Analyzing the communication in social media of the main sustainable brands during COVID-19 crisis: the Spanish vs. Italian cases

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Analyzing the communication in social media of the main sustainable brands during COVID-19 crisis: the Spanish vs. Italian cases

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Abstract.

Communication is now a valuable element to demonstrate the degree of commitment and transparency that organizations have towards *Sustainability*. In a critical moment such that experienced with the COVID-19 crisis, companies recognized facing the challenge of continuous and committed communication on social networks as a sustainable activity. All the latter raises the question whether the brands recognized as the most sustainable have actually succeed on being aware of communicating at the most critical moments of the COVID-19 crisis. In this context, an analysis is made of the activity maintained by the main sustainable companies, both Spanish and Italian, within two of the most popular social networks, Twitter and Instagram, at the very early stages of the crisis in both countries. Our results show that most companies have managed to rise to the occasion and show their commitment to the population through social networks.

Keywords: COVID-19 crisis, Sustainable brands, Communication, Social Networks, Spain, Italy.

1. Introduction

From the distance, when 2019 had not yet ended in some countries and the New Year was just starting in others, China alerted of the existence of an unknown condition originated in Wuhan that was spreading dizzily among its citizens (Güell, 2020). Even before its name was known, COVID-19 or coronavirus (as it is popularly known), the media already predicted the effects on the global economy. Thus, if the worst omens were fulfilled, how would the coronavirus crisis affect brand marketing and communication?

The closure of production chains of many companies, such as automobile brands, located in the area were quickly followed by the quarantines and travel restrictions in the Asian continent. That break coincided with the Chinese New Year festivities, a time of large sales figures that could plunge a company into a deep crisis (considering that the Chinese market has become an important source of income for many brands).

The scene that shook the first tab of that brand domino making events to be postponed or contingency plans to be activated and communicated was the Mobile World Congress (MWC) (García Muntané, 2020) in Barcelona. It was the first major event shaken by the health alarm and the first time that brands had to decide whether to put security before their own economic interests.

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The frightening of the brands of the MWC was not in vain. Weeks later the cases spread throughout the world, splashing mainly into Italy and Spain. What was the reaction then? Cancellations in blocks of massive events such as the Geneva Motor Show or any other agglomeration greater than 1,000 people as announced by the Swiss government. Security had become a priority and putting it at risk due to a marketing campaign that does not know how to adapt to the prevailing circumstances would be a critical error.

Some brands chosed not to lower their activity by increasing security measures even though they lessen the impact of their actions. A clear example is that of the fashion firm Armani who, in the middle of the Milan fashion week and at the most critical moment of contagion spread in the city, decided to carry out their show behind closed doors without media or buyers but broadcasted via streaming (Michel, 2020). That decision was accompanied by issuing a press release expressing their concern without generating more alarm than the situation itself. Like the Italian firm, other brands have positioned themselves as the technological Huawei that had planned to present its folding smartphone model at the MWC, but alternatively chose to do so via streaming with small private presentations in different cities. Likewise, Facebook canceled the most important annual developer event, the F8, keeping the sessions online and donating all the money raised from ticket sales.

The COVID-19 crisis is testing the ability of organizations to respond to an unprecedented health emergency caused by a global pandemic but also to impending problems in employment, human resource management, risk management at all levels, and solidarity. The goal of the current study is to shed some light on the communication strategy of brands in social networks during these difficult times. Our aim is to empirically test the commitment of a subset of brands, considered as the most sustainable in Spain and Italy, through an analysis of the communication established with their followers in social networks at the early stages of the pandemic. As said, we have selected these two countries since they were the most affected ones when the COVID-19 started to spread in Europe. We focused on the use of hashtags during the analyzed period as they are the most specific information units that can be identified in the brands' communication strategies in social networks as well as they allow the brands to enhance the message they wanted to provide. We thus collected data from Twitter and Instagram, two social media commonly used by brands that make an extended use of hashtags in their posts. By means of social network analysis and visualization techniques (Wasserman & Faust, 1994) (Scott, 1988) (Kobourov, 2012), we manage to uncover common and differential communication approaches followed by the brands analyzed in both countries and in the two social networks. This allows us to determine which of those sustainable brands have been the most successful when communicating in social networks at the most critical moments of the COVID-19 crisis.

The structure of this contribution is as follows. First we will briefly introduce a background about brands and social media, describing how they have progressively recognized the importance of social networks to get in touch with consumers. We will also refer to the importance of sustainability and its role nowadays as well as to how COVID-19 has extended its radius of action to all fields of society, including brands. Next, we will explain the methodology applied in our research study. The next and main section is devoted to analyze the collected data using social network analysis and visualization techniques to draw conclusions from it. Finally, some concluding remarks will be presented.

2. Background

2.1. Brands and Social Media

Social networks are considered as a "set of Internet-based applications that rely on the ideological and technological foundations of Web 2.0, and that allows the creation and exchange of user-generated content" (Kaplan & Haenlein, 2010) (Gomez, et al., 2019). Social networks

facilitate interaction and participation between users and companies or brands (Leung, et al., 2017) (Mangold & Faulds, 2009). They allow information to flow bi-directionally, which makes users not only receivers of content but also creators of brand information and therefore influencers (Tsai & Men, 2013) (Fournier & Avery, 2011).

We must understand that social networks give us the opportunity for brand building and brand value creation, including brand image and brand loyalty and brand management (Gomez, et al., 2019). Furthermore, experts recognize challenges such as measuring the influence of social media marketing activities on brand success, "dealing with the growing amount of customer brand information" (Harrigan, et al., 2017) and "identification mechanisms to improve brand pages to attract consumers and improve consumer-brand relationships" (De Vries & Carlson, 2014).

Brand communication has been recognized as one of the most important elements in brand value (Simon & Sullivan, 1993) (Yoo, et al., 2000). Some recent studies recognize the impact of social networks on brand value. For example, while (Laroche, et al., 2012) evaluates the effect of brand communities on social networks in brand loyalty, (Schivinski & Dabrowski, 2015) analyzes the influence of brand communication on brand value through Facebook.

Among the existing social networks, Twitter and Instagram are especially distinguished by using a very common element nowadays in their form of communication. This element is the *hashtag*, based on describing contents, pictures and videos using a short text preceded by the # symbol (Hu, et al., 2014). Twitter is recognized for being a long-known platform characterized by its immediacy (Zarco, et al., 2019). Meanwhile, Instagram is a relatively young social network allowing to share content through photos and retouching them with filters. It has experienced a rapid growth since it was launched in October 2010, resulting in an increase of brands' attention focus in recent years (Hu, et al., 2014).

Nevertheless, user behavior is different for each social network. Twitter and Instagram, like others as Facebook, have different purposes and their audiences use each of them for different purposes. For example, people usually share a maximum of two hashtags on Twitter as it only allows to write 280 characters. On the opposite, Instagram users write an average of four hashtags per post (McCune & Thompson, 2011).

2.2. Sustainability

The traditional, market-driven approach to develop strong brand relationships. It has been challenged by broader performance frameworks that include social responsibility, ethics, and sustainability (Mena, et al., 2019). This is also due to the increasing attention that customers have begun to pay to sustainable/ecological products and to corporate social responsibility. Brand values significantly affect company stock prices and long-term sustainability. As a prototypical example, the recent debacle of the Volkswagen's emissions scandal showed that social responsibility and (un) ethical actions of a company can have a significant impact on the value and classification of its brand (Harjoto & Salas, 2017) .

Sustainability is already a decisive factor when shopping. This is indicated by the results of the AECOC Shopperview study "How sustainability affects purchasing habits" (AECOC, 2020), presented during the celebration of the Second Congress of Sustainable Development, co-organized by AECOC (Association of Manufacturers and Distributors Companies) —one of the largest business organizations in Spain— and FIAB (Spanish Federation of Food and Beverage Industries). The report indicates that 44% of the surveyed consumers affirm that they have stopped buying products of those brands that they do not consider sustainable, with a particularly accentuated figure among those under 34 years of age.

Brands, also changing entities and sensitive to external circumstances, are currently immersed in the process of going backwards and then moving faster. One of the predictions in Kantar's Media Trends & Predictions report for 2020 (Kantar, 2020) was that brands must take

the step of supporting great social causes. Therefore, brands must work to accelerate the process, adapt to this new situation and succeed, and even reinforce or consolidate their value proposition.

2.3 COVID-19 and Sustainable Brands

The scale of the COVID-19 public health emergency is unmatched in our lives and will have serious social and economic consequences (European Council, 2020) (United Nations, 2020). All of this becomes vitally important when a recent study conducted at Harvard University argues that there is an important correlation between air pollution and COVID-19 lethality (Wu, et al., 2020).

While air pollution is already at a minimum thanks to widespread closures, scientists stress that ensuring cleaner air in the future will help reduce deaths from COVID-19. These studies and their conclusions help us understand the importance of sustainability awareness in companies and how it will help improve our quality of life, which has been altered by the pandemic. This moment is thus very important for brands, which have the opportunity to regain or not lose the trust they have achieved with users, demonstrating their values, purposes and CSR (Corporate Social Responsibility) policies.

3. Methodology

To carry out this study of the communication in social media of the main sustainable Spanish and Italian brands during COVID-19 crisis, we have compiled data related to their presence in Twitter and Instagram. First, we identified the brands considered to be the most sustainable in both countries according to the global study Dow Jones Sustainability World Index (ROBECOSAM AG, 2019) In this report, the companies perceived as the most sustainable on the planet are listed, organized by countries. In the case of Spain there are a total of 15 companies: Amadeus IT Group SA and Indra (Software & Services); BBVA, Banco Santander, Bankinter and CaixaBank (Banks); Enagas (Energy); Endesa, Naturgy Energy Group, Iberdrola and Red Eléctrica (Utilities); Inditex (Retailing); Mapfre (Insurance); and ACS and Ferrovial (Capital Goods). For Italy, the index included only 12: Pirelli & C (Automobiles & Components); Intesa Sanpaolo (Banks); Leonardo and Prysmian (Capital Goods); Moncler (Consumer Durables &Apparel); Saipem and Sna (Energy); Assicurazioni Generali and Poste Italiane (Insurance); Enel, Italgas and Terna Rete Elettrica Nazionale (Utilities).

The information was collected between January 30 and April 8 2020. These specific dates were selected because they include the key moments in the spread of the pandemic in both countries. That is, the day where the first infection cases were jointly reported in both countries as well as those weeks with highest spikes in infections and, therefore, in uncertainty. During these days that coincide with the state of alarm and the confinement of the population decreed by Spanish and Italian governments, it is when the users of social networks are most active. They wanted immediate information and companies tried to react to everything that was happening.

To scrape information from Twitter, we used the Tweepy Python library (https://www.tweepy.org/). For Instagram, we used an Apify scrapper (https://apify.com/jaroslavhejlek/instagram-scraper). Both tools allowed us to download the required data in a fast and orderly manner.

The basis of our study will be certain techniques of social network analysis (SNA) (Wasserman & Faust, 1994) (Scott, 1988) and visualization (Kobourov, 2012). These allow the design of bipartite social networks of brands and hashtags that show the characteristics of the Twitter and Instagram communication models of these companies. The use of SNA techniques has demonstrated its ability to analyze complex social systems and to generate high-quality schematic visualizations of network-based representations in various fields of knowledge (Dearholt & Schvaneveldt, 1990). For example, (Jun & Park, 2017) considered them to analyze brand positioning by establishing relationships among brands as well as among brand and

product attributes based on the structure of online web searchers developed by the users. Besides, (Zarco, et al., 2019) proposes using these kinds of network-based visual representations to identify the communication model followed by Spanish wineries in Twitter. In our case, the analysis of the bipartite social networks as well as their projections on the brands networks, on the one hand, and the hashtag networks, on the other hand, allows us to identify the communication models, uncover common and different patterns, and determine the most and less active actors in the complex systems.

Bipartite networks are a very usual network model for SNA (Barabási, 2016). In these kinds of networks, the nodes belong to two different sets, *A* and *B*, and the undirected links can only connect nodes from a different set, i.e. a node from *A* with a node from *B* (see the central part of Figure 1). Therefore, they are very well adapted to model collaboration activities in complex social systems as each link represents a relation between two nodes, one from each node set. A typical example of a bipartite social network is the Hollywood actor network, generated from the data in IMDb.com (Barabási & Frangos, 2002), in which actors compose the first node set *A* and movies compose the second *B*. A link between an actor a_i and a movie b_k represents that actor a_i played on movie b_k.

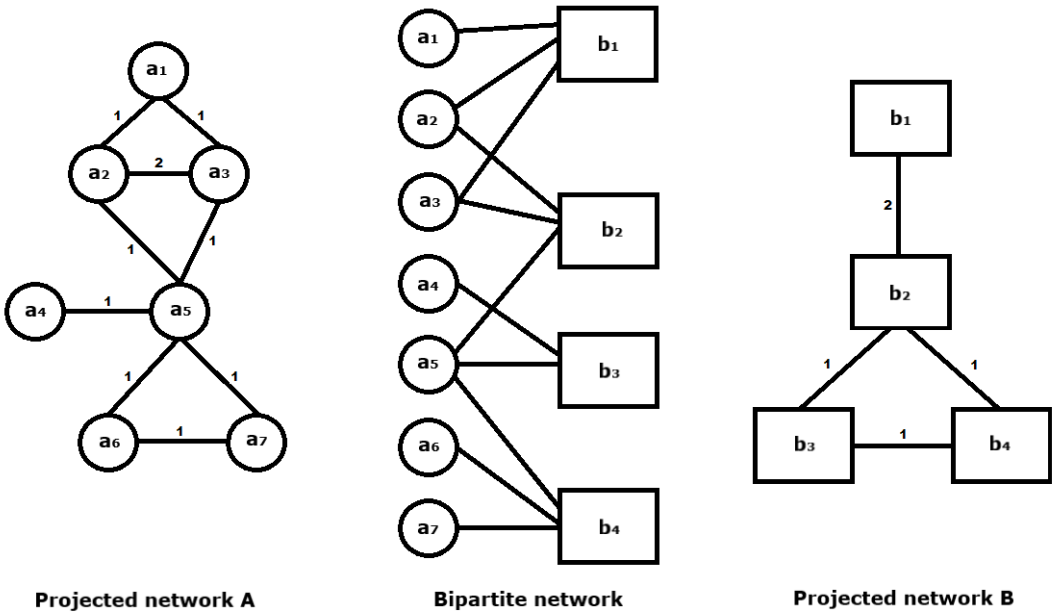

Figure 1: Example of a biparte network and its two projections

Notice that, two projections can be obtained from a bipartite network (see the left and hand side of Figure 1). The first projected network is only composed of nodes from the set *A* and reflects the interactions among them. There will be a link between two nodes a_i and a_j if both of them are linked to the same node from the *B* set in the original bipartite network. For example, in the Hollywood actor network this projection would correspond to the actor network and would correspond to a collaboration network: two actors would be linked only when they have played in at least one movie together. Reciprocally we obtain the projected network for *B*, which in the Hollywood actor network would correspond to the movie network. Two movies would be linked in case they have at least one actor in common in their respective casts.

In our case, the first node set comprises the selected sustainable brands while the second corresponds to the hashtags used in any post made by those companies in the social network during the analyzed period. We thus build **four different bipartite networks**, to analyze the behavior of the brands for two different countries, Spain and Italy, in two different social media, Twitter and Instagram: the **Twitter Spain**, **Twitter Italy**, **Instagram Spain**, and **Instagram Italy**

bipartite networks. To become more informative, we consider weighted links. The link weight is a normalized count of the number of times a brand has posted the specific hashtag during the analyzed period. In this way, we can not only account that a hashtag has been used by a specific brand in its communication strategy but also how actively has it been used. Of course, brands which have not showed any activity in the respective social network during the analyzed period are not included in the brand node set and thus on the network. As a consequence, each of the four bipartite networks can show a variable number of brands, depending on whether they have activity or not on the social network, and of hashtags, depending on the different hashtags used by every brand in their posts in that social network during the considered period.

Each of this bipartite networks is then projected into a **brand network** and a **hashtag network**, thus obtaining eight different networks: **Twitter Spain brands**, **Twitter Italy brands**, **Instagram Spain brands**, and **Instagram Italy brands**, on the one hand, and **Twitter Spain hashtags**, **Twitter Italy hashtags**, **Instagram Spain hashtags**, and **Instagram Italy hashtags**, on the other hand. These eight networks are no longer bipartite but weighed networks with a single node set. The weights in the links are computed by accumulating the normalized weights of the original bipartite network from which they are generated.

All the latter networks are processed and visualized using the Gephi tool (Bastian, et al., 2009). The usual network metrics in SNA as density, degree distribution, average degree, average weighted degree, and average clustering coefficient (Wasserman & Faust, 1994) (Scott, 1988) (Barabási, 2016) are computed and analyzed to understand the behavior of the complex social system represented by the four bipartite networks. The most important brands and hashtags are identified using the weighted degree, the measure best representing the activity for our case study. The betweenness centrality and eigenvector centrality measures are also considered eventually to identify prominent nodes for the case of the projected networks.

Finally, network layouts are also provided to make the analysis easier. Among the existing layout algorithms, we make use of force-based methods (Kobourov, 2012) as they provide visualizations with interesting characteristics for the analysis. Due to its operation, the most important and most related nodes from a global perspective are located in the center of the layout while the less important ones are located in the periphery (Borgatti & Everett, 2000). In particular, we consider some variants of the classical Kamada–Kawai method (Kamada & Kawai, 1989) available in Gephi, the Event graph layout plugin (see https://www.wouterspekkink.org/software/) for the bipartite networks and the Force Atlas 2 algorithm (Jacomy, et al., 2014). To make the network layout more representative, node sizes and link widths are scaled according to their weighted degree and weight respectively in every case. Brand nodes are always colored in pink while hashtag nodes are colored in red.

4 Analysis of the Networks Generated

The current section is devoted to analyze the networks generated following the methodology introduced in Section 3. The first subsection focuses on the four bipartite networks while the second deals with the eight projected networks.

4.1. Analysis of the Bipartite Networks

4.1.1. Twitter Spain

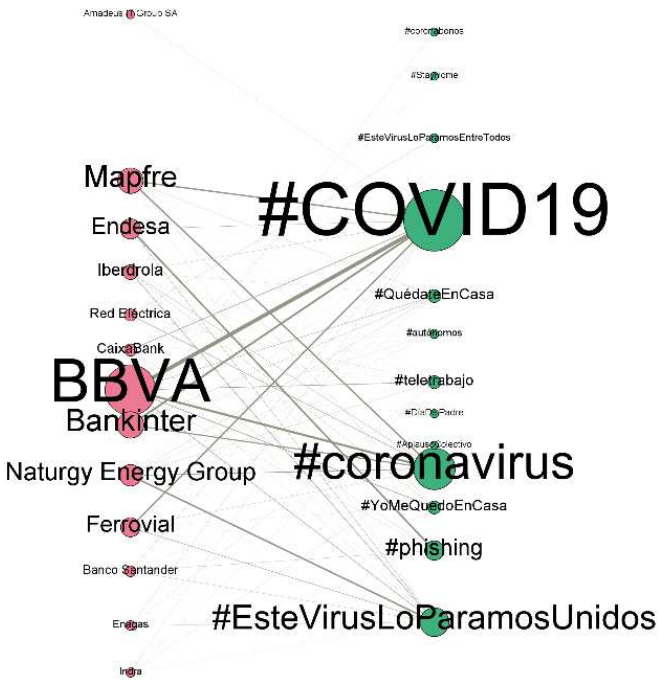

*Figure 2: Twitter Spain **bipartite** network*

The Twitter Spain bipartite network includes 13 brands and 13 hashtags. In this way, the maximum number of possible links is 13·13=169. The network shows 67 of those 169 links, thus having a density of 0.3965. This can be seen as a rather high value, meaning an active overall use of the hashtags by all the brands.

Concerning the brands, the node degree ranges from 1 to 10. The highest degree node is that of the BBVA brand with 10 links. This brand thus shows the highest diversity in its communication strategy, as it makes use of 10 of the 13 existing hashtags. Apart from a large use of the most general ones, #COVID-19 and #coronavirus (see the thick links in Fig. 2), it also uses 8 more. The new two brands with the most diverse communication strategy are Iberdrola and Mapfre with 7 hashtags each. On the opposite, the lowest value corresponds to Amadeus, that only used the generic #COVID-19 hashtag and just a small number of times, as illustrated by the very thin link showed in the figure. The next two "less diverse" brands are Enagas and Endesa, which at least use 3 different hashtags. Overall, the average degree of the network is 5.1538, showing that the brands use around 5 different hashtags in average, while the standard deviation is 2.2303.

As regards the hashtags, the degree distribution ranges from 1 to 12. The highest value is for #COVID-19, thus being used by 12 of the 13 brands, followed by #EsteVirusloParamosUnidos, used by 11. Notice that, the next two are #coronavirus and #teletrabajo, both used by 8 brands. The less general hashtags are #coronabonos, #Aplausocolectivo, and #StayHome, all of them used by only one brand. While the average degree is of course the same, 5.1538, the standard deviation is higher than for the brands nodes, 3.8045, showing a higher dispersion on the use of the hashtags.

The last metric to be analyzed for this network is the weighted degree, which allows us to analyze the overall brand activity and the overall hashtag use. The average is 0.5283 (remember that the link weights have been normalized). The standard deviation is 0.5742 for the brands and 0.8116 for the hashtags, showing the same behavior as the degree, higher dispersion for the latter ones. The weighted degree values allows us to stress the activity differences in both cases. For the brands, while BBVA has the highest weighted degree of 2.1371, the second most active brand is Bankinter (and not Mapfre neither Iberdrola, which showed the second position in the degree measure with 7) with 0.9239 and only a degree of 5. In fact, although Iberdrola is using 7 different

hashtags, its weighted degree is only 0.3401, one of the lowest values, showing a small activity. These differences are also observed for the hashtags: #COVID-19 is not only the one most used by the brands (degree=12) but also the one most twitted (weighted degree=2.6701). However, although #EsteVirusLoParamosUnidos is used by 11 brands, it is significantly less twitted (weighted degree=1.0406). In fact, #coronavirus is in between both of them, with the second highest weighted degree (1.6751) but with a lower degree, 8. This means that although it is used by less brands, it is more actively twitted. The weighted degrees of the remaining hashtags are significantly lower. The case of the next two hashtags with the higher degrees is clear, #teletrabajo with degree=8 and #QuédateEnCasa with degree=7, are used by more than the half of the brands but weakly tweeted as both weighted degrees are under 0.25.

The following two tables report the values of both degree measures for every brand and hashtag node, respectively. The cells in each column follow a color scale where the lowest values start from red and move to green while increasing.

Brand	Weighted degree	Degree
Amadeus IT Group SA	0.0203	1
BBVA	2.1371	10
Banco Santander	0.1472	6
Bankinter	0.9239	5
CaixaBank	0.2132	5
Enagas	0.0863	3
Endesa	0.6091	3
Ferrovial	0.5685	5
Naturgy Energy Group	0.6802	6
Iberdrola	0.3401	7
Indra	0.0609	4
Mapfre	0.8782	7
Red Eléctrica	0.2030	5

Hashtag	Weighted degree	Degree
#EsteVirusLoParamosUnidos	1.0406	11
#COVID-19	2.6701	12
#coronavirus	1.6751	8
#EsteVirusLoParamosEntreTodos	0.0508	2
#teletrabajo	0.2538	8
#phishing	0.5685	4
#StayHome	0.0102	1
#YoMeQuedoEnCasa	0.2437	5
#QuédateEnCasa	0.2487	7
#autónomos	0.0558	5
#DíaDelPadre	0.0203	2
#AplausoColectivo	0.0102	1
#coronabonos	0.0203	1

4.1.2. Instagram Spain

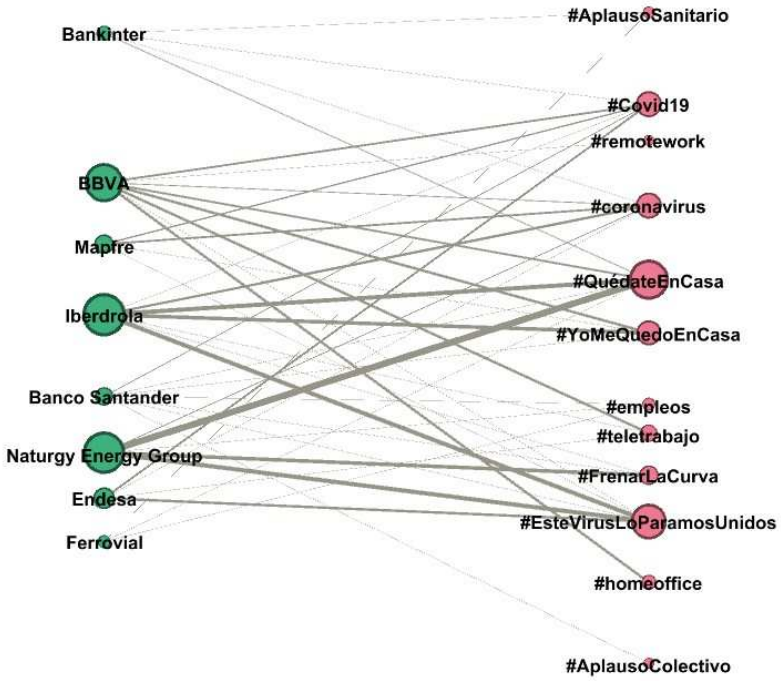

*Figure 3: Instagram Spain **bipartite** network*

The Instagram Spain bipartite network is comprised by a lower number of brands and hashtags than the Twitter one, 8 brands and 12 hashtags. The network has 42 of the 96 possible links, showing a density of 0.4375, a similar value to the former. Again, this an important overall activity.

In this case we find five companies less than on Twitter: Amadeus IT Group S.A., CaixaBank, Enagas, Indra and Red Eléctrica, although the number of hashtags used are practically the same. This clearly show that Spanish brands are less interested on using Instagram in their communication strategy than on using Twitter.

The brands show a homogeneous behavior, with an average degree of 5.25 and a small standard deviation (1.8323). BBVA is again the most diverse brand in hashtag use with 8 links (but this time it is not using other 4), followed by Banco Santander and Iberdrola with 7 links each. Ferrovial is the lowest degree brand but at least it uses 3 hashtags, followed by other three brands with 4. The average degree of the hashtag nodes is lower (3.5) but its standard deviation is higher (2.0671), showing again a high dispersion on the use of the hashtags. Four different hashtags are used by 6 of the 8 brands: #QuédateEnCasa, #Covid19, #coronavirus, and #EsteVirusLoParamosUnidos. On the opposite, other three are only used by a single brand: #homeoffice, #remotework, and #AplausoColectivo.

Concerning the weighted degrees, their values are higher than for the Twitter network. The brand nodes show an average of 1.2917 (std. dev. of 0.98) and the hashtag nodes have an average of 0.8611 (std. dev. of 0.7515). This measure allows us to uncover interesting behaviors. Iberdrola is the most active brand, showing a higher weighted degree than BBVA (2.5833 vs. 2.25) even if it uses one hashtag less. In fact, Naturgy Energy Group also shows a higher value than BBVA with only 5 hashtags but a larger use of them (weighted degree of 2.5). On the opposite, Banco

Santander arises as a low activity brand (weighted degree of 0.6667) even if it uses a high number of hashtags (7).

All the latter allows us to conclude that companies destined for public services (utilities) such as Naturgy and Iberdrola have preferred to enhance their communication on Instagram rather than on Twitter, thus trying to connect with a younger audience that is committed to the environment and corporate social responsibility. This is just the opposite situation we identify for the banks, that are more active in Twitter overall. Besides, their activity profile in Instagram is characterized by a few posts that jointly include several hashtags. The only exception is BBVA, which maintains a certain coherence in its communication policy in both social networks.

This behavior is not observed for the case of the hashtags. The degrees and the average degrees are pretty correlated and the same nodes have the highest values in both measures. This means that the hashtags used by more brands are also those more actively posted, while those used by less brands are less posted. Notice that, this is a different behavior than the one uncovered in the Twitter network.

The following two tables report the values of both degree measures for every brand and hashtag node, respectively.

Brand	Weighted degree	Degree
BBVA	2.2500	8
Banco Santander	0.6667	7
Bankinter	0.4167	4
Endesa	0.9167	4
Ferrovial	0.2500	3
Naturgy Energy Group	2.5000	5
Iberdrola	2.5833	7
Mapfre	0.7500	4

Hashtag	Weighted degree	Degree
#YoMeQuedoEnCasa	1.1667	4
#QuédateEnCasa	2.3333	6
#Covid19	1.2500	6
#coronavirus	1.2500	6
#teletrabajo	0.5833	3
#EsteVirusLoParamosUnidos	2.0000	6
#homeoffice	0.4167	1
#remotework	0.0833	1
#AplausoColectivo	0.0833	1
#AplausoSanitario	0.1667	2
#empleos	0.2500	3
#FrenarLaCurva	0.7500	3

4.1.3. Twitter Italy

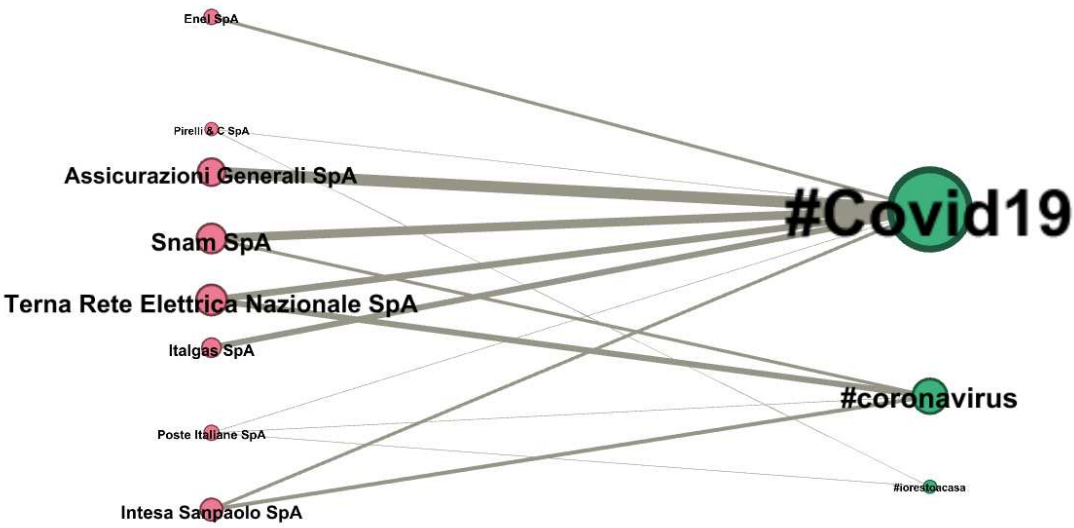

*Figure 4: Twitter Italy **bipartite** network*

The Twitter Italy bipartite network is comprised by a lower number of brands and hashtags than the two Spain bipartite networks. There are only 8 brands with presence in Twitter out of the 12 initial ones and they have twitted only 3 hashtags. The network has 14 of the 24 possible links, showing a density of 0.5833, which is higher than the previous two networks. This can be seen as a fairly high value, which means an active general use of the hashtags by all the brands, and can be understood in view of the low number of hashtags.

Brands have a quite similar behavior, with an average degree of 1.75 and a small standard deviation (0.7071). The highest degree node is that of the Poste Italiane SpA brand with 3 links. This is the only brand whose publications during this period of confinement used the three hashtags, which is considered as strategy to convey more impact. Pirelli & C SpA, Intesa Sanpaolo SpA, Snam SpA and Terna Rete Elettrica Nazionale SpA have 2 links and Assicurazioni Generali SpA, Enel SpA and Italgas SpA are the lowest degree brands with a single link.

The average degree of the hashtag nodes is of course higher (4.6667) as well as its standard deviation (3.0551), showing a high dispersion on the use of the hashtags. There is only one hashtag, #Covid19, which is used by every brand. The hashtag #coronavirus, despite having a significant impact by its own name, is not as widely used as the previous one, and only half of the brands have twitted it. The third one, #iorestoacasa, is only used by two of them.

Concerning the weighted degrees, the brands show an average of 0.68 (std. dev. of 0.37) while the hashtags an average of 1.8148 (std. dev. of 1.8428). In this case, Terna Rete Elettrica Nazionale SpA is the most active brand, showing a significantly higher weighted degree than the highest degree brand, Poste Italiane SpA (almost four times higher, 1.1667 vs. 0.3333). This means that although this brand has used less hashtags, it has applied an active communication strategy focusing its attention on specific messages.

Finally, due to the small number of existing hashtags, their weighted degrees are much related to their degree, thus not providing any additional information. This means that the hashtags used by more brands are also those more actively posted, while those used by less brands are less posted.

The following two tables report the values of both degree measures for every brand and hashtag node, respectively.

Brand	Weighted degree	Degree
Pirelli & C SpA	0.2222	2
Intesa Sanpaolo SpA	0.7222	2
Snam SpA	1.1111	2
Assicurazioni Generali SpA	1.0000	1
Poste Italiane SpA	0.3333	3
Enel SpA	0.3333	1
Italgas SpA	0.5556	1
Terna Rete Elettrica Nazionale SpA	1.1667	2

Hashtag	Weighted degree	Degree
#iorestoacasa	0.2222	2
#Covid19	3.8333	8
#coronavirus	1.3889	4

4.1.4. Instagram Italy

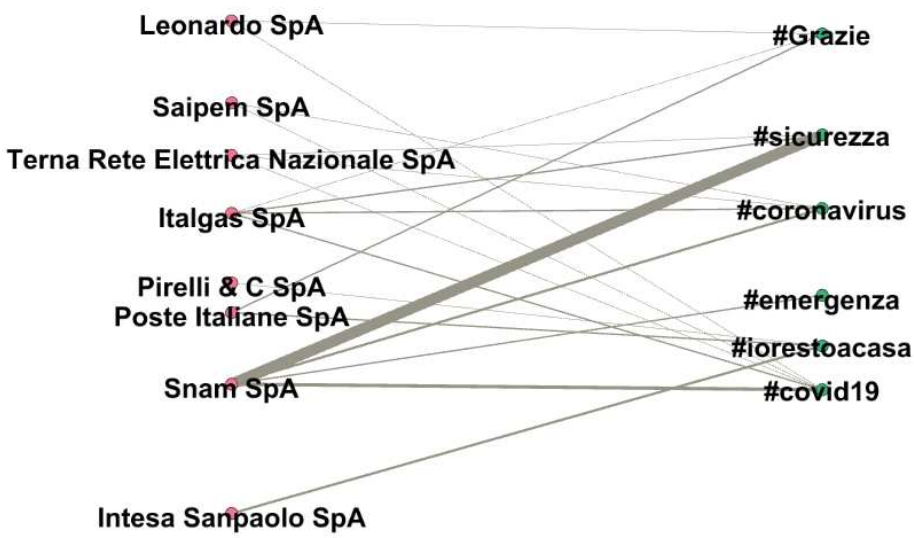

*Figure 5: Instagram Italy **bipartite** network*

The Instagram Italy bipartite network is comprised by the same number of brands than the Twitter one, 8 brands, but more hashtags in this case, 6. The 3 hashtags used in Twitter are also posted by the brands in Instagram, showing their very general nature, but there are 3 new ones, which are also very generic (#Grazie, #sicurezza, and #emergenza). For the case of the brands, 6 of them have considered both social media in their communication strategies but the other two have opted by a single one: Assicurazioni Generali SpA and Enel SpA for Twitter while Leonardo SpA and Saipem SpA for Instagram.

The current network has 19 of the 48 possible links, showing a density of 0.3958, a little bit lower value than in the former network. The brand activity is thus more distributed and it is not as concentrated as in the previous case, probably as a consequence of having the chance to provide different messages by means a higher number of hashtags.

The average degree of the brand nodes is not very high (2.3750) and the standard deviation is a rather small (1.1877). The highest degree nodes are those of the Snam SpA and Italgas SpA with 4 links, showing that there is no brand posting the 6 hashtags. Terna Rete Elettrica Nazionale SpA have 3 links, Leonardo SpA, Saipem SpA and Poste Italiane SpA have 2 links, and Pirelli & C SpA and Intesa Sanpaolo SpA are the lowest degree brands with only 1 link. Overall, this represents a cohesive behavior in the number of hashtags used but also a pretty high diversity in their choice.

For the case of hashtags, the average degree is 3.1667 and its standard deviation is 1.3292, which shows a considerable distribution in the use of the hashtags by the brands. In this case, only one hashtag is used once, #emergenza. The rest has been used a fairly homogeneous number of times. The general #covid-19 is the highest degree hashtag but has only been used by 5 of the 8 brands, showing again the diversity in the communication strategies in this social media.

As for the weighted degrees, the brands show an average of 0.4479 (std. dev. of 0.5472) and the hashtags an average of 0.5972 (std. dev. of 0.3779). Both values are pretty low, showing a small overall activity as reflected in the thin links in Figure 5. Snam SpA is the most active brand, showing a very higher weighted degree than Italgas SpAm, which is next (almost three times higher, 1.75 vs. 0.5833). Both brands showed also the highest degree, with 4 links. That leads us to conclude that Snam SpA has been very consistent in the publication of content, enhancing his message with the use of the different hashtags considered.

The weighted degrees of the hashtags allows us to identify an interesting behavior. We can see how #sicurezza has the highest value (1.25), which is well above the next one that corresponds to #COVID-19 (0.75). However, the former has a degree of 3 while the latter has a degree of 5. This means that 3 brands have actively posted the #sicurezza hashtag. In particular, the network layout clearly shows that the link with the Snam Spa brand has clearly the highest weight in the network, while the remainder maintain a relatively similar weight. This gives us to understand the importance that this brand has given to this hashtag in its publications.

The following two tables report the values of both degree measures for every brand and hashtag node, respectively.

Brand	Weighted degree	Degree
Pirelli & C SpA	0.0833	1
Intesa Sanpaolo SpA	0.2500	1
Leonardo SpA	0.1667	2
Saipem SpA	0.1667	2
Snam SpA	1.7500	4
Poste Italiane SpA	0.3333	2
Italgas SpA	0.5833	4
Terna Rete Elettrica Nazionale SpA	0.2500	3

Hashtag	Weighted degree	Degree
#iorestoacasa	0.5000	3
#covid-19	0.7500	5
#coronavirus	0.5833	4
#emergenza	0.1667	1
#Grazie	0.3333	3
#sicurezza	1.2500	3

4.2. Analysis of the Projected Networks

4.2.1. Twitter Spain

Brands:

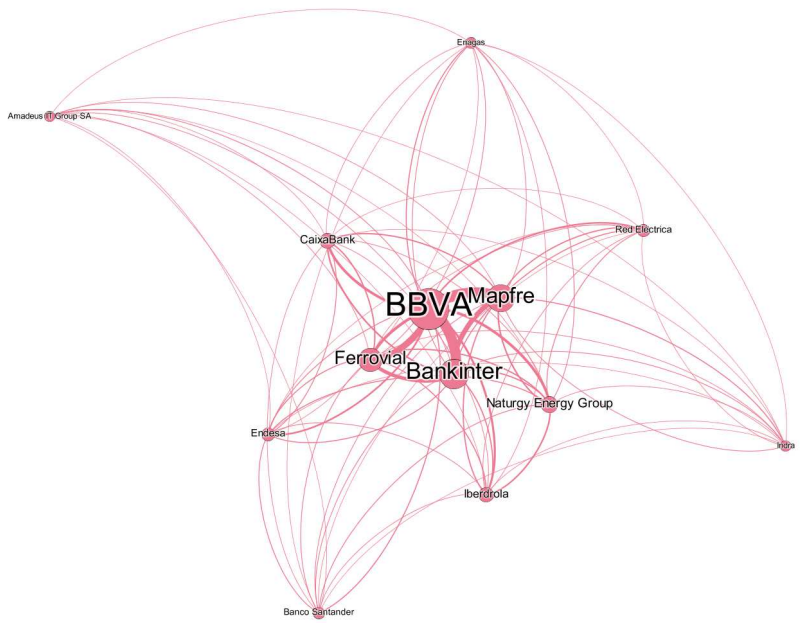

*Figure 6: Twitter Spain **brand** network*

The Twitter Spain brand projected network has 13 nodes, corresponding to the brands showing activity on Twitter during the analyzed period, and shows a high average degree (11.846) and density (0.987). This means that their communication strategies are strongly related and almost all of them share at least a single hashtag used in their tweets. As a consequence, the local density is also high, the clustering coefficient is 0.987 as well. However, the average weighted degree is significantly low, 0.674, stressing the differences in the communication strategies applied by the different brands. This means that they have not tweeted a large number of common hashtags overall.

The center-periphery effect resulting from the use of the Force Atlas 2 layout is especially relevant in our case, easing the network analysis at first sight. The same happens for the node sizes and link widths. We should remember that a thick link between two brands in the projected network means that they have tweeted several hashtags in common, i.e., they have a common communication strategy in Twitter. Besides, the closeness of several nodes in the graphical representation also means a high use of common hashtags and every path in the network reflects a sequence of relations. That is, a path $a_i - a_j - a_k$ means that brand a_i has some hashtags in common with brand a_j while brand a_j has some hashtags in common with brand a_k, with the similarity degree reflected by the link weight. The appearance of triangles or cliques mean a global relation between three or more brands.

In view of the latter, the layout easily allows us to uncover the four most relevant Spanish brands according to their communication strategies on Twitter. They are the four ones located in the center: BBVA, Bankinter, Mapfre, and Ferrovial. This means that they have tweeted many common hashtags with the rest of the brands (they show a high similarity in their communication strategy overall). Their ranking of importance is thus reflected by their node sizes, scaled with

respect to the weighted degree. Two strong triangles can be identified: BBVA-Bankinter-Ferrovial and BBVA-Bankinter-Mapfre, uncovering two different subsets of hashtags used. The former triangle shares the hashtags #coronavirus, #COVID-19, and #QuédateEnCasa while the latter shares the hashtags #coronavirus, #QuédateEnCasa, and #autónomos, thus uncovering two different communication strategies. The brands on the left side of the layout will be related to the first communication strategy while those on the right side to the second.

Finally, we can quickly identify the less active brands as those located in the periphery of the representation: Amadeus IT Group SA, Enagas, Red Eléctrica, Indra, and Banco Santander (listed clockwise). They have a small activity in the use of different hashtags, as also seen in the analysis of the bipartite networks, and a low interaction with other brands using more hashtags and in a more active way. That is, their communication strategies in Twitter are poor during the analyzed period.

Hashtags:

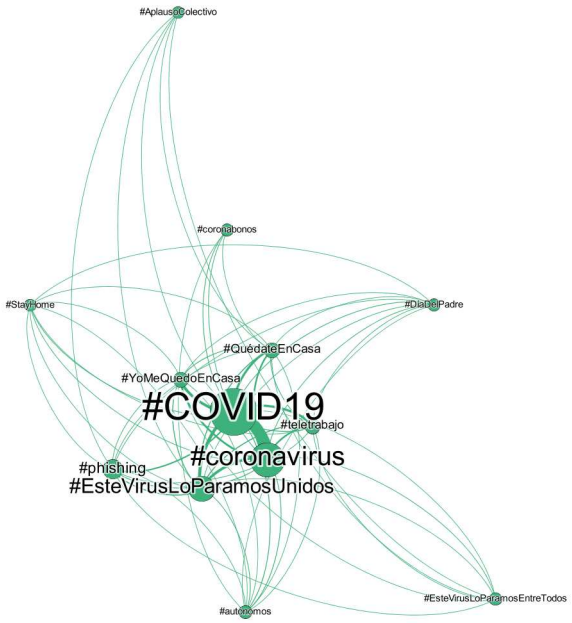

*Figure 7: Twitter Spain **hashtag** network*

The Twitter Spain hashtag projected network also has 13 nodes, corresponding to the different hashtags tweeted by the 13 considered brands. It also shows a high average degree (9.385) and density (0.782), lower than those for the brand network as well. This means that some of the hashtags are not jointly used by any brand. Even so, the local density stays very high (0.892), showing a joint use of triplets of hashtags in many cases. However, the average weighted degree is extremely low (0.371), stressing the strong differences in the communication strategies of the different brands, reflected in this case by the lack of a joint use of a large number of hashtags, as already mentioned.

The center of the layout is occupied by a single strong triangle, comprised by the #COVID-19, #coronavirus, and #EsteVirusLoParamosUnidos hashtags, following that ranking of importance. This means that these three hashtags have been jointly tweeted by many brands, especially the former two. Looking around that salient triangle in each direction, we can identify the hashtags that have been more jointly used with those three vertices of the triangle. For example, #QuédateEnCasa and #teletrabajo have been mainly jointly used with #COVID-19 and

#coronavirus by the brands. Meanwhile, #YoMeQuedoEnCasa and #phishing have been mainly jointly used with #COVID-19 and #EsteVirusLoParamosUnidos.

Again, the less used hashtags are in the periphery of the layout. The most relevant conclusion is that #AplausoColectivo and #EsteVirusLoParamosEntreTodos are the farthest ones. Even if they have a relevant degree, 5 and 8 respectively, their weighted degree is very low, 0.0014 and 0.008, thus showing the brands are only using them very occasionally.

4.2.2. Instagram Spain

Brands:

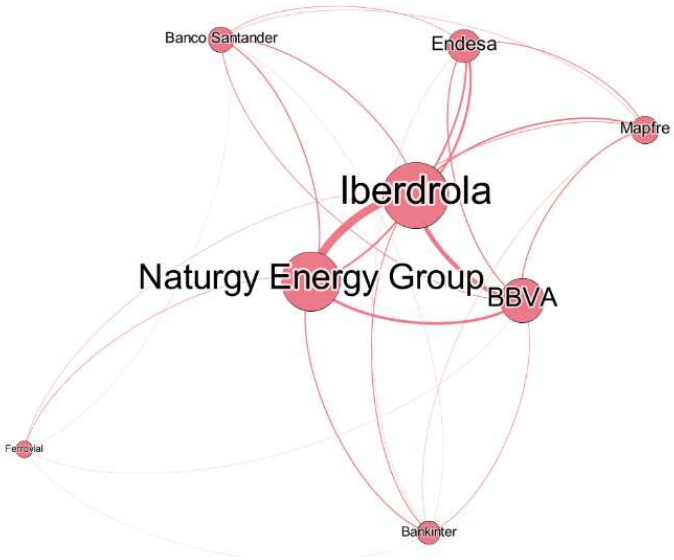

*Figure 8: Instagram Spain **brand** network*

The Instagram Spain brand projected network has 8 nodes, corresponding to the brands showing activity on Instagram during the analyzed period, and shows a significantly high average degree (6.5) and density (0.929). The local density also stays very high (0.94). The average weighted degree is extremely high as well (1.307).

The center of the layout is occupied by a strong triangle comprised by the Iberdrola, Naturgy Energy Group and BBVA brands. This means that they have made their posts with common hashtags with the rest of the brands. Its importance can be drawn by the size of its nodes. The hashtags shared by these brands have been #QuédateEnCasa, #coronavirus and #EsteVirusLoParamosUnidos, some labels that appeal to the sense of protection in the community.

The farthest node is that of Ferrovial, which also shows the lowest average degree and is mainly linked to the central triangle but with very thin links showing the low activity of its communication strategy in this social media.

Hashtags:

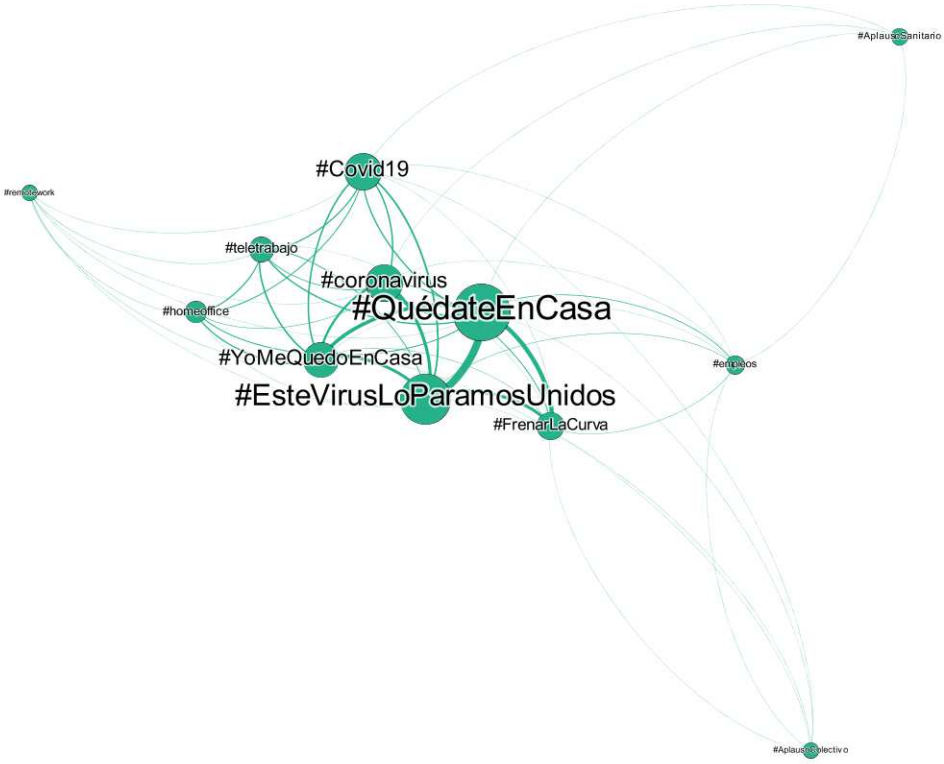

*Figure 9: Instagram Spain **hashtag** network*

The Instagram Spain hashtag projected network has 12 nodes and its layout is very spread, showing a higher diversity than in the previous cases. It has a low average degree (3.2) and density (0.221), values that also corroborate the latter assumption. Even so, the local density stays very high (0.868), thus meaning that many different triplets of hashtags are shared by the brands in their diverse communication strategies. The average weighted degree is high (1.033), representing an important activity, but the different node sizes allows us to conclude this activity level is also very diverse among the different brands.

The center of the layout is occupied by a strong triangle, comprised by the #Quedateencasa, #EsteVirusLoParamosUnidos and #YoMeQuedoEnCasa hashtags, following that ranking of importance. Nevertheless, on the opposite of the Instagram brand network, which was dominated by a single, strong, central triangle, in this case it is surrounded by some other important triangles. That is another proof of the diversity in the communication strategies applied by the brands in this social media.

Comparing the brand messages with those made in Twitter, the meaning of the hashtags on Instagram is somewhat different since those that are more widespread here refer to the protection of people, and the sense of community and of union. For the Twitter case, they appealed more to the alarm situation, information about the disease, and the seriousness of the situation.

Besides, the less used hashtags are clearly identified thanks to their peripheral location: #remotework and #empleos, and especially #AplausoColectivo and #AplausoSanitario.

4.2.3. Twitter Italy

Brands:

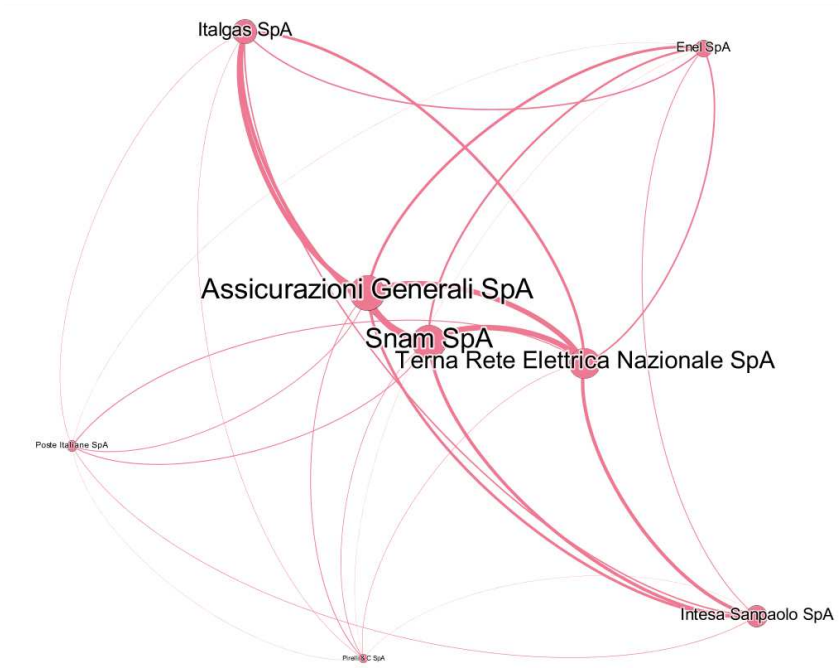

*Figure 10: Twitter Italy **brand** network*

The Twitter Italy brand projected network includes 8 brands and has the maximum values for the average degree (7) and density (1). The average weighted degree is also extremely high (1.691) and the layout clearly shows a low dispersion for this measure in 5-6 of the 8 nodes.

The center of the layout is again dominated by a single strong triangle comprised by the Assicurazioni Generali SpA, Snam SpA and Terna Rete Elettrica Nazionale SpA brands. This means that they have made their posts with common hashtags with the rest of the brands. Its importance can be deduced by the size of its nodes. The novelty is that we can also identify at least two other, less strong but still very strong, triangles: Italgas SpA - Assicurazioni Generali SpA - Terna Rete Elettrica Nazionale SpA and Intesa Sanpaolo SpA- Snam SpA - Terna Rete Elettrica Nazionale SpA.

This leads us to conclude this complex social system has a more cohesive behavior as the hashtags commonly used and the global activity is very similar. We should remember that only three hashtags were twitted in this case, what reinforces our conclusion as the diversity of possible communication strategies is clearly reduced. Poste Italiane SpA and Pirelli & C SpA can be clearly identified as the most differential brands, but in this case due to their lower activity.

Hashtags:

*Figure 11: Twitter Italy **hashtag** network*

The Twitter Italy hashtag projected network is very simple. It has only 3 nodes and it is fully connected, thus being composed of a single triangle. Even so, the average weighted degree has a low value (0.519) as two of the three links have a very low weight.

In this network, having so few nodes, it is easier to see the behavior of the links and understand the values obtained. All the hashtags are related and all of them have been used by the brands considered. However, there are two (#Covid19 and #coronavirus) that have a very strong relationship between them, much greater than with the third node (#iorestoacasa).

4.2.4. Instagram Italy

Brands:

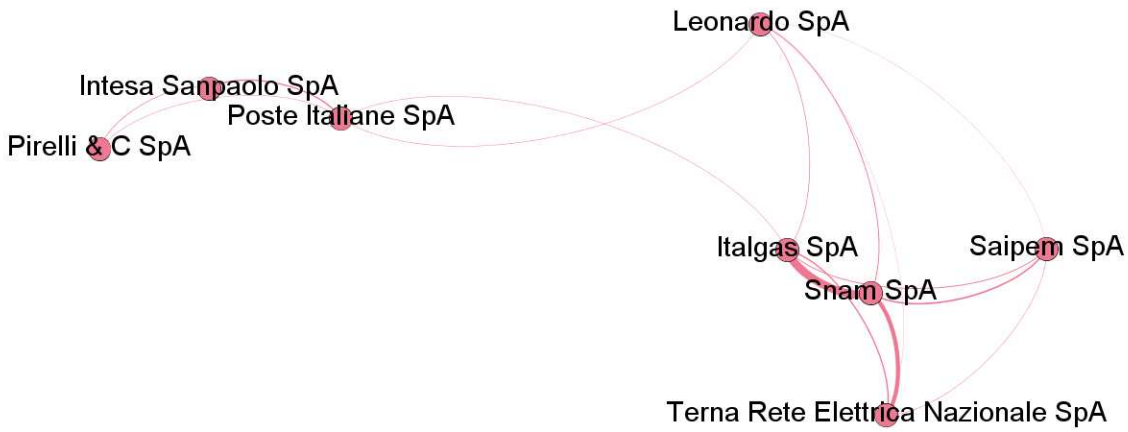

*Figure 12: Instagram Italy **brand** network*

The Instagram Italy brand projected network has 8 nodes. I shows a low degree (3.75) and a medium density value (0.536). The average clustering coefficient stays very high (0.842), showing a high local density. On the opposite, the average weighted degree is very low, only 0.174, and the network sizes clearly show us it has a very low dispersion. All the latter results in a high diversity of behavior patterns of the Italian brand communication strategies in this social media.

If view of the network layout, we can identify two different groups can be seen united by the Poste Italiane SpA, Leonardo SpA, and Italgas SpA brands. In fact, these three nodes show the highest betweenness centrality values in the network, a SNA metric that measures the brokerage capability of a node. The group on the right has a strong relationship between Italgas SpA, Snam SpA and Terna Rete Elettrica Nazionale SpA. They are brands that have shared the same hashtags in their publications, showing a more consistent communication. Meanwhile, we can identify another, very isolated group of other three brands on the left: Intesa Sanpaolo SpA, Poste Italiane SpA and Pirelli & C SpA, that are more distant and with slightly weaker links. These brands have shared a hashtag in their communications but in a very subtle way, with hardly any mention.

The eigenvector centrality measure has been computed in this case to identify the most relevant brands in the communication strategies applied and Leonardo SpA and Italgas SpA brands have both shown the maximum value. This makes full sense according to their central location and their high degrees, showing a large similarity with the communication strategies applied by the other brands.

Hashtags

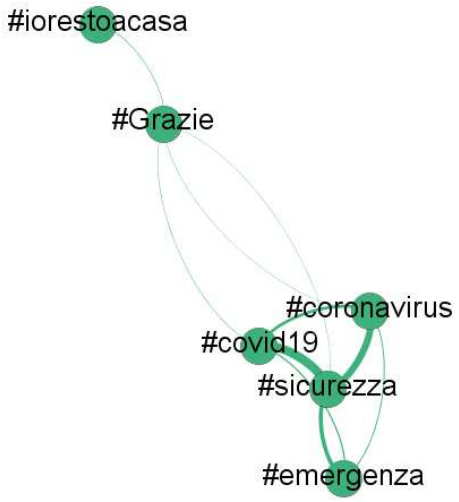

*Figure 13: Instagram Italy **hashtag** network*

The Instagram Italy hashtag projected network has 6 nodes. It shows medium values for the average degree (3.33) and density (0.667). The clustering coefficient stays high (0.8), showing again a high local density. The average weighted degree is low (0.373).

All the latter makes us conclude we can find again an important diversity in the communication strategies applied, as in the previous network. A group of hashtags are clustered in the lower part of the graph, #coronavirus, #COVID-19, #sicurezza, and #emergenza, while in the highest and most distant part we find two: #iorestoacasa and #Grazie.

We see that there is a strong relationship between three of these nodes: #coronavirus, #COVID-19, and #sicurezza, which suggests that they have been used together in the same publications. Actually, these three nodes have the highest value in the eigenvector centrality. There is another strong triangle sharing two nodes with the latter one: #coronavirus, #sicurezza, and #emergenza.

Focusing on the two most distant nodes, #Grazie plays the gatekeeper role between the group at the bottom and the one at the top. This is also clearly reflected by it high betweenness centrality value, 7 times higher than that of the next three nodes. Its location at the top of the

layout implies that it has been jointly used with #iorestoacasa in some posts. It has also jointly used with the three hashtags in the main triangle several times, which is reflected in a high eigenvector centrality value.

5. Discussion and Conclusions

The arrival of social media has introduced new channels of brand communication and has leaded to the application of online tools to engage with consumers (Gomez, et al., 2019). This study contributes to the general analysis of brand engagement on social media through the analysis of brand participation and communication in social networks (Bruhn, et al., 2012) (Pentina, et al., 2013) as well as commitment of brands in complex situations such as that the COVID-19 crisis recently experienced (Petts, et al., 2010) (Smit, et al., 2007). To do so, we have selected a set of Spanish and Italian brands considered as the most sustainable and have analyzed the communication activity and the communication strategies followed (represented in terms of the considered hashtags) in two different social media, Twitter and Instagram, during the early stages of the pandemic in their respective countries.

Regarding the results obtained, we observe that of the15Spanish brands considered, all but one (ACS) have a Twitter profile, but only 12 of them have maintained a constant activity during the analyzed period. Both Amadeus IT Group and Inditex have their profiles opened but they did not show any activity. In the case of Spanish brands on Instagram, we recognized that only 9 brands had an active profile and all of them also made publications related to COVID-19.

If we go into more detail, we can see how most of the publications made on both networks by Spanish brands had a common message: transmitting empathy and strength to those affected by COVID-19. Of course, some of the brands that did not show any activity on the social networks analyzed have alternatively acted in other contexts, such as Inditex which has shown its commitment to its country acting in solidarity and buying medical supplies to donate to hospitals.

It is noteworthy that two brands, Ferrovial and Caixa Bank, which have a presence on Twitter and Instagram, opted for not using both social networks as communication tools in relation to the pandemic. Both of them only focused their communication strategies on Twitter. Leaving this detail apart, in general terms we can conclude that all brands shared the main hashtags that were used to unify the message of support they wanted to transmit. The most used hashtags were #COVID-19, #coronavirus, and #EsteVirusLoParamosUnidos.

In short, focusing a little more on the particularities of brands on social networks in this period analyzed, we see in the Spanish case that the brands that have been on Twitter BBVA, which is a brand of a bank and is characterized by being very active on this social network; and on Instagram Iberdrola and Narturgy, which are more linked to the energy and public services sector, which makes them companies that, in theory, are more linked to the environment and its protection. On the contrary, the least active in the networks have been Amadeus in the case of Twitter and Ferrovial in the case of Instagram.

Regarding the most used hashtags globally, we have seen that on Twitter it has been #Covid-19, something that seems consistent due to the main characteristics of this network: immediacy and real and direct information; while in Instagram they have been #QuédateEnCasa and #EsteVirusLoParamosUnidos, two labels that more than mention the problem, invite us to empathize and be responsible with our peers.

In the case of Italian brands, we see that all the 12 sustainable brands but one, Saipem, had a profile on Twitter, although Moncler did not show any type of activity during the period. Meanwhile, if we look at the Italian brands on Instagram, we see that the 12 brands actually had a profile on the network and that they also maintain a very continuous activity, although not all of them referred to the current situation of the pandemic.

It is worth noting that in the case of Italian brands, unlike the Spanish ones, there was not a great diversity of hashtags. In most cases, the use was limited to a maximum of 6 while the Spanish ones considered up to 13. This clearly showed a most homogeneous communication strategy in terms of the broadcasted message for the case of Italy.

Compared to the Spanish case, the activity of Italian brands was much lower on both networks. In this case, there are companies that have very active profiles (of the 10 brands, 6 use the two networks, 2 use only Twitter and 2 only Instagram), but on Twitter they used less variety of hashtags than on Instagram, which suggests a different communication policy on one network and another. That was the case of Leonardo SpA, who made no mention to the pandemic in his tweets but did so in the posts made in his Instagram profile.

The case of Assicurazioni Generali SpA is quite the opposite. He mentioned the pandemic on Twitter but did not post anything related to COVID-19 on Instagram, but there was content related to the pandemic in the "*Stories*" (content that allows users to share moments and then personalize them with text, drawings and emojis, and pin them to do not lose them as they have the characteristic of being deleted after 24 hours) in the profiles of this network during the analyzed period. This decision may be due to the fact that they wanted to give more visibility to the publications related to the pandemic by giving them a prominent place as are the *stories* in their profile.

As for the most widespread terms among Italian brands to refer to the current health crisis, the hashtags were #coronavirus, #iorestoacasa, and #COVID-19.

If we look at the particularities of the Italian brands in the networks considered, we see that the most active on Twitter have been Poste and Terna Rete Elettrica, from the insurance and utilities sectors respectively. On Instagram it is Snam who leads the way, which belongs to the energy sector. By contrast, the least active on Twitter has been Enel and in the case of Instagram it is Pirelli & C.

In the case of the hashtags used, we have seen that on Twitter # Covid19 is the most numerous in all cases, while on Instagram #sicurezza and # Covid19 have been very similar in their use.

In short, this study has allowed us to analyze the behavior of the brands considered to be the most sustainable in Spain and Italy on two of the most extended social networks during the early stages of the COVID-19 crises in their respective countries. The commitment of these brands to the current situation and their presence in social media can be considered very relevant and will permit them to strengthen their solidarity character. We have been able to verify that Spanish brands have more activity on Twitter than on Instagram, therefore targeting a more mature audience, although not less committed to sustainable actions. We also uncovered that the Italian brands had a more prominent presence on Instagram than on Twitter, revealing an intention to communicate with a younger audience which is usually more committed to social causes, social responsibility corporate and sustainability-oriented actions.

Acknowledgements

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Figures

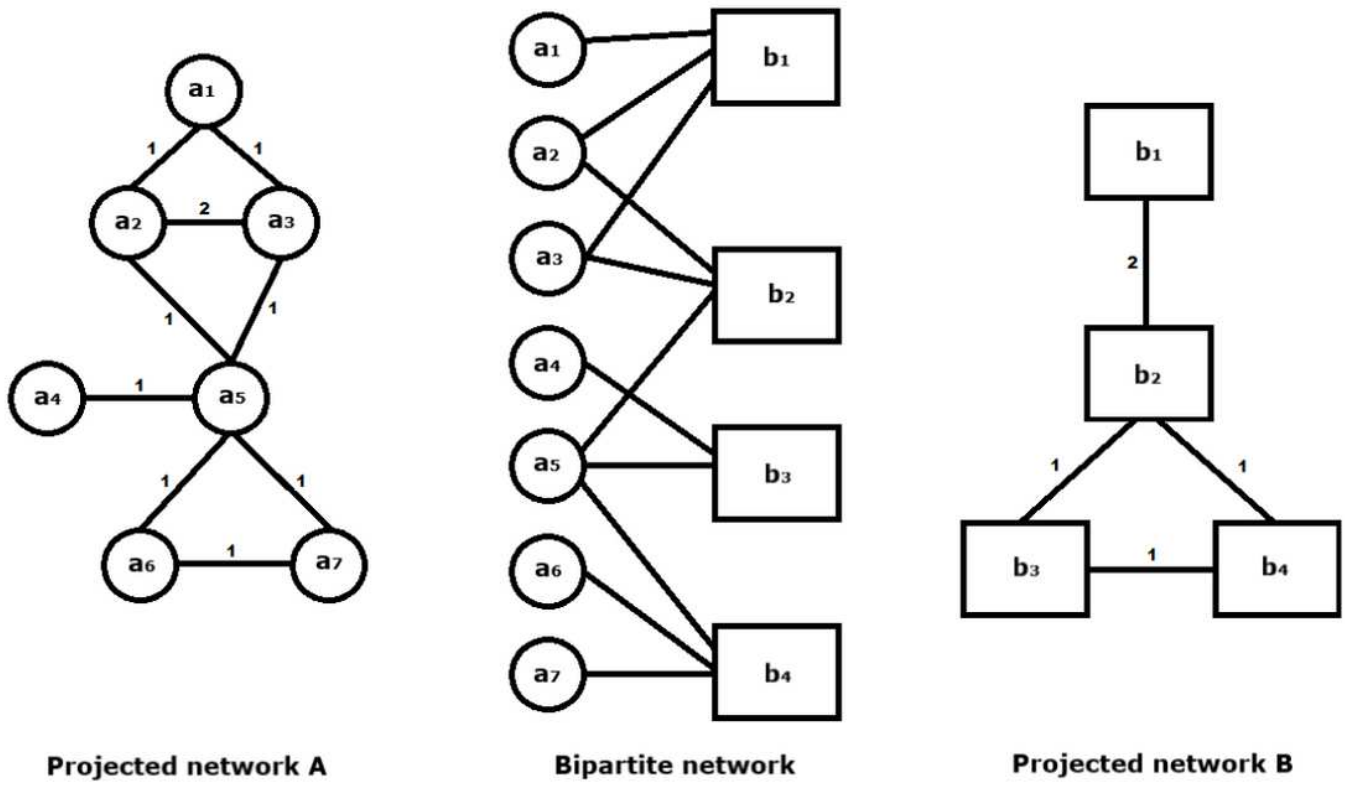

Figure 1

Example of a biparte network and its two projections

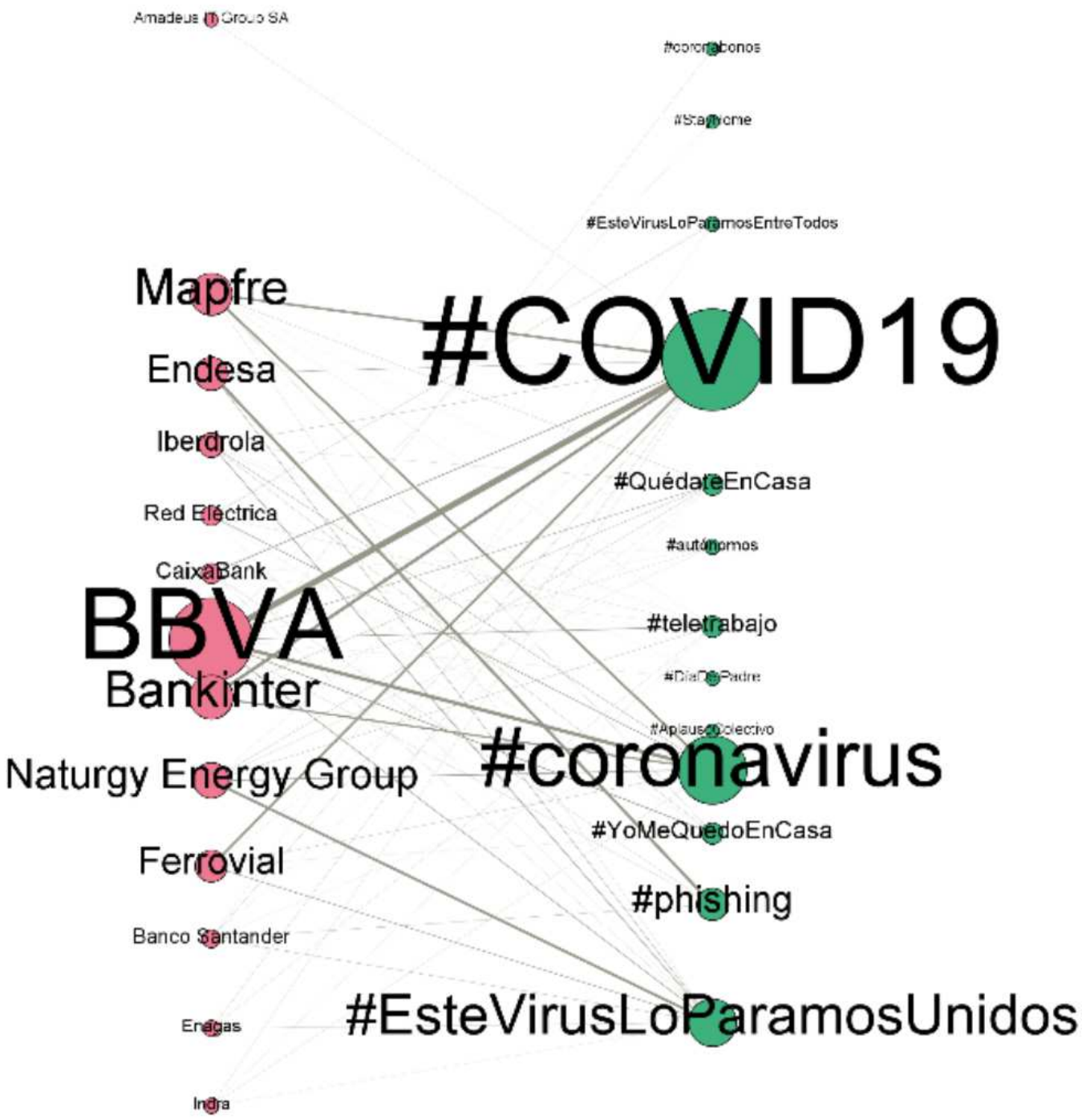

Figure 2

Twitter Spain bipartite network

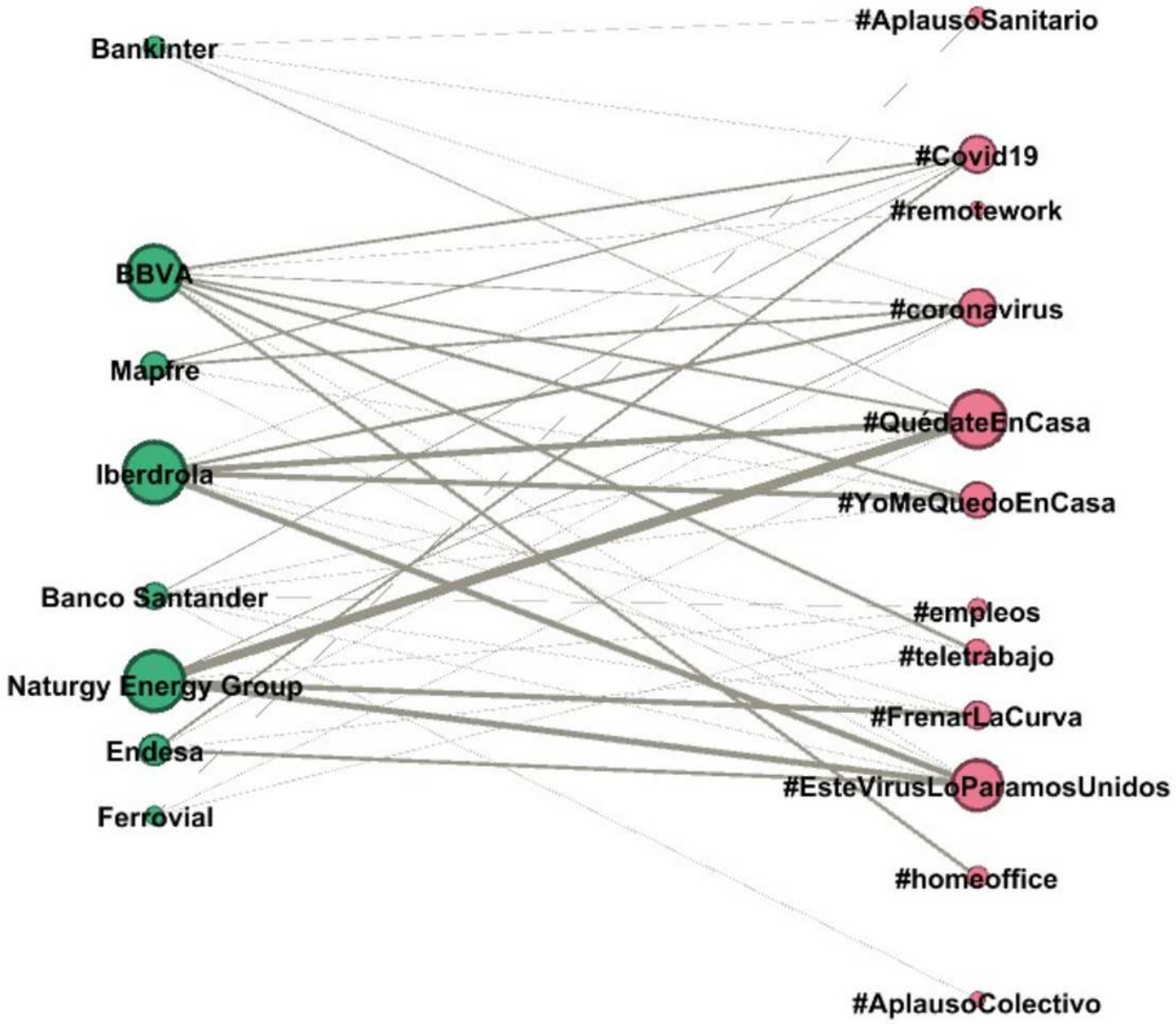

Figure 3

Instagram Spain bipartite network

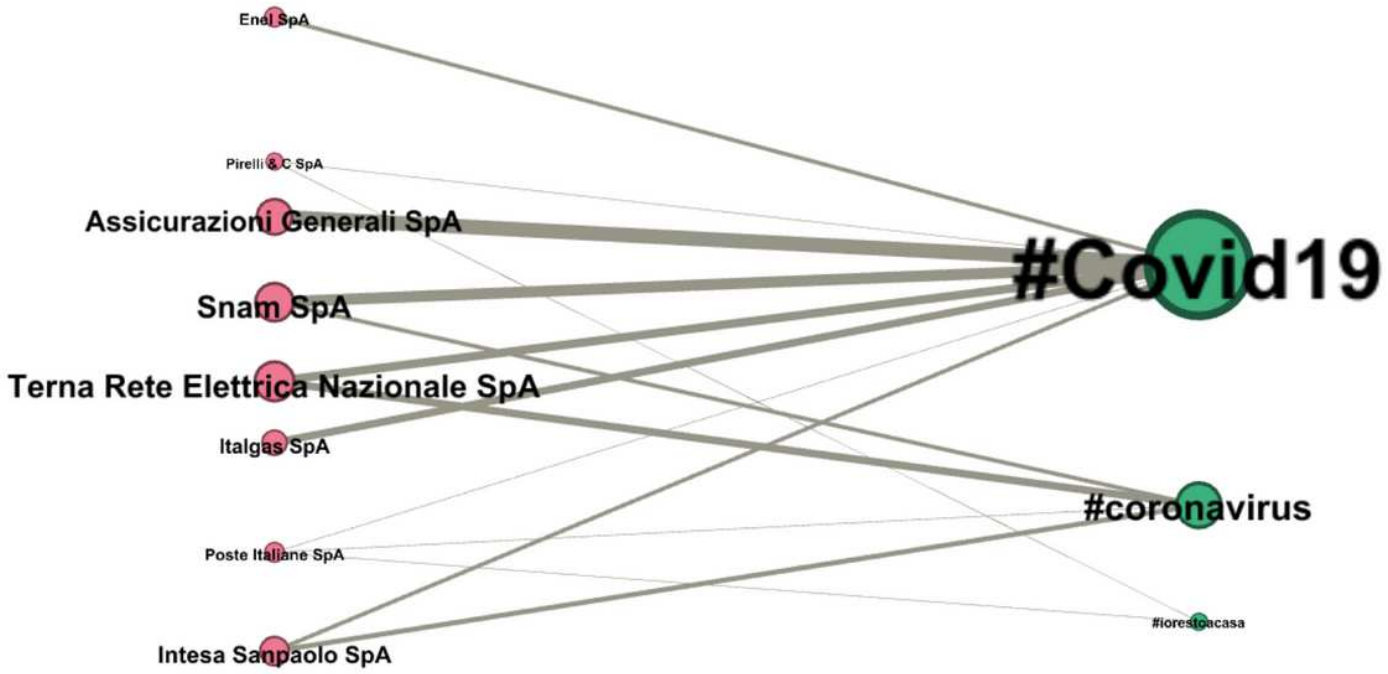

Figure 4

Twitter Italy bipartite network

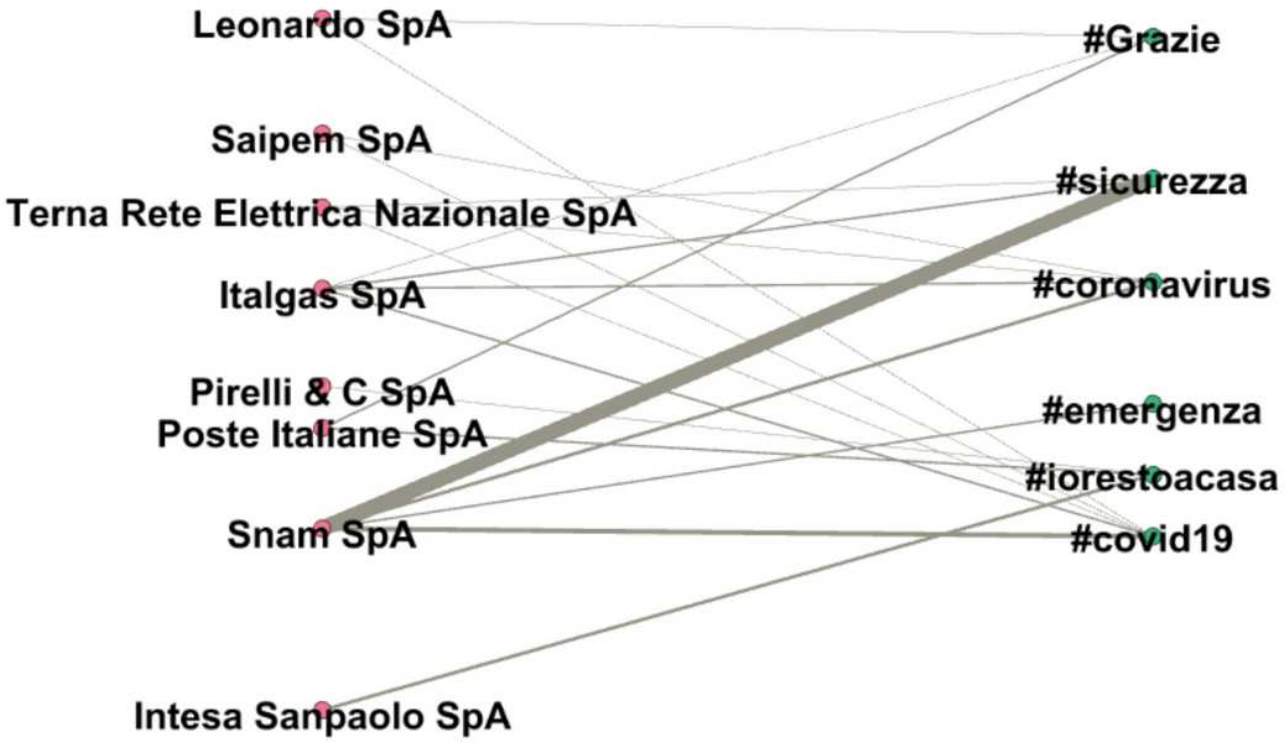

Figure 5

Instagram Italy bipartite network

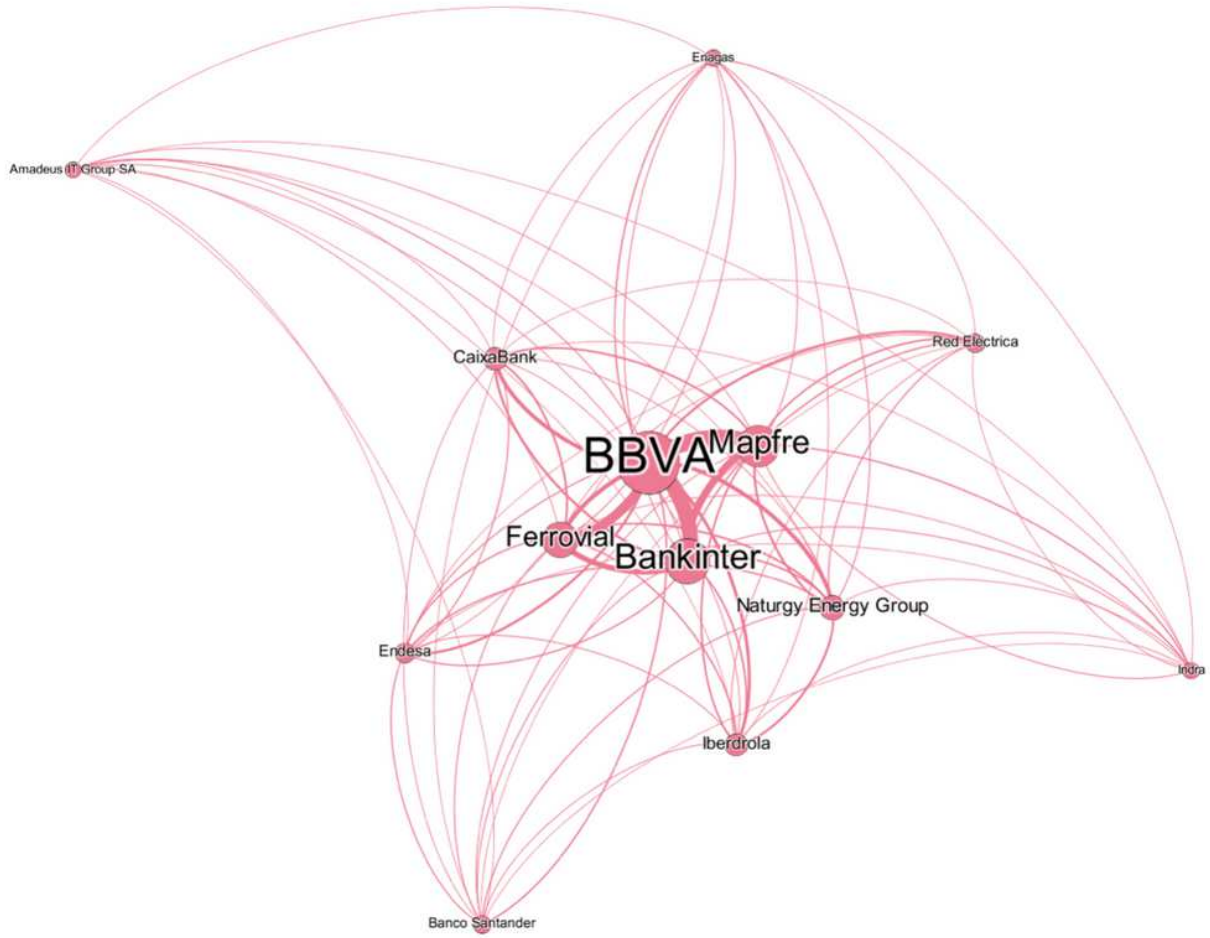

Figure 6

Twitter Spain brand network

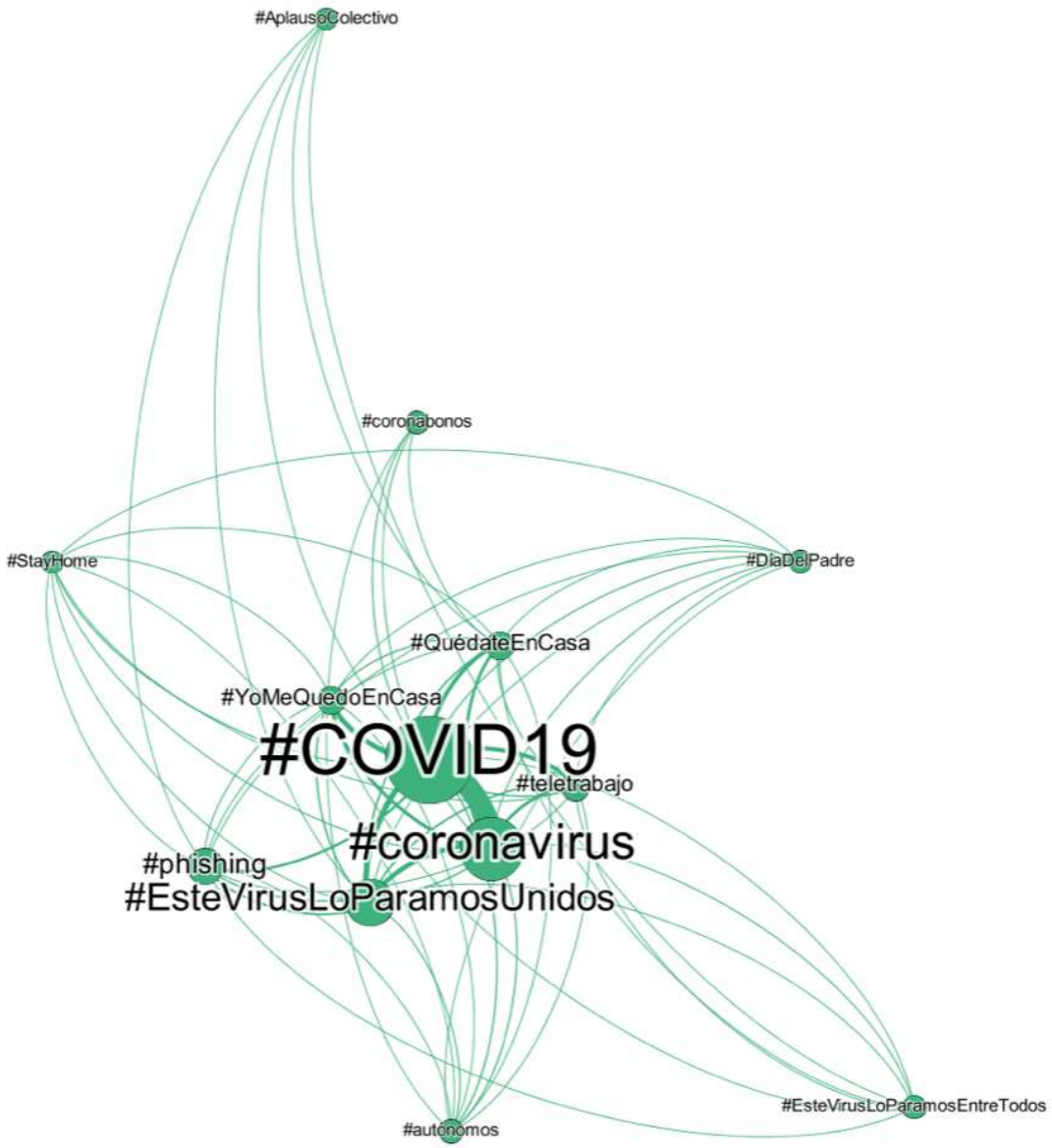

Figure 7

Twitter Spain hashtag network

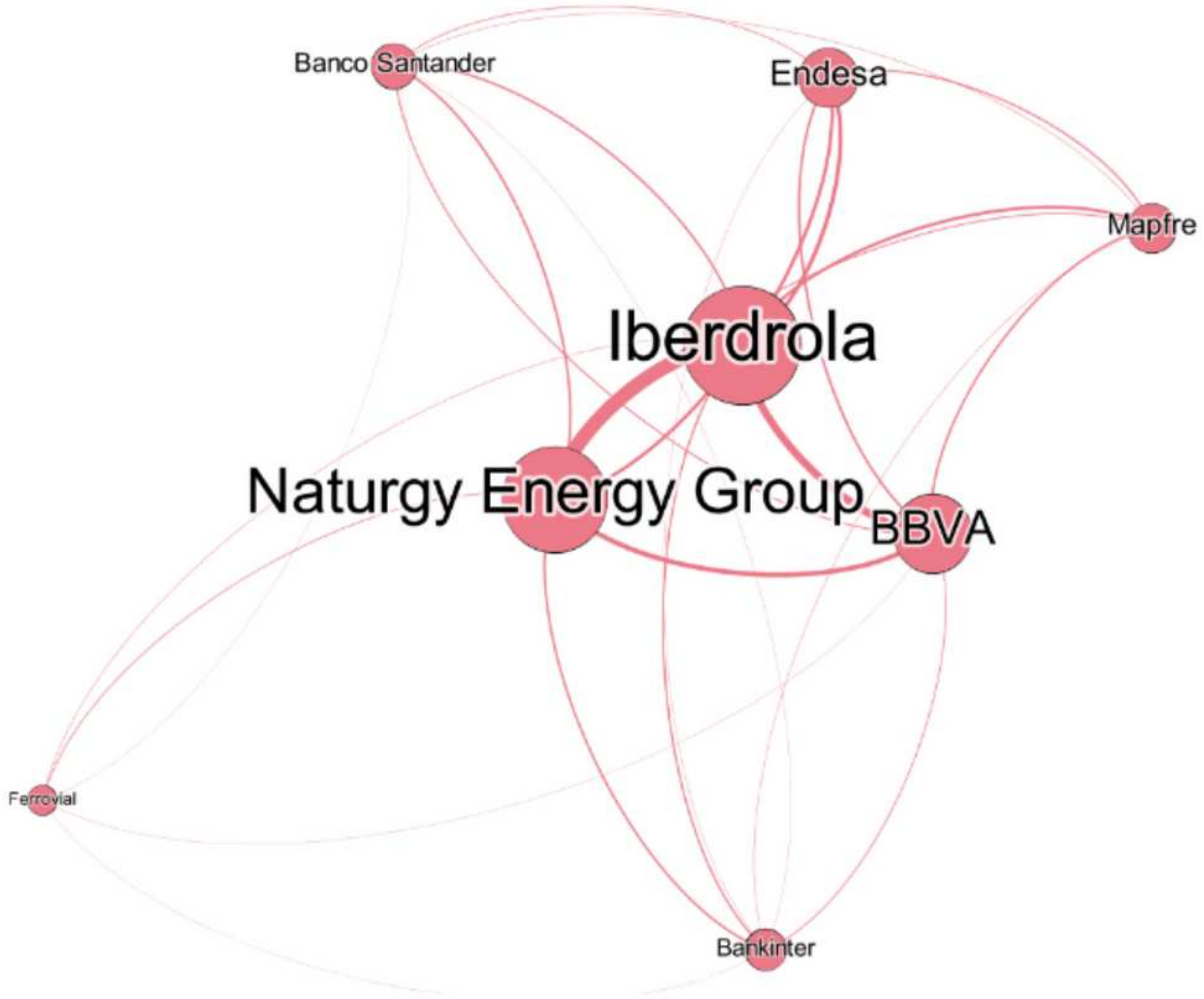

Figure 8

Instagram Spain brand network

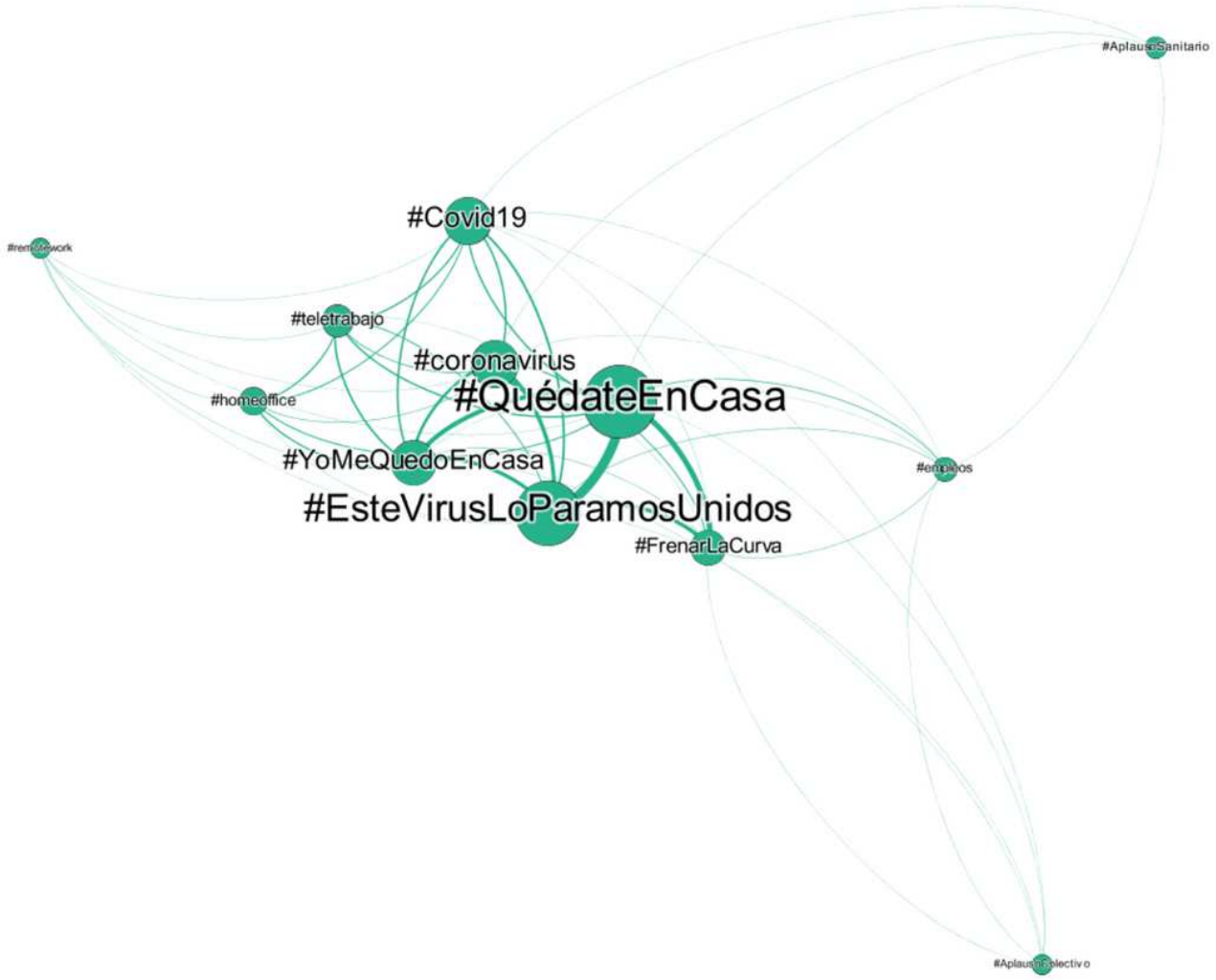

Figure 9

Instagram Spain hashtag network

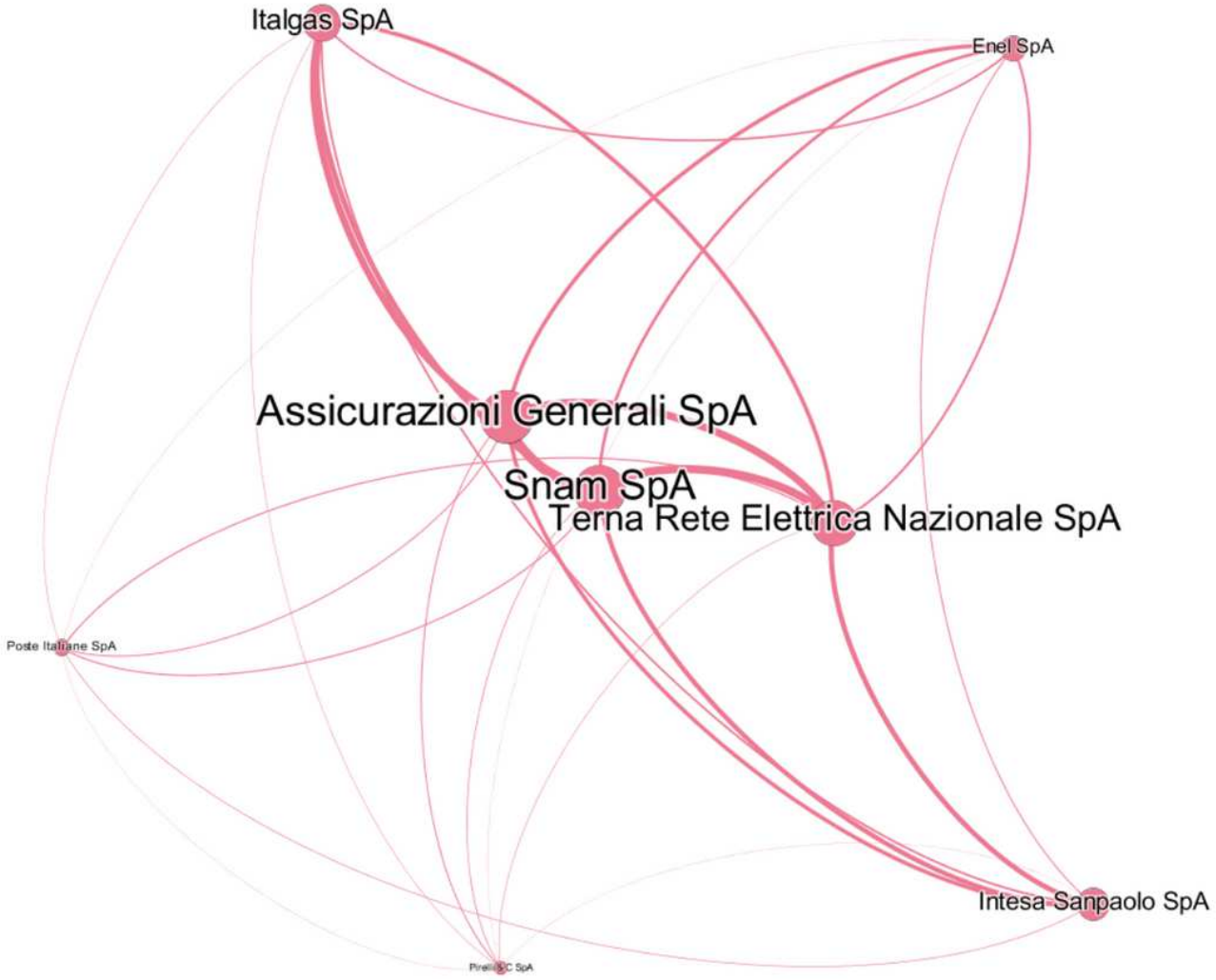

Figure 10

Twitter Italy brand network

Figure 11

Twitter Italy hashtag network

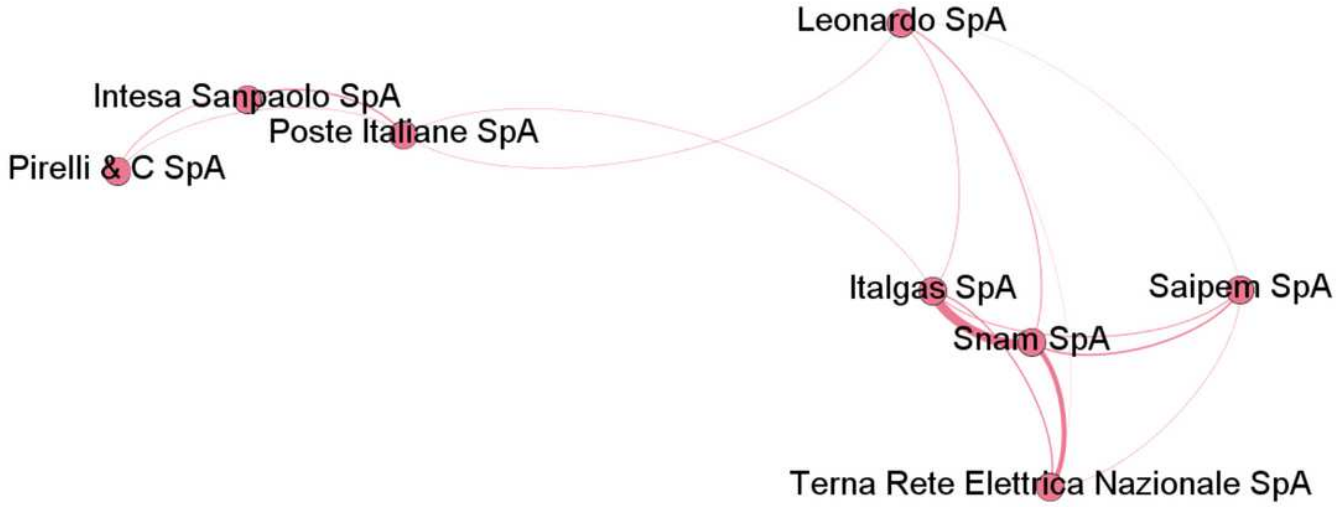

Figure 12

Instagram Italy brand network

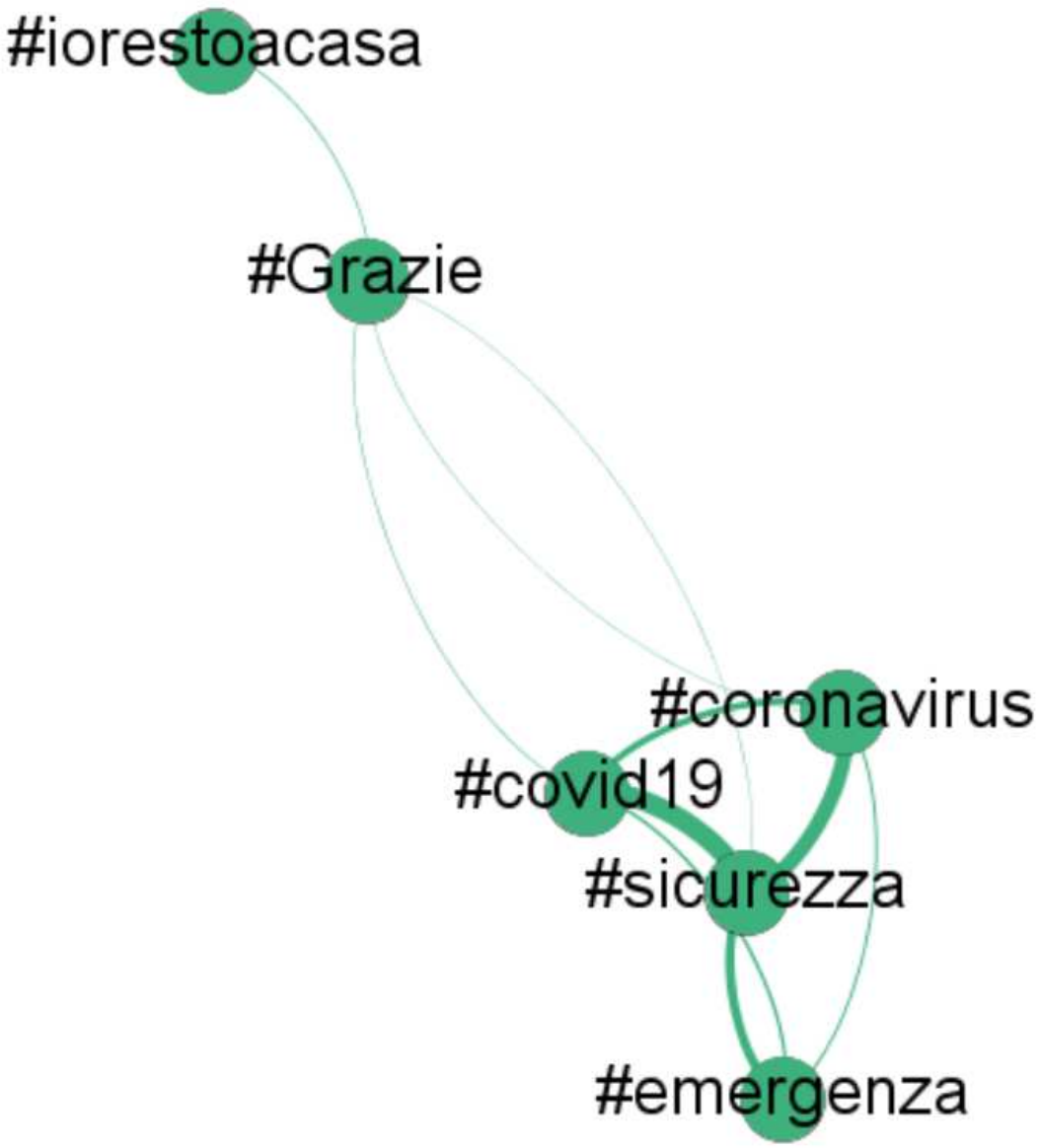

Figure 13

Instagram Italy hashtag network