

Twitter content analysis on Greek political leaders

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Abstract

Twitter has been - and is currently - widely used by politicians in order to convey quite important political messages. During the latest period, economies are shuddering, people are deified or downgraded and even local or regional wars are announced. In this paper we try to investigate the presence of Greek politicians in Twitter. We collected all relevant tweets regarding political leaders with parliament representation, examined and compared their volumes in Twitter traffic and proceeded in content analysis of the actual tweets through networks of words. Results reveal that Twitter plays an important role in the Greek political discussion, highly internationalized for at least half of the leaders and is used to convey important political messages in a rather mature way.

Keywords: Social Network Analysis, Greek politics, Twitter, content analysis

JEL classifications: C44, C45, C63, C80, O10, Z13

Introduction

It is a well-known fact that at least during the last decade, political discourse and influence has been highly altered through the use of social media platforms. Facebook and Twitter has been the most powerful platforms for such social interactions, since these two social media include a textual aspect, in contrast to other, more icon/pictorial based social media such as Instagram, but also allow for a more general discussion in contrast to media such as LinkedIn which mainly focus on professional networking. Twitter seems to have a much faster approach and influence, probably because of its short-message nature and the fact that it lacks the "personalized" nature of Facebook.

A large volume of relevant literature discusses the role of Social Media in politics (see for example Trottier and Fuchs, 2015). More particularly, Twitter and its high impact on the modern ways of politics, concepts and methods, perspectives and practices, politics and activism, have also been thoroughly investigated in collective works as in Weller et al. (2014). Twitter's role in election campaigns has been discussed in Jungerr (2016), where it is proved that this platform has become a pervasive tool in election campaigns. In Park (2013), a discussion on how Twitter motivates involvement in politics shows that opinion leaderships are more important in leading users to political processes than just frequency of use.

Content analysis is also a very important thread of research regarding Twitter and Politics. Brian Ott (2017) uses President Trump's twitter feed and discusses how Twitter privileges discourse becomes simple, impulsive and maybe uncivil. In Small (2011), a

discussion on Canadian politics regarding blogs and tweets is presented in a rather informative manner. Ausserhofer and Maireder (2013), discuss the example of Austria to show that the network formed by Austria's most relevant political Twitter users is dominated by an elite of political professionals but open to outside participation. The topic analysis reveals the emergence of niche authorities and the periodic divergence of the political discourse on Twitter with that of mass media.

Some relevant literature discussion has also been held for Greece, especially during the last economic crisis period. Poulakidakos and Veneti (2019) examined Twitter as a platform of information dissemination and dialogue. More particularly, they examined tweets from the two largest political parties in Greece (New Democracy and SYRIZA), regarding two main questions: Do the tweets promote the public political dialogue and/or do they contain propagandistic characteristics? To address those questions, use quantitative content analysis and thematic analysis. Kydros (2018) collected tweets containing the term 'GREXIT' and presented a thorough discussion on users and their interconnections, together with semantic analysis based on word pairs. A similar research was presented by Kydros et al. (2019) regarding semantic analysis on the term 'Macedonia' during the Prespes agreement.

Content analysis in literature follows different threads. In qualitative analysis the interference of persons is extremely high and involves a series of steps of abstraction in order to provide categories, themes and finally meanings (see Erlingsson and Brysiewicz, 2017). On the other hand, sentiment analysis refers to language processing and text analytic techniques to identify meanings in texts. An analytic review can be found in Mäntylä et al. (2017), where all relevant discussion is outlined and categorized.

In this paper we will use a type of content analysis that relies on word adjacencies (or word pairs), as described in Danowski (2012). This approach has also been used by Kydros (2018) and Kydros et al. (2019) in order to form networks of words when they are consecutive (adjacent to each other) within texts. This approach creates textual networks that can be examined in terms of social network analytic techniques. Our research questions (RQs) are presented as follows:

- RQ1: Is the presence of Greek political leaders balanced within Twitter? Which leaders are internationalized with respect to different languages?
- RQ2: Is Twitter used as a means of conveying political messages in the Greek case?
- RQ3: What do users discuss about leaders? Is there a connection between their position on the political spectrum and the quality of discussions?
- RQ4: Is the Twitter community "mature" in Greece with respect to political discussion?

The rest of our paper is structured as follows: In the next section we describe the data mining methodology in detail, together with its limitations. We also form our initial networks. In the following section we analyse our networks and discuss our findings with respect to our research questions. Finally, in our last section we present our conclusions and also discuss further research trends.

Data mining and preliminary networks

In all our subsequent procedures (data mining, computations, visualizations, etc.) we use NodeXL Pro (Smith et al., 2010), an Excel template that includes importing features together with computations and visualizations in one platform.

For our purposes, we collected Twitter data for a period of 7 to 10 days ending on the 10th of October, 2019. Twitter offers an interface (API) that allows for data mining; however, there are some limitations. It is reported that limits on the time period and/or on the number of tweets retrieved are set by the company. The actual limitations are not presented, so this interface may lead in somehow different results, even if the researcher performs the same query on the same day. Nonetheless, in our type of research we do not need exact primary data, since our results come from consecutive filtering, and processing of the original data in other forms.

In our research we chose to use the names of Greek political leaders as a search term. We did not use hashtags, since a hashtag does not always contain the actual politician's name. Furthermore, we chose not to use the official Twitter accounts of Greek politicians: we discovered that in most cases these official accounts do not contain any interaction to other twitter users. As an example, the official Twitter account of the prime minister does contain a number of official tweets but no interactions (especially replies) at all, at least for the investigated time period. These accounts are of no interest to us since no actual conversation is held, however it seems reasonable to deduce that there is a lack of maturity on behalf of users in the Greek case, since none or very few interactions are detected in official tweets. It seems that users prefer to use Twitter in more unofficial ways and prefer not to engage in serious discussions with the actual holders of the accounts. This is a preliminary answer to our Research Question 4.

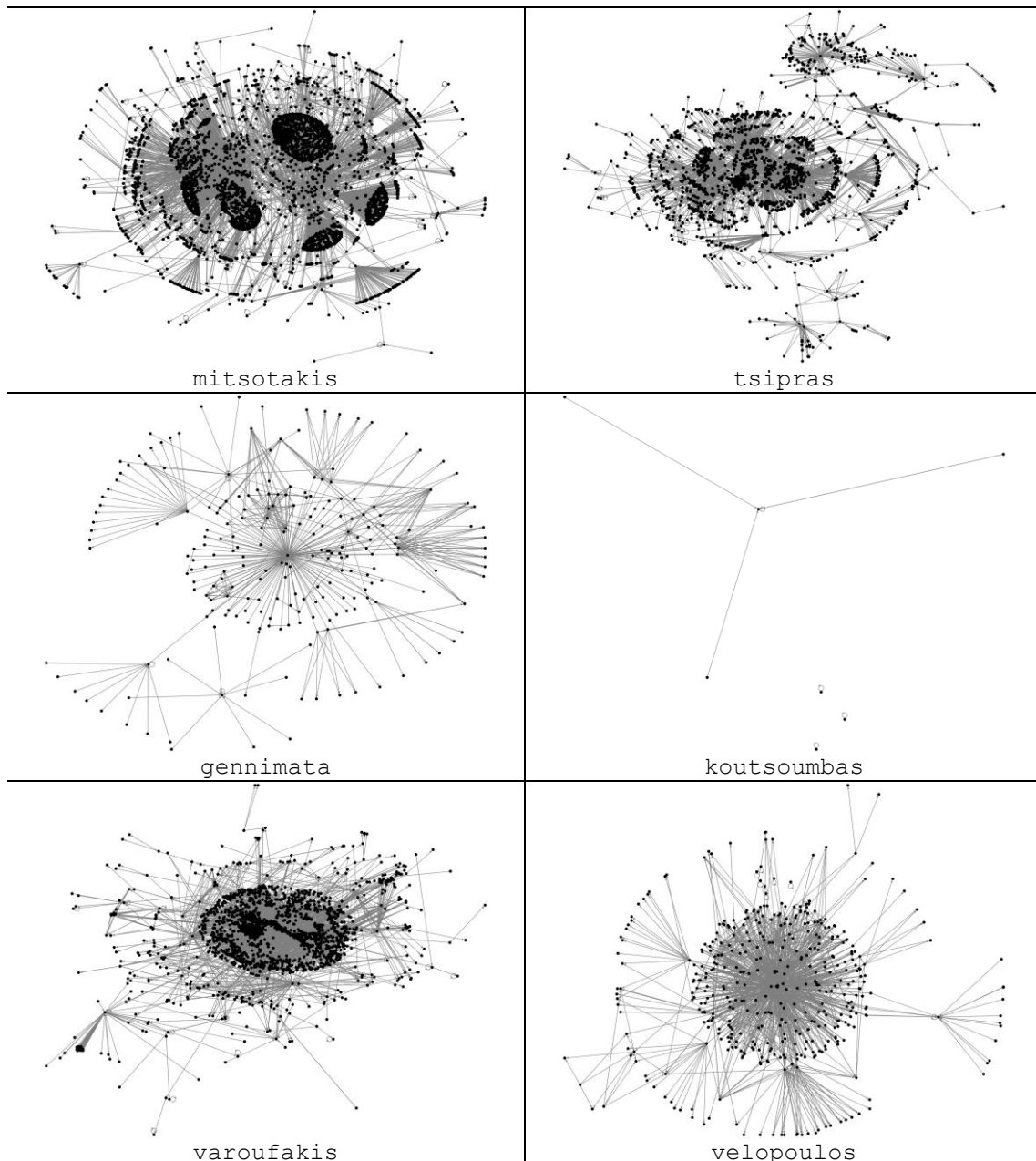
We searched for the following terms:

- "mitsotakis" (prime minister, head of New Democracy party)
- "tsipras" (head of major opposition SYRIZA party)
- "gennimata" (head of KINAL party)
- "koutsoumbas" (head of KKE party)
- "varoufakis" (head of Diem25 party)
- "velopoulos" (head of Greek Solution party)

The above-mentioned names belong to political leaders of parties represented in the Greek Parliament, after the July 2019 general elections. The language barrier (the use of Greek characters in tweets) is of course present; however, in our case language character mixing (i.e. greeklish) seems to help smoothing out any serious loss in information.

The output of the importing procedure is a list of links between Twitter users. A link is created between users whenever a tweet by one user contains the search term and is replied by, mentioned, followed or retweeted by the second user. In case no other user interacts with the original tweet, then a self-loop (a link to oneself) is created. A list of links leads to the creation of a network of users (nodes) that interact on the search term. In Figure 1, we visually present our produced six networks, each one for every search term, drawn with an application of Harel-Koren fast multiscale layout algorithm (Harel and Koren, 2001).

Figure 1: Preliminary users' - networks with the corresponding search terms



Results and discussion

From Figure 1 it is obvious that our search terms return different networks both in terms of volume and in terms of structure. Some networks exhibit many nodes and relative 'healthy' pictorial representations (bearing different clusterings) and other networks are quite poor in volume or present a star-like form. In the next subsection we will discuss volume issues and tweet types in depth.

Volume discussion

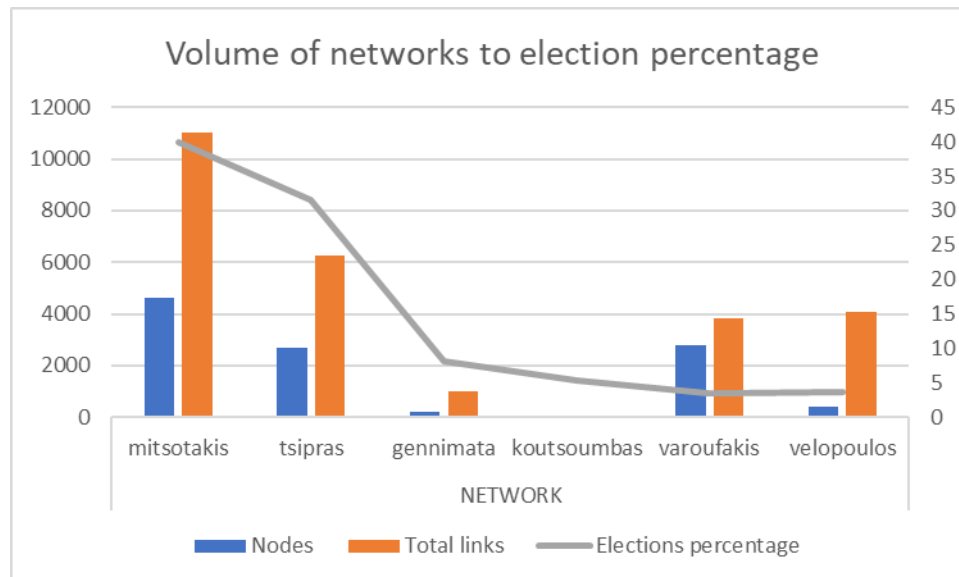
In Table 1 we list the basic network metrics, together with a tweet-type analysis on the networks shown in Figure 1. We include the

absolute number of nodes (users that interacted), links (tweets between users), the density of the network (the proportion of actual links over the maximum possible number of links), the number of single-node self-loops (isolated users that did not interact with anyone) and the types of links counted. In the last row of Table 1, we also include the percentage that each party achieved in the July 7, 2019 national elections (from Ministry of Interior, 2019). A part of Table 1's figures is represented in Figure 2 in chart form for ease of interpretation.

Table 1: Networks' volumes and types of tweets

Metric	NETWORK					
	mitsotakis	tsipras	gennimata	koutsoumbas	varoufakis	velopoulos
Nodes	4614	2684	223	7	2774	429
Unique links	6902	4048	329	5	3340	785
Parallel links	4131	2232	651	4	493	3310
Total links	11033	6280	980	9	3833	4095
Density	0.0003	0.0005	0.008	0.07	0.0004	0.006
Single self-loops	497	296	6	3	127	10
Tweets	2675	1323	25	5	278	29
Retweets	6608	2062	108	4	2159	703
Replies-to	174	481	135	0	652	428
Mentions	1576	2414	712	0	744	2935
Elections percentage	39.85	31.53	8.10	5.30	3.44	3.70

Figure 2: Totals of nodes and links, election percentages on the secondary vertical axis



From Table 1 and Figure 2 some interesting results can be obtained. As a first observation, we can easily deduce that at least for the first three out of six investigated political leaders, the volumes on twitter discussions follow their actual percentage in the elections. Between the first two leaders, the networks' densities are also comparable. These observations are hints to the answer of our first research question (RQ1), that in these cases the Twitter discussions are leveled and comparable. The fact that Mrs Gennimata's network is denser means that fewer users interact more frequently which in turn

suggests intense discussions on the decisions of this political leader.

The presence of Mr. Koutsoumbas (as a search term), however, is disproportionately smaller than expected. Actually, only 7 users tweeted something about this political leader, three of whom had no interaction to the others (self-loops). There are different ways to interpret this result. One could argue that in the general Twitter sphere, this political leader has no actual presence simply because his followers (in the broad sense) do not use Twitter as a means of political discussion, either because of social network illiteracy (older ages) or because of political antithesis on the actual use of social media. One could also say that the political party represented by this political leader (Communist Party of Greece - KKE) seems to be rather entrenched in its ideas, since there seems to be no interest in discussions from other parties' supporters.

The situation changes for Mr. Varoufakis, whose name has a disproportionately large impact on Twitter network traffic with respect to his party's elections percentage. The users that tweeted are actually more than those of Mr. Tsipras, whose elections percentage is 10 times larger. A closer inspection however reveals one important difference: the total number of links is rather smaller than expected and furthermore only a quite small number of parallel links (493) exist. Parallel links are created when users interact in a multiple, continuous manner, while unique links are created when there is exactly one interaction between users. This in turn may lead to the conclusion that in Mr. Varoufakis' case, users do tend to have quite a large interest, however they do not actually engage in discussions but prefer to comment just once.

In Mr. Velopoulos case, the situation changes again. The number of interacting users is relatively proportional to his party's percentage, however, here - in exact contrast to the previous political leader - the number of parallel links (3310 - 80% of the total links) is quite larger than expected. Again, this is a hint that despite the small number of users, they continuously interact and engage in conversations in a heavy manner.

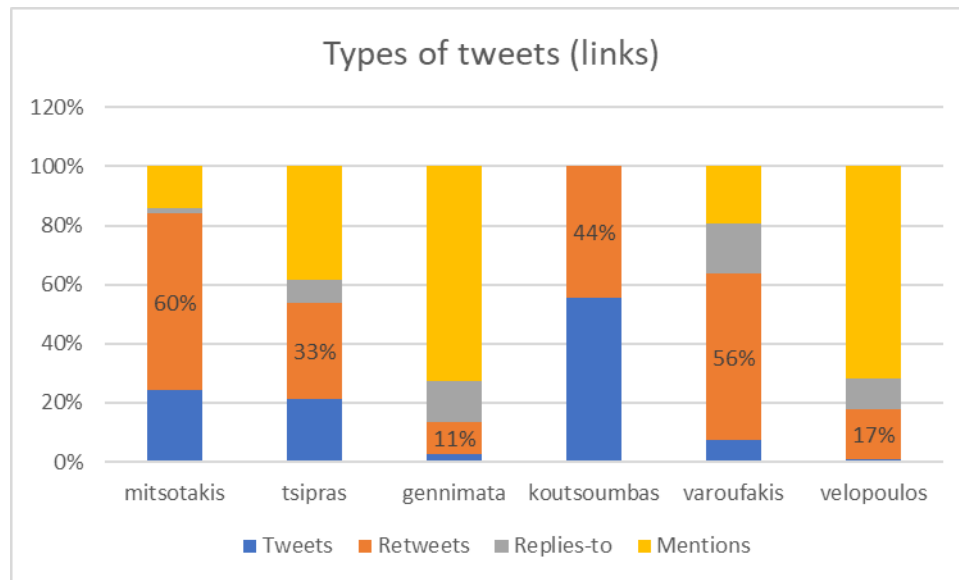
In Figure 3 we present a cumulative chart that represents the types of links for all political leaders. It is important to note that tweets are different in nature according to their type. A 'plain' tweet introduces an idea or a topic, a 'reply-to' tweet represents an answer, a 'mentions' represent a comment or a build-up on an idea and a 'retweet' is nothing more than a reproduction with no actual importance, being either a notice to someone else's tweet or plain noise within the general discussion.

From Figure 3 quite important results arise. The proportion of retweets in the cases of Mr. Mitsotakis and Mr. Varoufakis (in Mr. Koutsoumbas' case the numbers are very small whatsoever) is almost 60% over the total number of tweets. Users probably tend to press on the retweet button, possibly without real consciousness, adding more noise and useless circulation on original ideas or discussions. Again, this observation reveals that there is no actual 'maturity' in the Greek case with respect to real discussion (RQ4).

The situation changes with respect to Mr. Tsipras, Mrs. Gennimata and Mr. Velopoulos. Here it is obvious that the percentage of retweets is rather balanced over the total number of tweets. Furthermore, in all three cases one can observe that whereas the 'reply-to' is again

quite small, at least there is a large proportion of 'mentions'. In mentioning, users at least add their own perspective on the original tweets. Hence, in these cases it seems that users end to interact in a more 'social' manner, meaning that they engage in the circulation of ideas, adding up on them.

Figure 3: Tweets (links) by type



Up to now, we have dealt mainly with our RQ1 and RQ4. We now turn our attention to the actual texts and try to reveal the real discussions behind the tweets. In the next subsection we will deal with content analysis by using word adjacencies within the tweets.

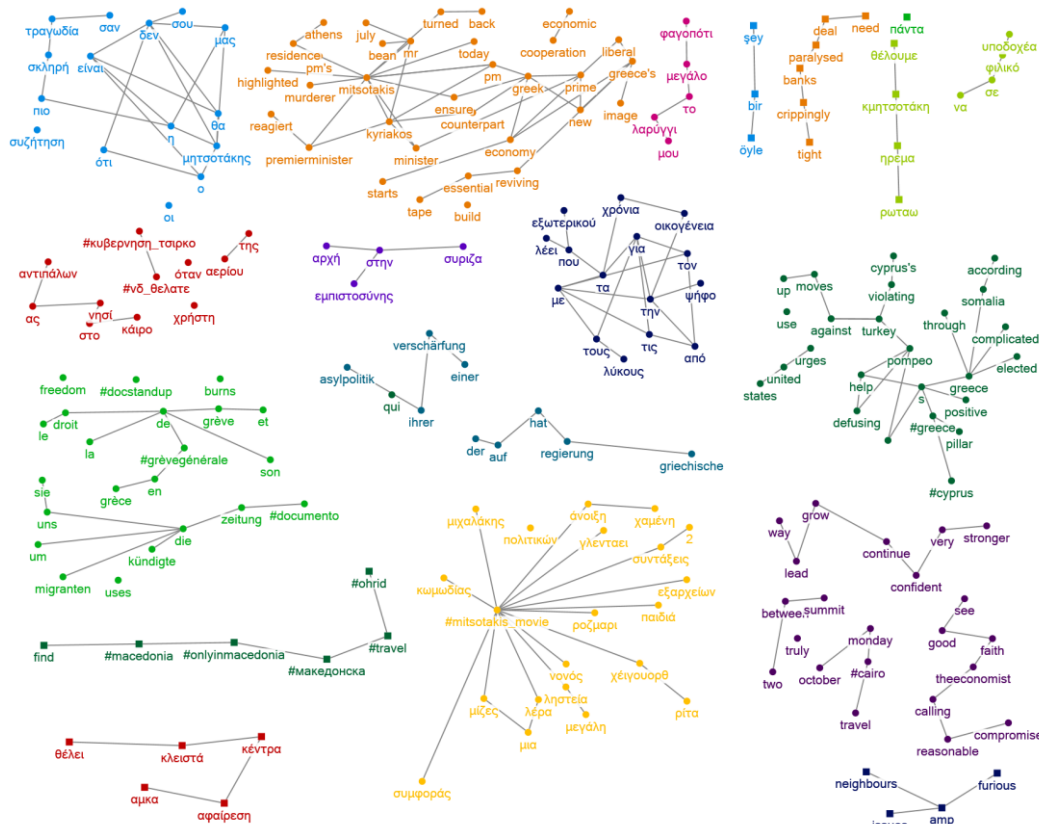
Content analysis

As already stated, we use word adjacency within text to create networks of words. In our case, texts are tweets. Obviously, since tweets are small by construction, sentences are not long; Common words in many sentences act as connecting nodes between tweets. In the general case of texts, some pre-processing is quite useful in our case, since words such as articles, particles etc., are quite frequent. However, in Twitter's case it seems that users tend to omit such words in order to reduce the amount of typing. To add in difficulty, it is almost impossible to predict all such small words in many different languages. Hence we will not use any pre-processing of such nature in our study. Furthermore, we should point out that in some cases it is necessary to incorporate more frequent word-pairs in the study. A word-pair found one hundred times is more important than a word-pair found ten times, so a threshold is used to denote the count of word - pairs taken into account for each network. As a final note, we should also mention that for clarity and simplicity reasons, further filtering of the produced networks can be used by removing words that may be found in the periphery of a network or do not have important topological position. We use degree and betweenness centrality in order to filter-out non-important words.

In Figures 4 to 9, we include the word networks created for all six political leaders by using word adjacencies within respective tweets.

Words are clustered in communities and depicted in different colors, through the use of Girvan-Newman algorithm (2002). Inter-community links are not shown, for clarity reasons. In each network we note the threshold of word-pairs' frequency incorporated, together with a filtering notion.

Figure 4: Mitsotakis word network (threshold \geq 20, degree \geq 2, betweenness centrality \geq 1700)

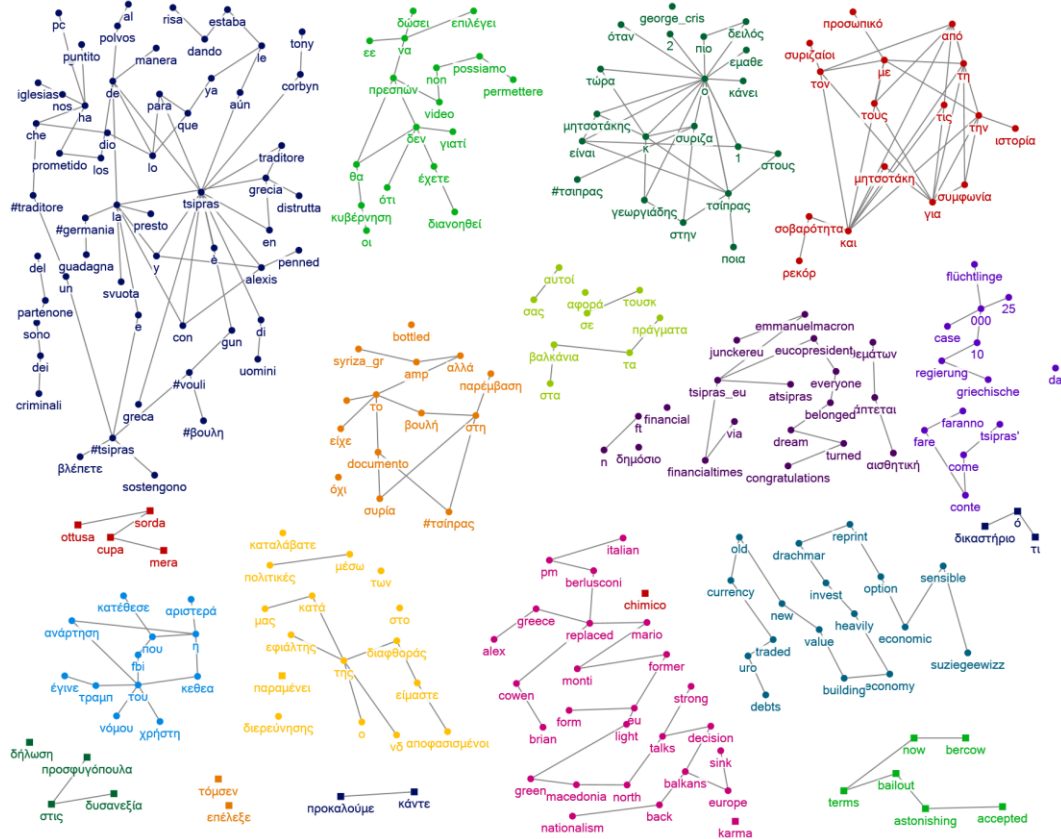


As shown in Figure 4, discussions include many important political and social issues that currently occupy the public's attention. Talks about the economy and a "new beginning", international affairs (Turkey and the visit of the U.S. Secretary of State), a three-party summit in Cairo, discussions on the Macedonia issue are all present. In a general sense, discussions do convey important opinions. There is no 'populistic' sense in this network, with the exceptions of two cases (talks about Mr. Mitsotakis' family and a comic discussion on a movie). Five different languages are located (Greek, English, Deutsch, French and North Macedonian) and it is obvious that the search term 'mitsotakis' has a strong international impact.

In Mr Tsipras' case (Figure 5), a similar situation is found. With respect to languages Greek, Spanish, English, Deutsch and Italian are located, so it is safe to conclude that this leader is also important in the international audience. However, different discussions are located here, such as a comparison between Mr Tsipras and Mr Inglesias (Spanish), talks about the French Presidency and the European profile of Mr Tsipras, discussions on Syria and also some discussions on the Prespes agreement and the change of course in the economy, taken place after 2015. All foreign discussion is definitely quite important. However, again, in the Greek language case, one can

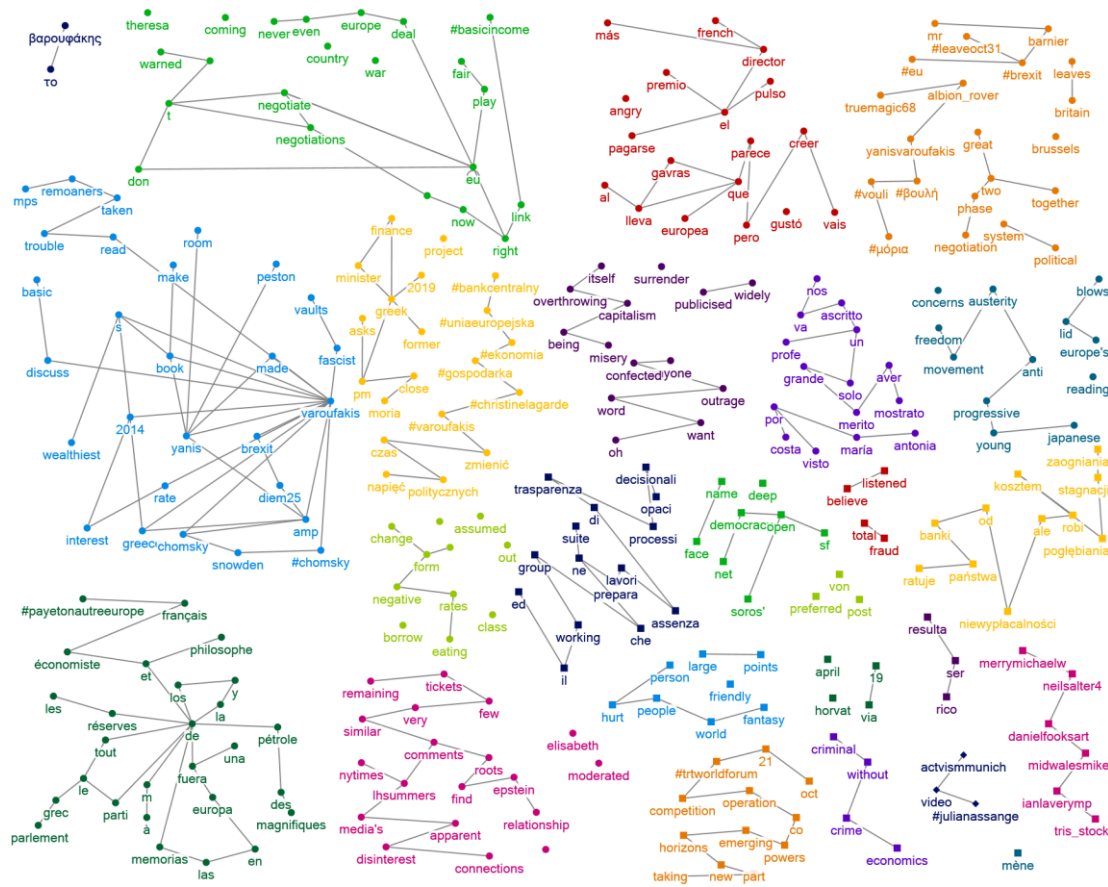
see a sense of dispute and opposition-like talks, mainly regarding refugees, corruption and the right wing of the governing party.

Figure 5: Tsipras word network (threshold >=10, degree >=2, betweenness centrality >=900)



Mrs Gennimata word network (Figure 6) bears a number of differences with respect to the previous networks. At first only a small fraction (bottom right) is found to be in English, while the rest of the network is fully comprised of Greek words (or just hashtags – as in bottom left). Differences are also located in the content of the discussions, which include meetings and procedures or some talks on the actual position of the party in the political spectrum, socially important but temporal issues (such as a child’s need for medical help) and some talks on illegal migration. Overall it seems that too much of internal talks are taken place during this time period in the party led by Mrs Gennimata.

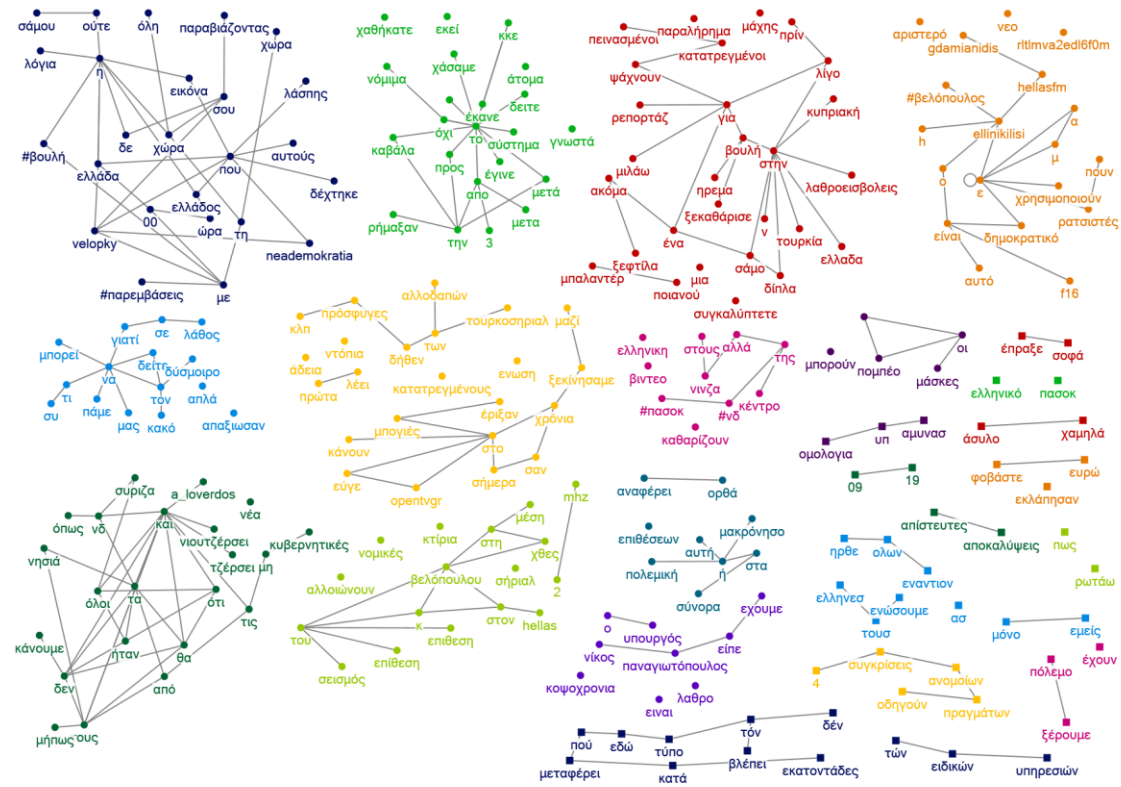
Figure 8: Varoufakis word network (Threshold=5, degree>=2, betweenness centrality>=1000)



What is quite interesting in Mr Varoufakis' case is that almost all talks and discussions are taken place in foreign languages and mainly in English, French, Italian and even some Polish. From this fact only it is obvious that the international impact of this political leader is not at all proportional to his party's election percentage. With respect to the actual content, one can easily deduct yet another difference from the previous (and next) political leaders, since in this case no discussion at all regards the Greek political situation. In contrast, one can see discussions on European politics and economics, the negotiation between Mr Varoufakis and the Eurogroup during the first half of 2015 and other issues of global (or at least European) interest, such as BREXIT, Snowden, Chomsky, Gavras (the director) etc. Overall this seems to be by far the most active in terms of political messages conveyed word network.

In our last political leader's (Mr Velopoulos) network (Figure 9), we see again a completely different setting. The complete network is comprised of Greek words, meaning that this name as a search term has no interest whatsoever to foreign commentators. Furthermore, the actual content of the discussions is largely monothematic, dealing mainly with illegal migration and some little talks on the other parties' positions in relative issues. Quite charged words can be located ("invasion", "racists", "war", "attack", "Turkish serials", etc.). No actual discussion on any other social or political issue can be found in this network. Overall, this network lies largely on the populist, far-right side of political discussion.

Figure 9: Velopoulos word network (threshold>=5, degree>=2, betweenness centrality>=400)



After the short description of the word networks, we now return on the remaining Research Questions (RQs).

Regarding RQ1, it now seems that apart from the volume issues, discussed in a previous subsection, we can safely reach the answer that in general the presence of Greek political leaders is balanced with respect to content, with the exceptions of Mr Koutsoumbas (due to an extremely small return on the search) and Mr Velopoulos, due to the largely monothematic issues discussed. When it comes to the degree of internationalization, which is turn can be seen as an important indicator on the impact of one's ideas in broader publics, the most important results have to do with Mr Varoufakis' imminent occurrence in the Twitter world. The corresponding international presence of Mr Mitsotakis and Mr Tsipras is also quite important, however to a smaller degree than Mr Varoufakis' case, while no serious international discussion takes place to the remaining three political leaders.

With respect to RQ2, again with the exception of Mr Koutsoumbas, it seems that Twitter can be perceived as a vehicle to convey political messages to the general public, but with somehow different types of audiences. In the cases of Mr Mitsotakis, Mr Tsipras and Mr Varoufakis, the discussions contain mainly political ideas and messages, and the level of "quarrelling" is rather low. In Mrs Gennimata's case, a kind of "self-restrain" is detected, since a large portion of the discussions deal with internal party affairs. Finally, in Mr Velopoulos case it is also obvious that one message (no matter if one agrees or not) is definitely conveyed. Generally, however, important ideas by means of important words are rather rare, perhaps with the exception (again) of Mr Varoufakis.

Regarding RQ3, it is found that in very few cases users tend to discuss personal aspects of Greek leaders. This fact also indicates a level of maturity (RQ4). Indeed, the level of verbal personal fight was found to be very limited in almost all cases, perhaps again with the exception of Mr Velopoulos' word network (where some personal diminishing words for others are found) and some minor discussions in Mr Tsipras network. In Mrs Gennimata's case some personal discussions are held but their mood is on the positive sense and regard some past health problems. Of course, it is possible that our filtering methods wore out such discussions, but again these methods are designed to deal with minor words within the whole network.

In general, the discussions "quality" does not seem to be clearly connected with the leaders' place in the political spectrum. In most cases, discussions remain polite and civilized, with the exception (again) of Mr Velopoulos' word network. One rather surprising result (regarding mainly the volume) is the high quality and important topics found in Mr Varoufakis' case, however this can be explained by this leaders' highly recognizable international political style.

Conclusions and further research

In this paper we used tweets that circulated for a period of one week to ten days at the beginning of October 2019, within the Twitter sphere, in order to investigate a number of research questions on the volume, quality and content of Greek political leaders' presence in this social medium.

In our research, we created networks of users that use the names of the political leaders of parties with parliament representation within their tweets, replies, mentions and retweets. We subsequently discussed some issues with respect to the volume of these networks and some discussion on their internal structure, in order to partly address our research questions 1 and 4. We found that in terms of volume, all networks seem to be proportional to the elections percentages of the corresponding parties, with the exceptions of the Communist Party's leader (extremely low presence in Twitter) and Diem25's leader (extremely high presence). However, rather high percentages of retweets do create questions on the maturity and the real political value of discussions, since retweets are considered to be just noise within the general talks.

We subsequently used a method to create semantic networks from texts. We used tweets as texts and words as nodes and created a link between words when they are adjacent within a tweet. The output of this method is a word network. We created word networks for each leaders' case and discussed their content with respect to the actual meaning of words and families of words. The method used is not a strict statistical analysis or an automated text analysis method, but rather a combination of network theory together with actual content interpretation of the discussions arisen within the networks. We also discussed issues posed in our research questions, including the quality levels of discussions, the extend of personal or aggressive word structures and also the levels of internationalization of the discussions. We consider that this mixed method is more suitable for this type of texts, since up to now no real text interpretation exists in the literature.

In venturing for further research opportunities, one could definitely include sentiment analysis on the semantic (word) networks. In

sentiment analysis, important words are divided in two main categories, those with positive and those with negative charge and a statistical analysis is then applied in order to locate the general "mood" of discussions. One difficulty in such an investigation is the use of many different languages in tweets. However, a full sentiment analysis could be quite useful in the Greek case.

One more thread for further research has to do with the actual users. It would seem important to investigate to which extend opinion leaders exist in the Greek case. In such a research question, not only the frequency of posting should be taken into account, but also the relevant position of the users in question should be examined. Social network analysis uses a quite large number of different metrics that identify important users, such as different measures of centralities. Furthermore, it would be interesting to unify (merge) all the above users' networks in a total network, in order to identify users that play the role of cut-nodes (i.e. nodes that when they are removed the result is a disconnected network).

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