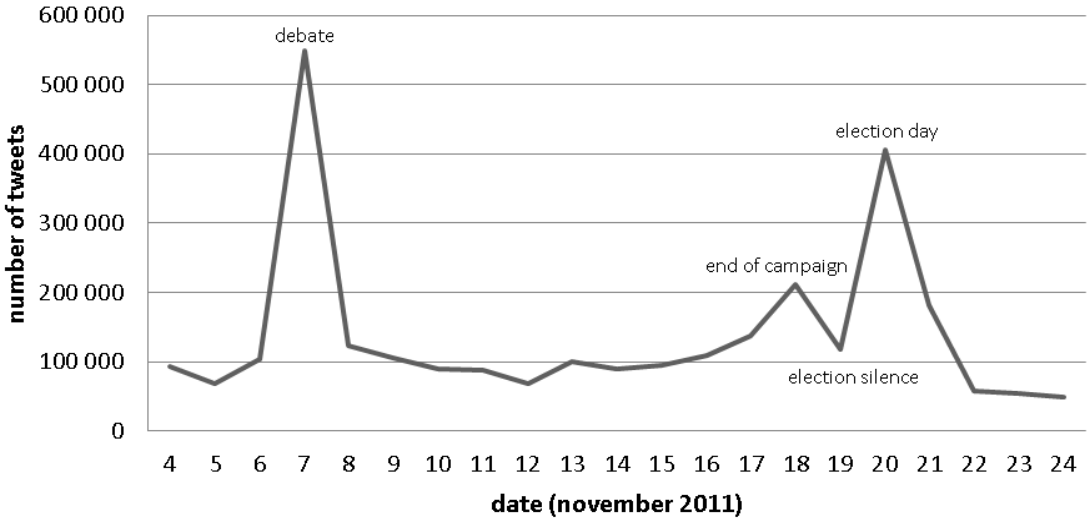

Figure 1: Number of tweets published per day.

The electoral law in Spain establishes the existence of election silence during the day that precedes the Election Day, known as the reflection day. The objective of this mechanism is the promotion of reflection prior to voting without influences from political parties. The law states that the parties can not diffuse propaganda and program electoral campaign activities for engaging new voters. Figure 1 shows a significant decrease of the activity within Twitter between the end of the campaign and the Election Day. Therefore, we confirm that Twitter users actually showed less active during the reflection day, at least, with tweets related to political issues. This means that even in the 'unregulated' space of Twitter –dominated according to Castells by mass self-communication, the so-called reflection day was followed and generally accepted.

As we commented earlier, the largest peak was produced the day of the debate between Mariano Rajoy and Alfredo Pérez Rubalcaba. We analyze separately the volume of tweets published by users identified as members of the political parties on that day. In Figure 2 we observe a common pattern among them, producing a peak of activity on that specific day. According to the ratio between the volume of tweets on the day of the debate (November 7th) and the average of adjacent days (November 6th and 8th), the participant parties, PP and PSOE, produced the largest increase: PP 3.72, PSOE 2.83, IU 2.63, UPyD 2.55, ERC 2.38, CiU 2.23, and EQUO 2.14.

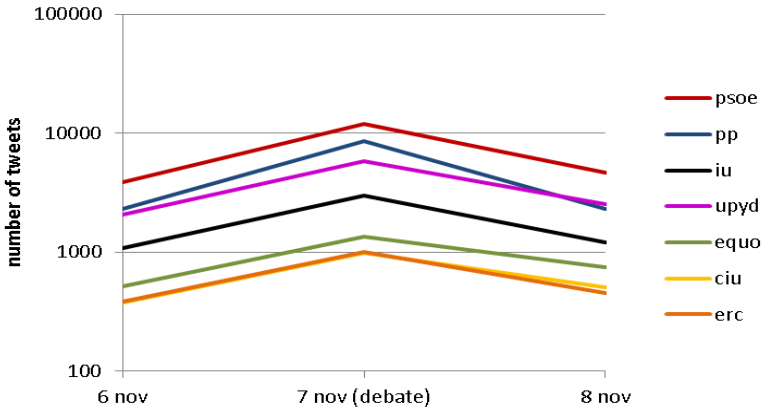

Figure 2: Number of tweets published by parties between November 6th and 8th on a logarithmic scale.

Figure 3 shows that all parties produced a decrease in the volume of tweets during the election silence, the day before the Election Day. However, we also calculate the factor of the number of tweets from the day of election silence to the Election Day: CiU 3.88, EQUO 3.32, UPyD 2.64, PP 2.49, IU 2.25, ERC 2.24 and PSOE 1.78. We note a minor increase, i.e. less activity when voting and results appeared, in the parties which received fewer votes than in the 2008 election: PSOE and ERC.

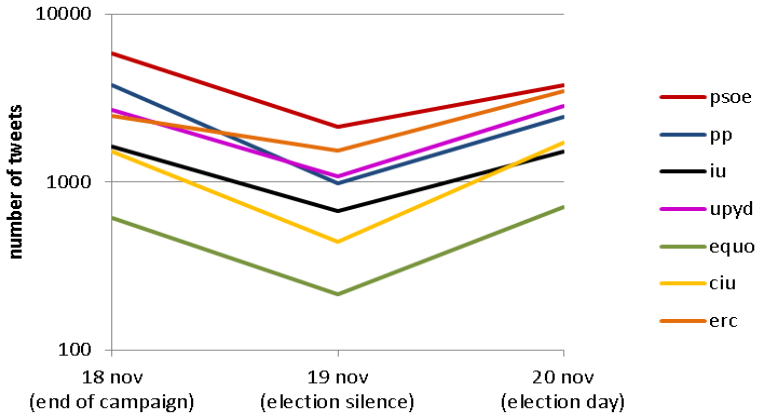

Figure 3: Number of tweets published by parties between November 18th and 20th on a logarithmic scale.

We observe that, as in previous studies of election campaigns, debates and the Election Day record most of the activity on Twitter. We find remarkable the effect of the electoral silence as a drop in the level of activity. Both results are consistent in the tweets posted by members of political parties. However, the parties participating in the debates and the ones with favorable electoral results acquire higher levels of activity in these peaks.

Evolution of the affective content

Specific events, as debates or election results, can affect the emotional load of the users over the course of the campaign. The analysis of the affective content of the tweets represents an interesting methodology to compare the course of the campaign with emotional variations. In this analysis we use an annotated corpus of words (Redondo, Fraga, Padrón, and Comesaña, 2007), the Spanish equivalent of ANEW (Bradley, and Lang, 1999). This lexicon which contains 1,034 Spanish words annotated with the following dimensions: valence, arousal and dominance. The valence measures the degree to which the words express feelings of happiness, satisfaction and hope or its opposite as sadness or disappointment. The arousal captures the association of the words with feelings of excitement or anger and their opposites. The dominance focuses on feelings of authority or their opposites as feelings of submission or fear. The annotated words take values from 1 to 9.

We only focus on PSOE and PP because of the large volume of tweets they generated in comparison with the rest of parties, and the historical antagonism they represent as national major parties with the same objective. Figure 4 describes the evolution of the valence. We observe that, although PSOE leads in the beginning of the campaign, PP obtains higher values than PSOE on the days after the debate (November 7th). This distance for PP, the party which finally won the elections, increases considerably on the

days prior to the Election Day (November 20th). Moreover, since that day, we note a decrease in both parties.

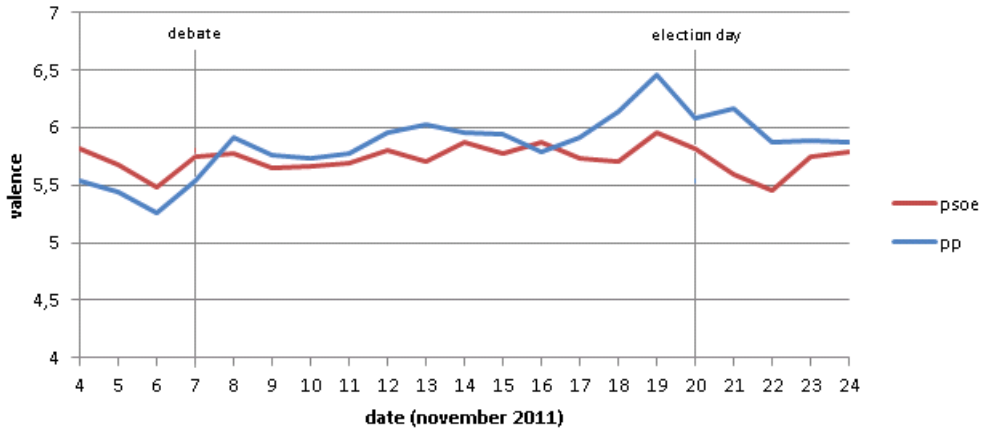

Figure 4: Evolution of the valence of tweets published by PSOE and PP.

We do not find important differences in the values referred to the arousal dimension. The dominance presents curves similar to those of valence. Figure 5 shows that, although PSOE expresses more dominance in the beginning of the campaign, this pattern ends after the debate. Since then, PP and PSOE alternates the dominance leadership until the last days of campaign. At that point, the members of PP, the winning party, acquire more dominant values in their tweets noticing a drop after the Election Day in both parties.

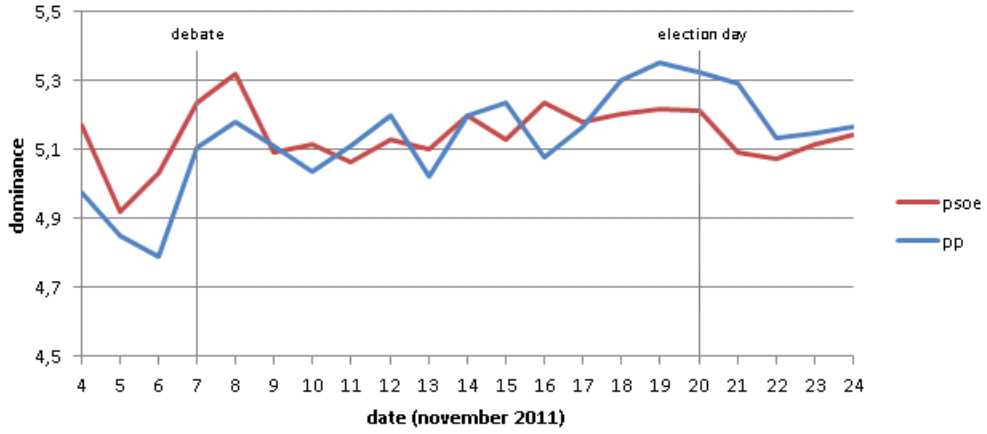

Figure 5: Evolution of the dominance of tweets published by PSOE and PP.

From these results, we find interesting the highest values of valence and dominance of the winning party on the days prior to the Election Day. Over the campaign, most polls declared PP as clear winner of the election. The affective results could be consequence of a feeling of confidence in an absolute victory. Therefore, we aim to apply this technique in future campaigns, preferably with a greater uncertainty about the results, and compare the outcomes.

Hashtags usage

As we mentioned earlier, election debates generate peaks of activity on Twitter. Therefore, there is an important increase in the number of users accessing the microblogging network and a wider audience to the terms that reach a trending topic status. The political parties are aware of this phenomenon and they often introduce their hashtags in political debates (Bruns, and Burgess, 2011). The day after the debate between the candidate of PP and the candidate of PSOE, the website of the Spanish public television corporation elaborated an analysis stating: "Rajoy dominates the debate on social networks (...) PP manages to place the 'hashtag' #rajoygana as a 'trending topic' on Twitter" (#rajoygana stands for Mariano Rajoy wins)[3].

As we displayed in Figure 2, members of PSOE and PP published 11,946 and 8,595 tweets on the day of the debate respectively. Table 2 lists the 20th most used hashtags, were we note that hashtags by members of PP were mainly propagandistic. We observe some hashtags by members of PSOE could be characterized as propagandistic while other hashtags are just descriptive. The amount of distinct hashtags they utilized is comparable: 11,051 in PSOE, 10,720 in PP. Nevertheless, the distribution of the usage of hashtags by members of PP presents a higher inequality than the usage of hashtags by members of PSOE according to their Gini coefficient: PP (0.90) and PSOE (0.87). The Gini coefficient measures the inequality among values of a frequency distribution (Gini, 1912). Figure 6 represents the cumulative function of both distributions where we observe that PP members were able to concentrate larger amount of tweets in less hashtags. In summary, members of PP focused their tweets on a shorter and more advertising vocabulary of hashtags facilitating the placement of propagandistic terms as trending topics in the microblogging network.

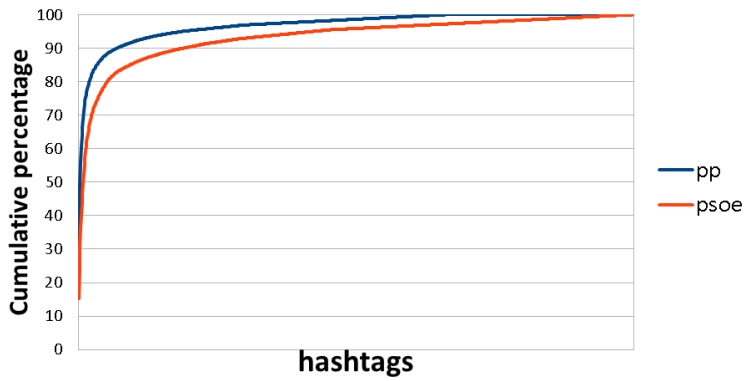

Figure 6: Cumulative Distribution function of the utilization of hashtags by PSOE and PP during the debate.

[3] http://www.rtve.es/noticias/20111108/rajoy-gana-puntos-unas-redes-sociales-llenas-ironia-indiferencia/473977.shtml, accessed at 15.08.2012

hashtag pp	number of tweets	usage (%)	cumulative percentage (%)	hashtag psoe	number of tweets	usage (%)	cumulative percentage (%)
caraacara (*)	2455	22.90	22.90	**contigopodemos** (*)	1697	15.36	15.36
rajoygana (*)	1819	16.97	39.87	undebatedecisivo (*)	971	8.79	24.14
alfredonotecreo (*)	1011	9.43	49.30	debate	742	6.71	30.86
eEstoyconrajoy (*)	735	6.86	56.16	**votapsoe**	611	5.53	36.39
sumatealcambio (*)	511	4.77	60.92	debatweetgr (*)	429	3.88	40.27
debate2011	313	2.92	63.84	rajoy	374	3.38	43.65
rubalcabayaestaba (*)	280	2.61	66.46	**peleaporloquequieres** (*)	348	3.15	46.80
eldebate	263	2.45	68.91	eldebate	318	2.88	49.68
votapp	256	2.39	71.30	caraacara	301	2.72	52.40
debate	238	2.22	73.52	20n	297	2.69	55.09
yoestoyconrajoy (*)	99	0.92	74.44	debateenh25	244	2.21	57.30
20n	92	0.86	75.30	**rubalcabavenceyconvence** (*)	235	2.13	59.42
programapp (*)	91	0.85	76.15	fuenlabrada (*)	157	1.42	60.85
rajoypresidente (*)	89	0.83	76.98	**rajoyderrotado** (*)	146	1.32	62.17
ganarajoy (*)	88	0.82	77.80	**noeselmateix** (*)	134	1.21	63.38
yovotoamariano (*)	88	0.82	78.62	debate7n	125	1.13	64.51
rubalcaba	72	0.67	79.29	**puntorubalcaba** (*)	124	1.12	65.63
debateenh25	66	0.62	79.91	debate20n	121	1.09	66.73
alfredonotecreo (*)	63	0.59	80.49	debate2011	107	0.97	67.70
debatea3	63	0.59	81.08	**votaporloquequieres** (*)	94	0.85	68.55

Table 2: Number of tweets, usage and cumulative of usage of the 20th most used hashtags of PP and PSOE during the debate. Propagandistics hashtags appear underlined and in bold. Hashtags with an asterisk are translated.[4]

[4] #caraacara (face to face, debate between PSOE and PP candidates), #rajoygana (Rajoy wins), #alfredonotecreo (Alfredo P. Rubalcaba I do not believe you), #estoyconrajoy (I am with Rajoy), #sumatealcambio (join the change), #rubalcabayaestaba (Rubalcaba was already in there, as vicepresident during the previous legislature), #yoestoyconrajoy (I am with Rajoy), #programapp (PP electoral program), #rajoypresidente (Rajoy for president), #ganarajoy (Rajoy wins), #yovotoamariano (I vote for Mariano Rajoy), #alfredonotecreo (Alfredo P. Rubalcaba, I do not believe you), #contigopodemos (we can with you), #undebatedecisivo (a decisive debate), #debatweetgr (debate in Granada between local leaders of PP and PSOE on that day), #peleaporloquequieres (fight for what you want), #rubalcabavenceyconvence (rubalcaba wins and convinces), #fuenlabrada (Fuenlabrada, Spanish city), #rajoyderrotado (defeated Rajoy), #noeselmateix (it is not the same), #puntorubalcaba (point Rubalcaba), #votaporloquequieres (vote for what you want).

Diffusion dynamics

Twitter has become a platform where political parties can spread content and engage voters. Propagation mechanisms provided by Twitter, e.g. retweets, can expand its visibility in a larger scope within the network. Initially, this section evaluates the activity of the profiles of the candidates for presidency and the official profiles of parties to generate content that can be spread on Twitter during the campaign. Then, we characterize the propagation networks to distinguish different diffusion dynamics of the parties through graph theoretical measures.

In UPyD, the candidate for presidency Rosa Díez has no Twitter profile; however, we choose @cmgorriaran (co-founder of the party, second candidate to the Parliament on the list for Madrid after Rosa Díez, and deputy after the elections). We observe that, in general, the number of tweets posted by candidates is higher than the volume generated by the official party account during the campaign; except for parties with limited mass media coverage: UPyD, IU and EQUO; see Figure 7. There is an intended interest of parties with mass media coverage to generate content from the account of the candidate rather than the corporate account. Moreover, @conRubalcaba, @marianorajoy and @ciuduran2011 (PSOE, PP and CiU) specified the existence of a professional team co-managing the account in the description of the profile. We also note the extraordinarily low activity of @cayo_lara (IU) in comparison with the rest of candidates and the profile @iunida (party account of IU).

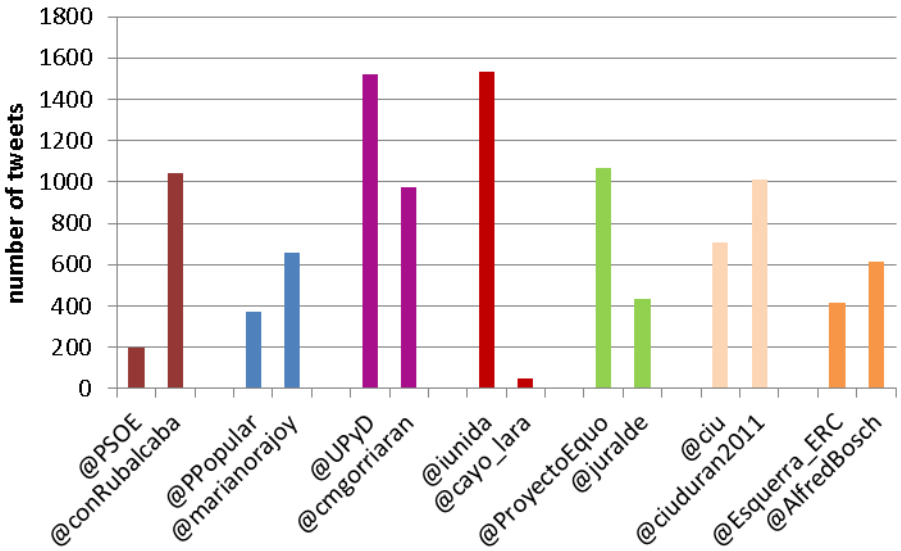

Figure 7: Number of tweets published by the profiles of the candidates for presidency vs. the official party profiles.

Once we evaluate the performance of candidates and parties accounts as message generators, we analyze the dynamics of party members to retweet and propagate political contents. For this purpose, we define a retweet social graph $G^{ret}=G^{ret}(V^{ret},E^{ret})$ comprising a set V^{ret} of vertices and a set E^{ret} of edges. Here, $V^{ret}=\{v^{ret}_1, \ldots ,v^{ret}_n\}$ is the set of users identified as members of selected parties that retweeted or were retweeted at least once during the campaign. We build a directed edge between user v^{ret}_i with v^{ret}_j if user v^{ret}_i retweeted user v^{ret}_j.

We apply the Louvain method to extract the community structure of large networks on the retweet social graph (Blondel, Guillaume, Lambiotte, and Lefebvre, 2008). The results, presented in Figure 8, reveal the existence of 16 clusters where 8 of them are just composed by a pair of nodes. The 8 remaining groups correspond to the political parties with the exception of PSOE, whose members are split into two different clusters: one formed by the politicians from the Socialists' Party of Catalonia (Partit dels Socialistes de Catalunya - PSC) and one including the rest of members from PSOE. This result might be due to the fact that, although PSC is part of PSOE, it is also a strong group with a high level of autonomy. Figure 9 represents the retweet social graph applying the layout algorithm Force Atlas 2 (Bastian, Heymann, and Jacomy, 2009). The color and size of each node correspond to the cluster it belongs and its in-degree respectively.

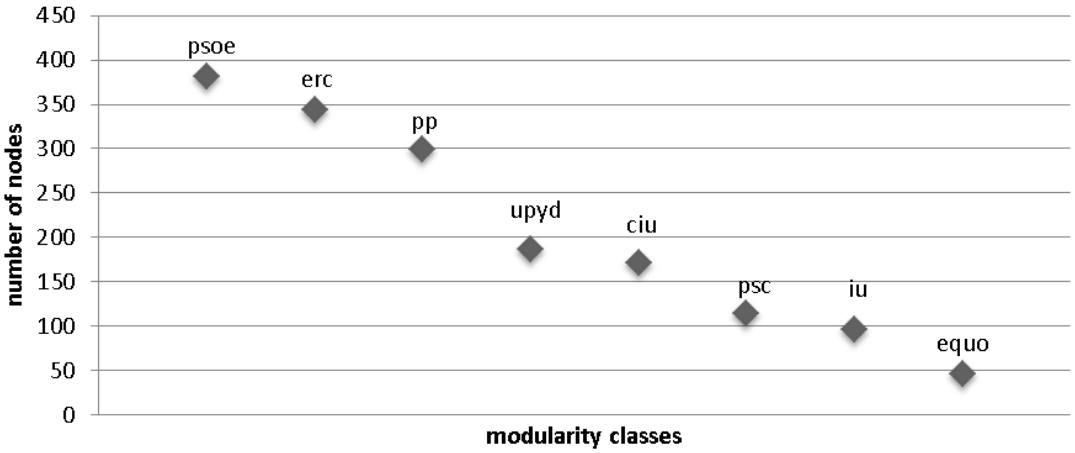

Figure 8: Clusters detected in the retweet social graph.

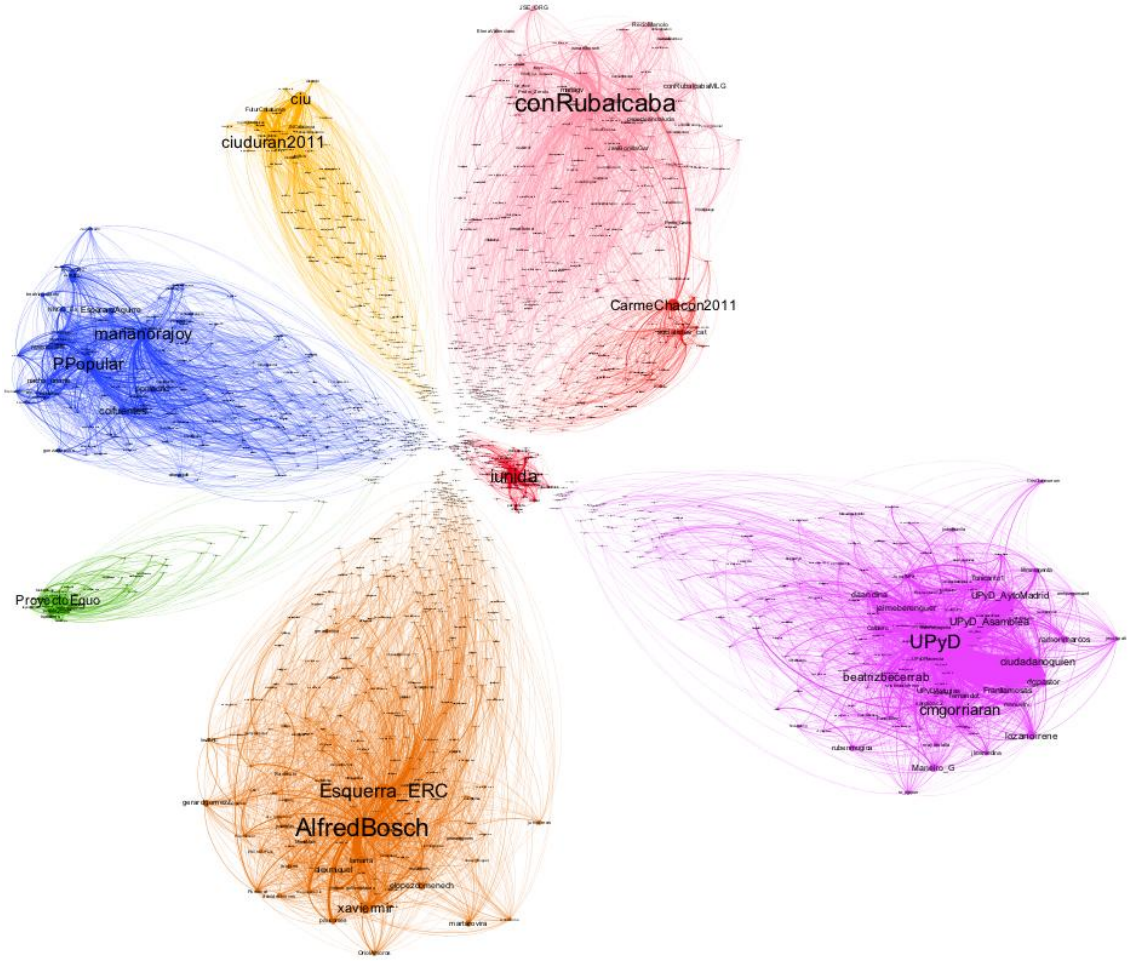

Figure 9: Retweet social graph. The color and the size of each node correspond to the cluster it belongs and its in-degree respectively.

From the previous results of the community detection algorithm we infer that members of political parties only propagate contents created by other members of their own party. Table 3 shows the number of tweets propagated by each party where, in over 97% of cases, retweets among members of political parties are within the same party.

from / to	ciu	equo	erc	iu	pp	psoe	upyd	own party
ciu	**1748**	0	31	6	4	7	2	97.22%
equo	0	**960**	0	6	0	4	3	98.66%
erc	22	2	**4040**	7	4	10	0	98.90%
iu	9	2	16	**964**	1	3	2	96.69%
pp	8	0	2	0	**4186**	0	3	99.69%
psoe	3	3	8	3	8	**4729**	13	99.20%
upyd	0	2	0	40	3	13	**7013**	99.18%

Table 3: Retweets between political parties.

Given that the parties generate independent networks of diffusion with almost no edges between them, we decide to consider parties separately. Therefore we define 7 retweets social graphs, one per party, where the nodes of each graph are exclusively members of the same party. For all of them we calculate macroscopic metrics as clustering coefficient, the size of the giant component and the average distance. The clustering coefficient measures the level of cohesiveness of the network. We used its directed version, which is defined as the probability that two nodes with a common neighbor are connected (Watts, and Strogatz, 1998). The giant component is the largest subgraph where there is a path between any pair of nodes. Its size represents the largest number of nodes which are directly or indirectly connected, i.e. through other nodes (Bollobás, 2001). The average distance between two nodes of the graph describes if the network accomplishes the small world property. Low values in the average distance imply that all nodes are interconnected through a small number of steps from one to another (Milgram, 1967).

The results, presented in Table 4, shows that parties with limited mass media coverage (EQUO, UPyD and IU) generate networks of diffusion with a higher clustering coefficient than parties with greater attention from national and / or local mainstream press (PP, CiU, ERC and PSOE). However, while most members of EQUO (82%) and UPyD (73%) are part of the giant component, less than half of the members of IU form its giant component (44%). This may be understandable due to its configuration as a political coalition formed by different parties. The average distance shows the small world nature of every social party graph, where the most clustered parties (EQUO and UPyD) present the smallest values with less than 3 steps.

party	nodes	edges	clustering coefficient	nodes in the giant component	average distance
equo	45	960	0.50	82.22%	2.02
upyd	186	7013	0.37	73.12%	2.43
iu	95	964	0.24	44.21%	3.07
pp	298	4186	0.19	57.38%	3.32
ciu	170	1748	0.18	52.35%	2.79
erc	343	4040	0.18	56.56%	3.02
psoe	501	4729	0.12	53.49%	4.13

Table 4: Graph measures of the retweet social graphs of the parties.

To obtain a deeper understanding of the structure of the networks we perform the k-core decomposition (Seidman, and Stephen, 1983). The k-core of a graph is the maximum subgraph in which each node is connected to at least k other nodes in the subgraph. In Figure 10, the k-core decomposition of the parties retweet social graphs reveals that UPyD network (k_{max} = 10) and EQUO network (k_{max} = 7) acquire higher levels of nested k-shells than the rest of parties. The maximum levels are: CiU k_{max}=4, ERC k_{max}=5, IU k_{max}=2, PP k_{max}=4, and PSOE k_{max}=3. Moreover, the political coalition IU is the flattest network according to the k-core decomposition and the network with the largest percentage of users (44%) within the outermost k-core (k=0).

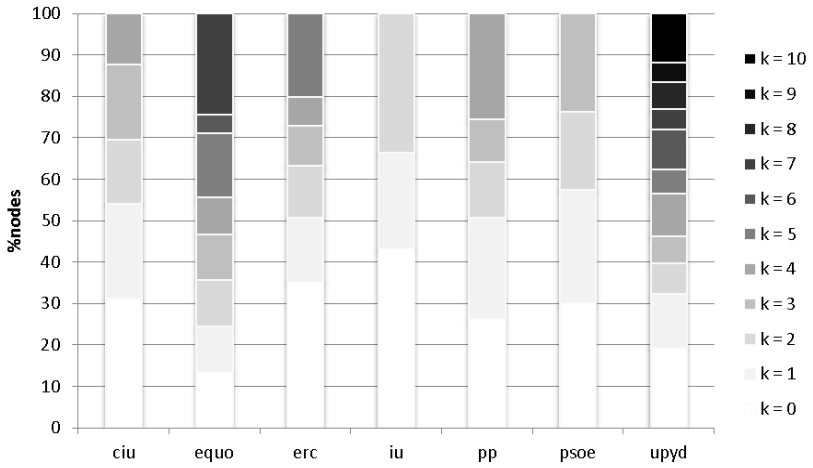

Figure 10: K-core decomposition of the retweet social graphs of the parties. Darker values stand for higher levels of nested k-shells.

For each retweet social graph, we calculate the betweenness centrality of every node. The centrality counts the number of shortest paths between other users passing through that node. The results, presented in Table 5, are normalized by setting the maximum value to 100. We note that in every network, except IU, there is a hub formed by the account of the party and/or the candidate: CiU (ciuduran2011 + ciu), EQUO (ProyectoEquo + redequojoven), ERC (AlfredBosch), PP (PPopular + marianorajoy), PSOE (conRubalcaba), and UPyD (UPyD).

In summary, we observe in traditional parties (PSOE, PP, CiU and ERC) a trend to generate more content from the account of the candidate than from the party's official account. However, most of these parties opt for co-managing the account of the candidate with a professional team of communication. The analysis of the content diffusion reveals that members of political parties propagate, almost exclusively, contents coming from members of their own party. The propagation networks also show remarkable differences in the graph macroscopic metrics. Parties with limited

mass media coverage (EQUO and UPyD) generate more clustered networks and their giant component comprises a greater percentage of users. This result reflects stronger community cohesion because fewer users appear isolated from the main party network. In fact, we find of interest that this phenomenon of isolation occurs most intensively in parties representing a coalition of parties, e.g. IU. The cohesion, larger in EQUO and UPyD and lower in IU, is also reflected in the values of the k-core decomposition. More cohesive parties generate more complex network structures with higher levels of nested k-shells, while the political coalition IU only generates 2 levels of k-shells. The results of the betweenness centrality of the propagation network reveal that, except for the political coalition IU, parties and / or candidates remain central elements in the diffusion dynamics over the election campaign.

ciu		equo		erc		iu		pp		psoe		upyd	
ciuduran2011	**100.00**	**ProyectoEquo**	**100.00**	**AlfredBosch**	**100.00**	PaulaRuMar	**100.00**	**PPopular**	**100.00**	**conRubalcaba**	**100.00**	**UPyD**	**100.00**
ciu	**94.18**	**redequojoven**	**86.75**	lamarta	48.31	hugomabarca	67.18	**marianorajoy**	**94.90**	osvalbuena	44.06	beatrizbecerrab	33.76
FuturCatalunya	28.14	isabanes	25.99	xaviermir	34.95	Ainhat	62.35	ppmadrid	50.64	ismaelbosch	41.87	jaimeberenguer	26.59
JNCatalunya	27.94	alesanper	23.70	**Esquerra_ERC**	24.17	lalivaquero	59.81	mariviromero	45.97	socialistes_cat	41.03	cmgorriaran	26.51
AlbertLM	16.31	Equo_Cadiz	21.69	Pumocat	19.78	Elba_Celo	47.14	nacho_uriarte	43.50	EnricPerez	31.58	Tonicanto1	26.25
ramonvibo	13.37	equomadrid	15.16	DieguezdeVic	19.26	iuandalucia	46.62	ChiquilloBarber	42.59	CarmeChacon2011	24.90	lilimmagenta	25.24
carlescampuzano	9.48	juralde	15.09	isaacperaire	17.91	JAGarciaRubio	44.20	LuisSalom	28.12	garciaretegui	24.47	ciudadanoquien	21.25
peremaciasiarau	9.32	EquoBurgos	11.80	Raulmuto	17.57	NUET	43.18	PPCatalunya	25.81	FundacionIdeas	22.82	UPyD_AytoMadrid	19.29
ciumartorell	9.17	equosevilla	11.08	paucomes	17.18	pabloprieto	27.15	PPGalapagar	23.11	david_donaire	18.40	UPyD_Asamblea	18.12
rpuigvi	8.58	ramonlinaza	9.18	gerardgomezf	15.03	agarzon	25.94	jovenes_afd	19.37	psoeburgos	17.26	manuelhi	17.08
carlotamafo	8.46	EquoCanarias	8.78	oscarperis	13.69	GLlamazares	24.22	maruhuevar	18.63	conRubalcabaMLG	17.23	Paco_Glez_	15.76
titonlailla	7.97	MarioOrtega	5.30	jbigorra	13.30	IUCM	23.29	NNGG_Es	18.60	JaviBonillaGar	15.93	cristinaandreun	14.66
morellsau	6.81	echa_morro	4.82	AnnaSimo	13.23	desdelacantera	21.14	ElenaaaBonet	17.31	DeSoleMartinez	15.79	MoratoGomezJL	13.36
ramontremosa	6.18	eQuoGipuzkoa	4.14	PauVilassar	12.46	Krisdekolores	20.88	populares fuenla	16.62	CarmenMonton	15.26	Junquera_	13.30
lciuro	6.12	EquoHuesca	3.85	jcsanglas	11.50	MaiteMolinaIU	20.12	patriestevez	14.06	Raul_lanjaron	14.74	Maneiro_G	12.91
margapayola	6.04	carlosrsierra	2.82	lesJERC	9.49	alternativajove	14.73	pp_jaen	13.47	alcaldehuevar	14.73	sergioac2	12.91
clotetpitita	5.45	reyesmontiel	2.81	yuribcn	7.93	iescudero	13.64	ppandaluz	13.12	txabito	14.35	covita666	12.69
ignasifreixa	5.44	EquoOurense	2.52	ERCSantFeliu	7.86	iblanco_eu	10.75	pptetuan	12.66	rosasiempreroja	13.46	Calbarro	12.29
uniodejoves	5.23	eQuoPontevedra	2.10	erc_fedgirona	7.03	Roberto_Rovira	10.47	palomaadrados	12.29	jjssburgos	12.70	pinedaandalucia	11.67
meritxellroige	5.02	EquoAsturias	1.38	peresabat	6.98	iujerez	10.36	NNGGTresCantos	12.11	Amgarcia01	11.68	anabel_castell	11.18

Table 5: 20th most central users by betweenness in the retweet social graph of the parties. The accounts of candidates/parties appear underlined and in bold.

Communication dynamics

As we discussed earlier, members of political parties only propagate content generated in their own party. This result is understandable because, although certain parties could share common points, the study is performed during a competitive environment as an electoral campaign. Here, we focus on the communication dynamics generated by members of political parties. First we intend to evaluate how the candidates for presidency use Twitter mechanisms for communication, e.g. replies. Next, we study the communication networks of the parties to examine their structure and asses if the microblogging network becomes a debate scenario.

While retweets are a common mechanism for spreading contents within the network, Twitter enables replies for establishing direct and public communication between users. We analyze the ratio of sent and received replies by the candidate of the parties, see Table 6. In national parties we observe an important gap between the candidates of UPyD and EQUO (@cmgorriaran 0.59 and @juralde 0.32) in comparison with the candidates of PSOE and PP (@conRubalcaba 0.07 and @marianorajoy 0.05 respectively). The ratio of the candidates of the major parties, PP and PSOE is conditioned by a considerably larger amount of received replies. Nevertheless, this effect is not compensated by the existence of a team of communication professionals which co-managed the account. @cayo_lara, who we observed in the previous section that hardly participated in the dynamics of diffusion, only published two replies. In the Catalan nationalist parties there is an important distance between the candidate of CiU @ciuduran2011 (0.30) and the candidate of ERC @AlfredBosch (0.03). We previously noted that the account @ciuduran2011 is co-managed by a professional team while @AlfredBosch was exclusively managed by the candidate. However, @AlfredBosch only posted 3 replies, comparable with the least active candidate @cayo_lara.

party	candidate	sent	received	sent / received
upyd	**@cmgorriaran**	47	80	0.59
equo	**@juralde**	10	31	0.32
ciu	**@ciuduran2011**	18	61	0.30
psoe	**@conRubalcaba**	26	397	0.07
iu	**@cayo_lara**	2	36	0.06
pp	**@marianorajoy**	14	280	0.05
erc	**@AlfredBosch**	3	109	0.03

Table 6: Sent and received replies of the candidates.

Similarly to the previous section focused on the dynamics of diffusion, we denote as $V^{rep}=\{v^{rep}_1, \ldots, v^{rep}_n\}$ all users identified as members of political parties that replied to or were replied by the other users identified as members of parties during the campaign. Next, we generate a reply social graph $G^{rep}=G^{rep}(V^{rep},E^{rep})$ with set V^{rep} of vertices and a set E^{rep} of edges. The directed edge e^{rep}_{ij} indicates if user v^{rep}_i replied to v^{rep}_j.

Again, we apply the Louvain method to extract the community structure on the reply social graph. We detect 31 clusters where 6 of them, presented in Figure 11, are composed by at least 130 nodes, while the rest of nodes are formed by no more than 5 nodes. We visualize the network in Figure 12 with the layout algorithm OpenOrd (Martin, Brown, Klavans, and Boyack, 2011) setting the color and size of each node according to the cluster it belongs to and its in-degree respectively. The layout algorithm distributes spatially the nodes depending on the relationships with other nodes, i.e. the communication interactions between political profiles through replies. We observe that the largest cluster is mainly formed by users identified as member of PSOE. We note its closeness to the fourth biggest cluster, formed by members of PP, indicating an intensive communication between these parties. We also observe that a subset of the cluster of PSOE is clearly distant from PSOE and PP clusters while it approaches to the clusters formed by members of CiU and members ERC respectively. This subset is essentially formed by the members of the Socialists' Party of Catalonia, whom seem more communicative with Catalan politicians than with members of PP or national PSOE. Moreover, the visualization shows a higher level of communication between Catalan parties PSC, CiU and ERC. The fifth cluster is formed by users identified as members of UPyD. We realize that members of IU and EQUO composed the sixth cluster. Nevertheless, the layout algorithm disposes members of IU and members of EQUO separately with the user @isabanes acting as a bridge. Inés Sabanés (@isabanes) is currently part of the core of EQUO but she previously worked in IU. We also note the presence of @GLlamazares, candidate of IU in the two previous elections. This user appears isolated because of the large amount of connections with different clusters. The closeness of UPyD and IU–EQUO, parties with limited mass media coverage, is also evident in the visualization.

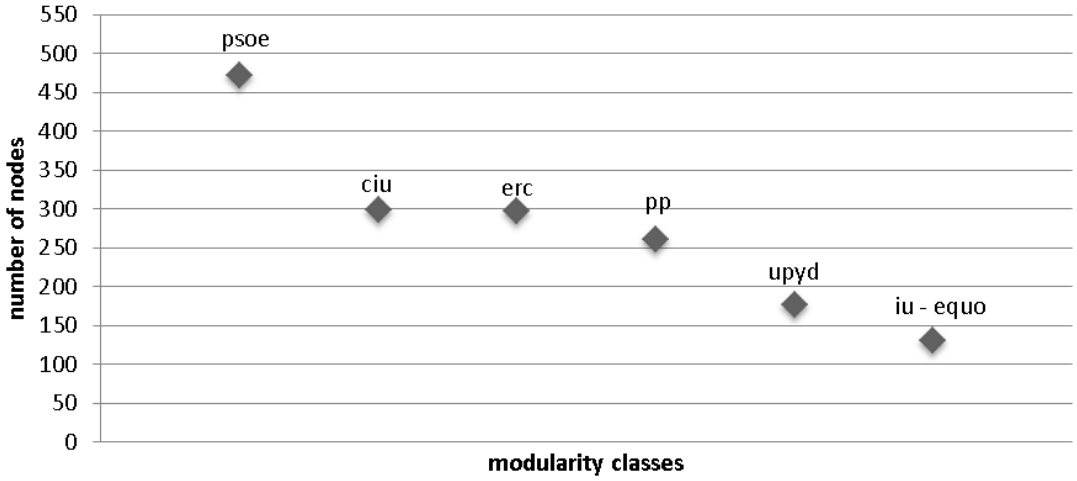

Figure 11: Clusters detected in the reply social graph.

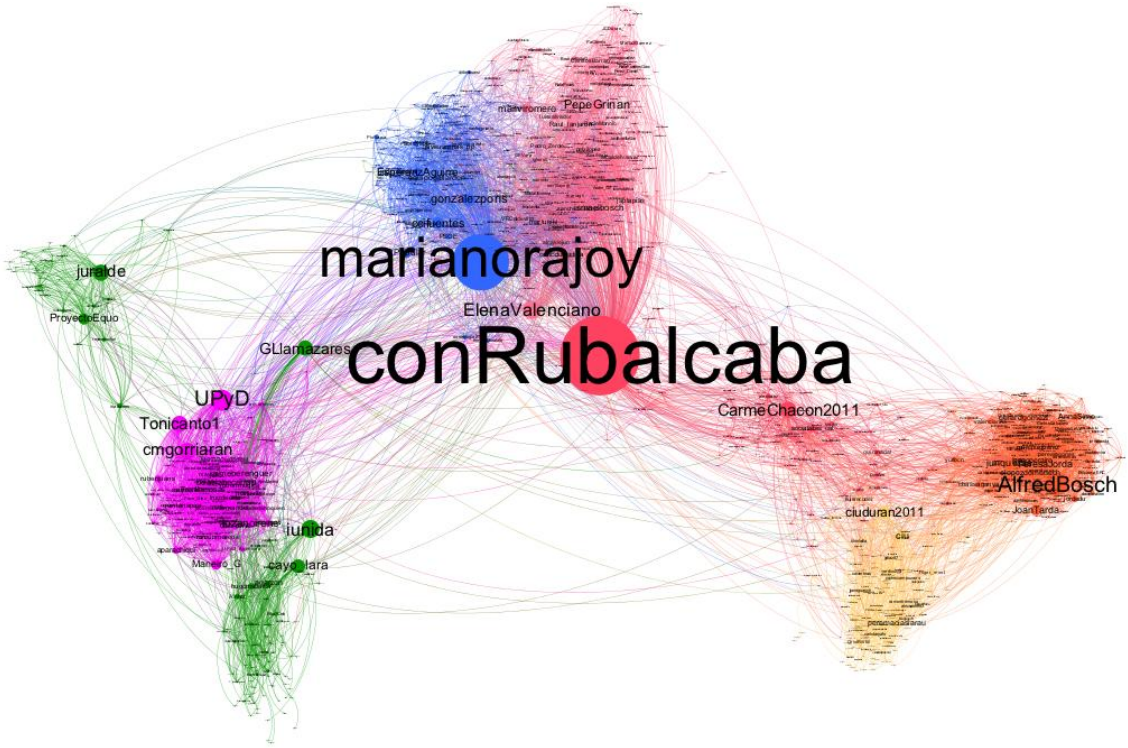

Figure 12: Reply social graph. The size of each node corresponds to its in-degree and the color represents the cluster it belongs to (PSOE: red, PP: blue, IU-EQUO: green, UPyD: pink, CiU: yellow, ERC: orange).

While the diffusion dynamics based on retweets occur principally between members of the same party, the communication dynamics based on replies present more diversity. Table 7 lists the amount of received and posted replies between members of parties. We observe that replies between members of the same party are between 79% and 93%, while in retweets the ratio was above 97% for all parties. The numerical results correspond to the information displayed in the visualization of the graph where PP and PSOE receive a perceptible attention from the rest of parties. Nevertheless, most of

replies to members of PP and PSOE come from those two parties. Also, Catalan parties CiU and ERC manifest an important communication between them. We also note a high level of communication among parties with limited mass media coverage: EQUO, IU and UPyD.

from / to	ciu	erc	psoe	pp	upyd	equo	iu	own party
ciu	**2260**	273	245	68	0	0	14	79.02%
erc	371	**4155**	181	51	2	0	5	87.20%
psoe	111	120	**14913**	2203	74	8	112	85.02%
pp	46	24	1782	**10222**	80	1	19	83.97%
upyd	2	2	177	150	**8955**	61	304	92.79%
equo	0	0	18	42	30	**1452**	57	90.81%
iu	8	0	102	22	147	53	**2295**	87.36%

Table 7: Replies between political parties.

Similar to the previous section, we define reply social graphs for each party in order to analyze the structure of the communication networks. While in the retweet social graphs the edges linked exclusively members of the same party, we consider an edge in the reply social graph of a party if it corresponds to a reply between two users identified as members of political parties in which at least one of them belong to that party. For each reply social graph we calculate the clustering coefficient, the number of nodes in the giant component and the average distance between nodes, listed in Table 8. We observe that EQUO and UPyD are again the most clustered networks according to communication dynamics, followed by IU that, in turn, is the party with the least number of nodes in the giant component.

party	nodes	edges	clustering coefficient	nodes in the giant component	average distance
equo	89	1722	0.23	48.31%	2.85
upyd	259	9834	0.23	69.50%	2.99
iu	196	3138	0.12	34.18%	3.63
erc	442	5184	0.10	63.12%	3.70
ciu	330	3444	0.10	63.64%	4.07
psoe	874	20046	0.07	55.26%	4.13
pp	601	14710	0.05	42.26%	4.26

Table 8: Graph measures of the reply social graphs of the parties.

Again, we calculate the betweenness centrality of users of the reply social graphs. Table 9 lists the 20 most central users in each one. We observe that for the most of the parties the most central users are the candidates: @ciuduran2011 (CIU), @juralde

(EQUO), @marianorajoy (PP), @conRubalcaba (PSOE), and @cmgorriaran (UPyD). We previously explained that @AlfredBosch (ERC) and @cayo_lara (IU) only posted 3 and 2 replies respectively. @AlfredBosch appears in the 3rd position, after two active members of ERC, while the betweenness centrality of @cayo_lara is almost zero. We also note, in comparison with the retweet social graphs, an important preponderance of profiles that represent real persons in communication dynamics.

In conclusion, the relationship between sent and received replies shows that the candidates of parties with limited mass media coverage, EQUO and UPyD, adopt the most conversational behavior. We observe some level of communication between members of different parties while the two national major parties, PSOE and PP, receive most attention. The communication dynamics between different parties are observed in comparable parties: PP-PSOE, IU-UPyD-EQUO, and ERC-CiU. Nevertheless, the most intensive communication flows occur between members of the same party. As we previously observed in the diffusion dynamics, the networks of EQUO, UPyD, and IU present the highest clustered structure. In most networks, the most central user according to the communication of each party is the candidate. We also note the important presence of politicians in the top-users rather than corporate party accounts. From this result we infer that users prefer to communicate with real people, in opposition to the diffusion dynamics which involved corporate accounts of the parties to a greater extent.

ciu		equo		erc		iu		pp		psoe		upyd	
ciuduran2011	100	**juralde**	100	elopezdomenech	100	hugomabarca	100	**marianorajoy**	**100**	**conRubalcaba**	**100**	**cmgorriaran**	100
jjdiaz87	80.44	ProyectoEquo	80.86	jordedu	99.66	GLlamazares	84.11	mariviromero	66.6	CarmeChacon2011	29.74	UPyD	69.63
peremaciasiarau	54.54	isabanes	68.66	**AlfredBosch**	85.98	Ainhat	77.33	maicagq13	43.41	robrindo	19.21	jaimeberenguer	60.42
carlescampuzano	47.68	jmanceb	56.23	AnnaSimo	76.79	enriquenormand	71.36	ccifuentes	38.22	mariviromero	16.41	Tonicanto1	42.36
lluisrecoder	43.07	redequojoven	50.9	gerardgomezf	73.73	iunida	71.34	conRubalcaba	25.2	ismaelbosch	15.3	Maneiro_G	31.27
marta_llorens	40.51	echa_morro	49.88	annanebre	65.67	agarzon	57.55	RecioManolo	19.95	japtapias	14.47	fernandot	27.21
s_grifell	36.03	equosevilla	38.09	cbassaganya	61.99	lalivaquero	52.88	LuisSalom	18.06	Raul_lanjaron	13.85	pinedaandalucia	26.65
ciu	35.91	alesanper	36.22	perearagones	60	Krisdekolores	41.88	ChiquilloBarber	16.63	alexsaez	13.45	Paco_Glez_	22.88
soniapereda	32	reyesmontiel	24.14	valencianna	52.64	cayo_lara	32.74	MarcosSanchezSi	16.48	EnriqueMoratalz	12.67	lozanoirene	22.39
OriolRistol	31.29	carlosrsierra	24.08	yuribcn	51.67	Dominbenito	24.31	angelgarridog	16.06	trinitro	10.39	aparachiqui	21.8
mapallares	28.67	EquoAlmeria	20.6	marcpuigperez	50.74	JovenesIU	22.44	santiagocervera	15.85	AuroraRosaCorn	10.08	manuelhi	21.32
carlotamafo	22.61	AitanaMas	11.49	jbigorra	48.23	MaiteMolinaIU	17.97	beatrizjuradofc	15.75	socialistes_cat	9.43	rubenjuans	21.28
ramontremosa	22.51	equomadrid	10.05	Raulmuto	47.7	angelsmcastells	17.62	JoseAngel_SJ	13.53	alcaldehuevar	8.96	robgrg	20.81
lciuro	22.39	EquoBizkaia	9.47	joanpuig	46.06	PaulaRuMar	17.19	maruhuevar	10.68	mireia1107	8.37	Franllamosas	19.41
Begggo79	21.77	MarioOrtega	6.73	isaacperaire	45	IUMalaga	16.99	JAMonago	10.25	RodolfoVPerez	7.84	Junquera_	19.4
jordixucla	21.49	donadrianblanco	6.49	holoturoideu	44.59	pabloprieto	16.43	PP_CALASPARRA	9.98	conEduMadina	7.64	mayteolalla	18.88
xtomas	20.45	ramonfermu	4.66	OriolClusells	44.35	RamonLuque1	14.8	gonzalezpons	9.05	garciaretegui	7.47	ancerverus	18.69
ignasifreixa	17.99	Equo_Cadiz	2.54	xaviermir	42.29	desdelacantera	14.47	nacho_uriarte	7.48	marianorajoy	7.39	quintanapaz	18.17
titonlailla	17.79	ramonlinaza	1.9	mferres	41.6	Elba_Celo	13.12	ismaelbosch	7.15	martuniki	7.14	ManuelCustodioM	17.76
alexsastre83	17.55	eQuoPontevedra	1.72	DieguezdeVic	33.82	iblanco_eu	8.75	PopularesCyL	6.69	sanchezcastejon	6.89	beatrizbecerrab	17.45

Table 9: 20th most central users by betweenness in the reply social graph of the parties. The accounts of candidates appear underlined and in bold.

Election results vs. Twitter engagement

After the evaluation of different communication and diffusion dynamics, we compare the electoral results with the engagement of users on Twitter. We intend to asses if parties with different strategies on Twitter receive different levels of acceptance by users and how it affects to the final electoral results. Because of the mentioned criticisms about the representativeness of the distribution of deputies, we choose the number of votes as the result of the elections, instead of the number of deputies. We measure user engagement as the number of users who retweet, at least, one tweet published by a member of the corresponding political party. We note that there may be users who retweeted tweets from more than one party.

Table 10 lists the number of users who retweet contents (retweeters) and the votes to each party. The ratio set EQUO (0.020), ERC (0.013) and UPyD (0.013) with the highest values, followed by IU (0.004). After them we observe CiU (0.002) and finally the national major parties, PSOE (0.001) and PP (0.001).

From this result we infer that, in general, parties which generate more clustered and connected networks of diffusion and communication produce higher levels of engagement within Twitter. Nevertheless, there is no correspondence between engaged users and the actual outcome of the elections. This may be interpreted as a possible bias in the political spectrum of social networks, particularly Twitter, in comparison with the political spectrum observed in the offline world. This result should be taken into account in studies that rely on datasets collected on Twitter, i.e. political prediction. Moreover, in this study we compare retweeters with the elections results. It may be of interest to contrast Twitter engagement with the differential between the current results and the previous elections; we should note that in our study, the party with the highest ratio value is a first participant party.

party	retweeters	votes	ratio
equo	4404	216748	0.020
erc	3236	244854	0.013
upyd	14611	1143225	0.013
iu	7382	1685991	0.004
ciu	1604	1015691	0.002
psoe	10112	7003511	0.001
pp	10603	10866566	0.001

Table 10: Retweeters and votes of parties. The ratio is calculated as the quotient of retweeters by votes.

Discussion and further research

Our findings make evident a notable growth of activity when offline events that involve different parties, in particular debates, take place. We find that events of peak activity in Twitter are considered important and reported by traditional media. Election related trending topics associated with these peaks are, thus, highly valuable for spreading propagandistic messages. In particular, mass media journalists assess the performance of the candidates of the two major national parties during a debate by the candidate-related hashtags which become trending topics. Our results prove that the members of the winning party of the debate, according to journalists, concentrated their tweets on a smaller set of hashtags. Moreover, their most used hashtags were mainly propagandistic, while the most used hashtags of members of the other party were identifiers of political issues under discussion. These results validated the existence of specific political marketing techniques and their effectiveness. The emotional analysis reveals more positive and dominant tone in the messages posted by members of the most voted party, with respect to the second most voted one, starting in the immediate days before the Election Day. The fact that the winning party leaded the election polls may influence decisively on this result. We aim to perform this technique in other competitive situations, mainly future electoral campaigns.

The analysis of the diffusion dynamics unveils the low occurrence of retweets between members of different political parties. Although there may be common points among parties, their members do not propagate contents if they are not generated within their own party network. The results of the macroscopic metrics show different values depending on the type of party. The metrics applied on each party prove that minor and new parties tend to be more clustered and better connected, which implies a more cohesive community. Therefore, we observe certain “process of formation and exercise of power relationships in the new organizational and technological context derived from the rise of global digital networks” in parties with limited traditional mass media coverage. However, we observe that the differences of structural patterns of the networks do not affect to the fact that the candidate and / or party are central elements in the diffusion dynamics. We aim to focus our future research on exploring in deep the topological patterns of party networks in order to characterize the different party apparatus as centralized, decentralized or distributed networks (De Ugarte, 2007). Moreover, we intend to contrast the topological patterns of the networks created by political parties with the networks produced by recent citizens' movements.

The communication dynamics present more diversity in comparison to the diffusion dynamic. Communication between members of comparable parties (PSOE-PP, IU-UPyD-EQUO, ERC-CiU) increases considerably. However the main flows of communication still occur between members of the same party. The political parties utilize communication mechanisms provided by Twitter, mostly, for internal communication. This may be interpreted closer to “electronic autism than to actual communication”. Previous studies already showed this fact for other social media platforms, such as political blogging (Adamic, and Glance, 2005). We observe that the leaders of the parties with limited traditional mass media coverage present the most conversational behavior. In turn, the communication networks of the parties based on replies characterize these parties as the ones that generate more cohesive communities according to the macroscopic metrics. The centrality measures determine, in most case, the candidates as central elements in the communication of their own party. In fact, we highlight the user preference to interact with accounts that correspond to politicians rather than political corporate accounts.

In summary, we evaluate the application of analytic techniques to one particular issue, political interaction online. Although the size of our dataset may not be considered as Big Data, the technologies of the study scale adequately to this new paradigm. By analyzing our dataset with measures from graph theory and sentiment analysis, we are able to gain deeper insights into how political parties leverage social media in their campaign strategies and how, in turn, voters respond. Social media platforms are highly influenced by the real world events proved by the appearance of peaks of activity within Twitter when debates are celebrated. The political parties are aware of this phenomenon and they apply political marketing techniques for increasing the visibility of their messages. The parliamentary representation of the parties, which determines their appearance in traditional mass media, encourages parties with little or no representation to exploit the capabilities of social networks as a free channel for engaging new voters. However, the political spectrum found in Twitter does not correspond to the political spectrum in the offline world according to the election results. This finding should be taken into account in future research, i.e. political prediction with social media. The development and refinement of the identified techniques is essential as online interactions play an increasingly important role in political campaigns.

References

Adamic L., and Glance N. (2005). “The Political Blogosphere and the 2004 US Election: Divided They Blog”. Presented at Conference on Knowledge Discovery in Data. Accessed online at http://portal. acm.org/citation.cfm?doid=1134271.1134277

Ammann S. L. (2010). “A Political Campaign Message in 140 Characters or Less: The Use of Twitter by U.S. Senate Candidates in 2010”. http://ssrn.com/abstract=1725477 Blei, D. M., Ng. A.Y., and Jordan.

Barberá P., and Rivero G, (2012). “¿Un tweet, un voto? Desigualdad en la discusión política en Twitter”. I Congreso Internacional en Comunicación Política y Estrategias de Campaña.

Bastian M., Heymann S., and Jacomy M. (2009). “Gephi: An Open Source Software for Exploring and Manipulating Networks”. Association for the Advancement of Artificial Intelligence

Bermingham A., and Smeaton A. (2011), “On Using Twitter to Monitor Political Sentiment and Predict Election Results”. Workshop on Sentiment Analysis where AI meets Psychology, November 13, 2011, Chiang Mai, Thailand.

Blondel V., Guillaume J., Lambiotte R., and Lefebvre E. (2008). "Fast unfolding of communities in large networks". Journal of Statistical Mechanics: Theory and Experiment 2008 (10), P1000

Bollobás B. (2001). “The Evolution of Random Graphs—The Giant Component”. Random Graphs. Cambridge studies in advanced mathematics. 73 (2nd ed.). Cambridge University Press. pp. 130–159. ISBN 978-0-521-79722-1.

Borge-Holthoefer J., Rivero A., García I., Cauhé E., Ferrer A., et al. (2011) “Structural and Dynamical Patterns on Online Social Networks: The Spanish May 15th Movement as a Case Study”. PLoS ONE 6(8): e23883. doi:10.1371/journal.pone.0023883

Bradley M.M., and Lang P.J. (1999). “Affective norms for English words (ANEW): Instruction manual and affective ratings”. Technical Report C-1. The Center for Research in Psychophysiology. University of Florida.

Bruns A., and Burgess J. E. (2011). “#ausvotes: How Twitter covered the 2010 Australian federal election. Communication”, Politics and Culture 44(2):37–56.

Bruns A., and Burgess J. E. (2011). “#The use of twitter hashtags in the formation of ad hoc publics”. Proc. ECPR, University of Iceland, Reykjavik.

Burns A., and Eltham B. (2009). “Twitter Free Iran: an Evaluation of Twitter's Role in Public Diplomacy and Information Operations in Iran's 2009 Election Crisis”. Communications Policy and Research Forum 2009. 19th-20th November 2009, University of Technology, Sydney.

Castells M, (2009). “Communication power”. Oxford: University Press.

Congosto M.L., Fernández M., and Moro Egido E. (2011). “Twitter y Política: Información, Opinión y ¿Predicción?”. Cuadernos de Comunicación Evoca, 4 (Comunicación política 2.0).

Congosto M., and Aragón P. (2012). “Twitter, del sondeo a la sonda: nuevos canales de opinión, nuevos métodos de análisis”. I Congreso Internacional en Comunicación Política y Estrategias de Campaña

Dader, J.L. (2009). “Ciberpolítica en los websites de partidos políticos: la experiencia de las elecciones de 2008 en España ante las tendencias transnacionales”. Revista de Sociologia e Política, 17, 34, 45-62.

Davis R. (1999). “The Web of Politics: The Internet’s Impact on the American Political System”. New York: Oxford University.

De Ugarte D. (2007). "El poder de las redes". Colección Biblioteca de las Indias.

Gini, C. (1912). “Italian: Variabilità e mutabilità (Variability and Mutability)”. C. Cuppini, Bologna, 156 pages.

González-Bailón S, Borge-Holthoefer J., Rivero A., and Moreno Y. (2011). “The Dynamics of Protest Recruitment through an Online Network”. Scientific Reports. 1 DOI: 10.1038/srep00197.

Hendricks J.A., and Denton R.E. (2010). “Communicator-in-chief: how Barack Obama used new media technology to win the Withe House”. Lanham: Lexington Books.

Hendricks J.A., and Kaid L.L. (2010). “Techno politics in presidential campaigning”. New York: Routledge.

Holotescu C., Gutu D., Grosseck G. and Bran R. (2011). “Microblogging meets politics: the influence of communication in 140 characters on romanian presidential elections in 2009”. Romanian Journal of Communication and Public Relations, 13, 1, 37-47.

Jungherr A. (2010). “Twitter in politics: Lessons Learned during the German Superwahljahr 2009”. CHI 2010, April 10-15, Atlanta, Georgia, USA.

Jungherr A., Jurgens P., and Schoen H. (2011). “Why the pirate party won the german election of 2009 or the trouble with predictions: A response to "predicting elections with twitter: What 140 characters reveal about political sentiment”. (Social Science Computer Review)

Klotz R.J. (2004). “The politics of Internet communication”. Lanham: Rowman and Littlefield Publishers.

Lehmann J., Gonçalves B., Ramasco J. J., and Cattuto C. (2012), “Dynamical Classes of Collective Attention in Twitter". To Appear in WWW'12; WWW'12, 251 (2012).

Livne A., Simmons M.P., Adar E., and Adamic L.A. (2011), “The Party Is Over Here: Structure and Content in the 2010 Election”. 5th International AAAI Conference on Weblogs and Social Media, July 17-21, 2011, Barcelona, Spain.

Martin S., Brown W. M., Klavans R., and Boyack K. (2011). “OpenOrd: An Open-Source Toolbox for Large Graph Layout”. SPIE Conference on Visualization and Data Analysis (VDA).

Metaxas P.T., Mustafaraj E., and Gayo-Avello D. (2011). “How (Not) to Predict Elections". in Proceedings of PASSAT/SocialCom 2011, 2011 IEEE Third International Conference on Privacy, Security, Risk and Trust (PASSAT) and 2011 IEEE Third International Conference on Social Computing (SocialCom), IEEE Computer Society, Los Alamitos, CA, USA, 165–171.

Milgram S. (1967). “The small world problem”, Psychol. Today 2, 60–67.

Tumasjan A., Sprenger T.O., Sandner P., and Welpe I.M. (2010). “Predicting Elections with Twitter: What 140 Characters Reveal about Political Sentiment”. 4th International AAAI Conference on Weblogs and Social Media, May 23-26, 2010, Washington, USA.

Peytibi F.X., Rodríguez J.A., and Gutiérrez-Rubí A. (2008). “La experiencia de las elecciones generales del 2008”. IV Congreso Internet, Derecho y Política (IDP). Software social y Web 2.0: Implicaciones jurídico-políticas [monográfico en línea]. IDP. Revista de Internet, Derecho y Política. Nº 7. Universitat Oberta de Catalunya (UOC).

Redondo J., Fraga I., Padrón I., and Comesaña M. (2007). “The Spanish adaptation of ANEW (affective norms for English words)”. Behavior Research Methods, 39(3), 600-605. Psychonomic Society Publications.

Seidman, and Stephen B. (1983), “Network structure and minimum degree”. Social Networks 5 (3): 269–287. doi:10.1016/0378-8733(83)90028-X.

Selnow G.W. (1998). “Electronic whistle-stops: the impact of the Internet on American politics”. Westport: Praeger.

Skoric M., Poor N., Achanuparp PL, Lim E.P., and Jiang J. (2012). “Tweets and Votes: A Study of the 2011 Singapore General Election”. In Proceedings of 45th Hawaii International International Conference on Systems Science (HICSS-45 2012), IEEE Computer Society, Los Alamitos, CA, USA, 2583–2591.

Tjong Kim Sang E., and Bos J. (2012), “Predicting the 2011 Dutch Senate Election Results with Twitter”. 13th Conference of the European Chapter of the Association for Computational Linguistics, April 23-27, 2012. Avignon, France.

Watts D.J., and Strogatz S. (1998). “Collective dynamics of 'small-world' networks”. Nature 393 (6684): 440–442. Bibcode 1998. Natur.393..440W. DOI:10.1038/30918. PMID 9623998.

Webster F. (2001). “Culture and politics in the information age: a new politics?” New York: Routledge.

Williams C., and Gulati, G. (2008). “What is a Social Network Worth? Facebook and Vote Share in the 2008 Presidential Primaries”. In Annual Meeting of the American Political Science Association, 1-17. Boston, MA.