MPs, Twitter and the EU referendum Campaign

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Introduction

In the UK, as in many democracies there has been a rapid rise of MPs using Twitter over the past six years. From being a relative novelty in 2010, over one parliamentary cycle, the technology had been normalized by 2015 with 576 MPs having Twitter accounts (McLoughlin, 2016, June 20). Research in this area has tended to focus on the use of technology for representative and participatory purposes, political marketing, or more broadly on changes in style of representative democracy (Jackson & Lilleker, 2011; Kruikmeier, 2014; Margolis and Moreno-Riano, 2013). The focus of this paper, however, is more on the communicative networks being fostered by social media and the tone of that communication. In particular, we are interested in examining how far social media are challenging both inter and intra party relationships. Whilst there has been much popular comment on the disruptive nature of technologies, much of the existing empirical research suggests a more conservative approach in the political/parliamentary sphere (ref). Some studies suggest far from challenging political representatives' behaviour or power structures and elites within parties – social media has hardened divides both between and within parties (refs). Moreover, far from democratizing politics and enhancing democratic discourse as enthusiasts hoped, social media has furthered coarsened the nature of public debate (refs).

The research here examines some these broad questions within the more specific context of MPs contribution to the EU referendum debate via Twitter. The referendum arguably offered rare opportunities for cross party linkages, MPs to publically explain their own individual (as opposed to a party), position on Britain's relationship with the EU stance as well as a chance for a sustained national discussion/debate focused around a single issue.

Literature Review

Whilst research on MPs/Parties and the internet has focused around questions of why politicians/parties use social media and the impact in terms of campaign organization and public engagement, we examine three lesser researched areas: (a) inter party linkages amongst MPs via social media; (b) intra party networks and challenges to party hierarchies and (c) the tone of discourse between MPs via Twitter.

Inter-party Politics: Eroding barriers?

The internet and social media are often seen as reducing the costs of networking and linkages especially given their relative ease of use and lack of editorial controls (Lassen & Brown, 2010). In a parliamentary context, one expectation at the outset was that technologies would allow different types of relationships to develop. Allowing ordinary backbenchers to challenge government ministers more effectively, reflecting institutional relationship across parties (connecting more effectively MPs on parliamentary committees for example) (Lusoli and Ward, 2005). Theoretically, at least social media could support an erosion of traditional partisan relationships in favour of more open and mixed networks within parliament settings. Whilst this argument might have technological potential, it underestimates the resilience of traditional partisan political networks and the strength of parliamentary party discipline in many parliaments. One Norwegian study found although personalisation by politicians was prevalent online, there was little identifiable desire to move away from party attachments (Enli & Skogerbø, 2013). Indeed, what it perhaps underplays is that technology is not only reflective of the institutional and political environment within which it operates but also even if technology reduces the costs of networking it doesn't do so randomly. Hence, the internet and social media are arguably most effective at helping sustain like-minded networks. It is easier for individuals to find people reflective of their own

interests (the birds of feather flock together argument) (Larsson & Ihlen, 2015; Himelboim et al, 2013). The limited empirical evidence on parliamentary social media networks, tends to bear this out. Although Miller (2015) found some evidence for cross party connections forming in the UK, research tends to indicate that social media networks are highly reflective of their political systems and party environments (Ward & Gibson 2012; Rauchfleisch & Metag 2016). Hence, in adversarial party systems like the UK with a relatively limited numbers of parliamentary parties, social media networks between MPs mirror offline polarization (NESTA, 2015). In short, MPs unsurprisingly tend to network most closely with their own party. The picture is marginally different in federal multi party systems where there is more of a culture of co-operation and coalition more and therefore more social media cross-over between MPs (refs)

Intra-party Politics: Eroding hierarchies?

Even if social media doesn't break down party boundaries one could suggest that social media facilitates challenges to intra-party politics (Gibson and Ward, 2010; Jacobs & Spierings, 2016). It has been argued that new technologies could erode traditional party and parliamentary hierarchies through its supposedly decentralist and individualistic tendencies (Karvonen, 2010; van Aelst et al, 2012). One argument is that social media and the internet generally allow individual MPs a more level communication playing field. In most western democracies studies indicate that newspaper and broadcast media have increasingly narrowed their focused on a handful of politicians and leading ministers with backbench parliamentarians receiving less and less coverage (Negrine 1999; Tresch 2009). The internet offers ordinary MPs a platform and low cost mechanism of communication not controlled by editors and media gatekeepers. Whilst party elites still have an advantage of traditional media coverage, the internet world at least allows, if not a leveling, a widening of the media communication sphere. In addition to offering MPs a greater general communication presence, social media allows MPs a greater opportunity to personalise party messages, make their own opinions heard and explain their own policy/issue stance. Hence, social media could accelerate tendencies toward personalisation and individualization of politics detected since the 1980s (Kruikemeier, 2014). Interrelated to presence and personalisation is the notion that social media platforms allow MPs to express dissent more easily and to challenge party leaderships. Given the ease, speed, and low costs of communication now available it has become increasingly difficult for parties to control communication flows despite the apparent growth in leadership resources in many parties since 1980s.

Certainly, there are indications that social media is increasingly disrupting traditional UK party politics and making less predictable. Jeremy Corbyn's rapid rise to Labour leadership from an outsider position has been attributed in part to support inflated by twitter/social media networks (Prince, 2016; Gilbert, 2015). Similarly, (although more slowly), Labour's current deputy leader Tom Watson also owes some of his prominence from his early innovative adoption of new technologies and the audience and mainstream coverage it gave him (Francoli and Ward, 2008). Whether the rise of some outsider or populist politicians represents decentralist or democratization of parties is more debateable. One could of course argue that social media is simply creating a new form of elite politician through the promotion of personality traits or charisma.

Campaign communication: Highlighting the negative?

Alongside potential disruption to the organization of party and parliamentary politics are also changes to the mode and tone of political communication. Commentators have referred to a move from top-down broadcast politics to post broadcast (conversational) world (Coleman, 2005; Prior, 2008). A dominant theme in the internet/politics literature over the past two decades, has been the role of the internet as a

democratic public sphere and the ability of new technologies to support discussion and wider democratic interaction. More than a decade ago (before the rise of social media) Stephen Coleman argued the case for the development of a conversational style of representative democracy where MPs interacted regularly with a wide range of citizens and rather than simply provide information top down engaged in listening, deliberation and debate.

However, studies have indicated that political representatives still tend to use social media in broadcast mode as means of providing opinion or information, far less often do they engage in discussion. Furthermore sceptics have raised the fear of increasingly balkanised political debate (Sunstein, 2009) suggesting that the internet more prone to negative campaigning, abuse and mistrust. Since social media allows like-minded individuals to connect more easily together and ignore content they don't like, it also promotes echo chambers where Twitter and Facebook reinforce peoples pre-existing views and rarely challenge them. Douglas Alexander, former Labour MP and 2015 election co-ordinator has argued:

> social media was fuelling misinformation, baseless facts and at worst conspiracy theories among voters – as groups and individuals on the site's claims come under less scrutiny than the newspapers… and online publications 'websites such as Facebook and Twitter have become "echo chambers" for "at best [users'] own opinions and at worst their prejudices (2015).

The EU Referendum, Twitter and MPs: Expectations

The Brexit debate offered a useful opportunity to look afresh at some of the potentially disruptive challenges of new technologies. If much of the empirical research thus far suggested a relatively conservative approach to technologies by MPs and parties and limited impact in highly traditional political sphere. The UK EU referendum debate presented new opportunities, for a number of reasons Firstly, this was a focused debate that crossed party boundaries and divided parties (notably the Conservatives especially). The campaign was in theory was supposedly cross party offering a chance for new networks to be created not simply based on party linkages/ideology. Moreover, the referendum debate given it divided parties also risked heightening internal divides amongst parliamentary parties. Thirdly, whilst campaigns were led by well-known leading politicians, the social media world potentially allowed other voices to be heard and for MPs more generally to clearly state their own individual positions. Fourthly, there was much popular talk of "project fear" during the course of referendum campaign – the attempt allegedly to highlight the risks of leaving the EU and frighten voters into remaining or alternatively to promote fears of membership to drive people to leave. The newspaper world in particular has been highly partisan for some time on issues related to the EU and it could be suggested that both remain and leave campaigns used social media to further promote this polarized, negative and sometimes abusive atmosphere.

Research Questions

In short, in light of the discussion above therefore we focused on the following questions:

- Inter-party: Do MPs Twitter communication networks reflect by the party divides and to what extent did the referendum disrupt this and foster new cross party connections?

- Intra party: To what extent does Twitter linkages reveal divides within parties over Europe and did this harden over the referendum period? Additionally, did Twitter allow backbenchers a greater presence and centrality or were traditional campaign party leaders the most prominent?

Following the campaign, the extent to which Jeremy Corbyn campaigned actively for a Remain vote has become a divisive point within the Labour Party. Hence, we subsequently also were interested, to examine Corbyn's prominence (or otherwise) in social media networks.

- Campaign Tone: Finally, what sorts of messages did MPs promote during the campaign? How far did MPs' Twitter utterances and discussion reflect the supposedly overall negative tone of the debate?

Methodology

Researching the ways political representatives communicate between themselves is a difficult challenge. Permission to access the behind the scenes communication from in person, letter, or email would be complicated, and the ethical considerations would be significant. However, with MPs uptake of social media, a glimpse of their interpersonal communication now takes place online: accessible and open to research. For this paper, we used online communications by MPs through an extensive methodology to create a greater understanding of these previously hard to research interpersonal communications. With an aim to understand the networks between MPs, who is the most prominent members in these networks, and the nature of this communication. To do this, we took messages posted by MPs from the social network and microblogging site Twitter; which is built on networks based on messaged made up of 140 characters or less, and asymmetrical 'follower' relationships. The social network was used as a basis for study due the relative openness of data collection due to its streaming API[1], and its high index of use amongst UK MPs.

Data Scope

Before any data collection can take place on any social media platform, it was important to have a good understanding of target research audience. For this paper, we aimed to collect every message sent between MPs during the official EU referendum campaign. Therefore, the research omitted any communication which did not take place between two MPs. To do this, we identified all MPs with a Twitter account and added their Twitter handles to a database. To ensure that no fake profiles entered the database, each MPs handle was confirmed through Twitter's verified status service. This is where the social network places a 'verified badge' on high profile users of the service which they have contacted independently to insure validity. If the MP did not have a verified status on Twitter, we cross-examined the MPs websites or their biography on the Parliament.uk website, as it could be assumed that if the MP had placed a Twitter handle in their biography sections or personal website the Twitter account could be deemed legitimate. Through this process we found that 576 out of 650 MPs had a Twitter account.

To answer the research questions, we limited the data collection to the period during the official EU referendum campaign which took place between the 15th April and the 23rd June 2016. This data collection period was chosen for computational resource reasons in an expectation of the large amount of communications relating to the referendum between MPs on Twitter. Furthermore, although it could be assumed some campaigning would have taken place before the official campaign, an official purdah set by the European Union Referendum Act 2015 limited some communication by MPs. Therefore, for the

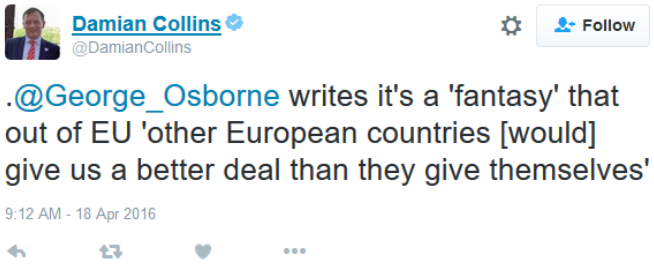
[1] API stands for 'Application Programming Interface' – an API is a way for programs and other software to retrieve and modify data from an external source, bypassing website interfaces. In this instance Twitter allows access to two separate APIs: the streaming API, and search API. Each allow access to different data and usage of each is selected dependent on requirements.

purpose of this research an assumption was made that a majority of the campaign communication would take place during the official campaign.

Data Collection

The dataset on MPs handles was applied to a data acquisition software that integrates with Twitter's streaming API called *NodeXL* to collect all the communication between MPs (Smith *et al,* 2010). This collected all the Tweets, Retweets, Replies and Mentions (referred to as *actions* in this paper) between all MPs over the course of the EU referendum campaign. During this period eight MPs made no communication on Twitter, and are therefore not included in the dataset. Communication which did not include a relationship between two MPs was excluded from data collection. This was done for two reasons: firstly, communication that did not take place between MPs would not bare any impact on the interpersonal relationships between elites, and secondly, the computational resource cost to collect every Tweet would have been excessive. We further collected account information from every MP, which includes the follower relationships on Twitter. This data collection produced a dataset of 8,149 actions, which we believe represents the entirety of all communication between MPs on Twitter during the referendum campaign. From the collected data of 8,149 actions between MPs, the majority came from mentions (6,681), while 1,244 came from tweets, and replies only made up 224 of the total. Meanwhile the dataset which includes follower relationships between MPs includes 51,348 connections.

During the data collection, there was a number of events of political importance which were exogenous to the research focus. During the EU referendum campaign, a number of elections took place alongside other events that took the national attention, such as the death of Jo Cox MP. These events shaped a significant amount of communication between MPs on social media. To ensure that the research questions were kept in focus, action was taken to filter out unrelated actions from the data. Tweets which included text and hashtags related to the referendum campaign were retained – the results of this can be seen in table 1.



Examples of Tweets captured within the dataset

Table 1: Total number of Tweets by Party

Party	MPs in Sample	MPs in Filtered Data	Number of Tweets by MPs	Tweets EU related	Tweets EU related (%)
Conservative	275	152	2,828	906	32.0
Labour	210	148	4,353	862	19.8
Green	1	1	25	8	32.0
DUP	7	0	39	0	0.0
Liberal Democrat	8	4	129	18	14.0
Plaid Cymru	3	2	42	6	14.3
SNP	54	32	681	92	13.5
SDLP	3	2	18	4	22.2
Sinn Féin	4	0	5	0	0.0
UKIP	1	1	26	13	50.0
UUP	2	0	3	0	0.0
Total	**568**	**342**	**8,149**	**1,909**	**23.4**

After this data was filtered, it was then inputted into network analysis software *Gephi* (Bastian *et al,* 2009). This was used as a visual and numerical method of understanding the groupings which formed within the elite interpersonal communication. Furthermore, we were also able to use Gephi to find which MPs had the most importance in the networks and if the online discussions were led by particular MPs.

In order to create an understanding of the overall tone of the campaign, the tweets within the interpersonal communication was inputted into the sentiment analysis software *SentiStrengh* (Thelwall *et al,* 2013). Which is able to find the overall tone of the communication between MPs. Both programs are well regarded and have been used previously in multiple academic papers for the analysis of Twitter data.

Ethics

Whenever using data taken from social media, it is important to ensure rigorous ethical standards. Therefore, we implemented the ethics frameworks from a number of sources (Markham & Buchanan, 2012; Salmons & Woodfield, 2013; Beninger, 2014). The steps taken to ensure that this research is within the ethical frameworks found above are summarised below:

– Data collection took place from only publically accessible data. Data from private Twitter accounts were not collected. Furthermore, it can be assumed that MPs are public figures and use social media to

send messages to a public audience, and are not concerned about the messages they post being in the public domain.

- Data was only collected on verified MPs; therefore, no members of the public are part of the data set.

- In accordance with Twitter's developer agreement and policy agreement (Twitter, 2016), no tweets deleted by MPs will be published as part of this paper at the time of publication.

Findings

Understanding Network Analysis

As part of the analysis, we created a series of network graphs to visualise the data collected in this research. These network graphs are made up of *Nodes* which symbolise each user in the network, and *edges* which show the relationship between the nodes. In these graphs, the more connections between two nodes will be visualised by a relative closeness between them on a graph. Furthermore, in some network graphs we have displayed the importance of each node through size, with the bigger nodes representing MPs who are more important within the network.

Follower Relationships between MPs

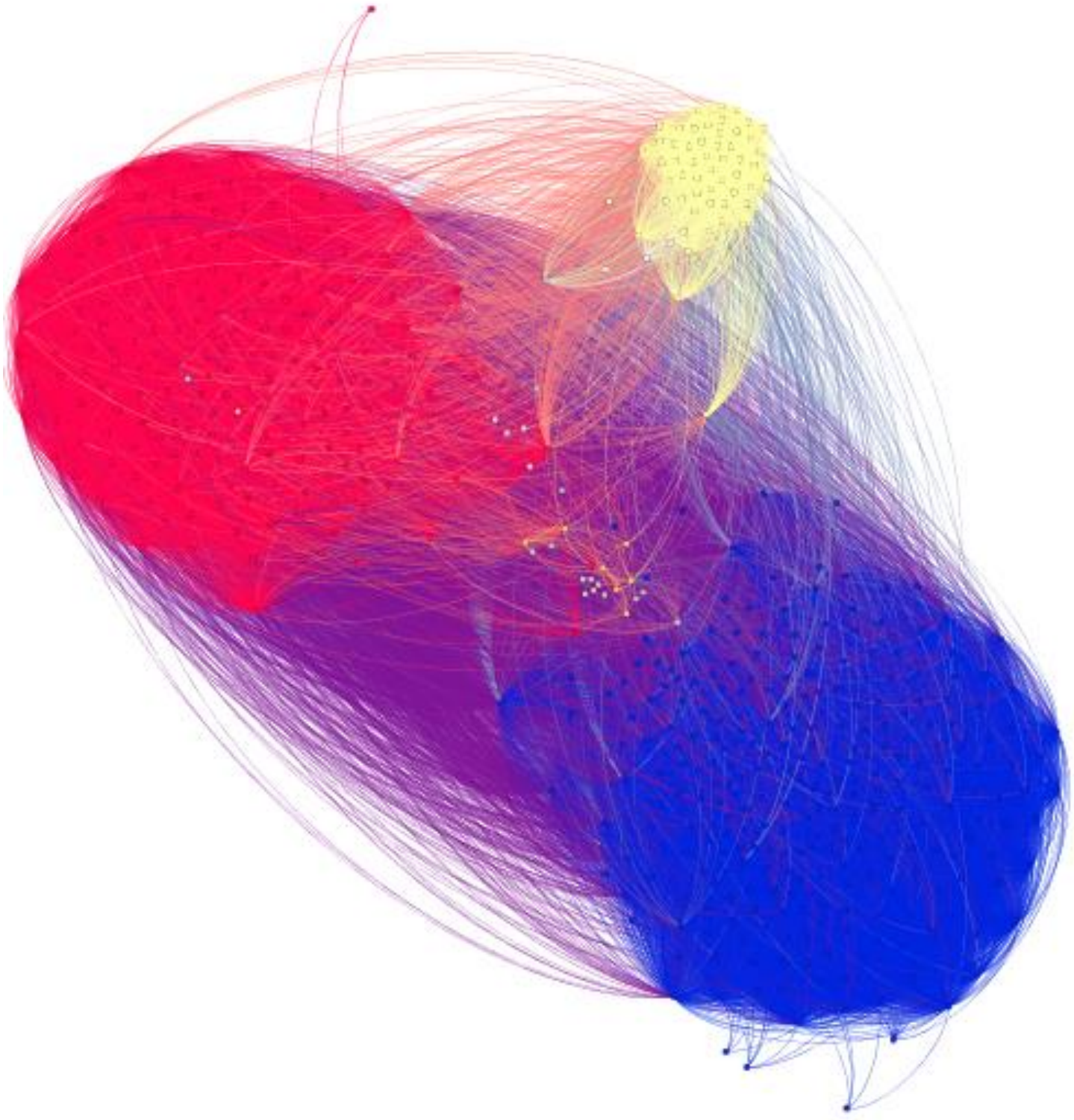
Follower relationships on Twitter are asymmetrical connections between two people which allows the follower to receive updates of the followee within their social network streams. There are numerous studies in to the importance of follower relationships, Takemura *et al* (2015) found there is a variety of reasons as to why one why one person would follow another, and not one singular cause. Factors that induce follower relationships include information gathering, a method of enacting personal communication, showing support for the followee, or simply as a method to see what the user is up-to. Although the reason for an MP to follow another is undetermined, followers are a useful method of being able to see how the networks of particular set of people are grouped. Furthermore, understanding the network based from follower relationships is a useful method for measuring longstanding relationships on Twitter between MPs. As the networks based upon following is more stable than tweets, retweets or mentions; which are more dependent on political climates. Consequently, we are able to use follower networks to create a perspective of MPs networked groups.

An initial examination of the data looking at the follower relationships could suggest that MPs on Twitter have the opportunity to be somewhat interconnected. We located 51,348 follower connections between MPs. We found that MPs follow on average 90.4 other MPs, however this differed by party. Conservative and Labour MPs followed the most, following 93.6 and 102.1 MPs. Meanwhile MPs from other parties followed significantly less, with SNP MPs and all other party MPs following 60.3 and 31.8 respectively. This suggests that MPs are interconnected in some way.

Although MPs do follow each other, its seems the majority of these relationships are highly partisan. From the total of 51,348 follower connections, only 10,896 (21.2%), of the relationships cross party lines. To investigate this relationship, we created *graph 1* and *graph 2* which visualises the follower network amongst MPs. Graph 1 shows the three main groups coloured by party. Although the edges display some cross-party relationships, these are not as significant as the relationships between party members. The

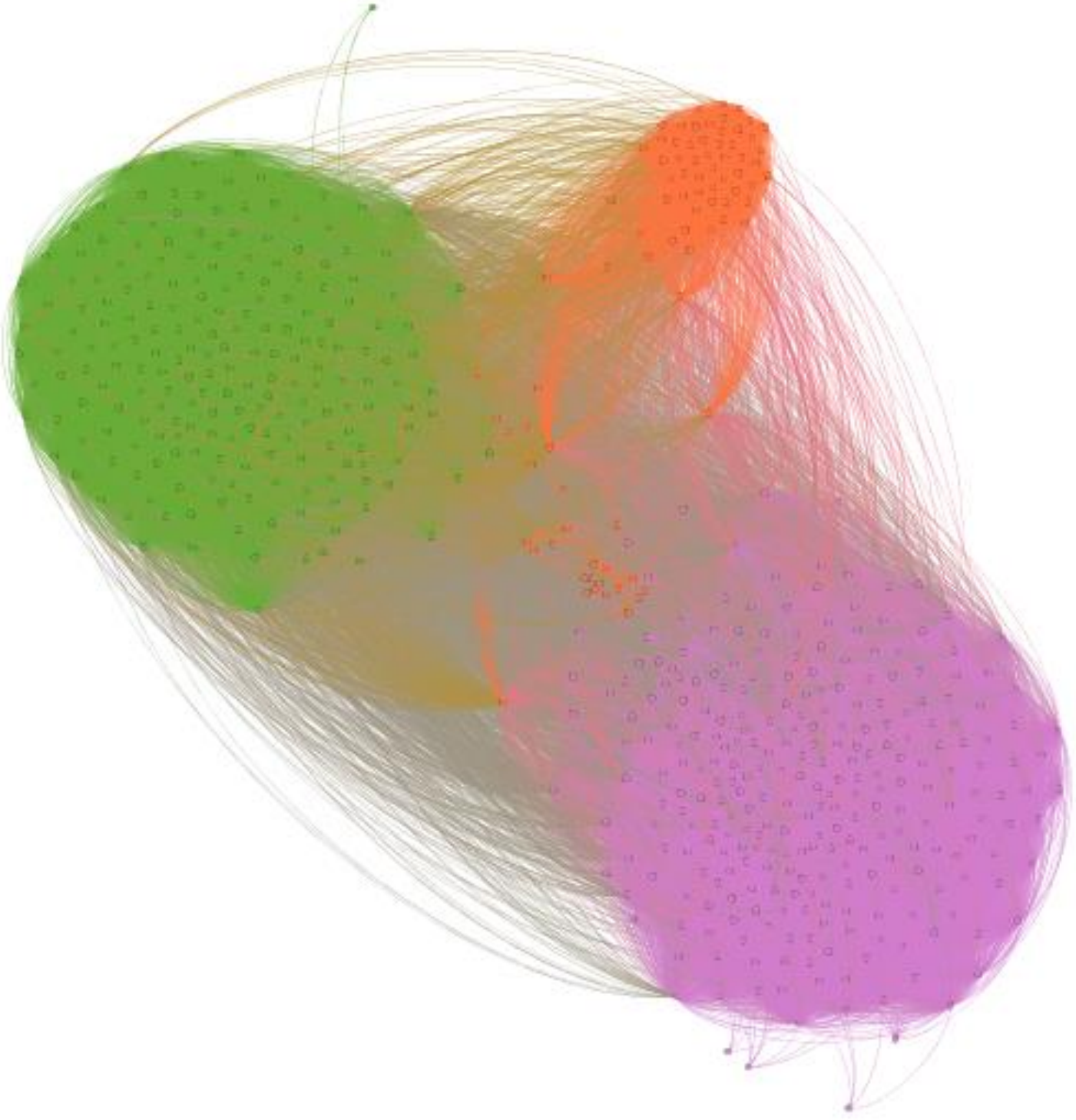
notable exception to this partisanship are minority party MPs whose networks are less defined by party. Graph 2 confirms these groupings, with the colours displayed by modularity class; statistical groupings defined by the strength of divisions in a network, rather than party. The correlation between both modularity class and party indicates significant partisan groupings within the overall network. This would suggest that MPs do not follow a wide variety of MPs, but are more selective about which MPs they follow on Twitter, with the majority of these connections identifiably partisan as they strongly correlate with party membership.

Graph 1: Follower relationships of MPs; nodes coloured by party



Created using Force Atlas 2 Layout. Each MP (displayed as nodes) has been identified by the party they represent: Blue, Conservative – Red, Labour - Yellow, SNP - Liberal Democrats, Orange - Grey; Other

Graph 2: Follower relationships of MPs, nodes coloured by Modulatory class



Created using Force Atlas 2 Layout. Each MP (displayed as nodes) has been identified by the modularity class

Communication between MPs during the referendum campaign

During the EU referendum campaign, Twitter became a communication medium for a large range of debates, campaign communication, current affairs, and information sharing between a range of actors of topics related to the UK's membership of the European Union. Members of the political elite also engaged in this type of communication on Twitter between themselves. From the data collected we located 1,909 separate incidences of communication between MPs during the referendum campaign. Using these actions for the basis of analysis, we were able to see how the debates surrounding particular topics and timeframes influences the overall networks and the groups which MPs reside. As actions are less stable than follower relationships, we predicted that we could use the analysis to create an understanding of how MPs' communications change depending on the political climate. Therefore this has a potential for the creation of a predictive tool to understand positions of MPs on single issues where they have not already publically declared their position.

To test this, we created a series of network graphs. Graph 3 displays the network actions by MPs during the campaign. We coloured each node by party membership to test if partisanship remained a prominent factor in the make-up of online groups. Analysis of the graph shows three major groups within the network, and that while there is some correlation to party and the groups, there are significant other factors in determining the make-up of the network. This is significant, as it has the potential to demonstrate that while the normal relationship between MPs is defined by party membership as shown by the follower relationship graphs, when focusing on particular issues such as the referendum, party has less significance in defining areas within the structure of the network.

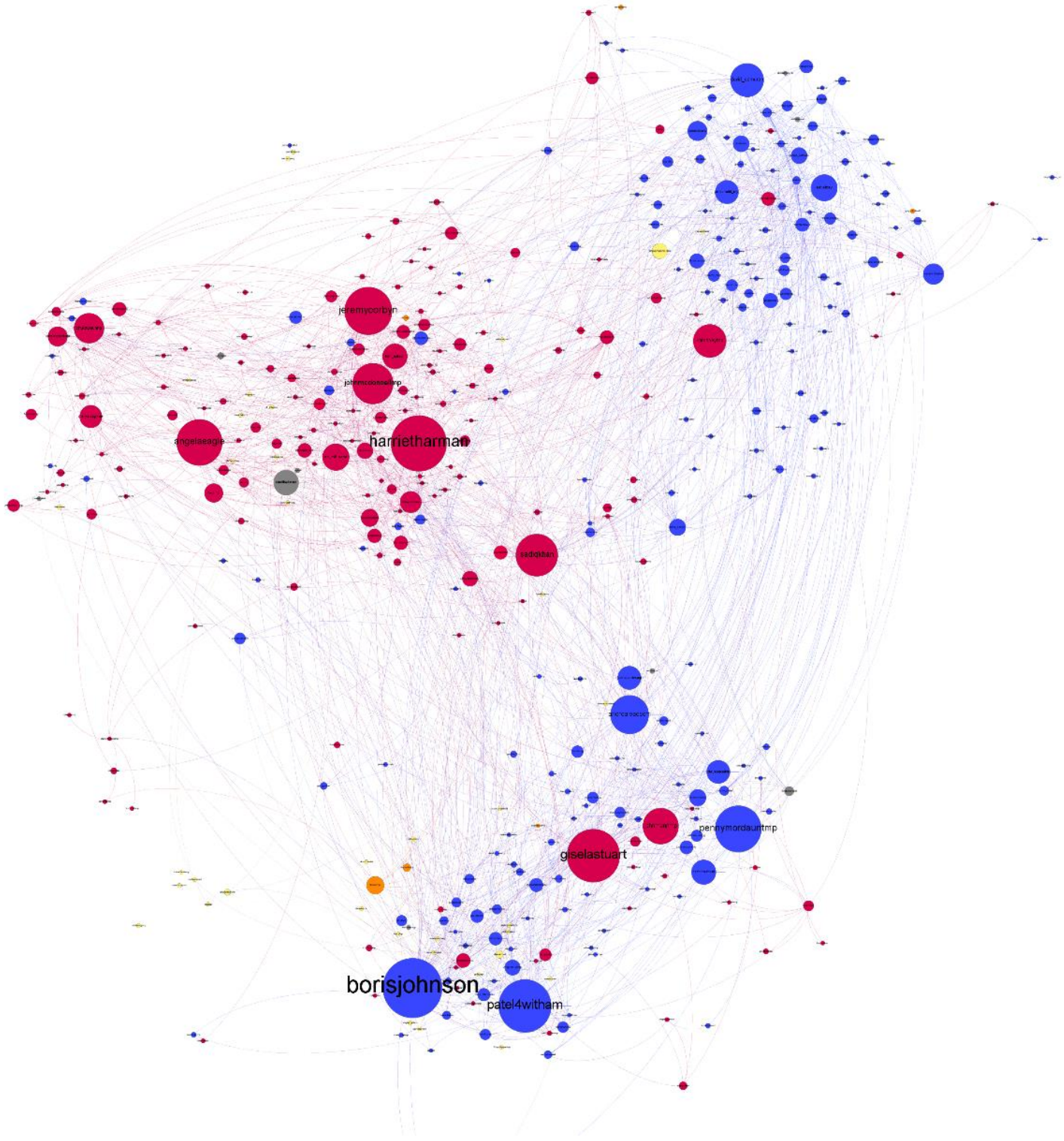
To further understand the changes within this network, and to detect the factors that determine the membership of the groups within the graph, we undertook analysis through the use of modularity classes. We found eight different groups based upon modularity, five of the groups only contained nine MPs between them and therefore insignificant and emitted from further analysis. The three main groups can be seen in graph 4, which is a network graph of all actions taken between MPs during the campaign coloured by their respective classes. This shows that each group is closely interlinked, and while there is communication between each group, this is not as significant as those within the groups themselves. Table 2 outlines the characteristics of each group in terms of group figures, intention to vote in the referendum, and party membership. The makeup of each group shows particular characteristics. Group 1 is characterised by a high index of Conservatives who wish to remain in the EU, Similarity, group 3 also wishes to remain but has a higher probability of Labour membership. Group 2 is significantly different. This group has a greater mix of party memberships compared to groups 1 and 3, and although has a majority of remain supporters, it also has a higher propensity to support leaving the EU than the two other groups.

Through further analysis, it was found overall groups 1 and 3 shared a relative commonality of support for the remain campaign, and this can be seen in comparison to group 2 in graph 4. However, the groupings show the deep party political divisions across the remain campaign, suggesting a less united front than the overall remain campaign wanted to create in the media. Although MPs in both Group 1 and 3 supported the same cause, party politics remained a centralising factor. Suggesting although MPs may support a shared cause, it was not greater than their desire to focus on party communication on Twitter.

Group 2 showed a significant difference in overall composition. Its membership was less defined by party, and more inclusive of a wider range of party support. Furthermore, group 2 MPs were more likely for to vote to leave the EU, than groups 1 and 3. It was also found this group contained the vast majority of SNP MPs in the dataset, who in a content analysis was using Twitter to debate with MPs who supported the EU leaving the UK, which explains their high degree of communication and inclusion with

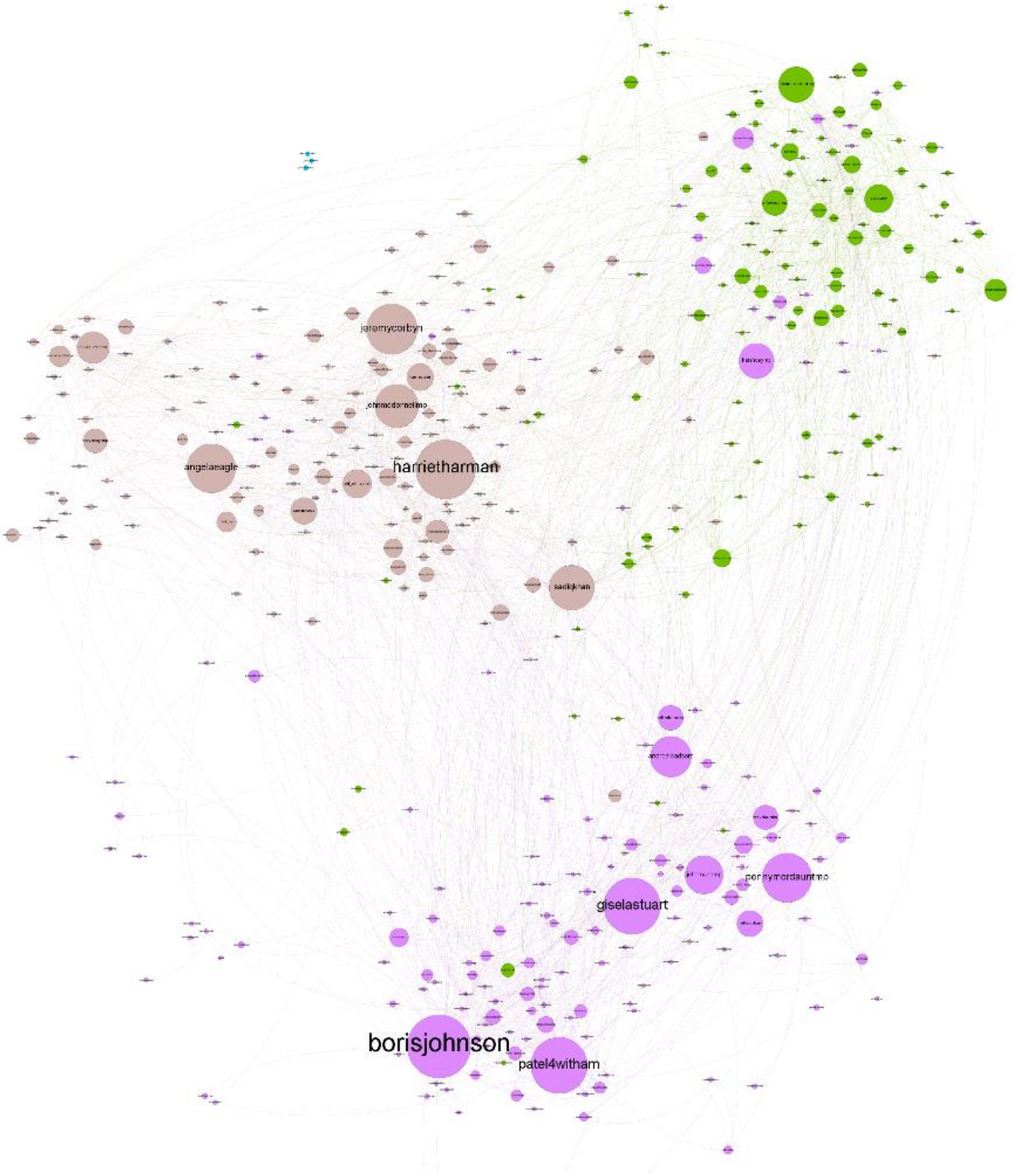
this group. Similarity there are a number of Labour and Conservative MPs who overall supported remaining in the EU, but was using Twitter to discuss the referendum with their campaign opponents. Therefore, this group signifies MPs who wish to leave the EU and those more willing to cross party and ideological barriers to discuss the EU referendum. This group therefore has a somewhat divergent split within it, with a closely connected group of leave supporters and remain supporters found more towards the outside of the group.

Graph 3: MPs network of communication based from actions during the referendum campaign coloured by party



Created using OpenOrd Layout. Each MP (displayed as nodes) has been identified by the party they represent. Blue, Conservative; Red, Labour; Yellow, SNP; Liberal Democrats, Orange; Grey; Other. The size of the Nodes and Labels are dependent on their importance within the network (Eigenvector)

Graph 4: MPs network of communication based from actions during the referendum campaign coloured by modularity



Created using OpenOrd Layout. Each MP (displayed as nodes) has been identified by the three modularity classes. The size of the Nodes and Labels are dependent on their importance within the network (Eigenvector)

Table 2: Modularity group displayed by intention to vote & party

Group	Number in Group	Intention to vote			Party			
		Remain	Leave	Un-declared	Labour	Conservative	SNP	Other
Group 1	120 (28.6%)	109 (90.8%)	11 (9.1%)	0 (0%)	20 (16.7%)	96 (80%)	2 (1.67%)	2 (1.67%)
Group 2	153 (36.42%)	85 (55.6%)	66 (43.1%)	2 (1.3%)	36 (23.53%)	81 (52.9%)	27 (17.6%)	9 (5.89%)
Group 3	147 (35%)	133 (90.5%)	13 (8.84%)	1 (0.68%)	116 (78.9%)	22 (14.9%)	5 (3.4%)	4 (2.72%)
Total	**420**	**327**	**90**	**3**	**172**	**199**	**34**	**15**

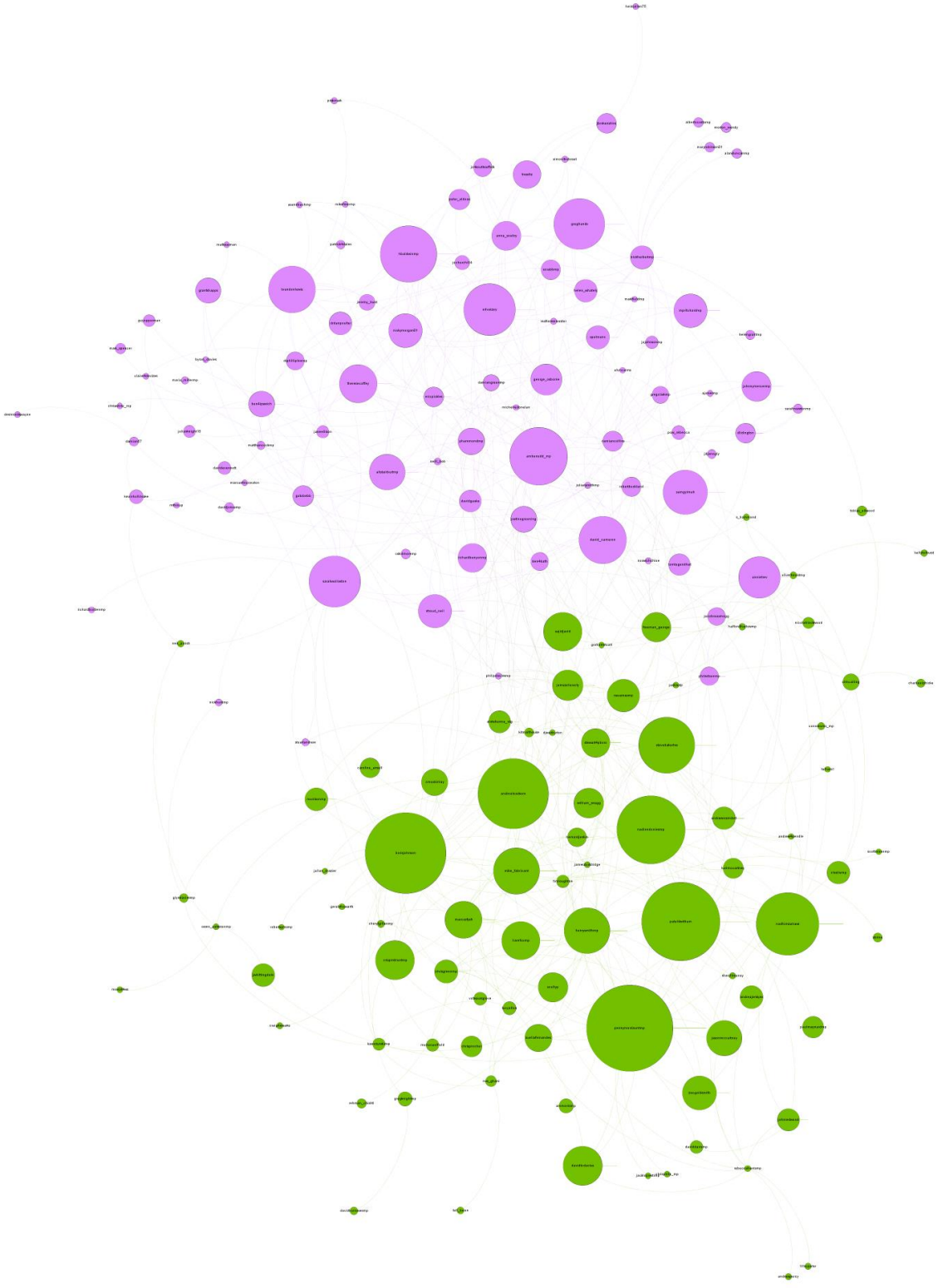
(MPs intention to vote data, BBC 2016)

Intra-party communication

As shown above, while there was inter-party communication, partisanship remained a significant factor. This is evidenced by the split in the remain campaign between Conservative and Labour MPs. As shown by *Graph 5* and *6,* there was clear divisions within the internal Conservative MP network, but few divisions within the Labour party during the referendum campaign. Graph 5 which displays the connections within the Conservative party show two significant modularity classes (both classes make up 94.54% of all Conservative MPs). The membership of each modularity class correlates with the MPs intention to vote in the referendum. This is of no surprise; as Conservative party was significantly split in regards to induvial MPs intention to vote in the referendum. However, this graph shows that these splits are evident and measurable on social media.

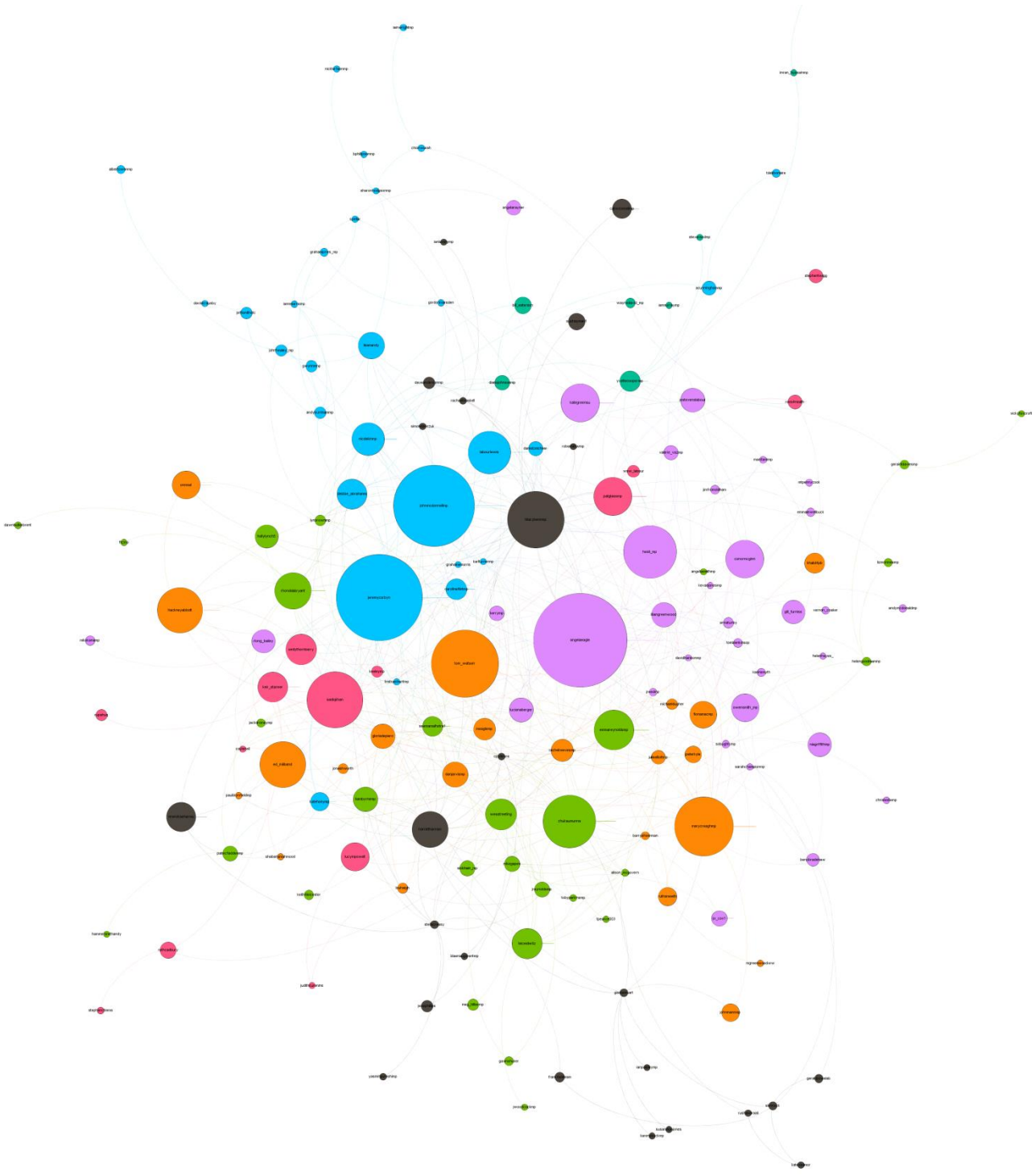
Graph 6 displays network under the same conditions but for Labour MPs. This shows Labour was less divided as a network, with no significant divides being displayed. The divides that do exist in terms of modularity are insignificant, with no correlation between groupings of nodes and modularity. This was to be expected as all but a few Labour MPs intended to vote remain. The main findings show that Labour MPs that did support for the UK to leave the European Union cannot be found as a group in this network, instead they remain on the outskirts, mostly ignored by the rest of Labour MPs. The graph overall suggests that overall Labour MPs remained much more cohesive on the issue of Europe compared to their Conservative opposites.

Graph 5: Network between Conservative MPs coloured by modularity



Created using ForceAtlas 2 Layout. Each MP (displayed as nodes) has been identified by modularity class. The size of the Nodes is dependent on their importance within the network (Eigenvector)

Graph 6: Network between Labour MPs coloured by modularity



Created using ForceAtlas 2 Layout. Each MP (displayed as nodes) has been identified by the three modularity classes. The size of the Nodes and Labels are dependent on their importance within the network (Eigenvector)

Measuring prominence/importance amongst MPs

While measuring the importance of a particular node within a network there is a range of statistics that could be used. For this research we used the statistical algorithm Eigenvector-Centrality [2], this produces a figure that can be used as measure of relative importance of every node across the overall structure of the network, rather than the groups which they reside. This measure is useful for understanding the MPs who had the most prominence in the campaign amongst all MPs. In Graphs 3 and 4 each node is sized based upon Eigenvector-Centrality, with the bigger nodes having a relative importance across the network. This suggests when MPs are discussing particular subjects there are MPs who hold significance prominence across the network in contrast to others.

Table 3 lists all MPs with an Eigenvector-Centrality range of 1 to 0.3; with 1 being the most prominent/important MP within the network. These are listed alongside party, modularity class, and intention to vote. The table shows that MPs with significant pre-existing profile have a higher importance within the network. The list includes the leaders of the two major parties, and senior government officials. Furthermore, the characteristics of modularity groups who these MPs belong in align closer, suggesting these are not only the most important in terms of connections within the network, but also in terms of defining the groups in which they belong. This is somewhat significant in consideration of the location of party leaders in table 3. As mentioned in the review, it was expected that Jeremy Corbyn, whose prominence and successful leadership campaign was led through social media support would be expected a significance place within the network of MPs. This would suggest that Although Corbyn has a level of popularity on social media – this was replicated within the network of MPs.

Without content analysis the data alone cannot be used to understand why these particular MPs are the most prominent within this network. However, the data suggests that this is due to these members having their tweets retweeted on a greater basis compared to all other MPs. However indications from the way MPs are grouped indicate that politicians within smaller networks, such as the Leave side, are more supportive of each-other irrespective of party compared to the larger Remain side. This would explain the unexpected importance of some members. This is something that shall be investigated at a later date with a full content analysis.

[2] For further information on the ranking algorithms used, please see Hanneman & Riddle, 2005.

Table 3: MPs ranked by Eigenvector-Centrality

MP	Eigenvector-Centrality	Party	EU ref voting intention	Modularity Group
Boris Johnson	1.000	Conservative Party	Leave	2
Harriet Harman	0.932	Labour Party	Remain	3
Gisela Stuart	0.882	Labour Party	Leave	2
Priti Patel	0.879	Conservative Party	Leave	2
Jeremy Corbyn	0.787	Labour Party	Remain	3
Penny Mordaunt	0.764	Conservative Party	Leave	2
Angela Eagle	0.755	Labour Party	Remain	3
Sadiq Khan	0.686	Labour Party	Remain	3
John McDonnell	0.662	Labour Party	Remain	3
Andrea Leadsom	0.622	Conservative Party	Leave	2
John Mann	0.575	Labour Party	Leave	2
David Cameron	0.533	Conservative Party	Remain	1
Kate Hoey	0.525	Labour Party	Leave	2
Chuka Umunna	0.469	Labour Party	Remain	3
Ed Miliband	0.411	Labour Party	Remain	3
Ed Vaizey	0.405	Conservative Party	Remain	1
Caroline Lucas	0.381	Green Party	Remain	3
Tom Watson	0.379	Labour Party	Remain	3
Nadhim Zahawi	0.372	Conservative Party	Leave	2
Amber Rudd	0.350	Conservative Party	Remain	1
Nadine Dorries	0.349	Conservative Party	Leave	2
Steve Baker	0.348	Conservative Party	Leave	2
Mary Creagh	0.335	Labour Party	Remain	3
Hilary Benn	0.315	Labour Party	Remain	3
Sarah Wollaston	0.302	Conservative Party	Remain	1

The tone of the campaign between MPs

During the referendum campaign there were complaints over the negative tone of the overall campaign on both sides (Wright, 2016; Skinner, 2016; Williams, 2016). Using sentiment analysis of the actions between MPs we tested if this supposed negative campaign existed between MPs themselves on Twitter. We did this by inputting all 1,909 actions through the sentiment analysis tool *SentiStrength* (Thelwall *et al,* 2010). Sentiment analysis works by detecting the positive and negative sentiment of a text, with two values given: the first figure related to how positive the text was, with 1 being neutral and 5 extremely positive, the second value displays how negative the text was, with -1 being neutral and -5 extremely negative. The accuracy of sentiment analysis is disputed, with the use of the English language online often disregarding common grammatical rules, or the use of abbreviated text. The use of SentiStrength was decided based upon its ability to correctly identify positive, negative, and neutral sentiments in online communication, alongside its identification of the colloquialisms often found on social media. (*ibid,* 2010). The software has a reported error rate of 22%, mostly due to its inability to detect sarcasm and irony (Thelwall *et al,* 2010; Thelwall *et al,* 2012). Therefore, the use of this tool is a good indicator for the sentiment of vast majority of communication between MPs.

On the whole, the debate was somewhat neutral in tone, with a total average sentiment of 1.57 positive, and -1.422 negative. This would go some way to argue that MPs when communicating between

themselves showed a greater level of civility than the reported tone in the overall campaigns. The results could suggest that while MPs might have been negative outside their networks, internally and on the whole, the debate was neither significantly negative nor positive in tone.

Table 4: Sentiment analysis of MPs segmented by party membership

Party	Mean Positive	Mean Negative	Mean Total Sentiment	Mean Total Standard Deviation
Conservative	1.63	-1.402	0.22	1.15
Labour	1.50	-1.428	0.072	1.104
SNP	1.70	-1.536	0.170	1.124
Other Parties	1.6	-1.475	0.125	1.284
All MPs	1.57	-1.42	0.150	1.143

However, it could be expected that the communication between campaigners on either side would be somewhat more combative. To test this, we segmented actions taken between MPs who share the same position on Europe, and those who are on opposite sides of the campaign. Table 5 shows that there are some differences between sides which will require further analysis, with less positive and more negative sentiment shown between tweets shared across the two campaign camps. Further analysis will involve coding the actions individuality and segmenting the data by action type to better understand the sentiments of the tweets during the referendum campaign.

Table 5: Sentiment analysis of MPs segmented by communication across referendum campaign groups

Relationship	Mean Positive	Mean Negative	Mean Total Sentiment	Mean Total Standard Deviation
Leave - Leave	1.71	-1.42	0.293	1.15
Remain - Remain	1.589	-1.402	0.186	1.14
Leave – Remain	1.475	-1.39	0.077	1.16
Remain - Leave	1.344	-1.586	-0.241	1.101
Total Same	1.614	-1.406	0.208	1.14
Total Opposite	1.392	-1.514	-0.122	1.128

Discussion & Conclusions

The use of Twitter to identify concepts of interpersonal relationships: methodological implications

The collection and use of data from this paper has important methodological implications for research on politician's interpersonal relationships. It shows that through the collection of data based strictly between MPs communicative acts on social media; analysis can now take place on a previously difficult to research area of the interpersonal relationships between political elites. To understand who, and why, MPs communicate with others outside of the House of Commons, researchers previously required access to a politician's private communication channels: access to which is extremely difficult and has significant ethical considerations. With MPs use of social media a glimpse of their overarching interpersonal communication is now online, and accessible to research without the requirement to access private emails, letters, or spoken conversations. In this paper, we have used this data to create a greater understanding of how MPs have communicated over the duration of the European referendum campaign to find which MPs are talking to each other, and the contents of this communication. However by focusing the topics of conversations included for analysis, greater understanding of the groups and networks between MPs can be achieved. This has implications for a wide range of areas of research, for example, scholars researching the interpersonal relationships of political elites with a focus on single issue campaign communication.

Inter-party networks: Remainers remained, Leavers joined?

The referendum campaign was a rare event in UK politics. Political representatives from a range of political parties campaigned together, it seems for once that parliamentary whips were left out, and inter-party linkages were in. This was a significant opportunity to test if such linkages were created, the manor which they would exist. However, on the whole, it seems the inter-party relationships remain centred on partisanship rather than issues. The groupings within MPs who supported remain shows that linkages between MPs had party as a determining factor despite the desire by MPs to support a single cause. Therefore, groups 1 and 2 suggests two possible important situations: Firstly, that a majority of remain supporters, regardless of a shared cause, still sought to keep party divides, and secondly, that party politics is replicated through interpersonal communication on Twitter.

However, partisanship was less influential between MPs within group 2. This group which membership incorporates a small number of remain voters from the Conservatives and Labour, alongside a majority of SNP members, and most MPs who supported the UK leaving the EU. This group, can be summarised as the vast bulk of the Leave supporters, and Remain voters who wished to interact or debate on the subject. This group therefore shows that although some cross party linkages formed, these were limited to more negative online exchanges (see tones of communication). However, the Leavers within the group are the exception to the theory regarding UK MPs and partisanship. This can be explained through MPs who express an opinion outside the majority of their respective parties banding together for campaign support. If this is true, this would partly explain why some MPs such as Gisela Stuart, Steve Baker, & Kate Hoey, had a significantly increased importance within MPs Twitter networks than expected. As MPs who supported Leave banded together much more effectively than their respective Remain supporters.

Overall the network suggests that partisanship remains a defining characteristic in the overall network between MPs. However, the metrics behind group 2 somewhat suggest a breakdown of partisanship in parts of the network, with Leave supporters having effective cross-party linkages. This is a result which is in need of significant further research in understanding the complex factors behind this group.

Intra-party divides & erosion of party leadership

The literature suggested that the effects of social media has different impacts between parties and within them. The suggestion that MPs networks overall will be partisan did hold some truth, this opens up the question of the impact social media has in internal party networks. This has two interrelated concerns. Firstly, that splits within the networks of party MPs should be evident on social media, and secondly, due to the nature of social media itself, there would be a smaller importance of party leaders within networks due to the personalised nature of online communication. Our research focused on these concerns through a detailed analysis of the two largest political parties.

Regarding how the party's networks were defined through online communication, we found the expected split within the Conservative party which correlated to support for either the remain or leave campaigns. This was an expected result as the split within the Conservative party was evident before the EU referendum campaign. The Labour network was somewhat more complex, with no discernible groupings, and the overall network surrounded prominent Labour MPs. This was also to be expected as a significantly higher proportion of Labour MPs supported to remain, and therefore, any split within the party would be a less significant factor in the makeup of the network.

In regards to the party leaders position within a network, we found that both parties displayed a similarity within their internal hierarchies. In both graphs 5 and 6, the party leaders did not have the most importance within the network when concerning the EU. In the Conservative graph, the party leader was overshadowed by a number of leading leave campaigners including Boris Johnson, and by a number of remain campaigners. In graph 6, the Labour leader, Jeremy Corbin was also not the most important node within the network with Angela Eagle placed in a more central location with a marginally higher Eigenvector centrality. This would suggest that within social networks, party leaders play a less significant role than their offline position would expectedly deserve. It seems not only does social media allow for a greater level of independence away from core party lines, but also MPs networks signify that online party leaders have less of a say in online debates, with other high profile politicians becoming more central in the network of MPs. In summary, Twitter highlights interparty divides on decisive issues, and allows for erosion of leadership sway in online communications.

Tone of the communication between MPs

The conversations and messages on Twitter between MPs on the whole were neutral in tone. This challenges the expectation that the campaign was overtly negative, and although the data does not indicate the tone of communication to the general public, it does suggest MPs show a level of civility towards each other online. It was also found MPs with opposing intentions to vote in the referendum had more negative discussions than MPs who shared the same platform. The results therefore suggest that MPs on the same side were more positive in tone towards each other. A possible indication that those on the same side of the EU debate who share a common cause show greater levels of solidarity through online communication. Meanwhile the opposite was true for MPs on opposing sides.

The tone of the communication, alongside the nature of groupings of MPs would suggest that while the negativity was less of a factor of the campaign there is evidence of echo chambers within groups 1 and 3. Showing that echo chambers are prevalent within both elite and citizen networks. Furthermore as the only negative element of the communication was between opposing sides of the campaign, this would suggest that MPs networks are defined by a supportive network, with brief and occasional and marginally

more negative discussions with MPs of opposing views. However, a further content analysis will take place to better understand the nature of the debates across the board.

The EU campaign offered an opportunity to create a greater understanding of the nature of interpersonal relationships between MPs on Twitter. It showed that the expectations of strong levels of divide on a single issue across political parties can be seen on social media communication, and has shown that while the majority of MPs networks remained partisanship, small groups of MPs who share a common cause may can be found banding together on in supportive groups. This paper has therefore identified new methodological options for research, but has also created a greater understanding of the nature of fractionalisation on a whole and within parties on big single issues such as the EU. However, this research will benefit significantly through the inclusion of a content analysis approach to further understand the causal factors that not only determine modularity group membership, but also network importance and tonal analysis.

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