Emotion analysis of Portuguese Political Parties Communication over the covid-19 Pandemic

Joao Tiago Aparicio
Instituto Superior Técnico,
University of Lisbon
Lisbon, Portugal
joao.aparicio@tecnico.ulisboa.pt

João Salema de Sequeira
Instituto de Estudos Políticos
Universidade Católica Portuguesa
joaosalemasequeira@gmail.com

Carlos J. Costa
Instituto Universitário de Lisboa
(ISCTE-IUL), ISTAR-IUL,
Lisboa, Portugal
ISEG, Universidade de Lisboa,
Lisboa, Portugal
carlos.costa@acm.org

***Abstract* —** In this paper, we explore the use of emotions in the Portuguese political parties' (with a seat in the Portuguese Parliament) communication as expressed by their official Twitter accounts, as of March 2020. The chosen period of our investigation is particularly interesting because political parties had a chance to communicate their views during a pandemic situation and over a period of one year. These views include possible solutions to face the crisis and their comments on the development of the whole situation. Using a standard lexicon we classified the amount of particular emotions in different tweets. Using this method we plotted the average positivity and negativity along time per party. We also analyzed the impact of each emotion to classify positivity using the present corpus. Finally, we considered some important words regarding the pandemic and their average positivity score. The analysis allows us to identify different approaches to participation in social media according to different strategies, more than political ideology.

Keywords - political communication; Portuguese political parties; Portuguese parliament; Portuguese; lexicon; sentiment analysis; emotions; visualization; social media; twitter; covid-19.

I. INTRODUCTION

Now-a-days, different political actors are increasingly using social media platforms to communicate their worldviews. American Presidents have used Twitter heavily to communicate their position in relation to specific ideas and to specific policies [5]. Hence it is essential to analyse what is being communicated and even more important how this communication is being done in order to best assess their impact. Political communication can help us explain the ups and downs of the electoral polls and the electoral success of a certain political party or individual in the following election.

The publication of *The Gutenberg Galaxy: The Making of Typographic Man* [8] considers the effects of social media in different human dimensions. However, a new empirical approach is needed, one that considers the effects of social networks or to put it simply a Zuckerberg Galaxy approach which demonstrates how Facebook, Twitter, and other social media are used and to what extent they have a more decisive influence on some of the voters, in comparison to the traditional media. In this context, the evolution in Natural Language Processing (NLP) and sentiment analysis is significant, however the political communication in Portugal has not yet been a subject of this kind of study, since the available models and lexicons are not yet adapted to European Portuguese. In this sense, we aim to answer the following question: What are the prevalent emotions in the Portuguese political parties' tweets during over the first year of the covid-19 pandemic?

The purpose of the work performed in this paper is to analyse the communication of the official Twitter accounts of the Portuguese political parties. The time frame ranges through 3200 last tweets, going as back as March 2020, when the first case of covid-19 was registered in the country. This period is specially interesting because political parties had a chance to communicate to the electorate their ideas in face of a social and economic crisis. It is important to take into consideration that the different parties tweeted with a different frequency, however the reality they were facing was one and the same.

II. LITERATURE REVIEW

Sentiment analysis refers to using several approaches, such as: natural language processing, text analysis, computational linguistics, and biometrics, to systematically identify, extract, quantify, and study affective states and subjective information.

Emotions can be reactions to internal stimuli (such as thoughts or memories) or events in our environment. To analyze emotions, Mohammad and Turney [1] proposed a lexicon. This lexicon uses six emotions [2], [3]: joy, sadness, anger, fear, disgust, and surprise, along with how positive and negative the words are. These are a subset of the eight emotions proposed in Plutchik [4] which are still relevant today [10]. Recently the study of the impact of texts on such emotions has been done, namely in the USA political context [5]. This was done with a focus on awareness and topical emergence. However, there was no analysis over the emotion on the content of the message shared by the political parties, instead it was focused on its reception using Twitter users from states with opposing political views. This analysis was done over the covid-19 pandemic period, from 9th of March to the 13th of December, not encompassing any analysis over 2021. The study was composed of three stages, unigram frequencies identification, sentiment analysis and then topic modeling. The

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first two are important to identify the content being discussed and the emotions latent to it. In contrast, the last is important to identify the main topics and group them. Much like that study, its predecessors [6,7] in terms of data collection have a strong bias for English tweets and incidents including English-speaking nations, in terms of expression selection. This is also coupled with a focus on the frequency of tweets and retweets to assess the popularity of a particular set of hashtags. A study of this sort is lacking in the Portuguese political context.

Antonakaki et al. [12] presented the taxonomy of the uttermost important concepts regarding Twitter research. Laying four main branches, Basic (Twitter stats), Threats (in terms of content), Social graphs and Sentiment analysis, the later one was clearly the one with the more complex structure. Within the included studies using lexicon labeling, there is a lack of comparison of different sentiment analysis lexicons with a wider range of emotions other than positive and negative, as the one done by Gonçalves et al. [13]. Other contemporary studies [15,16,18] of sentiment analysis also focus only on positive versus negative emotion. In light of the said above, we chose a lexicon that had a wide range of emotions to confer a more complete analysis.

III. METHODOLOGY

The methodology used in this article followed a data science process [9]. We collected tweets from the official accounts of political parties: BE, PCP, PAN, PS, PPD/PSD or PSD, CDS, IL, CH[1]. Using the Twitter API we extracted the last 3200 tweets by each Twitter account. Since the number of tweets from each Party varied greatly, we extracted the tweets only from the pandemic period until the day of extraction, this was: 2nd March, 2020 (first Covid-19 cases registered in the country) and will finish on 10th February, 2021. We analysed the most used words by each political party. A previous study [11] proposed a way to bypass the limits posed by the Twitter API, however we did not opt for this method because the limit was substantial enough for the majority of the analysis.

The lexicon proposed by Plutchik [4] was analysed and translated to European Portuguese. There were some words used in Brazil that had to be replaced by others used in Portugal. Then we performed a classification of the tweets using the lexicon. Using this information, we analysed the emotions over time and the impact of each emotion to assess its positivity or negativity.

To perform the emotion classification of the tweet, each word is classified as positive or negative according to each emotion. Consequently, each tweet has a corresponding positive value, corresponding to the sum of each word's occurrences. It also has a negative value, corresponding to the sum of all of each negative word's occurrences. The same applies to each one of the emotions.

The nomenclature used for the emotion analysis is the following:

Tweet – text /expression of the tweet
The nomenclature of the emotions correspond to the sum of the particular emotion in the entire tweet, i.e., **Positive** corresponds to the sum of the positivity in the words in the tweet. The same applies to the other emotions: **Negative**, **Anger**, **Anticipation**, **Disgust**, **Fear**, **Joy**, **Sadness**, **Surprise**, and **Trust**.

To understand the co-presence of each emotion and the positivity and negativity of the communication, we created a regression model for each set of tweets by party. This helps us measure the weight of certain emotions within a negative or positive style of communication and how that is distributed over each party by emotion.

Two regressions were calculated for each party. One regression uses as a dependent variable the variable positive and as independent variables all the emotions considered. The second regression uses as a dependent variable the variable negative and as independent variables all the emotions considered.

To select the main words for the analysis of the emotion per topic relevant for the whole amount of tweets, we have removed the portuguese stopwords and selected high frequency words and synonyms. Then we analysed the positivity and negativity of the emotions of the tweets with words and synonyms that were available in all parties, presenting the net positivity (averaging the total subtraction negative from the positive).

IV. RESULTS

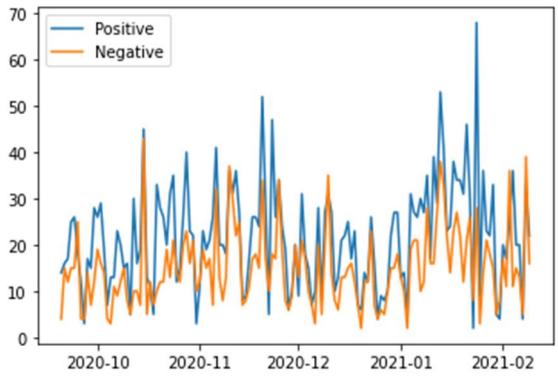

Figure 1. BE Positive and Negative communication over time.

Generically, the BE has more positive than negative messages. BE is also the party that has the most frequent presence on Twitter. Therefore we had to extract messages until September 2020 and not begin in March 2020.

[1] Left Bloc, Portuguese Communist Party, People-Animals-Nature Party, Socialist Party, People's Democratic Party/Social Democratic Party, Social Democratic Centre-Popular Party, Liberal Initiative and Enough

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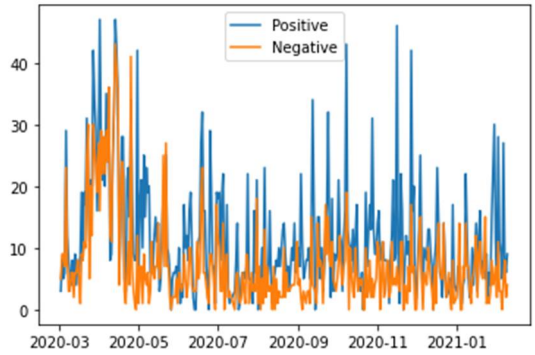

Figure 2. PCP Positive and Negative communication over time.

Mostly, the PCP has more positive than negative messages. We observe a very high level of negative communication over the beginning of the pandemic period from March 2020 until May 2020.

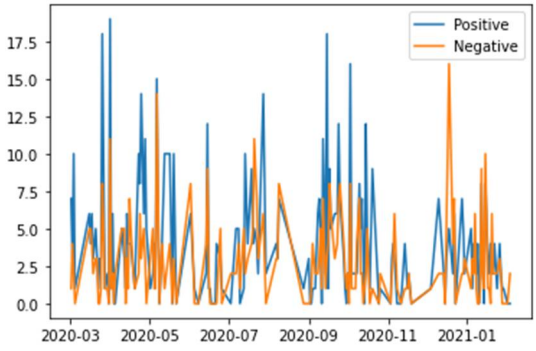

Figure 3. PAN Positive and Negative communication over time

On the other hand, PAN shows a higher level of negative communication over the end of the selected period, however this can be due to their support of Ana Gomes (a candidate for President of the Republic) and a competitor of the president and runner for the second time Marcelo Rebelo de Sousa, and other candidates. Keeping an overall more positive communication over the rest of the period analysed.

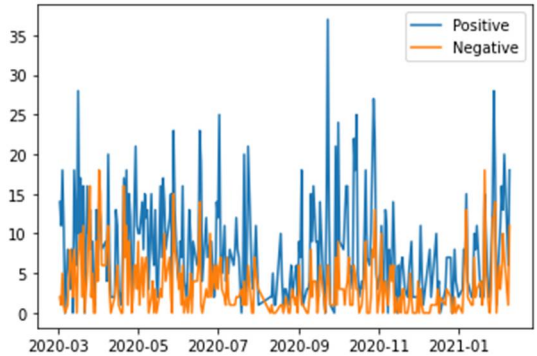

Figure 4. PS Positive and Negative communication over time.

PS is the political party, which has clearly the most positive messages over negative. This may be due to political strategy since it is the political party that holds the majority in parliament.

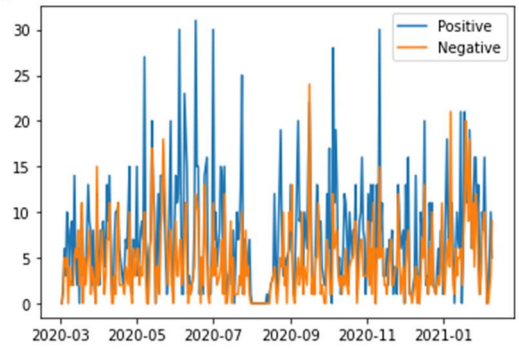

Figure 5. PSD Positive and Negative communication over time.

Essentially, the PSD has more positive than negative messages. However it shows a higher level of positive communication from May to October. For a political party which is part of the opposition this perhaps is worth considering.

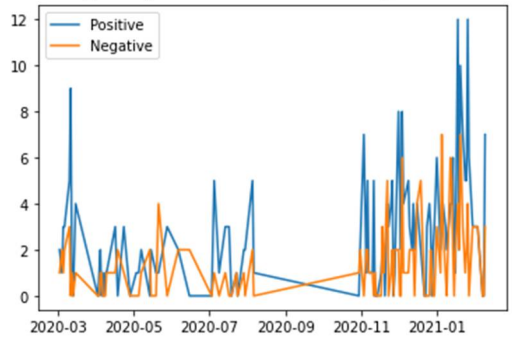

Figure 6. CDS Positive and Negative communication over time.

CDS has generically more positive than negative messages. However, what characterizes the communication of this party on Twitter is the reduced number of messages, compared to other parties, perhaps due to the different average age of their electorate. Hence, conclusions are very difficult to arrive at.

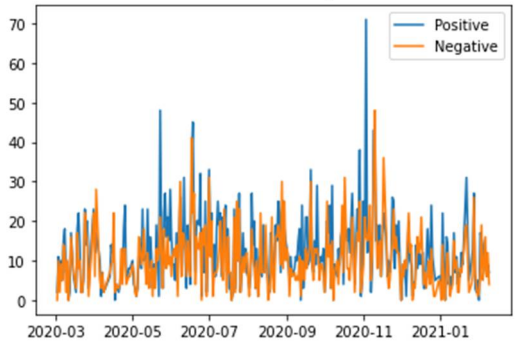

Figure 7. IL Positive and Negative communication over time.

Generically, the IL has about the same levels of negative and positive messages. It seems this can be a strategy to have a more negative tweet which is followed by a positive one, this can be a strategy as not to be seen as mere critics of the ruling party, but also as a different and new voice who wishes to have his ideas read and interpreted by potential voters of other parties. It is important to take into consideration it is their first legislature

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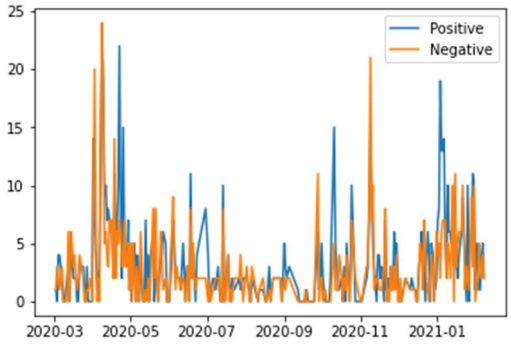

Figure 8. CH Positive and Negative communication over time.

What was said for IL and how new they are in the Portuguese Parliament also applies to CH. However, CH generally shows a stronger negative emotions over April followed by a stronger positivity by the end of the month and lower levels of positivity and negativity until October.

By analysing all the charts, we verified that political parties which support the government have generically more positive than negative messages. This also allows us to see that PSD has also a generically positive communication. This can be an explanation as to why new political parties have been having higher vote intentions, it could also be a sign of PSD as not very effective as an opposition party in terms of communication and a possible electoral volatility to the newest parties IL and CH.

Consider the following two tables, which present two types of regressions. Table 1 and the positive attitude is explained by each one of the emotions. Concerning Joy - the Liberal Initiative has the highest of all values scoring 0.5917 and in Trust - the Socialist Party has the highest value with 0.6671 these two emotions are the ones which explain more the positive messages across all political parties. Interestingly, Joy is the emotion with the lowest of all values in the Socialist Party scoring 0.4056 and Trust in the Liberal Initiative scoring 0.4554

TABLE I. IMPORTANCE OF EMOTIONS ON POSITIVE ATTITUDE (REGRESSION ANALYSIS).

	BE	PCP	PS	PSD	CDS	IL	CH
R2	0.425	0.428	0.418	0.359	0.431	0.317	0.431
const	0.3657	0.59	0.6389	0.4738	0.3723	0.9657	0.3218
Anger	0.05	0.0723	-0.0538	0.068	-0.0311	0.0581	-0.0276
Anticipation	0.2701	0.3073	0.2438	0.2351	0.2916	0.2421	0.1435
Disgust	-0.1459	-0.0712	-0.2425	-0.0944	-0.0867	-0.2438	-0.1162
Fear	0.0563	0.1027	0.0678	0.0443	0.1809	0.096	0.1026
Joy	0.4603	0.5227	0.4056	0.553	0.4904	0.5917	0.5222
Sadness	0.1226	0.0195	0.1057	0.0331	0.0359	0.0362	0.1413
Surprise	-0.0667	-0.0811	-0.1396	-0.0489	-0.1923	-0.0028	0.2013
Trust	0.5446	0.4806	0.6671	0.5252	0.584	0.4554	0.5427

In table 2 the negative attitude is explained by each one of the emotions. Sadness is the most important emotion to explain negative messages across all political parties and CH has the highest value with 0.7463. Unlike in the positive attitude the second most important emotion is Anger in the case of all the political parties except PSD (Disgust is the second most important emotion with 0.3103) and BE (Fear is the second most important emotion scoring 0.3063 close to Anger), these two political parties are respectively the second and third parties with most MPs in the Portuguese Parliament.

TABLE II. IMPORTANCE OF EMOTIONS ON NEGATIVE ATTITUDE (REGRESSION ANALYSIS).

	BE	PCP	PS	PSD	CDS	Liberal	CH
R2	0.677	0.585	0.717	0.653	0.620	0.510	0.758
const	0.1581	0.2296	0.1593	0.1191	0.1353	0.6466	0.1437
Anger	0.303	0.3632	0.3104	0.2989	0.3613	0.4978	0.4443
Anticipation	0.0329	-0.0468	0.0108	0.0955	0.0882	0.1259	0.0297
Disgust	0.148	-0.0839	0.0807	0.3103	0.1839	0.103	0.1379
Fear	0.3063	0.2713	0.1799	0.1826	0.1624	0.1124	0.1074
Joy	-0.0303	0.1025	-0.024	-0.041	-0.0663	-0.1414	-0.0416
Sadness	0.6354	0.6401	0.6606	0.653	0.719	0.6671	0.7463
Surprise	-0.0689	-0.1582	0.0319	-0.0038	-0.0854	0.0571	-0.0575
Trust	0.0346	0.0225	0.01	0.0228	0.0065	0.0359	0.0778

In the following graph we can see the average presence of emotion per tweet over all emotions and parties. We can clearly see a prevalence of positive communication over all parties, with the less positive ones being: CH, BE and PSD. CH is a particular case in terms of net negative versus positive since it has the lower difference between the two, leading us to conclude that it has a more net negative message overall. In contrast IL has the most negative communication overall, far ahead of PAN. PCP shows the most angry communication, as well as, the highest levels of anticipation, disgust and surprise. PS has the communication that invokes more trust, as well as, the most positive message overall. In terms of global usage, the least prevalent emotions are disgust, joy, surprise and anger. Consider that this analysis has no political affiliation and is methodologically neutral. This is just an interpretation of the data extracted from the methodology presented before.

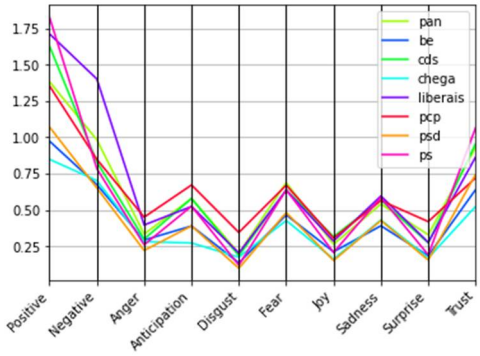

Figure 9. Comparison of prevalence of emotions over each party.

To select the main unigrams of the content of this analysis we extracted the words with higher cardinality from all tweets available. For a better use of this table the bolded words are the ones present on the heatmap in the following section (and we did not consider names of different people referred by the political parties).

TABLE III. LIST OF WORDS WITH A FREQUENCY GREATER THAN 100 TWEETS

BE	PCP	PS	PSD	CDS	IL	CH
Mmatias (398) Bloco (264)	PCP (1780) **trabalhadores (906)**	PortugalMelhor (863)	PSD (2742)	CDS (579) cdspp(438) **Portugal(372)**	Liberal(1043) Iniciativa(746)	CH (595)

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Marisa2021 (213) **Contra (160) Governo (156) SNS (151) trabalhadores (151)** catarina_mart (146) **pessoas (137) pandemia (129) apoio (126) crise (124) país (122)** Marisa (116) **Portugal (115) Saúde (106)**	**direitos (658) direito (586) COVID19 (580) COVID-19 (556) COVID19PT (556) epidemia (546) combate (546) denuncia (514)** pcp.pt (507) **Denuncia (504) nemumdireitoamenos (482) ataque (462) luta (314) proposta (285) Conhece (263) Avante (176) contra (173) todos (168) Governo (138) trabalho (137) situação (133) povo (131) País (128)** João (127) **saúde (125) PS (124)** ser (123) Sousa (119) **Estado (117)** Congresso (116) **Orçamento (113) medidas (112) propostas (112) PSD (105) resposta (104)** Jerónimo (104)	UmPaísParaTodos (611) antoniocostapm (321) PS (319) Costa (296) **Portugal (294) Governo (276)** Cumprimos (276) antoniocostaps (264) Legislativas2019 (250) **Estado (232)** António (223) **país (197) pandemia (177)** SomosEuropa (172) psocialista (159) **afirmou (153) todos (145) Covid-19 (135) primeiro-ministro (127)** Partido (127) Luís (125) Socialista (123) Europa (121) Carneiro (121) Nacional (120) Europeia (120) **portugueses (116) medidas (113) social (107)** milhões (106) Conselho (106) ministro (106) José (104) **Política (102)**	PrimeiroPortugal (1263) RuiRioPSD (1177) **Governo (413)** Rio (364) PortugalPrecisa (301) Social (268) **Portugal (265)** Partido (259) Democrata (236) **COVID19 (226) portugueses (180) Estado (148)** Rui (121) **pandemia (117) todos (115) medidas (113) Saúde (109)** PS (108)]	**Governo(282)** Paulo(224) CristasAssuncao (201) Portas(171) **Estado(151)** CDS-PP(122) portugalàfrente(118) **país(113) todos(112)** aalternativasomosnós(110) Nuno(104) Meireles(101)	PortugalMaisLiberal(427) **Estado(394) país(325) portugueses(317) governo(264) Governo(249) todos(219)** IL(206) LiberalMayan (184) **saúde(179) TAP(167)** PS(153) **contra(144) sempre(143)** partido(138) **liberdade(133) pessoas(132)** Cotrim(129) Figueiredo(127) João(121) **partidos(121)** liberal(116) **vida(114)** República(114) **contribuintes (112)** Mayan2021(109) **medidas(108) Liberdade(103)** Presidente(103) **países(102)**	AndreCVentura (308) Ventura (282) **Portugal (232)** André (204) **portugueses (140)** AndréVentura2021 (115) **todos (102)**

The most used words by different political parties vary, however PCP and PS are the parties with most words used in more than 100 tweets and CDS and CH the ones with less quantity of words in more than 100 tweets.

The most usual words correspond normally to the names of the political leaders, important figures of the party and candidates to the presidential elections of 2021. It is important to consider that each party on the table above supported a candidate with the exception of the ruling party - PS. Hence, BE supported Marisa Matias referred in the table as: Mmatias, Marisa2021 and Marisa; PCP supported João Ferreira, tweets his candidate as João; PSD and CDS supported Marcelo Rebelo de Sousa - president and candidate - the most famous of all candidates and winner of the election and have not tweeted more than 100 times about the candidate, IL supported the less-known candidate of all and he is on the table as LiberalMayan. CH supported André Ventura, who is also president of the party and their only MP (even before the pandemic started) - he is on the table as AndreCVentura, Ventura, André, and AndréVentura2021 (with the latter being the most used for the tweets about the presidential election).

On the one hand, it is also interesting to note that PCP is the party which refers most to other parties present in Parliament referring more than 100 times to both PS and PSD. On the other hand, BE, CDS and CH do not refer to any political party in more than 100 tweets.

An interesting word worth considering is 'todos' or 'all' which appears in every political party with the exception of BE. Also, words which are the same but have different meanings for different political parties appear only in some parties. A case in point is the word 'liberdade' 'freedom or liberty' which appears only on IL. Words which are part of the ideological jargon of a certain party 'trabalhador(es)' or 'worker(s)' appear only on BE and PCP and 'contribuinte(s)' or 'taxpayer(s)' is only used by IL. An important word for any political party 'medida' or 'measure', which can have different meanings but one of the most prevalent uses is approve a measure to solve problem *x* and important in the context of the covid-19 pandemic is used by all political parties with the exception of BE, CDS and CH in more than 100 tweets.

In the following heatmap, are some words more related to the pandemic - vertical left axis, the scale used for the vertical right axis is the net positivity of the tweet containing the word specified ranging from -4 to 5, and on the horizontal axis are the different political parties.

As expected, communication about relevant concepts are significantly different according to a certain ideology that relates to each party but also as a result of the political strategy of each political party. It is clear that PS has the most positive communication on the words selected, with the exception of the tweets regarding the leader of PSD and the Portuguese President (Presidente da República and Marcelo Rebelo de Sousa and synonyms). Interestingly all parties with the exception of PAN have positive communication about the vaccine. The only parties that exhibit a positive communication about 'Direção Geral de Saúde' (DGS) or the Portuguese Directorate-General of Health are BE and PS. The communication about SNS or NHS, Covid, Isolation and Portugal are fairly neutral. The communication about poverty is negative in all parties (mainly on CDS) with the exception of PS where it is very positive.

The synonyms selected for the words presented below are the available, with the translation after, at: https://drive.google.com/file/d/1EpgBUY_FvMmH6DanQ2wraMnmLN4OGFos/view?usp=sharing.

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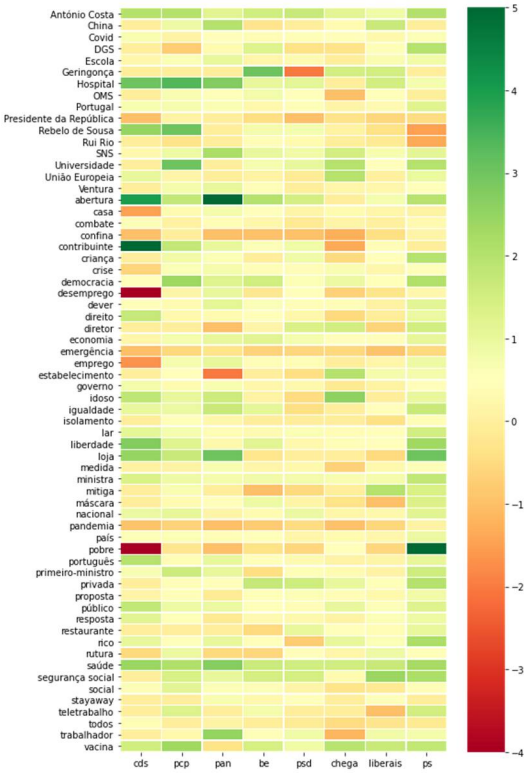

Figure 10. Relationship between parties and some specific concepts

V. CONCLUSIONS

The analysis of the communication of political parties, as expressed explicitly by their official Twitter accounts allows us to verify some differences as expected. Although being the official communication the ideological perspectives are evident. Also, some strategic approaches may be evident. For example, the support of the government is an example. It is also interesting that BE is the party that has more tweets, while CDS is the party with less tweets, perhaps this can be explained by the average age of their respective electorate. A further study would try to develop a more comprehensive list of words and include them in clusters to assess their net positivity or negativity for a better understanding of more general themes. It is worth studying how different emotions used by each political party result in varying levels of popularity. A comparison between the sentiments and expressions used in the political party platform or program and the average sentiment in their use in social media. Also, an important aspect worth considering in a different study is how different political parties respond to the approach of the elections to assess a possible cyclical behaviour, i.e., how this use of emotions changes over a longer period of time, when covid-19 is no longer a reality. Finally, how the Portuguese reality compares with other countries and different national parliaments mainly in the European context and taking into account all the differences. Lastly, expand the referred questions to different social networks.

In terms of limitations, this study is limited to 3200 tweets per party, which was not enough for analysing all the BE tweets over the selected period. Also, it is important to reflect on how CDS rarely tweets, and how we can best interpret its tweets and emotions. The translation of the lexicon may impact the emotions subjacent to the words used, given new conferred meanings. Other ways of classifying emotions such as using valence, arousal and dominance dimensions such as the ones used by Warriner et al. [17] could be even more interesting in the context of political party communication.

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