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Crisis management of Pandemics
The analysis of communication during COVID-19
emergency

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“Ciò che avviene per necessità, ciò che è atteso, che si ripete ogni giorno, tutto ciò è muto. Soltanto il caso ci parla. [...] La nostra vita quotidiana è bombardata da coincidenze o, per meglio dire, da incontri fortuiti tra le persone e gli avvenimenti chiamati coincidenze [...]. La stragrande maggioranza di queste coincidenze passa del tutto inosservata [...]. Perché proprio in questo modo sono costruite le vite umane. Sono costruite come una composizione musicale. L'uomo, spinto dal senso della bellezza, trasforma un avvenimento casuale in un motivo che va poi a iscriversi nella composizione della sua vita.”

– Milan Kundera, “L'insostenibile leggerezza dell'essere”

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Abstract (English)

Within Crisis Management, communication has a fundamental role in order to successfully limit panic diffusion, increase government credibility and enhance the adoption of the measures among population until there is a possibility to recover from the emergency. Indeed, without a proper provision of information, a crisis can dramatically arouse fear up to a level that exacerbate harm and damages, pushing citizens to bypass the law in order to ensure their own survival.

For this reason, the objective is to analyse the communication of press and government during Covid-19 Pandemic and investigate how it affected citizens' fear. In particular, the study wants to assess which are the main dominant themes that have been discussed by the two sources of information, understand how they evolved through time and, finally, reveal which of them are able to explain fear expressed by citizens.

A conceptual frame of crisis management highlights the strategies for an effective communication during each stage of a crisis. The initial stage, when the crisis breaks out, is characterized by intensive media coverage and high uncertainty among population due to the lack of available information, and therefore fear must be reduced to manageable levels by providing timely, precise and clear details about the situation. During the maintenance stage the provision of information to citizens must continue, but it must be considered that informative needs evolve through time, and therefore also official messages should adapt to them, until the recovery phase is completed. Within these phases, news media play a crucial role since they convey governmental messages, affecting their understanding and acceptance, and can elicit fear and concerns among the population.

Empirically, the study has investigated the first weeks of Coronavirus pandemics in Italy, which broke out in the end of February 2020, caused several tens of thousands of death in the country, forcing the authorities to establish in March a strict lockdown.

Referring to this context, 1.465 newspapers articles belonging to the official press release of Prime Minister's Office and 77 official Governmental announcements have been analysed, which represent the sources of information that reached citizens during the emergency. Simultaneously, to measure the fear perceived by the population, 201.098 tweets have been retrieved using the "iorestocasa" hashtag.

The topic modelling distributed the content of the information sources along six main topics, either in the initial and in maintenance stages. Five among them maintained the same general topic along the two periods: "Decrees and Measures", which details the decisions established by government, "Personal Thoughts", that narrate the impact of the crisis at an individual level, "Sanitary Situation", which describes the conditions of the health system, "Economic Situation", focusing on the financial consequences of the emergency, and

“Focus on Government”, which report what government and prime ministers are doing. Moreover, while in initial stage the sixth topic was “Pandemic Evolution”, this thematic lost interest over time and have been replaced in lockdown by “European Discussions and Relationships”, narrating the negotiations held within European union.

In the correlation analysis among themes, tested in both crisis phases, some of them resulted negatively correlated. For instance, the more political theme has been alternated with the discussion of the sanitary situation at the beginning of the outbreak and with the economic consequences in the lockdown, while the discussion of measures established by government was opposed to economic matters in the initial phase and to European-level negotiations in the maintenance stage.

Focusing then on the two information sources separately, government focused only on few themes, especially the one detailing the new measures applied in the decrees. However, especially during the lockdown, it also covered the economic matters, most of all regarding the decree “Cura Italia” which assigned the financial support to the country and, thanks to Civil Protection’s daily press conferences, it has also been able to share timely and continuous updates regarding the sanitary situation.

Finally, fear was extracted from the texts of tweets and of the sources of information and the study was finally able to assess which communication themes affected fear.

In particular, some topics covered by information sources, revealed as significant factors that influenced the fear of citizens. Indeed, during lockdown, the general discussion of new decrees and measures has increased the worries expressed by users, while instead the thematic about European actions against the crisis have reassured people.

Examining more precisely which themes discussed by the two information founts are able to explain the fear trend extracted in users’ tweets, the study reveals that, during the lockdown, the government raised the fear of users while discussing the new measures and while describing the dramatic sanitary situation. Instead, press raised concerns while covering the economic thematic.

The success of a communication strategy affects citizens fear, organization credibility, and therefore the success of the adoption of measures established to handle the emergency. This study demonstrated that some themes covered by government and press are effectively able to affect citizens scare and explain part of its pattern. These results warn public health officials, and crisis managers in general, to properly address the epidemic of fear with a suitable crisis communication.

Abstract (Italiano)

All'interno della gestione delle crisi, la comunicazione ha un ruolo fondamentale per limitare la diffusione del panico, aumentare la credibilità del governo e migliorare l'adozione delle misure tra la popolazione finché non si apra la possibilità di riprendersi dall'emergenza. Infatti, senza un'adeguata informazione, una crisi può aumentare drammaticamente la paura fino a un livello tale da aggravare le perdite e i danni, spingendo i cittadini ad aggirare la legge per garantire la propria sopravvivenza.

Per questo motivo, l'obiettivo è quello di analizzare la comunicazione della stampa e del governo durante la pandemia di Covid-19 e indagare su come abbia influenzato la paura dei cittadini. In particolare, lo studio vuole valutare quali sono i principali temi dominanti che sono stati discussi dalle due fonti di informazione, capire come si sono evoluti nel tempo e, infine, rivelare quali di essi sono in grado di spiegare la paura espressa dai cittadini.

Il modello teorico della gestione delle crisi evidenzia le strategie per una comunicazione efficace in ogni fase di un'emergenza. La fase iniziale, quando sopraggiunge una nuova crisi, è caratterizzata da un'intensa copertura mediatica e da un'elevata incertezza nella popolazione dovuta alla mancanza di informazioni disponibili, e quindi la paura deve essere ridotta a livelli gestibili fornendo dettagli puntuali, precisi e chiari sulla situazione. Durante la fase di mantenimento, invece, la fornitura di informazioni deve continuare, considerando però che le esigenze informative dei cittadini si evolvono nel tempo, e che quindi anche i messaggi ufficiali devono adattarsi, finché la fase di recupero è terminata. All'interno di queste fasi, i mezzi di informazione svolgono un ruolo cruciale in quanto trasmettono i messaggi governativi, influenzandone la comprensione e l'accettazione, e perché sono in grado di suscitare timori e preoccupazioni nella popolazione.

Empiricamente, lo studio ha analizzato le prime settimane di pandemia di Coronavirus in Italia, scoppiata alla fine di febbraio 2020, che ha causato diverse decine di migliaia di morti nel Paese, costringendo le autorità a stabilire a marzo un rigido blocco.

In questo contesto sono stati analizzati 1.465 articoli di giornale appartenenti alla rassegna ufficiale della Presidenza del Consiglio dei Ministri e 77 annunci ufficiali del Governo, che rappresentano le fonti di informazione che hanno raggiunto i cittadini durante l'emergenza. Contemporaneamente, per misurare la paura percepita dalla popolazione, sono stati recuperati 201.098 tweet con l'hashtag "iorestoacasa".

L'algoritmo di modellazione dei temi (topic modelling) ha distribuito il contenuto delle fonti di informazione su sei argomenti principali, sia nella fase iniziale che in quella di manutenzione. Cinque di questi hanno mantenuto la stessa tematica generale lungo i due periodi: "Decreti e Misure", che descrive in dettaglio le decisioni stabilite dal governo, i "Pensieri Personali", che narra l'impatto della crisi a livello individuale,

“Situazione Sanitaria”, che descrive le condizioni del sistema sanitario, “Situazione Economica”, che si concentra sulle conseguenze finanziarie dell'emergenza, e “Governo al centro”, che riporta ciò che il governo e i primi ministri stanno facendo. Invece, il tema “Evoluzione della Pandemia” dalla fase iniziale ha perso interesse ed è stato sostituito in fase di manutenzione da “Discussioni e Relazioni Europee”, che narra dei negoziati svoltisi all'interno dell'Unione Europea.

Nell'analisi di correlazione tra i temi, testato in entrambe le fasi della crisi, alcuni di essi sono risultati negativamente correlati. Ad esempio, il tema più politico è stato alternato alla discussione della situazione sanitaria all'inizio dell'epidemia e alle ripercussioni economiche durante il lockdown, mentre la discussione delle misure stabilite dal governo si è opposta alle questioni economiche nella fase iniziale e alle negoziazioni a livello europeo nella fase di mantenimento.

Concentrandosi poi sulle due fonti di informazione separatamente, il governo ha concentrato la discussione solo su pochi temi, ed in particolare su quello relativo alle nuove misure applicate nei decreti. Tuttavia, durante il lockdown, ha affrontato di più anche le questioni economiche, soprattutto per quanto riguarda il decreto "Cura Italia" contenente le misure sostegno finanziario al Paese e, grazie alle quotidiane conferenze stampa della Protezione Civile, ha maggiormente condiviso informazioni sanitarie, con aggiornamenti puntuali e continui sulla situazione sanitaria.

Infine, la paura è stata estratta dai testi dei tweets e dalle fonti di informazione e lo studio ha potuto finalmente valutare quali temi di comunicazione hanno impattato sulla paura.

In particolare, alcuni temi trattati dalle fonti di informazione, si sono rivelati fattori significativi che hanno influenzato la paura dei cittadini. Infatti, durante il lockdown, la discussione generale di nuovi decreti e provvedimenti ha aumentato le preoccupazioni espresse dagli utenti, mentre invece la tematica sulle azioni europee contro la crisi ha rassicurato i cittadini.

Esaminando più precisamente quali sono i temi discussi dalle due fonti di informazione in grado di spiegare l'andamento della paura espressa nei tweet degli utenti, lo studio rivela che, durante l'isolamento, il governo ha aumentato la paura degli utenti discutendo le nuove misure e descrivendo la drammatica situazione sanitaria. Invece, la stampa ha suscitato preoccupazioni trattando la tematica economica.

Il successo di una strategia di comunicazione influenza la paura dei cittadini, la credibilità di un'organizzazione, e quindi il successo dell'adozione delle misure stabilite per gestire l'emergenza. Questo studio ha dimostrato che alcuni temi trattati dal governo e dalla stampa sono effettivamente in grado di influenzare la paura dei cittadini e di spiegare parte del suo andamento. I risultati avvisano quindi i funzionari della sanità pubblica, e i gestori delle crisi in generale, di affrontare adeguatamente l'epidemia di paura con una consona comunicazione di crisi.

1. Introduction

Industrial Society is susceptible to catastrophic events, including technological disasters and social and political crises. Risk, uncertainty, crisis, collective stress, and “normal accidents” now need to be incorporated into a broader understanding of how governments and decision makers respond to the un-ness of crisis situations (Rosenthal e Kouzmin 1997). The more lives are threatened, the more dramatic the crisis becomes, the greater the importance of an effective governmental intervention. Indeed, governance has a growing need to rely on a well-structured crisis management process (Boin et al. 2016) in order to limit damages and the spread of fear among population.

At the beginning of 2020, Italy was one of the first western countries hit by coronavirus and became in the following month one of the most damaged ones (Anon 2020a) . Indeed, despite many attempts to stem it, the pandemic was characterized by an unconstrained expansion in the country, and it forced the government to establish dramatic measures in order to handle the emergency. One of the most dangerous factors of this crisis was the fact that most of the countries were unprepared to such event (redazione ANSA 2020), including Italy. Indeed, considering that the last comparable pandemic occurred more than a century before (Spanish flu, 1918 (Anon 2020d), organisations were unable to detect the potential risks and to effectively tackle the threat in the early phase, preventing severe consequences from occurring. In such a situation, once the attempt to isolate the first citizens infected has failed and the pandemic successfully expands, there are very few actions that can be effectively done. Indeed, J. Barry, an academic, revealed that “In the next influenza pandemic, the single most important weapon against the disease will be a vaccine. The second most important will be communication” (Lee and Basnyat 2013).

In this research study, the main agency under examination will be the government, that must exploit communication channels in order to best manage the crisis, informing citizens about the situations, explaining the measures established and trying to place itself as the reference figure to rely on. In fact, official messages’ design needs a proper and well-structured management of crises in order to best prepare, handle and recover from sudden detrimental events.

In addition to this, also news media have an important role by reporting the governmental releases and collecting available information conveying them to citizens, affecting therefore also their perception of the situation and their emotional state (Pan and Meng 2016). In fact, the exponential increase of infections and deaths also provoke a psychological impact on population, commonly addressed by news media (Pan and Meng 2016) that tends to focus on the information with the higher social impact (Kolb and Burkhardt 2008). However, this could cause under certain circumstances harmful and dangerous effects threatening the population or parts of it. For instance, the Covid-19 rapid spread and magnitude of pandemic unleashed panic

among people, generating for example episodes of racism against people with Asian descent (Caladanu 2020) and violence from those that doesn't accept restrictions and social distancing measures (Anon 2020e). This warrants public health officials, and crisis managers in general, to also address the epidemic of fear (Peitl, Golubić Zatezalo, e Karlović 2020).

Communication is therefore fundamental in order to tackle fear diffusion among population, improve government credibility and therefore to guarantee a proper adoption of the countermeasures established to limit the growth of infection. In the literature, recently, Sandman argued that ideally crisis messages should serve to both alert and reassure people (Sandman 1998). Further, he posits that crisis and risk communication should establish a certain degree of manageable fear in order to adequately motivate at-risk audiences, while at the same time presenting a realistic depiction of the level of harm posed by the crisis.

Despite most of previous research agrees that crisis communication is a key factor within an emergency in order to cover informative needs, the relationship between fear of population and the content communicated by government and media during a crisis is still unclear.

For this reason, the objective of this study is to analyse and evaluate the role of communication during Covid-19 pandemic, studying how it has been reported and discussed by the government and the media and how it has impacted the level of fear on the population. For this purpose, three kind of data sources have been collected: official governmental announcements, press releases and Italian tweets regarding coronavirus.

In this complex and unexpected context, it is important to study what happened in order to understand better the measures undertaken, to evaluate the actions of public authorities and, more importantly, to gather information and learn as much as possible with the aim of being more prepared and equipped to face future emergencies.

The study is organised as follow. The next chapter is the State of the Art, which describes the current knowledge regarding crisis classification and Crisis Management Cycle, highlighting the key role of government and press communication and the importance of addressing fear. Secondly, the Methodology will explain how the datasets have been generated and how the study wants to achieve its goal using topic modelling techniques and fear analysis. Then, the results are detailed, focusing on the descriptive analysis of datasets, on the dominant themes obtained and their characteristics and finally on the assessment of fear transmitted and of the communication factors that affected it. Finally, the conclusions summarize the main findings of the study, detailing the opportunities for further research and the insights that can be retained from a managerial perspective.

2. State of the art

The first part of this chapter will present crises classification, in order to best categorize pandemic and understand better its characteristics. Then, Governmental Crisis Management will be defined, describing its main phases and explaining which are the main factors that affect it. Finally, previous studies that analysed communication topics and exploited sentimental analysis will be discussed, to understand what academics and practitioners have already observed.

2.1. Crises classification and pandemic characteristics

From a governmental point of view, a crisis is intended as an event that seriously challenges the institutional structure of the public organisation (Boin and 'T Hart 2000). The more lives are under threat, the deeper the crisis goes (Tokakis, Polychroniou, and Boustras 2019) and the greater the importance of an effective governmental intervention. Therefore, in order to facilitate the handling of these events, the first step is classifying them into homogeneous and mutual exclusive groups (Gundel 2005). Indeed, if crisis types are properly categorized, it is easier to consolidate the findings of past experiences and of the countermeasures that worked as crises can be properly named and analysed. Despite that the simplest distinction can be made by distinguishing man-made and natural disasters, it is considered as a controversial classification since the origin of the disaster could be often assigned to both causes, considering for example global warming consequences which leads to a greater frequency of natural incidents.

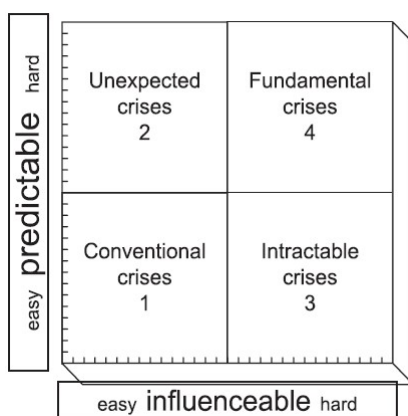


Figure 1: Gundel's model

In order to find an appropriate categorisation, Stephan Gundel proposed a well-structured and flexible model which distributes crises along two dimensions: predictability and influence characteristics (Gundel 2005). Predictability in this context depends on the extent of which a particular emergency, or at least the manner of its occurrence, are known. This implies that the system management of the system entails dedicated precautions and countermeasures to be taken for the eventuality the crisis breaks out. Influence possibilities, instead, relate to how much the crisis can be fought with appropriate antagonist actions which are known and possible to execute. Once these dimensions have been defined,

Gundel proposed a matrix-model aimed at classifying crises made of four quadrants, each of one containing different combinations among the two attributes (Figure 1).

The easiest typology to handle is made of conventional crises, for which planning activities are easy, countermeasures are proved and tested and interventions can be carried out rapidly. Then, unexpected crises are characterized by hard unpredictability, and in this case the major concern regards the lack of preparation in the first implementation of remedies. Instead, intractable crises can be timely anticipated, but it is very difficult to contrast them properly. Beside the fact that the possibilities of influence are rare, intractable disasters often bring up a degree of damage far beyond unexpected disasters, so that they are apparently more dangerous. Finally, fundamental crises are both unexpected and hard to address. They represent the most dangerous class of crises, since appear surprisingly or are even beyond comprehension. Recommendations on how to counteract or even prevent fundamental crises are difficult to find, and they may include undesired effects like barriers to economic growth. In those dramatic cases, it is important to establish an expert group with the goal to collect, manage and analyse all the knowledge acquired from the emergency in order to improve the reactivity and the effectiveness of countermeasures, and utilise the learning obtained also in future outbreaks.

In order to understand better the context of coronavirus crisis, pandemics are defined and described. Finally, it will be possible to position the dramatic event within Gundel's model.

According to WHO (World Health Organisation), a pandemic is defined as an epidemic occurring worldwide, or over a very wide area, crossing international borders and usually affecting a large number of people (Kelly 2011). However, the international organisation agrees to admit that the definition should be redefined including a description of the potential severity range, which is an indicator to anticipate the risks associated to the epidemic.

A pandemic may come and go in waves, each of which can last several weeks and could lead to high levels of illness, death, social disruption and economic loss, disrupting the lives of a great number of people. One severe effect that this devastation cause is that "with the sharp increase in number of affected persons by pandemic, both infected or suspected cases in isolation, fear and anxiety grew in general population" (Peitl et al. 2020). Therefore, government must be ready to panic diffusion and able to limit its spread with a proper communication (Reynolds 2006).

Other risks associated to the crisis regards hospitals and other medical facilities, that could be overwhelmed, creating a shortage of resources such as medication, hospital beds, materials and personnel. Death rates are affected by four factors: number of infected people, virulence of the virus, characteristics and vulnerability of affected population and availability and effectiveness of preventive measures. This last point represents the main lever that governments can exploit in order to handle the crisis, especially in the early phase when it is possible to isolate the first infected. Indeed, in pre-crisis phase, managing active prevention and looking

for early signals before the outbreak of the crisis is the most effective action that could be taken to handle eventual emergencies before they effectively come up.

Once the epidemic has started, instead, these measures are only useful to limit the speed of contagion, reducing the workload and the stress of hospitals and medical facilities. At this point, as the pandemic progresses, it is important that citizens understand what they should do in order to limit the spread of the illness, and why. As John Barry predicted in 2009 “In the next influenza pandemic, be it now or in the future, be the virus mild or virulent, the single most important weapon against the disease will be a vaccine. The second most important will be communication” (Lee and Basnyat 2013). During this delicate stage, the effectiveness of the measures depends on people acceptance and govern credibility (Reynolds 2006). Moreover, fear, anxiety, and despondency can be reduced to manageable levels by reducing situational uncertainty with information, and therefore communication becomes the only weapon that public administrators have, until a vaccine is found. Transmitting the right messages, at the right time, in a correct form, helps to limit panic diffusion, and pushes the population to adopt appropriate actions to contain an outbreak, limit exposure and reduce mortality.

For this reason, in the later stages and at the end of the emergency, it is important to evaluate the communication success, in order to be able to improve the management of future pandemics, and of an eventual second wave.

Therefore, Covid-19 crisis that broke out in 2020 can be classified in the category of fundamental crises. Indeed, with regards to predictability, either the population, the government and the national health system did not expected such a crisis to occur and revealed to be unprepared. Moreover, the countermeasures that could have been employed in the short-term were very limited and poorly effective, constraining the country to make huge societal and economical sacrifices. In addition to this, as it is a major public safety disaster, all population will be particularly affected emotionally, with reactions ranging from terror and shock to blame, anger, and guilt. Governmental messages must tackle fear, anxiety and despondency by reducing situational uncertainty with proper communication providing, answering to informative needs.

2.2. Crisis Management definition and phases.

Crisis management is defined as the systematic effort of the members of a system with the cooperation of stakeholders to prevent or manage a crisis (Tokakis et al. 2019). It is a cyclical, never-ending, process that requires constant testing and revision of plans and that allows an organization to cope more effectively with future unpredictable events (Mitroff, Shrivastava, and Udwadia 1987). Although crises are unforeseen, they are not unexpected, can affect all areas of society and are triggered by many different causes, that can be either endogenous or exogenous. In this research the focus is on Governmental Crisis Management, defined

as the management function of the state that aims to improve government's ability to foresee the crisis, ability to response and control during crisis (Ren and Li 2010).

Indeed, among all organisations, governments have the greatest need to manage crises adequately, as they often face emergencies that threaten peace and order in society and the well-being of the population. In Italy, for example, 154 states of emergency have been declared since 2014 and have been further extended on 88 other occasions, giving rise to a crisis emergency call almost every 10 days (Gurrado Antonio 2020). Moreover, it is believed that poorly managed economic growth and climate change is driving a rapid overall rise in global disaster risk for all countries (United Nations Development Programme 2013). Indeed, governance has increasingly become a matter of crisis management (Boin et al. 2016) and the ability to respond and properly manage crisis are therefore fundamental to contain the physical, societal and phycological damages. In these situations, citizens expect their leaders to promptly tackle the crisis, minimize the damages, provide clear instructions on what to do and prepare a quick and safe recovery.

However, besides government, people around the world also perceive health crises through press coverage, which disseminates information giving meaning to global distress (Pan and Meng 2016). Indeed, news media play an important role within Governmental Crisis Management since they convey official messages to citizens and therefore they can affect its understanding and interpretation, as well as the emotional state of the readers. Indeed, people's understanding of health crises is a multifaceted psychological construct, given that their reactions are linked to different characteristics of risk information that they perceive from news media (Pan and Meng 2016). Thus, sometimes this influence could be detrimental, since media coverage of scientific data tends to focus on the most dramatic findings with the most social impact (Kolb and Burkhardt 2008) which directly stimulated more anxiety and concern among the public (Pan and Meng 2016) that government must handle.

Therefore, the relationships between the government and news media should be mutual and cooperative during crisis management processes, cultivating a better relationship between the former and the public, and limiting the fear uncontrolled spread. In particular, in these dramatic contexts, the main role of crisis managers is to prevent public panic and allow journalists to report what is a newsworthy event, while the role of journalists is to provide adequate information to the public to lessen crisis gravity and correspond to the needs of the risk society (Pan and Meng 2016).

Crisis management can be divided into three mayor phases: *pre-crisis*, *crisis* and *post crisis*, summarized in *Figure 2* (Tokakis et al. 2019), but the role of governmental communication becomes particularly crucial at the outbreak of the emergency, along *crisis phase*. Indeed, once an emergency arises, population gradually becomes aware of the threat, and the uncertainty regarding the possible consequences that the dramatic event could generate must be promptly addressed by public agencies. Therefore, communication is

important because it builds credibility and facilitates the adoption of the measures put into place by the State, but also in order to limit panic and fear diffusion, which would may exacerbate harm, leading to severe and sometimes deadly consequences (Espinola et al. 2016). For example, referring to the Chilean earthquake of 2010, in the absence of information concerning relief efforts and steps that could be taken by the public, citizens began bypassing the law in order to ensure their own survival by stealing what they could (Lachlan, Spence, and Eith 2014).

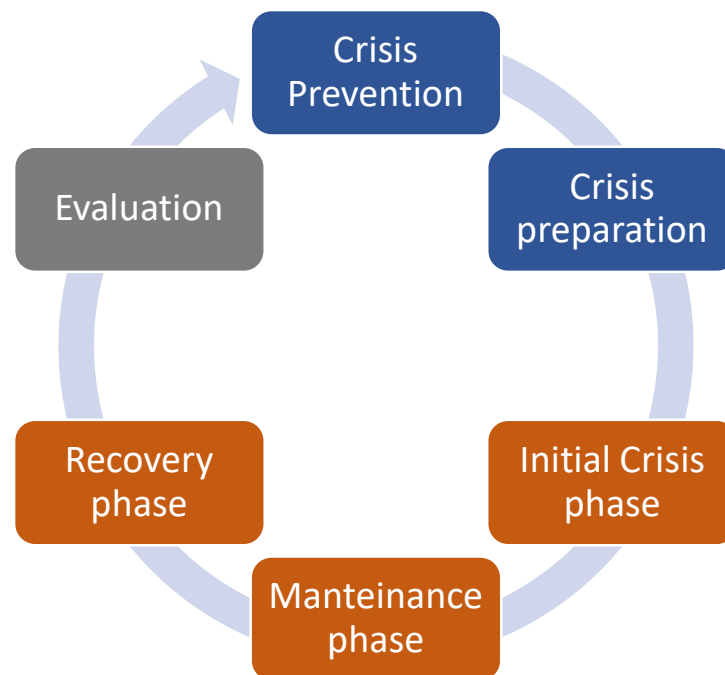


Figure 2: Crisis Management Cycle

■ Pre-crisis phase ■ Crisis phase ■ Post-crisis phase

Pre-crisis phase

Pre-crisis phase includes crisis prevention and crisis preparation, including the signal detection of a forthcoming crisis. In short, it regards all the preparation activities made before the outbreak of an emergency, with the aim of being as much prepared as possible to manage future unexpected events that could thread the environment around an organisation. This phase heavily influences the crisis and post-crisis phases (Tokakis et al. 2019). Indeed, if the organisation is well prepared and is able to quickly detect the outbreak of a crisis, then the management of the emergency will be more effective, able to prevent many damages and will help to recover safely. In order to prepare for the emergency, the majority of the planning and preliminary work should be done in pre-crisis phase. It is documented that organisations that have a Crisis Management plan updated annually, a designated team, conduct exercises to test the plans at least annually and pre-draft some crisis messages are more likely to better get over a crisis (Tokakis et al. 2019).

Crisis phase

The second phase of Crisis Management Cycle starts with a trigger event that sets off the emergency and includes crisis recognition, crisis containment and crisis recovery activities. Concretely, this stage covers all the period where the crisis manifest, develop and gradually pulls back, where all the functions of Crisis Management are stressed into action, supported by the knowledge, learning from past events and organisational structure build in pre-crisis phase, which heavily influence the ability to respond to emergencies in the following phases. The success of the management of this phase, in terms of response speed, accuracy and efficiency, depends on the abilities of crisis management team in running situation assessment, communication and team working (Coombs 2012). Communication is hence a key factor especially in this stage, in order to transmit clear information and instruction to citizens. Indeed, as the emergency is started, people want information and government must provide it timely and effectively in order to tackle uncertainty, which generates fear (Reynolds 2006). Therefore, governmental communication must be designed in order to satisfy those needs, being aware that they evolve as soon as the emergency progresses.

Crisis phase is composed of three main stages: initial, maintenance and resolution phase. Despite it is usually difficult to find clear separation from one stage to the other, it is important to know that as the emergency progresses, available information and citizens' needs will change, and therefore also governmental action must follow.

The *initial phase* can be identified in the period immediately following the outbreak of the crisis, where there is the need to recognise the emergency and draft the first response measures. This stage is characterized by great confusion, lack of available information and intense media interest. For this reason, the population affected and threatened by the crisis want information. They want to receive timely and clear information on what is happening, instruction on what to do, and description of what the government is doing in order to face the crisis. Therefore, a crisis communication system should be established for the public and affected groups for uncertainty reduction, self-efficacy and reassurance (Pan and Meng 2016) and government should tackle the damages caused and exploit the knowledge acquired from past events in order to draft the actions aimed at successfully set off the crisis.

Moreover, in this context, also press represents a key channel, facilitating these efforts by discussing the main subjects that satisfy the shortage of knowledge about the situation. However, during this stage, Vasterman and Ruigrok found that press coverage of the crisis tends to be not regular, but instead to be intensive and alarming especially in the first days after the crisis outbreak, and when the crisis consolidates (Vasterman and Ruigrok 2013).

Thus, public communication at this stage should be as prompt, as continuous in time, as complete, as clear as possible and must be the reference source of information, fighting eventual inaccurate news, rumours and disinformation which are detrimental for crisis management, especially in the beginning phase where there the incertitude is high. Fear, anxiety and despondency can be reduced to manageable levels by reducing situational uncertainty with information, and organisation's reputation depends strongly on the messages transmitted (Reynolds 2006). In this perspective, one study (Ding Huiling and Zhang Jingwen 2010) observed in Chinese social media how some students, disappointed by the lack of an effective response of government communication, were capable to disseminate their own narratives to a large audience in social media, circumventing public official messages. Their posts managed to accumulate, and the narratives together contributed to boost the credibility of overall messages, building a strong presence able to intervene in the official discourse and change the decision-making process.

Maintenance phase refers to the period from which the first countermeasures are taken limiting the expansion of the crisis. The stronger the support from the different stakeholders of the response, for example press, the higher the probability of success of the measures taken by the organisation (Reynolds 2006) and therefore it is important to transmit consistent messages all along the crisis and to collect as many feedbacks as possible. As the time evolves, the effects of the decisions taken start to be come out and the organisation can measure them in order to eventually reinforce, lessen them or apply some changes. In his stage, the information coverage and sources rise, since experts, professionals and others not associated with the organisation will comment publicly and sometimes contradict or misinterpret governmental messages. For this reason, it is increasingly important to build up processes to track the information flow, in order to tackle divergent and ambiguous sources of information and the consequent uncertainty that they can generate, rising the overall anxiety of population.

Again, in this stage, the fear expressed by population is an important indicator that must be addressed and limited. For instance, according to Peitl, it is safe to say that with the spread of COVID-19 further measures of providing psychiatric and psychological support are required (Peitl et al. 2020). Therefore, a proper governmental communication aims also at reassuring and preventing serious traumas in population affected by the crisis must be considered.

Gradually, as the crisis goes to the resolution phase, media and public interest on the emergency situation decreases, but it is important for the government to further explain and underline the risk associated to the crisis. This is the core pillar of risk communication, which is a process of informing people about risks and persuading them to modify their behaviours to reduce risks (Pan and Meng 2016).

The **recovery phase** covers the last part of the emergency where the emergency state has been terminated and it is necessary to come back to the normal situation. In this stage, the public and media interest have continued to drop, but the government should continue to stress the importance of being alert to the risks associated with the crisis in order to end the emergency safely. It is the occasion for the public administration to promote the activities and capabilities of the agency during the crisis.

Post-crisis phase

The post-crisis phase involves the evaluation of the measures undertaken. The organisation should seek to improve prevention, preparation and future responses, since the way knowledge collected in the terminated crisis is internalised, analysed and stored will affect the long-term future of social system and the Management of future crises. This regards not only the concrete measures made, but also how they have been communicated and accepted by the community, which is a crucial point especially in public agencies. Hence, the evaluation and learning outcomes should consider both indicators regarding the effects of the countermeasures and the success of the different communication strategies, to understand what must be improved in future emergencies. Concretely, once the agency has evaluated its plan during the crisis, it is important to document the lesson learned and determine specific actions aimed to improve Crisis Management, returning therefore to pre-crisis planning phase. This last step shows how Crisis Management is a cyclic process seeking continuous improvement, in order to adapt to the unpredictability of future crisis outbreaks.

Finally, considering Gundel's model, it is clear how a well structured Crisis Management Cycle can influence predictability and influenceability of future crises, resulting in an easier prevention, management and containment of damages. Therefore, the outcomes of this study are not only useful to describe the role of communication during the first wave of the pandemic, but it is important to consider them also in future dramatic events.

2.3. Understanding communication during a crisis: topic modelling approaches

This section is dedicated to identify and describe the main papers that used Topic Modelling techniques to explore the main communication strategies of different information sources, and then the releases that analysed one or groups of emotions that have been transmitted in some messages of government, press or users in social media. The outcomes observed will be considered in order to define and structure the

methodological steps of the analysis, and then the results observed in this study will be compared to these references.

With regards to studies that look at the topic modelling when communicating a crisis, Seow Ting Lee and Iccha Basnyat, in a paper named *“From Press Release to News: Mapping the Framing of the 2009 H1N1 A Influenza Pandemic”* (Lee and Basnyat 2013) examined how government press releases are transformed into pandemic news coverage. In particular, they linked government announcements with articles on the media, comparing the communication and the frames discussed of the two different health sources of information. The results demonstrated how the government focused its communication on few themes regarding basic and preventive information, while newspapers covered a much larger spectrum of topics. Also, the paper *“Analyzing Spanish News Frames on Twitter during COVID-19 —A Network Study of El País and El Mundo”* (Yu, Lu, and Muñoz-Justicia 2020) from Jingyuan Yu et al. analysed the topics of two different newspapers, exploring also the relationship among themes and comparing the situation pre, during and post lockdown. The results showed how the two journals differed in terms of topics discussed and the study revealed some changes in the discussion of certain themes. For example, both newspapers tended to less discuss of politics during the lockdown and less of pandemic as the crisis went to the later stage. Finally, *“Public Engagement and Government Responsiveness in the Communications about COVID-19 during the Early Epidemic Stage in China: Infodemiology Study on Social Media Data”* (Liao et al. 2020) compared the government and user posts in Weibo social media discussing the change in communication themes along the crisis, confirming the observations made in other studies regarding the governmental communication which is mainly used to inform the public about updates of the epidemic situation.

Instead, looking for researches that used Sentimental Analysis, *“From Press Release to News: Mapping the Framing of the 2009 H1N1 A Influenza Pandemic”* (Lee and Basnyat 2013) has compared the feelings transmitted by government and media, finding that the former was much less prone to share some emotions than the latter and hence preferred a more formal and neutral tone. Moreover, *“Chinese Public's Attention to the COVID-19 Epidemic on Social Media: Observational Descriptive Study”* (Zhao et al. 2020) studied the user interactions in blogs during Covid-19 epidemic in order to plot over time positive, negative and neutral emotion, finding a decrease over time of negative feeling counterbalanced by an increase of positive ones in the second half of the examined period.

Despite many studies have exploited the dominant themes in order to analyse the content of information sources discussion, and despite many others have examined the emotion transmission in social media and blogs, none of them analysed the relationship between dominant themes and fear expressed by users and discussed the results in a Governmental Crisis Management perspective.

The next part will describe the structure that supports the research study.

3. Theoretical framework

Along the different phases of Governmental Crisis Management, communication has a key strategic importance in order to inform citizens about what is happening and what should be done to resolve the crisis, deal with the spread of panic and ultimately recover from the crisis with as little damage as possible. This concept becomes even stronger when referring to pandemic's management, as it is the only driver that can help public administrations to effectively tackle the emergency while waiting for a proper vaccine (Lee and Basnyat 2013). Therefore, it is crucial to study and understand how communication was held and evolved along the first part of coronavirus pandemic, and how it effectively affected population's fear.

Looking at the existing literature that is relevant to support the study, the book "Crisis and Emergency Risk Communication" (Reynolds 2006), written by Barbara Reynolds, provides many interesting insights regarding how communication should evolve along the pandemic stages for a better crisis management and easier recovery. Specifically, governmental communication is fundamental in a proper Crisis Management, since it is able to reduce fear to manageable levels by reducing situational uncertainty with information. Moreover, in particular in the initial stage of a crisis, public officials must be prepared to answer to informative needs as timely and precisely as possible, since organisation's reputation, and therefore the acceptance within citizens of the measures established, depends on that ability. The insights taken from this paper, and in particular those that refer to the crisis, will be applied in the discussions of the results.

Referring to Crisis Management Cycle of coronavirus outbreak, communication has a key role especially in the crisis phase, when the outbreak has manifested and there is the need to address uncertainty and build governmental credibility in order to limit fear diffusion. Therefore, the study will focus on that phase, and in particular on its initial and maintenance stages (since recovery phase of coronavirus is believed to occur in 2021, when the vaccine will be widely released globally (Gallagher James 2020)).

For this purpose, the study will be structured in two main parts, the first one that wants to extract and study in detail the main dominant themes discussed during Covid-19 pandemic and the second one that will apply all the previously obtained results in order to assess which are the main communication factors that affected fear patterns in tweets.

In order to verify those assumptions and evaluate the governmental crisis communication, this study uses data collected from government official announcements, articles on newspapers and tweets published from Italian users during the outbreak of coronavirus crisis. Furthermore, the dominant themes from messages in the dataset will be sought using a topic modelling algorithm, while the fear transmitted by the messages published during the pandemic has been measured through a sentiment analysis.

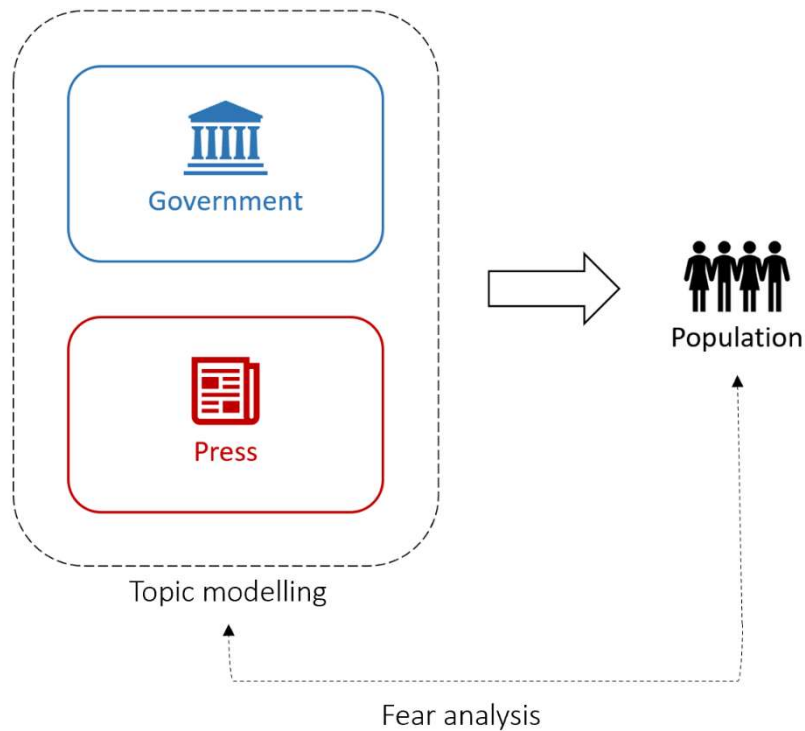


Figure 3: Theoretical Framework

Considering this general framework in *Figure 3* and the main goals, the first part of the study is aimed at finding the main topics, or “dominant frames”, that have been discussed by information sources during the emergency. A topic is a latent construct that explains the semantic composition of a text. In other words, the study will extract from messages collected the general subjects, or themes of discussion, that information sources talked about during the crisis.

In this study, fear will be the main variable that will be examined to evaluate how communication affected citizens. It is a key factor within governmental crisis management, since its unconstrained diffusion could raise harm and damages dramatically within a crisis (Espinola et al. 2016) and the goal of government is to exploit communication in order to limit its spread.

It is therefore important to recognise the main dominant themes discussed during the pandemic in order to verify if some of them have affected population’s fear. More precisely, the outcome desired is a set of insights that describe how informative needs have changed over time, revealing to public officials which topics affected the fear of citizens and therefore suggesting which subjects should be best covered with governmental messages if a similar situation comes up.

Before assessing which topics affected population’s fear, it is important analyse how dominant themes evolved through time in order to have a deeper understanding of how informative needs changed. Therefore, the themes of both initial and maintenance stages will be analysed separately, and then compared.

Furthermore, some differences in the communication strategy of government and media are expected. Indeed, in general, government tends to focus only on few topics, while press usually covers all themes more evenly (Lee and Basnyat 2013). Therefore, it is important to understand how these information sources differ and evaluate if they affected differently citizens' level of fear.

To summarize, the objective of this research will be to analyse the role of communication during the Covid-19 sanitary emergency in Italy, understanding how dominant themes have evolved along the crisis, comparing government with national press and finally assessing how communication factors affected the fear pattern transmitted by citizens. The results will be compared with those coming from theoretical papers and previous research. For instance, the more the governmental communication follows the recommendations of experts, such as Reynolds, the more it will be positively evaluated.

The theoretical framework that represents the goals and steps of the analysis is summarized in *Figure 4*.

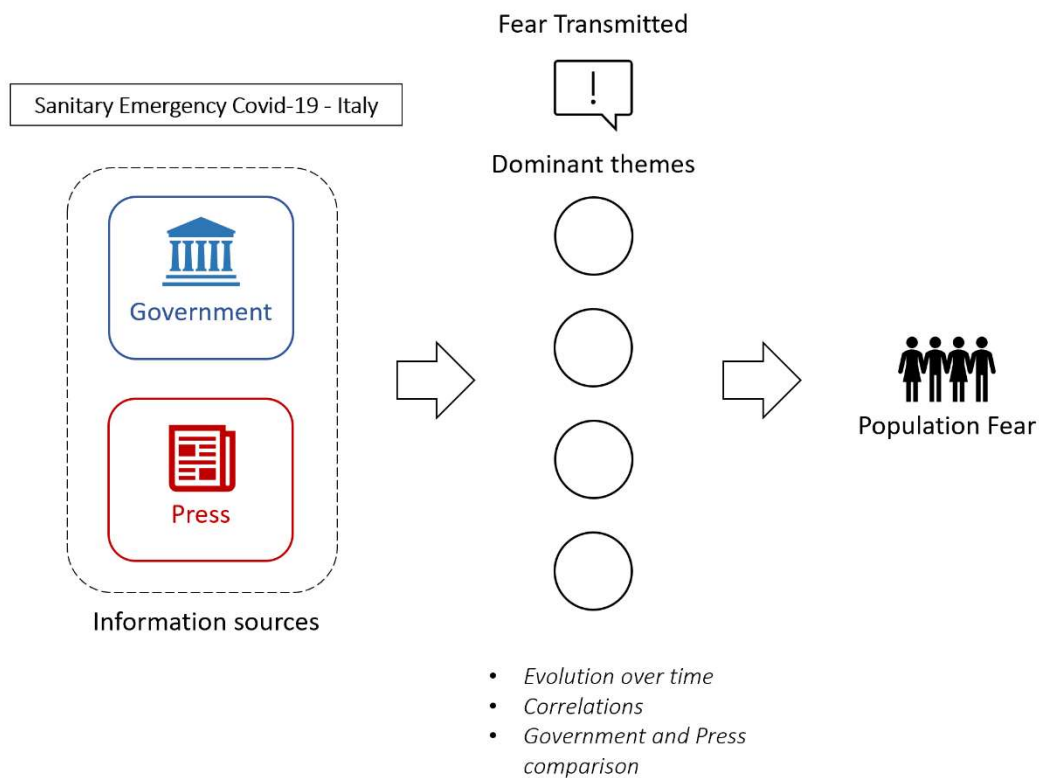


Figure 4: Structure and goals of the analysis

The context examined in the study and the methodological steps and described in next section.

4. Methodology

This chapter describes the context chosen to empirically study the communication impact on fear, and then details the different steps that will be followed in order to reach the research goal, explaining in particular how the communication factors will be sought and deepened with topic modelling and how fear will be measured and assessed.

4.1. The first wave of Covid-19 pandemic crisis in Italy (Salvioli Luca and Bassan Valerio 2020)

On December 31st, Chinese authorities reported to WHO (World Health Organisation) the founding of a mysterious pneumonia which affected several patients in Wuhan, a metropolis with 11 million inhabitants in the centre of China. This is the beginning of a global pandemic that affected the World in 2020, and that it is believed to persist until at least 2021, when a proper vaccination will be found. On 30th of January, Italy suspended all the flights coming from China, once the number of cases has been growing exponentially the previous days, also in the neighbour countries. It is the first country to decide to apply this drastic measure, but it will be followed by other countries also in the successive days. However, it is believed that by that time, the virus was already present in Italy.

The 31st of January, the first two cases were reported in Italy, from two Chinese tourists, and subsequently first minister Giuseppe Conte officially declared the national medical emergency. The 21st February, a 38 year old man from Codogno is tested positive, followed in few hours by 14 other citizens. The next day, at Vo' Euganeo, in Veneto, the first reported victim died. This convinced the government, the 23rd of February, to create the first "red zones" in 11 cities, where the movements were restricted within the borders of the municipality and every event was cancelled.

Despite all the efforts to restrain the pandemic, in March the contagions raised exponentially all over the country. In order to limit the virus diffusion, the Italian government decided the 4th of March to close the schools all over the country and to extend the "red zones", at first including the whole Lombardy region, and then enlarging all the restrictive measures all over the country, the 9th of March. Meanwhile, the large number of patients that required medical support due to the pandemic was starting to stress the hospitals, that struggled to enlarge their operational capacity, which the risk of being overwhelmed. In the following days of March, the restrictions imposed for the quarantine became stronger, prohibiting most of the travels outside the city of residence and outdoor sport activities and closing most of productive activities. The government put in place a series of measures providing financial support for the citizens most hit by the

Covid-19 pandemic. The peak of the crisis occurred the 27th of March, when Italy overcame China as the country with most reported cases of coronavirus and register 969 death.

The month of April, instead, have been characterized by a slow decreasing of the reported cases and of the deaths in Italy, mainly due to the very restrictive measures established by government. After almost two months of quarantine, on 26th of April the prime minister announces that the gradual resumption of activities would start from the 4th of May. However, despite the progressive recovery and the re-opening of the majority of activities, some basic measures, such as the mandatory use of the mask in most social occasions, have been kept even during the following month, as a prevention for an eventual second wave in autumn.

Considering the data available, the research study will focus only on the first days of this pandemic, that is believed to last at least until 2021. Therefore, referring to the Crisis Management Cycle shown in *Figure 2*, the analysis will deepen the effects of communication only during crisis phase, and in particular in initial and maintenance stages. In particular, in this research study, the 10th of March is assumed to be the first day of the maintenance phase, since it is the day when the conditions to deal with the emergency stabilized. Indeed, on that day the Prime Minister established the quarantine.

4.2. Methodological steps

With the goal to analyse and evaluate the communication mechanisms during the Covid-19 emergency and their effect on Governmental Crisis Management, this study will assess the dynamics of dominant themes, the factors that affect fear of citizens and compare the result with those that the reference theoretical papers have forecasted in the different phases of a pandemic crisis. As previously discussed, the period under examination covers 40 days, of which 16 are assumed to be in the initial, pre-lockdown, phase (22nd February – 9th March) and 24 in the maintenance phase (10th March – 1st April). Therefore, the analysis will stop when the pandemic in Italy reached its peak in terms of number of intensive cares, while sanitary situation was gradually starting to improve. In fact, it must be considered that what in this study is defined as “maintenance phase” includes only a portion of the actual maintenance stage of the Italian coronavirus crisis, considering that lockdown was gradually suspended from the 4th of May and considering also the second wave occurred in autumn 2020. Therefore, the discussion of the results must consider that data collected represent only a restricted part of the whole phenomenon, which lasted several months and that could represent threat until at least 2021.

The methodological steps are structured in three main parts, describing at first the dataset generation, then detailing how topic modelling will be structured and finally explaining the procedures that will be done in the fear analysis part.

4.2.1. Dataset generation

Newspapers Articles Dataset

The dataset containing all the articles concerning Coronavirus crisis has originated from the press review that have been selected, collected and finally shared by Prime Minister's Office for this research study. In particular, raw data was shared under the form of pdf documents, each of them containing all the press articles published in one specific day, collected by the Office. In total, the shared folder contained the press review covering the period from the 23rd of February to the 12th of June. However, only the articles published between the 23rd of February and the 2nd of April have been included in the analysis, since some days were missing in April and since the data collected in that time-span was deemed significant to perform the analysis. Since newspapers are released the day following the facts, the true period under examination covers from the 22nd of February and the 1st of April.

In the first step of data cleaning, it has been necessary to select in the review only the articles that were strictly relevant for the analysis. Therefore, the selection has included only the articles that were directly related to the Covid-19 crisis in Italy, including daily chronicle, comments and personal thoughts of journalists regarding the situation and discussion of government actions. Instead, newspapers' covers, news about political parties and leaders, updates regarding other countries and EU and all interviews (except those directly made to the Prime Ministers', that have been included into Government's Official Press Dataset) have not been considered. The final selection includes 1465 articles from 27 different newspapers, distributed along 40 days during Coronavirus crisis. All the documents have been converted from pdf to Word format through the means of an online OCR converter, and were manually pasted into an Excel file dataset ready to be used in the analysis. Finally, the copied texts of each article have been manually cleaned, eliminating the dashes used in articles to wrap, spacing the apostrophes, removing mis-interpreted symbols and correcting as many textual mistakes made by the pdf-to-word converter as possible. The aim of this long process was to increase as much as possible the number of words that the algorithm could process, achieving higher results' precision and reliability.

Government's Official Press Dataset

The aim of this dataset is to collect all government's official announcements regarding Covid-19 crisis, in order to analyse them, study how they have been reported and interpreted and in order to assess the influence it has provoked into population's emotions.

The texts of the official announcements have been collected from different sources: official government webpage (www.governo.it), official Health Ministry webpage (www.salute.gov.it) and interviews of prime minister Giuseppe Conte in newspapers (taken from press review shared by Prime Minister's Office). The dataset includes also the text of press conference's video, published into the official websites, extracted exploiting DIY captions website. This tool is able to recognise the text of YouTube videos and allowed to paste it into the dataset.

Tweets Dataset

The objective of these last data is to provide an indicator related to the population emotional state, in order to assess the impact that information sources (government and newspapers) were able to generate. Among all social medias, twitter has the big advantage to be able to collect thousands of messages on the media and to sort them by using some special key words, called "hashtags" that user themselves decide to write in order to identify their short thought into a particular topic, state of mind, idea, activity or context.

The 9th of March, Italian government launched a communication campaign called "#iorestoacasa", in order to raise awareness about the establishment of the lockdown and of the other drastic measures decided in order to tackle the pandemic that were spreading all over the country. This initiative gained a great success and "#iorestoacasa" became the reference keyword used on social media to talk about the crisis. Therefore, by creating a Twitter Developer Account, this study succeeded in downloading all tweets connected to this hashtag and will use them to monitor anxiety and fear over time, looking for eventual correlations and insights. As a result, the dataset contains 291.544 tweets from Italian users during the pandemic.

Once the datasets have been properly prepared and cleaned, the analysis will be structured in two main phases, each one with specific steps and research goals.

4.2.2. Topic modelling

This first part is aimed at identifying the main dominant themes discussed after the outbreak of coronavirus in Italy, understand how they have evolved during the lockdown, if there are some correlation between them and finally compare governmental and newspapers coverage. The results of this part will be then exploited to understand which factors have impacted on population's emotional state.

The tools used to run the text-mining procedures exploit topic modelling algorithms, that can be exploited in R software installing "tm" and "topicmodels" packages. Specifically, Topic modelling is a method for unsupervised classification of documents, similar to clustering on numeric data, which finds natural groups of items (Silge and Robinson 2017). Being an "unsupervised" method, the computer will autonomously find homogeneous groups of documents that have similar vocabulary. The research will then need to understand the thematic differences of the resulting clusters and identify each one by naming them appropriately. Finally, the output of the algorithm will attribute to each document in the datasets a percentage score for each topic, indicating how much the text relatively discusses each thematic. For instance, if a document will have a score of 60% for topic A, 35% for topic B and 5% for topic C, it means that it covers mainly the first dominant theme, talking a bit about the second one and almost not mentioning the last.

Dominant themes and their evolution

The first analysis will exploit the articles talking about coronavirus crisis collected from the official news release and a dataset with the official announcements made by the government. The objective is to run a Topic modelling in order to recognise and study the main themes that have been covered during the crisis, considering all main sources of information (press and government) together. This analysis will study two periods of time separately, initial and maintenance phases, with the aim of understanding more clearly how the thematic discussed changed over time in terms of popularity and of vocabulary. Moreover, the goal will be to assess if, as Yu has observed in his study (Yu et al. 2020), there're will be a drop in the popularity of themes that are linked with politics and with the narration of the pandemic.

The main interest of this part is therefore to explore the general changes of topics that reflect the changing communication needs of citizens in the country, and in particular to investigate if a decrease of interest regarding the pandemic per se occurred along the emergency period considered.

Correlation between themes over time

Once the dominant themes have been recognised and studied, it could be interesting to understand if there are some correlations among them. In other words, the goal is to reveal if the popularity of a topic gained or

lost importance when another one became less discussed. This focus will be done in both periods considered (pre-lockdown and lockdown phase), revealing if correlations remained also in the long-term.

In order to statistically assess such relationships between the topic variables, correlation analysis will be exploited. This test is used to explain the relationship between two variables, providing a statistical evidence of what kind of correlation they have and, most importantly, if this relationship is significant.

The metrics considered for this analysis will be the coefficient of correlation, that gives indication regarding the sign of the relationship, and p-value. This last indicator is probably the most important one, since it provides the degree of significance, and therefore of robustness, that the relationship has. The lower the p-value, the more the correlation found by the model can be considered reliable. In other terms, high scores of p-value in the test indicate that there is no evidence to believe that the two variables are correlated.

In this analysis, the maximum threshold of p-value in order to consider a correlation reliable is set at 5%, even if also results with a score ranging from 5% to 10% will be shown, and presented as “suspect cases of correlation”.

Government and press thematic comparison

The next step includes a comparison between government and media communication, to understand the differences, explore how they vary over time and in the two distinct time periods in examination, evaluate how governmental communication strategy was handled and finally assessing if press communication is somehow related to governmental messages.

Firstly, Topic Modelling scores of government and press will be isolated from each other, in order to be able to plot the respective evolution of communication trends, both in initial and maintenance phases. Indeed, firstly the two sources of information will be compared in terms of average coverage of the several topics and also looking at their time evolution, revealing the main differences. In particular, it is expected that government has focused only on few themes (Lee and Basnyat 2013), that should be mainly informative(Liao et al. 2020).

Then, looking at the reference theory, specifically regarding the initial phase, the goal is to assess how much Government covered informative themes defined by Reynolds (Reynolds 2006), by finding the topics that are related to communication needs that the population cares about during pandemics. Moreover, it will be interesting to understand how much the government insisted on stressing the importance of sanitary measures and prevention all along the period considered, in order to keep the state of alert high.

Finally, a correlation analysis will be exploited on government and press topics daily discussion, with the goal of revealing wherever the discussion of a topic by one of the sources impacted on the other.

4.2.3. Fear analysis

This part contains the core purpose of this study, providing insights regarding which factors of information sources and in particular of governmental communication have impacted on population worries expressed in the social media “Twitter”. The tweets have been collected using the hashtag #iorestoacasa, which has become the reference word when talking about the pandemic.

Sentimental Analysis aims therefore to investigate the emotional state transmitted by newspapers and government announcements during the crisis. In particular, the study will focus on fear, which according to theory should depend on uncertainty and confusion, and that can be affected by governmental communication. For this purpose, the analysis will be supported by the R package “syuzhet”, which is able to associate words to emotions in a text, through the means of a dictionary. Since the original algorithm are set to analyse English text, the vocabulary has been translated in Italian to be able to process Italian texts and enriched by the researcher to make up for the different language and to include contextual terms. The “fear” score that a document gets from the model is equal to the number of its words that in the vocabulary are associated to that emotion. In the analysis, that indicator has been named “*Total Fear*”.

The correlation between information sources and population’s fear

The analysis will start by running the algorithm and reveal the “fear” score that emerges from all sources: governmental announcements, press and tweets. Since those datasets are very different from each other in both the number of observations in the dataset (dozens of government announcements versus hundreds of thousands of tweets) and in the lengths of documents (tweets can’t overcome 280 characters per message), one relative measure, in addition to the fear score, will be set according to the formula: ***Relative Fear*** = $\frac{\#Fear}{Tot\ Words}$, where “#Fear” is the score of fear-related words and “Tot Words” is the count of all the word included in the text.

The results will be plotted over time and compared, investigating which one has mostly expressed fear words and was has been the general trend in the period covered. Moreover, sentimental Analysis will give insight regarding the emotional state of population during the crisis and will be exploited to verify if there has been a decrease of fear and anxiety over time once the initial phase characterized by great confusion and lack of information was passed, as forecasted by Reynolds (Reynolds 2006). Furthermore, it is expected that press transmitted more fear than government, as Lee and Basnyat have found in their research (Lee and Basnyat 2013) and also tweets should transmit high worries than official messages. Since the number of observation of sources is much different, the relative measure of fear will be more meaningful to perform this analysis.

Moreover, it could be interesting to assess if fear transmitted by tweets has decreased over time, as Liao have observed in China (Liao et al. 2020).

Finally, the correlation between information sources' fear and with the one conveyed in tweets will be tested, similarly to what was applied in the previous parts of methodology. The aim is to understand if the fear transmitted by information sources, and in particular by government, has an influence on people's anxiety expressed in tweets. In fact, results could assess government emphatic influence on population emotional state, and therefore on Crisis Management in general, as it would lead to a better fear control and a stronger credibility.

The impact of dominant themes on population's fear

The final evaluation will attempt to find a relationship between population's fear (expressed in the tweets) and the different topics found with the topic modelling. At first the relationship will be sought considering the topics' evolution of both information sources together, hypothesising that population's worries have been affected by the discussion of general thematic.

Then, the themes covered by both sources separately will be considered, in order to assess which is the impact that can be directly attributed to press and government communication. In this case, the study will exploit a slightly more complex model: linear regression. In particular, this tool is used in order to model the relationship between a dependent variable, that in this case will be tweets' fear, and several explanatory variables, that will be the themes coverage of government and press considered individually. The final output will tell which are those variables that can explain better the pattern of fear-related words expressed in tweets. Again, the aim is to understand if particular subjects have influenced the emotional state of citizens. Since fear is measured with two indicators (Tot Fear and Rel. Fear), two models will be run separately and then the results will be compared. The method used to select the significant variables will be backwards stepwise regression (NCSS Statistical Software n.d.).

The following chapter is focused on the discussion of results obtained following the methodological steps that have been described.

5. Results

This chapter is structured in three main parts. The first one describes the main characteristics of the final datasets created, the second one includes all the analysis related to the topic modelling, and the last one assesses fear transmission in tweets and information sources and finally reveals which are the main communication factors that affected it.

5.1. Descriptive analysis

Newspapers Articles Dataset

The final dataset contains 1465 articles, distributed along the first 40 days of the crisis in Italy.

By looking their plot over time in *Figure 5*, it is clear that the amount of relevant articles has grown over time, going from an average of 25 news in the first days to more than 40 in late March, overcoming the 50s in four occasions. This phenomenon is probably due to the increasing importance that the crisis has acquired over time, gradually becoming the first topic in the spotlight. Moreover, the fact that most of the activities in the country have been interrupted due to lockdown measures has visibly reduced the spectrum of novelties to draw on for writing new newspaper articles. This phenomenon becomes clear comparing the number of articles in the initial phase (pre-lockdown, light grey) with the maintenance phase (lockdown, dark grey).

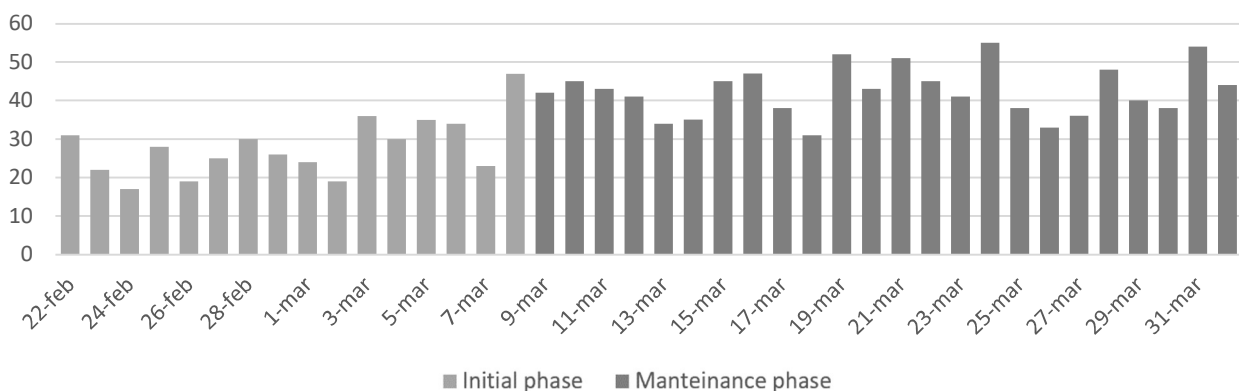


Figure 5: Newspapers' Articles per day

Moreover, 27 newspapers were involved in the analysis. The distribution of articles for each newspaper follows the pareto distribution (*Figure 6*), where the articles of the five more represented journals worth almost 80% of the whole dataset. The pareto ranking is quite aligned with the popularity that the newspapers have in the country, expressed in terms of number of readers. Indeed, excluding sport news, “Corriere della Sera”, “La Repubblica” and “La Stampa” are the most read press agencies (Ferretti Ermanno 2019), followed

by “Il Sole 24 Ore” and “Il Giornale” among the mid-high ranked. Looking at the first places, “Il Messaggero” reveals to have a surprising high number of articles, comparing it to its popularity in the country. This can be due to the fact that this newspaper is strongly positioned in Rome, closer to the Prime Minister’s Office that collected the press releases. On the other side, “Avvenire” is poorly represented in the analysis considering its good popularity, maybe because of its great catholic footprint. Among the journals settled in the south of Italy, the more popular “Il Mattino” has been surprisingly overtaken by “Il Quotidiano del Sud” in terms of articles in the dataset. Finally, the independent newspapers such as “Il Fatto Quotidiano”, “Verità”, “Libero” and “Il Foglio” have been much retained in the government press release, probably due to their particularly strong critics in order to understand better what could have been improved.

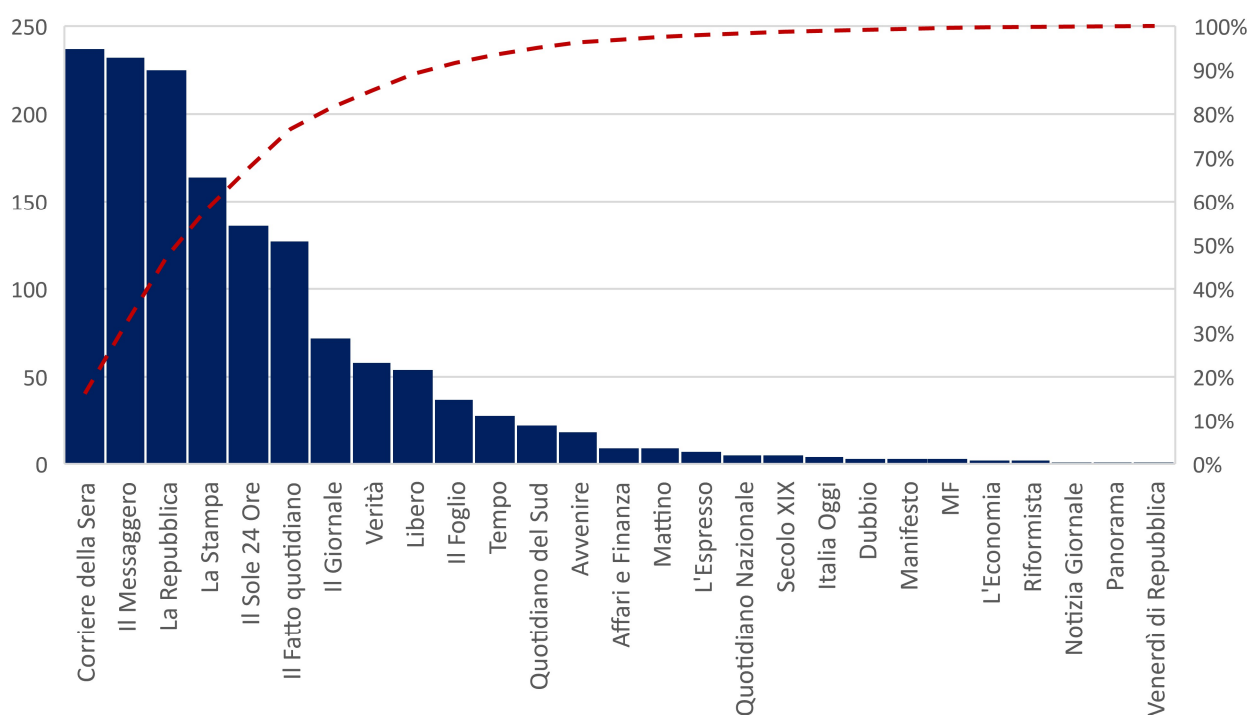


Figure 6: Articles by Newspaper Agency

Government’s Official Press Dataset

Since the 22nd of February, 77 government’s announcements were successfully collected and represented in *Figure 7*. Along the period in examination, they are quite evenly distributed, having a value of 1 or 2 per day most of the times. Unlike newspapers’ data, however, official declarations are surprisingly slightly more frequent in the initial phase than during the lockdown. This is probably due to the progressive organisation and optimisation of government communication management, which assigned the communication role to fewer actors, in order to establish clear references to rely on. Less declarations, less voices, more clarity. For example, civil protection has been charged to daily report the epidemic and health situation. On 27th of February, instead, no significant governmental declaration have been reported.

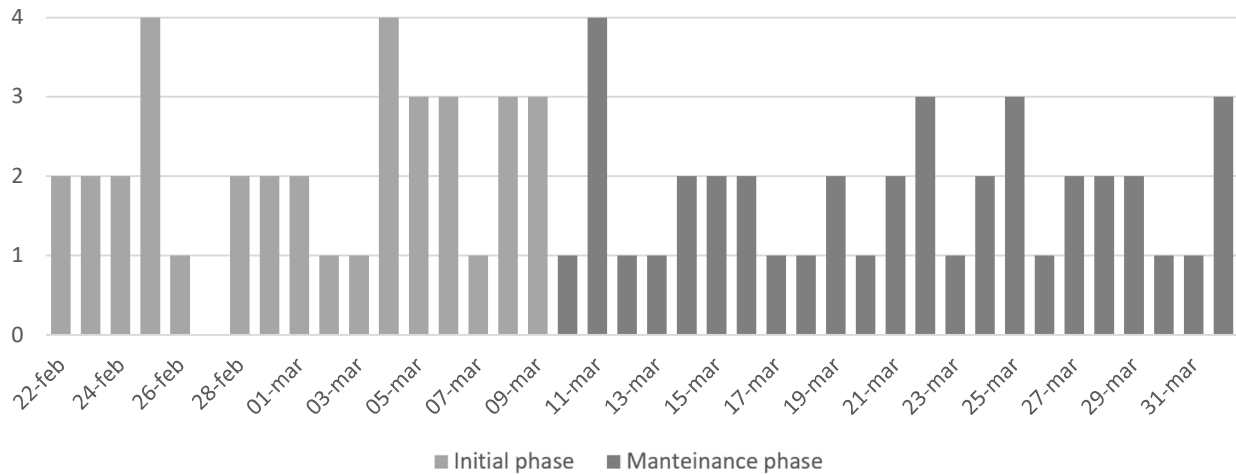


Figure 7: Gov. Announcements per day

As expected, looking at the authors of the official messages there are only three relevant voices, and each of ones acquired a specific communication role: Civil Protection, Giuseppe Conte and the Cabinet. Indeed, reading samples of the data collected, it can be deduced that Civil Protection was providing updates and answering the question regarding the evolution of the pandemic and of the sanitary situation, the Cabinet published all the official documentation regarding the new measures established and prime minister Conte was charged to expose and explain them to population. The other official voices are those of some ministers, of Lombardy region, of a special committee and of the Italian president However, they presented a speech in very few occasions, all of them in the pre-lockdown phase. The share of official communication among the different authors is summarized in *Figure 8*.

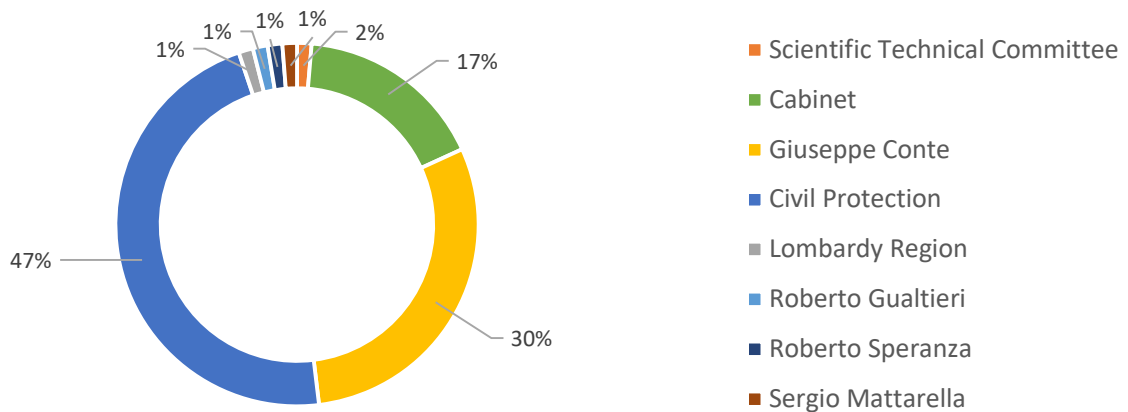


Figure 8: Main authors of Gov. communication

Tweet's Dataset

Exploiting Twitter Developer, a total amount of 291.544 tweets with the hashtag “iorestocasa” were collected. This tag was officially promoted by the government the 9th of March in order to encourage citizens to respect the strict countermeasures deployed to handle the crisis. However, some tweets already used that hashtag the previous day, due to an information leak occurred (Anon 2020c). Despite the dataset collected tweets until the 7th of May, the analysis will consider the messages only until the 1st of April, since also the information sources messages have been collected until that day. For this reason, the final number of tweets processed is 201.098. In *Figure 9*, the daily trend on tweets containing that hashtag can be observed. What emerges is that the number of post with this tag became instantly very high, reaching its peak on the 10th of March, but it gradually declined over time, being on 1st of April about only one fourth of the initial value. This can be considered as a preliminary result regarding the decreasing interest of population related to the quarantine, and to the coronavirus crisis in general.

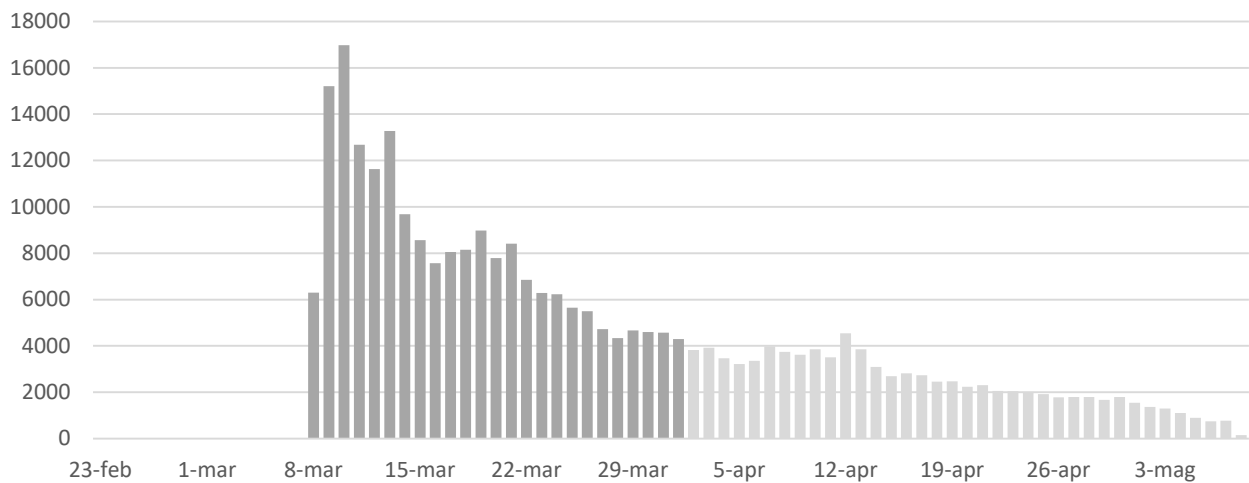


Figure 9: Total number of tweets per day ■ Considered in the analysis ■ NOT considered

The dataset provides many variables related to the tweets, but only few were considered interesting to explore. In particular, *Figure 11* shows the number of tweets that each user has posted with the hashtag “iorestocasa”. The majority of people (61%) have only published once, and only around 3% of the users have actually posted more than 9 times. Therefore, despite the great initial success of the hashtag, very few people have used it regularly to share their experience and their emotional state. Moreover, looking at the likes per posts in *Figure 10*, only around 10% reached a reasonably large consent, with at least 10 likes. The popularity of the subject has rarely reached a large share and that could explain in part the rapid decline of posts.

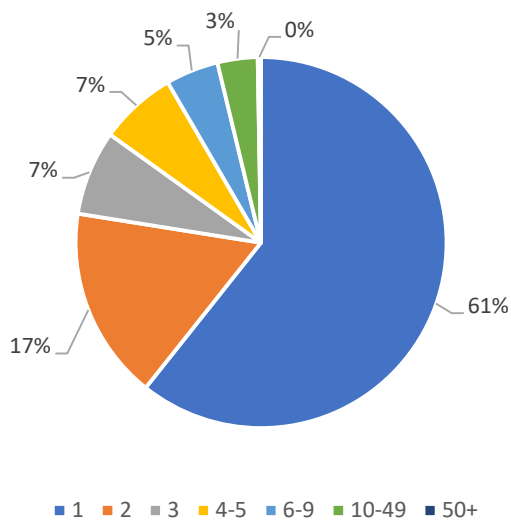


Figure 11: Number of tweets per user

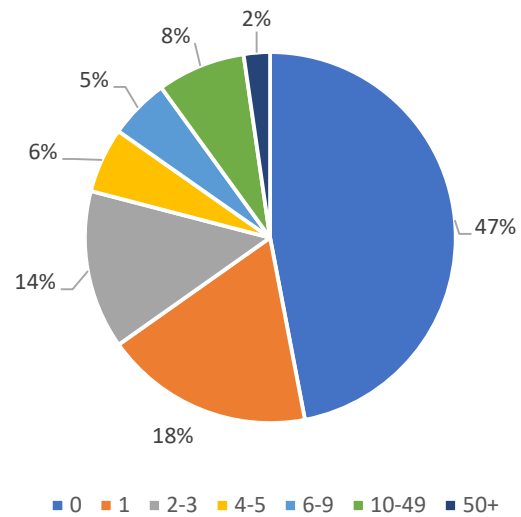


Figure 10: Number of likes per user

5.2. Topic Modelling

The goal is to explore the relevant thematic of Government announcements and newspapers' articles and study how they evolve through time, understanding if public agencies covered informative needs, if the interest on pandemic decreased over time, assessing the difference between media and governmental communication differences and studying in general the thematic changes in the communication through time. Initial and maintenance phases will be analysed separately, in order to be able to observe how topics evolved after the lockdown.

5.2.1. Dominant themes and their evolution

The articles and government announcements related to this phase have been plugged together as a unique dataset in the 'topicmodel' algorithm. This has been done first of all because they are together part of the flux of information that reached the citizens, and secondly because by combining both sources in the same dataset their thematic coverage will be directly comparable along time. 'Topicmodels' is a unsupervised technique and this means that the resulting topics are completely created by the algorithm. The topic names, however, have been given in this research in order to best describe the content.

Initial phase (2nd of February – 9th of March)

After diverse attempts, made by setting up different Topic numbers, the best optimal topic's number reveals to be 7. Indeed, on one hand it is a solution that satisfy the bias-variance trade-off considering Deveaud2014 metric (Deveaud, SanJuan, e Bellot 2014) and on the other all the topics revealed a clear thematic different from the others. Moreover, one of the topics that emerged simply collected all the messages of Civil Protection together, not covering any particular information theme and, for this reason, it has been removed from the analysis. Therefore, the final number of dominant thematic belonging to the initial phase that will be analysed is six: Decrees and Measures, Personal Thoughts, Sanitary Situation, Economic Situation, Focus on Government and Pandemic's Evolution.

As can be seen in *Figure 12*, the topics have been equally discussed along time by the different sources.

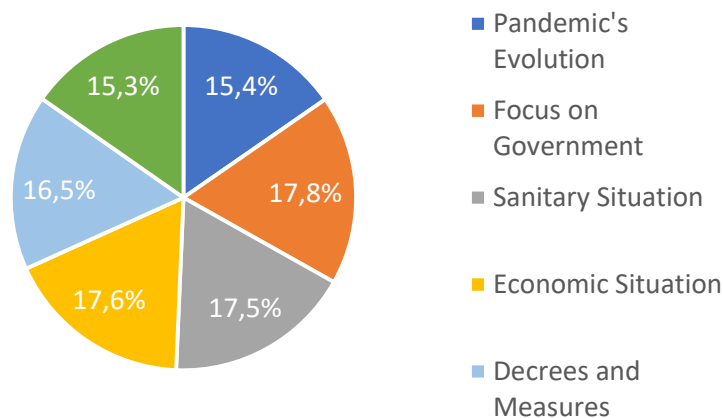


Figure 12: Average Topic Discussion

Now, the main topics are described and analysed through time, in order to be aware of their specific content and to understand how the sources of information covered the different dominant themes though the pre-lockdown phase. Two different graphs will support this part of the analysis. The first one will list the 10 most frequent words belonging to the topic, giving a clue on the content discussed. The second one represents the day-by-day percentage of discussion of that theme in the initial phase.

Topic 1: Decrees and Measures (D&M)

This first Topic covers all the texts that describe the enactment of new decrees that government decided to establish in the country. In particular, all the countermeasures to reduce the expansion of the pandemic are detailed, explained and discussed.

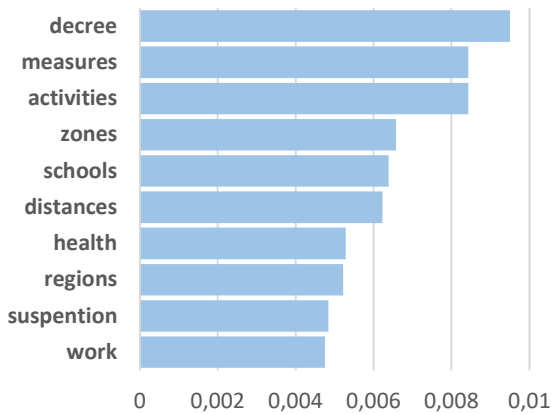


Figure 13: Most frequent words in D&M

The 10 most frequent words in the topic are shown in Figure 13, classified by the probability of occurrence in the Topic. Indeed, aside from the key words “measures”, “decree”, among the other frequent words there are “activities”, “work” and “suspension”, related to the progressive interruption or limitation of the majority of businesses, “zones” and “regions,” connected to the establishment of red zones across the country, “distances” and “health”, indicating the measures to prevent contagions and preserve citizens well-being, and

“schools”, indicating how much education was a strong concern during the first part of the crisis.

In order to understand how much the debate of this topic evolved over time, the daily percentage of discussion involving D&M have been plotted in Figure 14.

The first observation that can be deduced from the plot is that D&M had a very irregular discussion along the initial crisis phase, with some very high crests and sudden drops. This behaviour is mainly affected by the establishment of new decrees, that causes the peak in the discussion of this theme. Indeed, the days when new decrees of Prime Minister’s

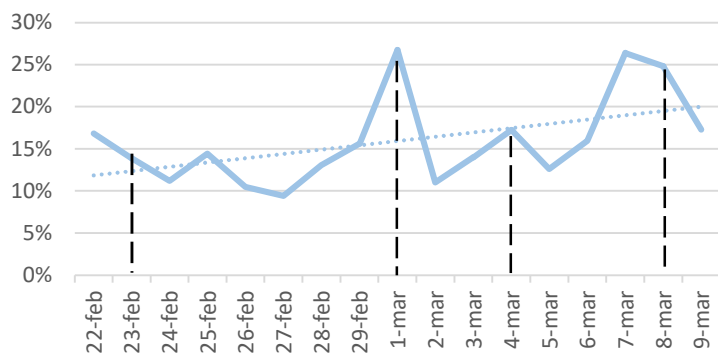


Figure 14: D&M Evolution initial phase

Office came out (23rd of February and 1st,4th and 8th of March (Prime Minister’s Office 2020b)) have been highlighted with a black dashed line, that coincide with all the main peaks, except the one on the 7th of March, probably due to an informative leak that occurred regarding the decree that was being designed.

Furthermore, the growing trend of this Topic can be explained with the higher concentration of decrees in the second part of the time period.

Topic 2: Personal thoughts (PT)

This thematic is very related to the emotional state that the pandemic raised in Italian society.

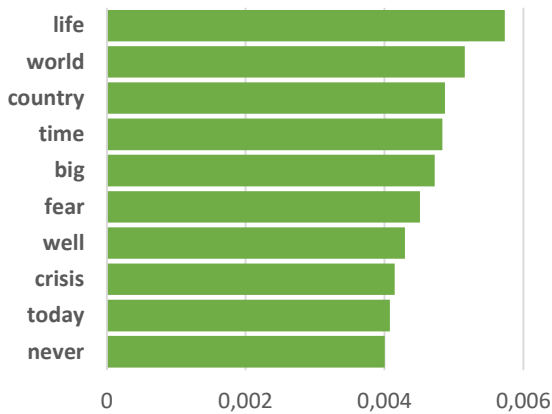


Figure 15: most frequent words in PT

“world”). In a way, this theme can be seen as the narration of the Covid-19 pandemic at a personal, individual level.

As it can be expected, this theme gradually becomes more and more important in the whole information generation, since the population started to realize the importance and uniqueness of the crisis they were going to face (Figure 16).

The major questioning in the text belonging to PT regards indeed the worries about what will be the medium and long-term impact that this crisis will bring, with a focus on the consequences that coronavirus emergency caused to individuals. For this reason, as shown in Figure 15, the most common words are “life”, “fear”, “crisis”, “big”, and this tells how much the situation is perceived as important, historical (“today”, “never”, “time”), as it affects the whole nation, and also global (“country”,

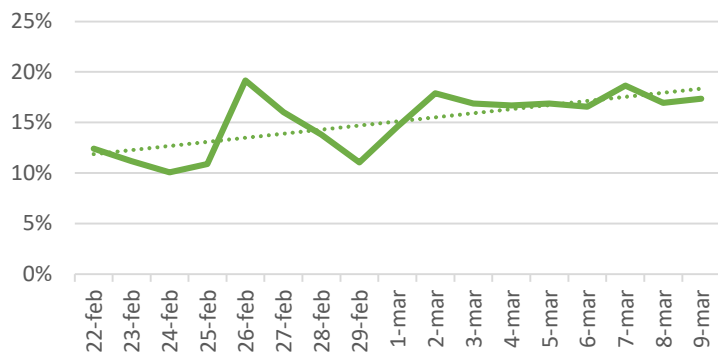


Figure 16: PT Evolution initial phase

Topic 3: Sanitary Situation (SS)

This theme focuses mainly on the issues that health system had to handle during the pandemic.

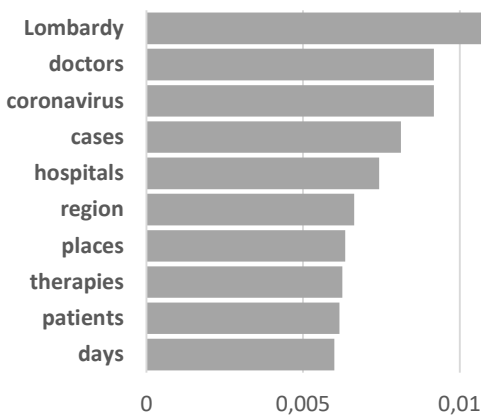


Figure 17: most frequent words in SS

In particular, the hospitals and their personnel (“hospitals”, “doctors”, see Figure 17) have been in the spotlight during the coronavirus epidemic, since they had to manage high sanitary needs (“patients”, “therapies”) with low resources (“places”, referred to beds available). The most hit region, where the health system was stressed more has been Lombardy, which is significantly the most common word of this category.

Looking at the popularity of this topic in information sources in *Figure 18*, a slight decrease can be recognised. This is quite surprising result considering the difficult conditions in the health facilities that in that period were worsening. However, it must be considered that the peak of sanitary demand has occurred the first days of April (Anon 2020b), a long time later.

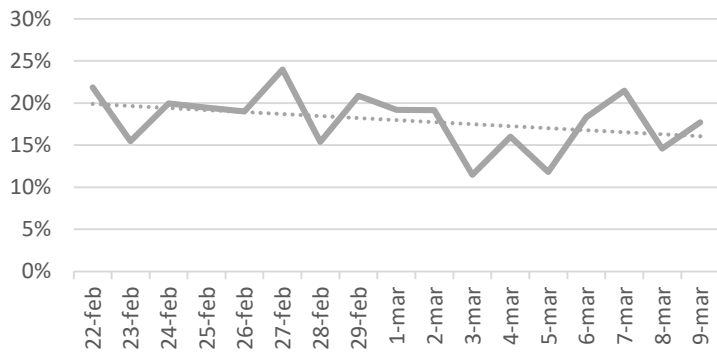


Figure 18: SS Evolution initial phase

Topic 4: Economic Situation (ES)

This last Topic focuses on the economic dimension of the coronavirus crisis in Italy.

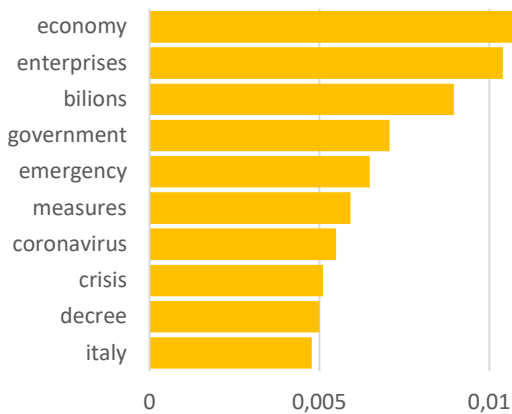


Figure 19: most frequent words in ES

Indeed, the most frequent words, resumed in *Figure 19*, regard the description of economic system (“economy”, “enterprises”) impacted by the crisis (“coronavirus”, “crisis”, “emergency”) and explore the role of government (“government”) and its measures (“decree”, “billions”) in order to readjust the system and trying to prevent as many damages as possible.

The popularity of this thematic varies significantly from one day to the other, even if the overall trend is stable in the pre-lockdown phase, as can be seen in *Figure 20*.

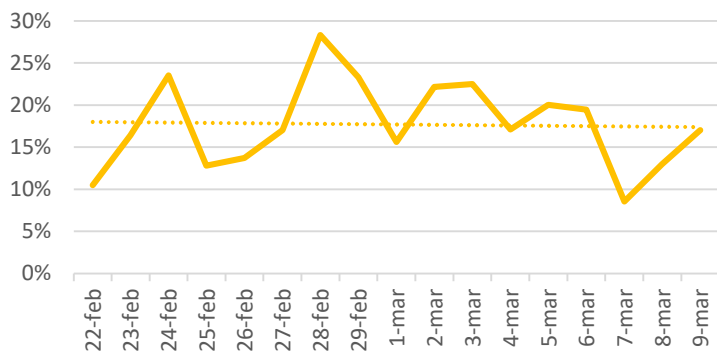


Figure 20: ES Evolution initial phase

Topic 5: Focus on Government (FoG)

This Topic groups all articles and declarations that reported what the government, and in particular Italian's prime minister Giuseppe Conte, was doing during the crisis.

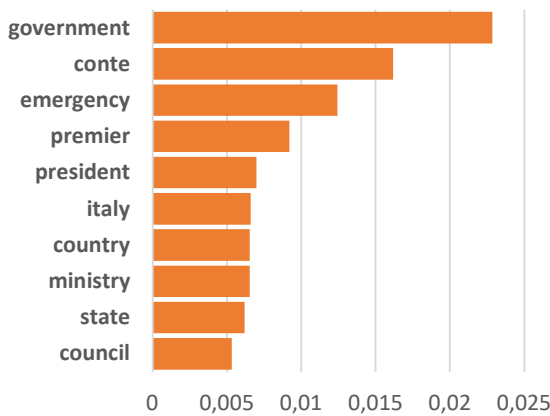


Figure 21: most frequent words in FoG

Indeed, most of the key words that *Figure 21* shows refer to the head of the state, such as “Conte”, “premier”, “president”, “state” and “council”. Moreover, also ministers and other figures of public administrators are relevant (“government”, “ministry” and also outside the ranking “Speranza” and “Fontana”). This theme contains also all political debates, as other frequent words outside the top 10 ranking regard the political forces such as “majority” “opposition”, the opposition leader “Salvini” and its political party “lega”.

Despite the political footprint of this topic, since the description of what is planned and was being done by the government has been also naturally commented by other parties, it must be considered that the articles that were purely discussing politics have not been included in the analysis as they have not been considered as directly related to the crisis narration (as stated in the dataset generation part). Considering this premise, findings by Yu (Yu et al. 2020) regarding the decreasing interest that political matters received during the crisis can only partially be verified, since some purely political articles are missing in the dataset.

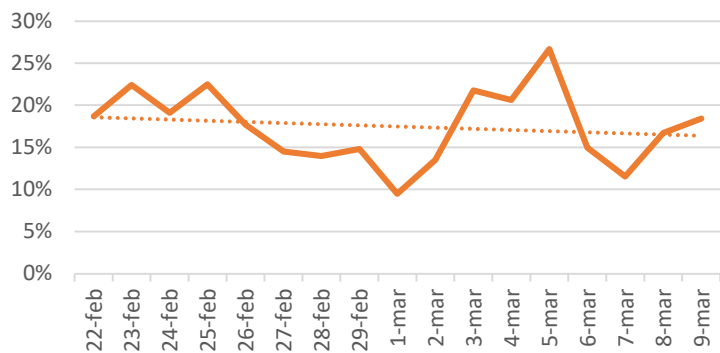


Figure 22: FoG Evolution initial phase

Thus, *Figure 22* highlights a trend with many crests and valleys that slightly decreases over the initial phase. However, the proof of a drop in political discussion, found by Yu study, seems not very significant.

Topic 6: Pandemic's Evolution (PE)

PE measures the extent to which a text published in the pre-lockdown phase talks about the evolution of the pandemic in the world.

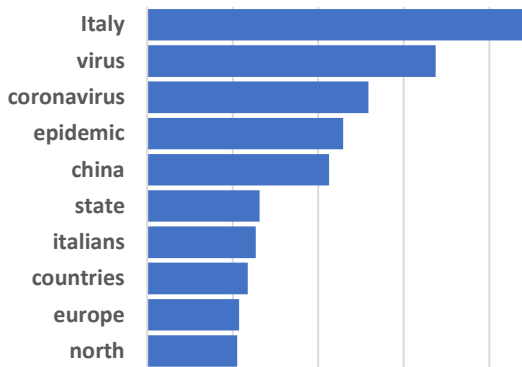


Figure 23: most frequent words in PE

In fact, most of the key words, represented in *Figure 23*, refer to the Covid-19 (“virus”, “coronavirus”, “epidemic”) and the relative geographical places where the crisis originated (“china”), initially hit (“north”, “Italy”) and finally expanded (“countries”, “Europe”). Italy is of course the main centre of attention the information sources focused on, and the two main actors recognised this emergency have been government (“state”) and citizens (“Italians”).

This topic reveals therefore an interesting representation of how the epidemic diffused geographically, from China to northern Italy, expanding then in the rest of Europe.

In *Figure 24* it can be observed that the discussion of PE topic dropped naturally as the crisis took place. In fact, once the diffusion reached all western countries, other themes became more attractive and this one slowly decayed. This is in line with Reynolds, which forecasted a gradual decrease of interest about the pandemic (Reynolds 2006), that in this case lasted

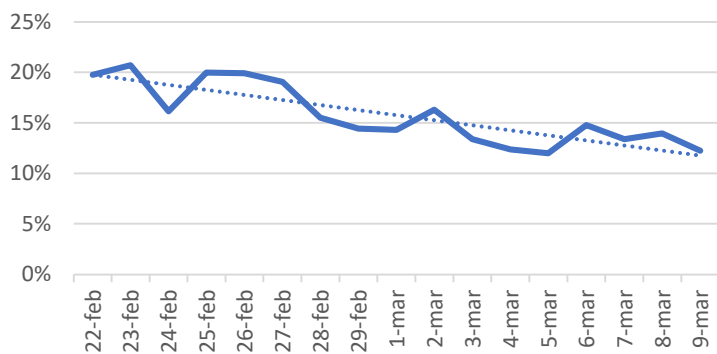


Figure 24: PE Evolution initial phase

only few weeks, since the pandemic after the Italian lockdown was now consistently established everywhere.

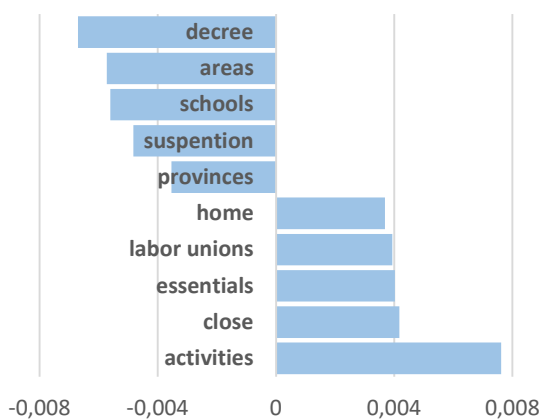
Maintenance phase (9th of March – 1st of April)

Topic Modelling has been applied again using this time governmental announcements and articles posted in the maintenance phase, and therefore during the lockdown. The results have proved to be very similar with the one related to the initial phase. In particular, among the 6 new Topics that will be considered in the maintenance phase, 5 maintain similar semantic and thematic than in the previous period, and therefore also their name remains unchanged. Only “Pandemic Evolution” evolved, being substituted by the discussion of debates and measures negotiated among the European union.

However, in order to explore how themes evolved, the new topics will be compared to those in the initial phase. To do so, the study managed to highlight the words that have been less used after the lockdown, and those that instead became much more frequent. In the resulting graphs, words represented with negative probability are those that were more frequent in the initial phase, while positive values mean a higher occurrence of these terms during the maintenance.

Topic 1: Decrees and Measure (D&M)

Comparing the semantic changes from the pre-lockdown phase in *Figure 25*, the new focus is more related



to the quarantine, with the words “home” and “essentials”. Moreover, in maintenance phase the measure mostly regarded the suspension of businesses (“close”, “activities”). Instead, during the lockdown, the enactments regarded much fewer specific areas, since all the country was concerned in the same situation, and less mentioned educational domain (“schools”).

Figure 25: words changes in D&M from initial to maintenance phase

In contrast to the initial phase, looking at *Figure 26*, this thematic lost popularity in the late days of March. This is probably due to the normative situation that stabilized once the quarantine was established and fully regulated. Once again, the days when new or modified decrees came out have been highlighted

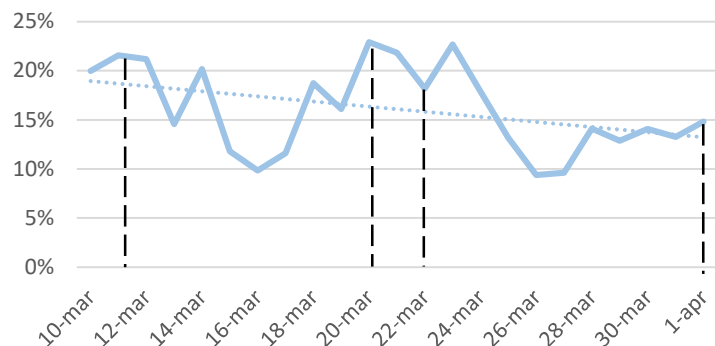


Figure 26: D&M Evolution maintenance phase

(Prime Minister’s Office 2020b), revealing how much in last days considered the discussion regarding new measures dropped.

Topic 2: Personal thoughts (PT)

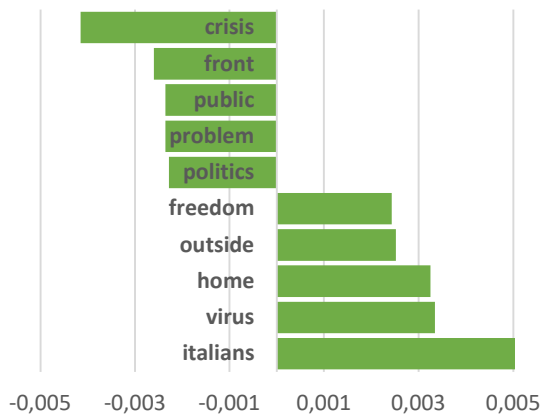


Figure 27: words changes in PT from initial to maintenance phase

The psychological impact of quarantine becomes very evident once comparing pre-lockdown and lockdown situations. Indeed, as *Figure 27* reveals, words related to the strong movement restrictions such as “home”, “outside” and “freedom” became much more frequent as the quarantine went by. Other words such as “politics”, “crisis” became less mentioned in personal thoughts, while Finally, a great increase in the use of the word “italians” could mean that the sense of community enhanced, in a situation where everyone were under the same condition.

In this case, the overall trend of the discussion of this thematic has been quite stable all along the 24 days, with a slight peak when the new decree came out the 22th of March, that restricted even more the movements of citizens. The evolution is shown in *Figure 28*.

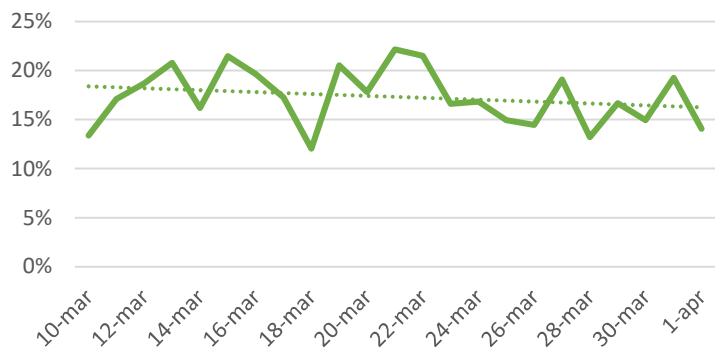


Figure 28: PT Evolution maintenance phase

Topic 4: Sanitary situation (SS)

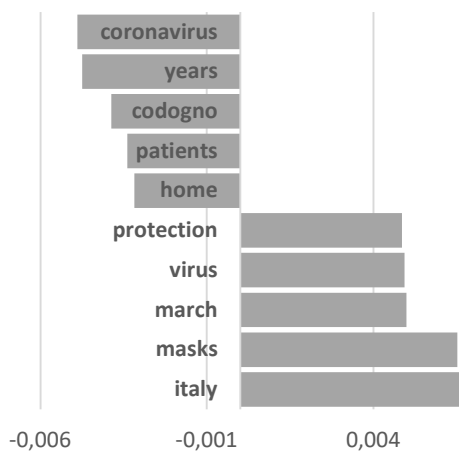


Figure 29: words changes in SS from initial to maintenance phase

The discussion of health, comparing the word frequency changes in *Figure 29*, seems to evolve by losing descriptive words such as “patients”, “years” (related to the age of affected people) and “codogno” (one of the cities where the pandemic started) and acquiring terms related to active prevention such as “mask” and “protection”.

The popularity of this topic represented in *Figure 30*, instead, highlights a quite stable trend, that seems to follow a wavy behaviour, with alternated crests and valleys.

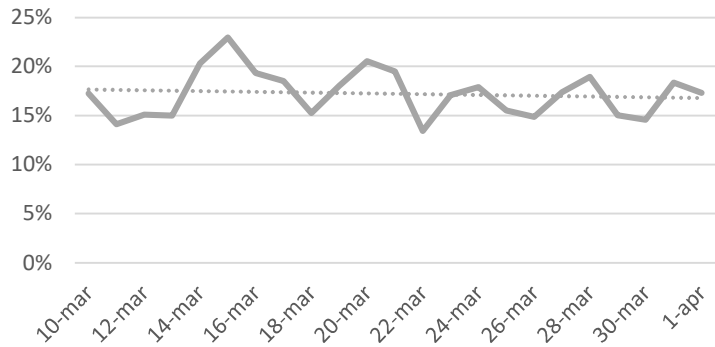


Figure 30: SS Evolution maintenance phase

Topic 6: Economic Situation (ES)

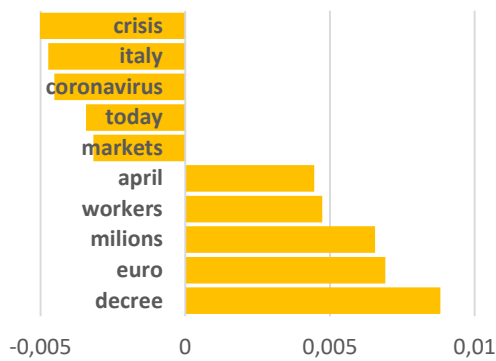


Figure 31: words changes in ES from initial to maintenance phase

Regarding the trend over time, apart from a loss of popularity around the 22nd of March the theme has maintained a stable popularity over time, as shown in *Figure 32*.

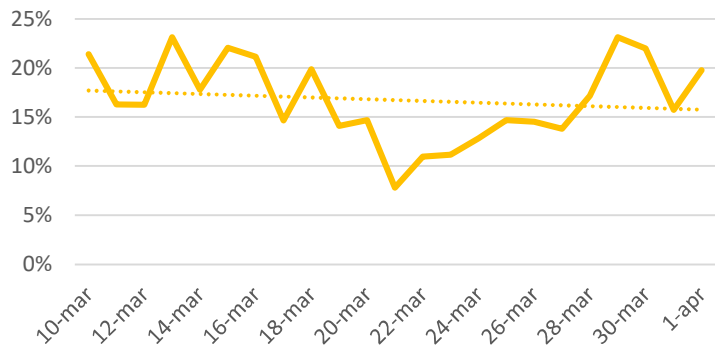


Figure 32: ES Evolution in maintenance phase

Topic 3: Focus on government (FoG)

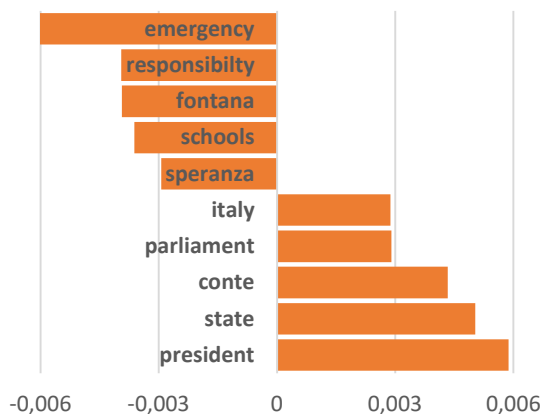


Figure 33: words changes in FoG from initial to maintenance phase

Analysing *Figure 33*, the main semantical difference that emerges in the two periods in the shift from local actors and ministers of public administration (“fontana” is the Lombardy’s president and “speranza” is the head of health minister) to the central authorities of government (“conte”, “president”, “state” and “parliament”). This could be also a consequence of the evolution of communication roles assigned by the government, that

over time decided to centralise the report of official messages on fewer actors, as noticed in descriptive analysis of government dataset.

Looking at *Figure 34*, as the days in quarantine persisted, the discussion about governmental actions and politics have become more popular, following a positive and stable trend.

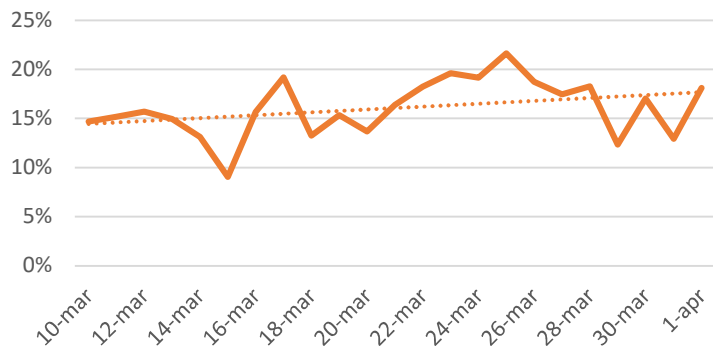


Figure 34: FoG Evolution in maintenance phase

Topic 5: European discussions and relationship (EDR)

Finally, this topic is the only one that changed from the initial phase to the lockdown. It replaces “Pandemic Evolution”, that lost interest even since the first phase of the crisis. EDR focuses instead on all the discussions aimed at handling the crisis at a European level with common economic, sanitary and politic actions.

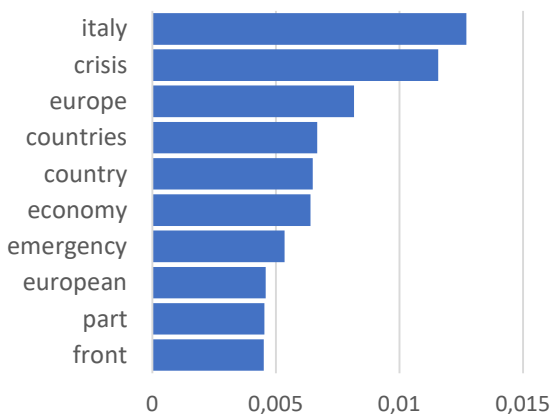


Figure 35: most frequent words in EDR

Looking at the most frequent words in this topic, shown in *Figure 35*, the focus on European level is quite clear, considering the words “Europe”, “European” and “countries”. In particular, the other frequent terms suggest that the theme covers the narration of how EU tackled the crisis (“crisis”, “emergency”, “front”), especially from the economic point of view (“economy”) and what has been the role of Italy in that discussion process (“Italy”, “country”).

As can be noticed in *Figure 36*, this theme became more and more relevant as the crisis evolved, since the severity of the crisis needed some common countermeasures. On 26th of March this discussion reached its peak after the Joint statement of the members of the European Council, signed on that day (European Council 2020).

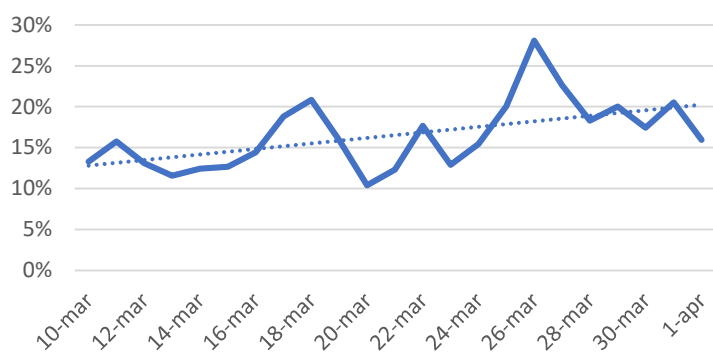


Figure 36: EDR Evolution in maintenance phase

5.2.2. Correlation between themes over time

Once every thematic has been presented, described and analysed, the existence of some significant relationship and correlation among them should be explored. In order to do so, statistical correlation between all the topics have been assessed. The objective of this analysis is to understand if some thematic have been discussed together (and therefore are positively correlated), or instead have been alternated (having a negative correlation). Despite the majority of themes revealed no significant correlation in the linear regression (p-value >5%), some interesting results emerged.

Initial phase

The most significant relationship revealed to be among FoG and SS. In particular, the algorithm found a negative correlation with coefficient= - 0,73277 (relative p-value of 1,04%). This means that the thematic focused on government and politics gained popularity when the sanitary emergency was losing interest, and vice versa (*Figure 37*). Assuming that sanitary situation communicates a strong sense of threat (due to the difficult situation that was worsening in those days), FoG could be see as a “secondary” topic, discussed when the sense of imminent danger is lower.

Moreover, quite surprisingly, the discussion regarding D&M in initial crisis phase was inversely proportional to ES (coef. = - 0,46228, p-value = 4,94%). This means that, before the lockdown, the explanation, establishment and discussion of measures taken to tackle the coronavirus crisis left behind the discussion of the economic affairs, which were more popular in a second moment (*Figure 38*).

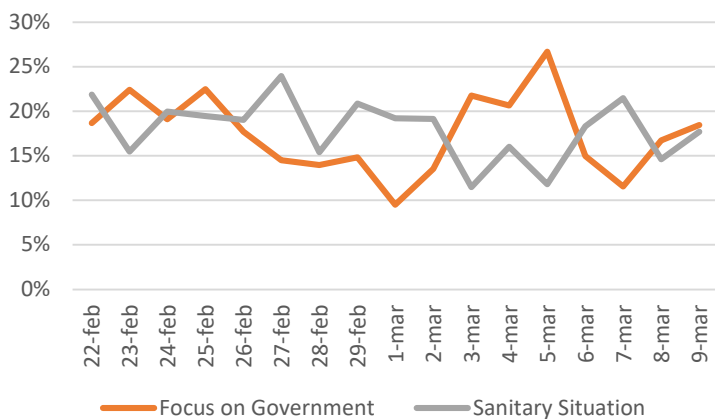


Figure 38: Negative correlation between FoG and SS in initial phase

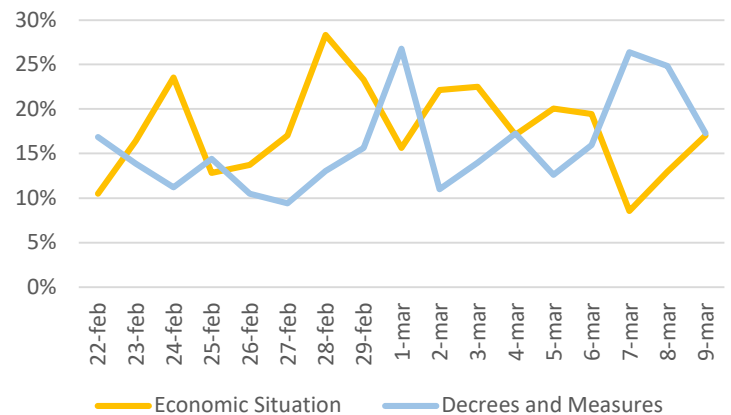


Figure 37: Negative correlation between ES and D&M in initial phase

Finally, other two possible relationships have been found, even if the p-values in these cases (indicating the level of significance of the relationship, and therefore of reliability of this analysis) were quite high. At first, PE could be positively correlated to the sanitary situation (coef. = 0,3765, p-value = 7,49%), meaning that the thematic about the evolution of the pandemic seems to go with the discussion of sanitary situation (*Figure 40*). Then, FoG could be negatively correlated with the explanation of decrees and measures (coef. = - 0,34481, p-value = 7,31%), as shown in *Figure 39*.

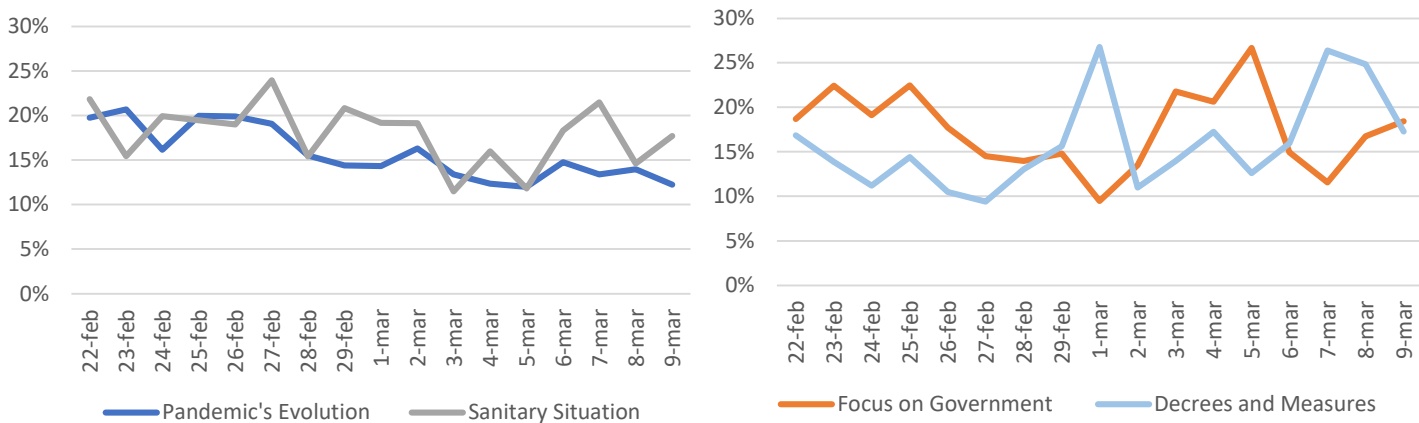


Figure 40: Possible positive correlation between PE and SS in initial phase Figure 39: Negative correlation between FoG and D&M in initial phase

Maintenance phase

The correlation analysis applied to lockdown phase revealed some changes in the correlations among topic that were found in the initial phase.

At first, surprisingly, the topic that focuses on government has a negative correlation with the theme that regards the economic situation (coef. = - 0,532, p-value = 0,90%). Apparently, economic situation and politics have been discussed alternatively during the lockdown, as two separate aspects that raised attention during the maintenance phase. In fact, looking at the *Figure 42*, it is possible to argue that economic matters were discussed mostly during the first and the last part of March, while political debates raised more attention in the central part of the month, when most of the discussion within EU parliament were made. Considering the findings of the initial phase, economic matters replaced sanitary situation as the alternative to the discussion of governmental intention and political discourses, being in a way the primary need that substituted internal debates. This result can be compared to the findings of Yu, which found that during lockdown, both spanish newspapers studied covered less political matters (Yu et al. 2020). Apparently, despite no clear decrease of popularity of FoG topic occurred, the information sources' interest on government and political themes seems to drop when the urgency of economic and sanitary subjects becomes stronger.

Moreover, the theme regarding European debates during the coronavirus crisis appears to be negatively correlated to the discussion about on decrees and measures (coef. = - 0,620, p-value = 0,16%, *Figure 41*). This means that, once the main governmental decisions were established, the focus shifted towards European actions, that could possibly support and strengthen the measures adopted by Italy.

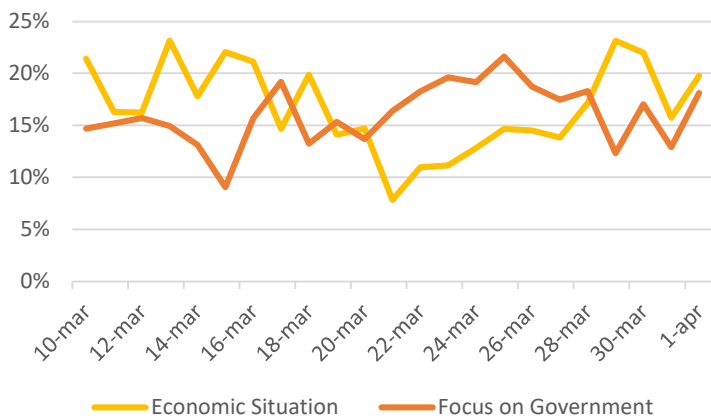


Figure 42: Negative correlation between Fog and ES

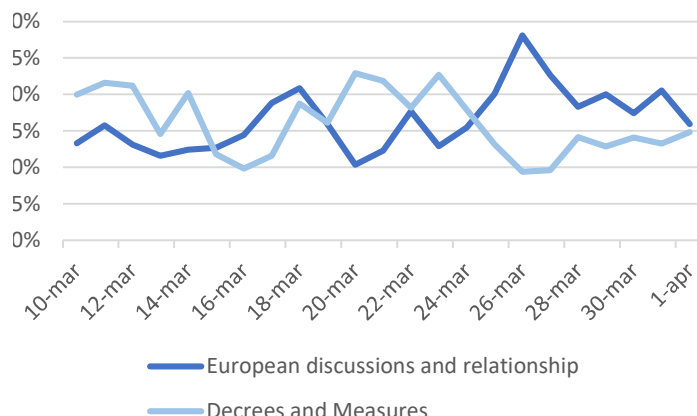


Figure 41: Negative correlation between EDR and D&M

In addition to these relationships that have been found and that were proven as significant (thanks to their very low p-value) other two suspect correlations have been hypothesised. As for initial phase, these cases have a p-value which is too high to assure the reliability of those findings but, being still lower than 10%, they were still mentioned as possible relationships. Thus, European discussions seems could be inversely related to the health theme (coef. = -0,383, p-value= 7,09%, Figure 44) and the discussion about economic situation could be inversely related to the detail of measures and decrees adopted in the country (coef. = - 0,358, p-value = 9,32%, Figure 43).

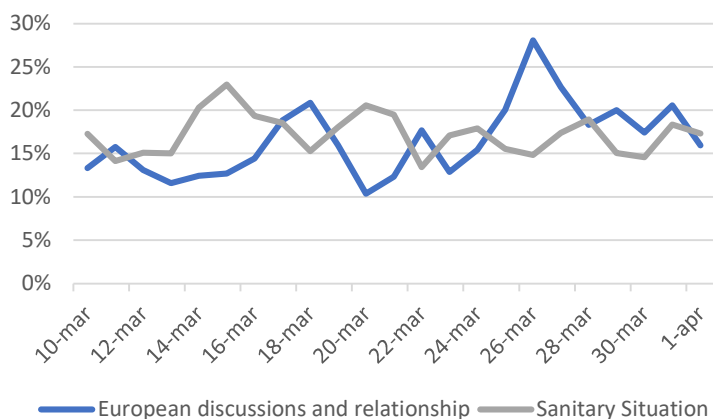


Figure 44: Possible negative correlation between EDR and SS

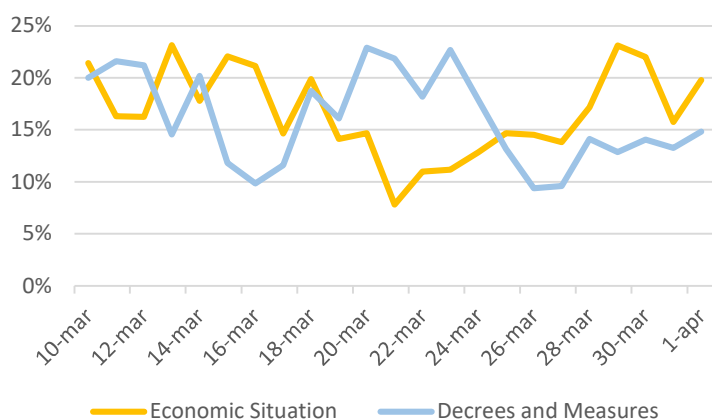


Figure 43: Possible negative correlation between ES and D&M

5.2.3. Government and press thematic comparison

This part of the analysis will compare the communication differences of the two sources of information, in both initial and maintenance phases, monitoring the different evolutions over time and revealing eventual correlation between governmental content that has been transmitted and what has been then reported on press.

In particular, once a general comparison will be done, the discussion of the several topics of the two different sources will be compared along time, and then a linear regression will be exploited in order to reveal an eventual correlation between the sources' coverages of each topic. In other words, the goal of this latter attempt is to understand if the discussion of a topic by government also affected the coverage among newspapers news, assessing eventually if and how media followed State's official topics.

Initial phase

A first distinction can be found by comparing how government and press tackles the different thematic (*Figure 45*). In fact, while government focused only on few topics (especially discussing Decrees and measures), press wrote about all themes in an even way. Moreover, newspapers spoke about all thematic more extensively comparing to public officials' sources, except for the case of Decrees and Measures. This means that countermeasures' design and communication has been the first priority and the first purpose in the governmental messages to population. These results are in line with previous research studies, in particular the one from Lee and Basnyat, that revealed how government tends to focus only on few topics, while press covered more or less evenly each of them (Lee and Basnyat 2013).

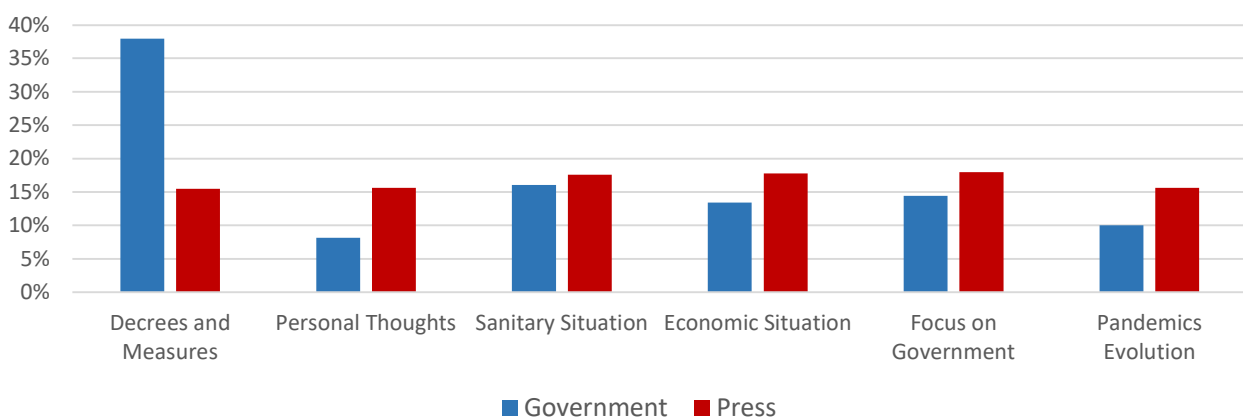


Figure 45: Average coverage of topics by government and press (initial phase)

After this overview, the study will reveal the day-by-day evolution of themes coverage by both sources.

Decreases and Measures

To understand why, *Figure 46* shows the time comparison of the two sources. As already noticed previously, the government covered this topic much more than the media. On 7th of March, however, in the graph it can be observed that media discussion overcame the governmental one, creating a climax. Indeed, on that day an information leak that anticipated the incoming decree mysteriously came out, generating many critics and panic on population (Anon 2020c).

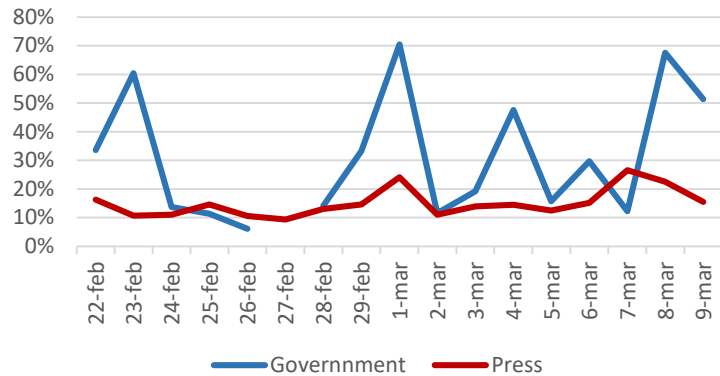


Figure 46: D&M Government vs Press initial phase

Regarding correlations between media and government in this case, no proven correlation was found.

Personal thoughts

Comparing the government with the newspapers in *Figure 47*, the latter discussed much more the theme, even if both sources increased their coverage over time.

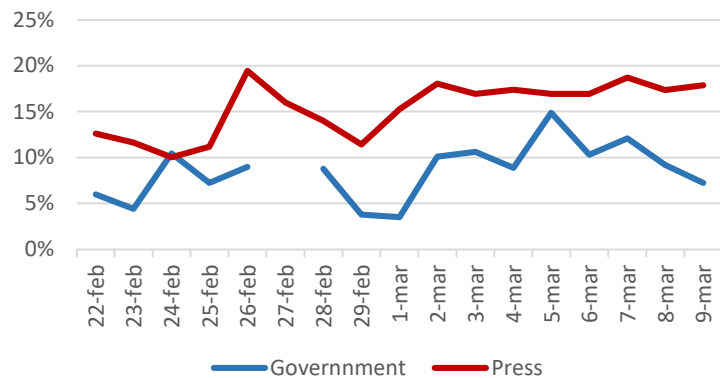


Figure 47: PT Government vs Press initial phase

Surprisingly, in this case, linear regression suggest the possibility that government discussion of the crisis on a personal dimension has positively affected also personal comments in newspapers articles, even if the quite high p-value doesn't assure a strong reliability of this result (coef. = 0,489982; p-value = 5,44%).

Sanitary Situation

Furthermore, the sources' coverage is slightly in favour of newspapers, even if government discussed the thematic at a similar level, in particular with the Civil Protection that established a daily press conference to give updates on the situation (Figure 48).

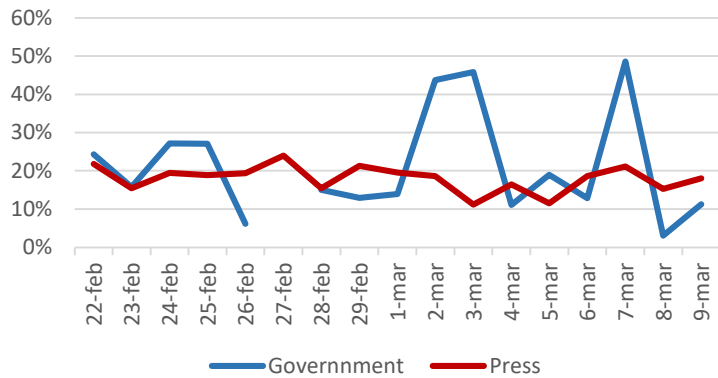


Figure 48: SS Government vs Press initial phase

Neither in this case, linear regression didn't find a correlation between government and press discussion.

Economic Situation

By comparing the two sources of information in Figure 49, press has usually covered the economic dimension more often than government. The only significant days where public messages intensively dealt with economy are on 28th and 29th of February. Indeed, on that days the Cabinet and the minister of the economy Gualtieri presented decree "Cura Italia", containing specific measures to support the economy during the crisis.

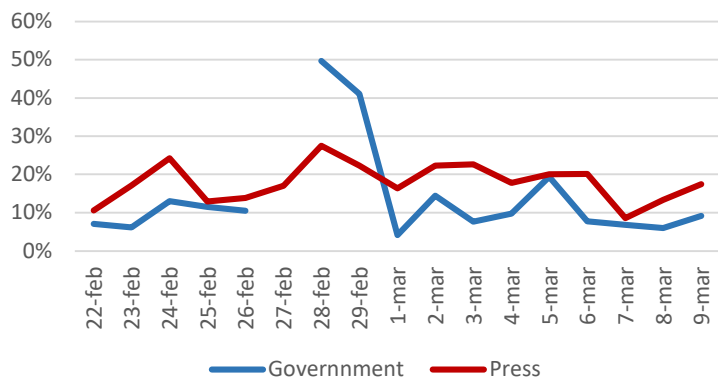


Figure 49: ES Government vs Press initial phase

Results demonstrated a positive relationship in the discussion of this thematic by government and press, which means that the economic theme discussion of one source has been affected by the other one. Since the government announcements came out chronologically before the newspapers' articles, it is reasonable to believe that government influenced the discussion of economic matters, rather than the opposite. In this case, p-value is sufficiently low to support this conclusion (coef. = 1,5423; p-value = 0,99%).

Focus on Government

Regarding the comparison between government and press, most of the times the latter write more about FoG, as shown in *Figure 50*. There are some exceptions, for example on the 6th of march, during the speech of the president of the republic Sergio Mattarella regarding the crisis and the role of government in that moment.

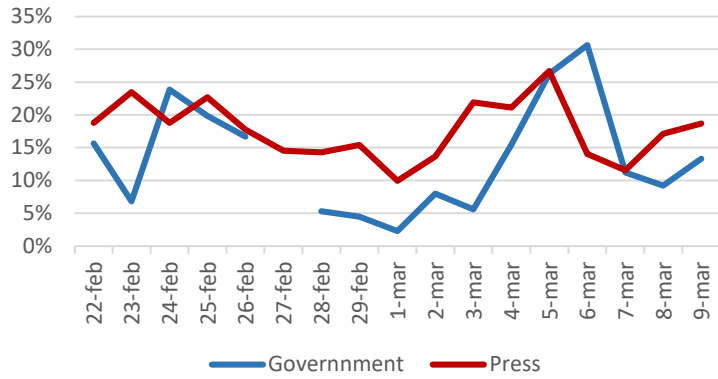


Figure 50: FoG Government vs Press initial phase

Moreover, the correlation analysis with linear regression model didn't find a relationship between government and press discussion.

Pandemic Evolution

Looking at *Figure 51*, the theme was largely discussed by media compared to government. The only exception occurs the 26th of February, when Health minister Speranza made a common press conferences with its counterparts from neighbouring countries to decide common actions to handle the thread of coronavirus pandemic.

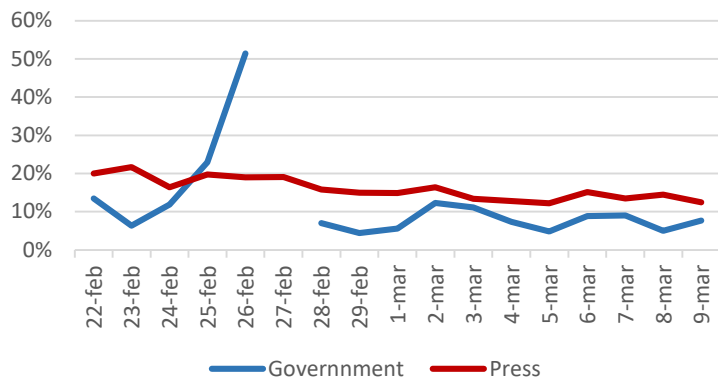


Figure 51: PE Government vs Press initial phase

To conclude, linear regression suggested that there could be here some negative correlation between the two different sources, even if also in this case p-value warns about the reliability of these results (coef. = 1,811; p-value = 7,62%).

Focus on government’s coverage of informative themes

Once the different dominant themes in the initial phase have been described and analysed, governmental communication can be evaluated according to Reynolds research, which explains that, in the initial phase, government in the outbreak of a pandemic should provide information in order to prevent anxiety and fear of population. In particular, it tells that citizens “Want timely and accurate facts about what happened, and where, and what is being done, and they want it now” (Reynolds 2006). According to this definition, information that must be provided regards two distinct matters, firstly regarding the pandemic per se, what is it, where it started, etc. (“what happened, and where”) and secondly people need to know what the government is actively trying to do in order to counteract the crisis (“what is being done”). Looking at the main thematic found in the topic analysis of sources, the former point is best represented by Pandemic Evolution, the latter by Decrees and Measures. Therefore, we assumed both this themes to be informative, and plotted in *Figure 52* how much government provided them in its official communication in initial phase.

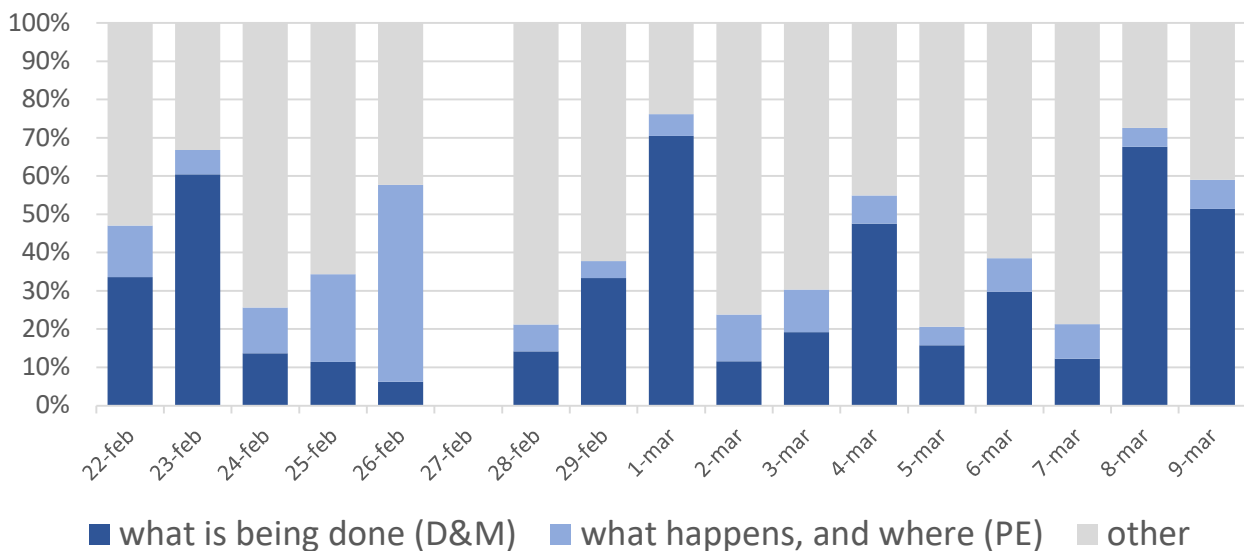


Figure 52: Informative themes covered by government

Looking at the results, it appears that government widely covered the informative topic regarding the measures that were established, that has been the main governmental priority during the first weeks of the pandemic. However, the other thematic has been left apart, meaning that government under-provided explanations that presented and described the characteristics of the disease, the main thread that it could lead to citizens, how it spread and which factor affected its apparently unrestrained expansion. The lack of information provided by government in this sense could have increased citizens’ uncertainty, leading to a diffusion of fear on population(Reynolds 2006), which could be detrimental for a proper crisis management (Espinola et al. 2016). Moreover, this information hole has been covered only by media that however tend to be alarming (Vasterman and Ruigrok 2013) raising fear rather than limiting it.

Maintenance phase

The themes' coverage from the two sources of information in the lockdown phase is shown in *Figure 53*. While press thematic coverage doesn't seem to have changed much and remain quite evenly distributed, governmental communication has overtaken newspapers with what regards the discussion of sanitary and economic thematic, and remains also strong in communicating information regarding decrees and new measures applied.

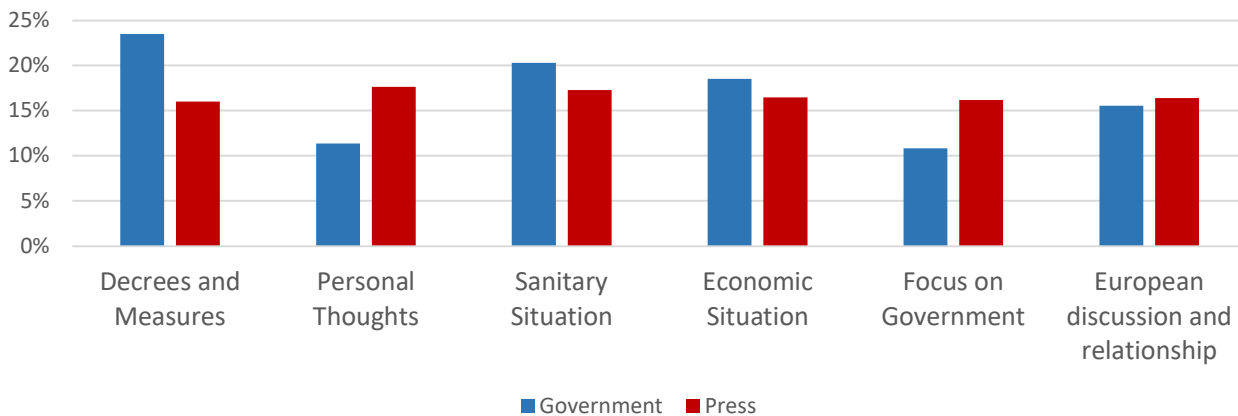


Figure 53: Average coverage of topics by government and press (maintenance phase)

In particular, the main differences among the two periods in terms of thematic discussed are shown in *Figure 54*. That image reveal how government focused much less on detailing new measures and increased its coverage of health situation, economy, European relationships and sharing individual-level comments. The press, instead, changed much less its thematical coverage. However, newspapers articles shared more personal thought, and less focused on government.

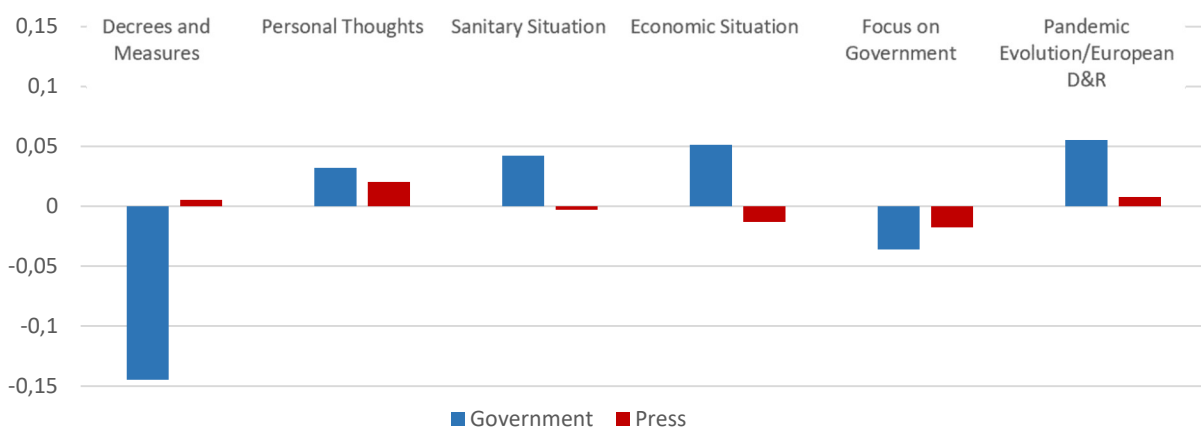


Figure 54: Changes in topics discussions from initial to maintenance phases

The comparison daily evolution of topic discussion of government and press, as well as eventual correlations among the two sources, are discussed below.

Decrees and Measures

Looking at *Figure 55*, similarly of what happened in the initial phase, government covered this topic on specific days, most of the times to announce new measures or in order to clarify existing ones. Instead, press have been much more constant in discussing this theme.

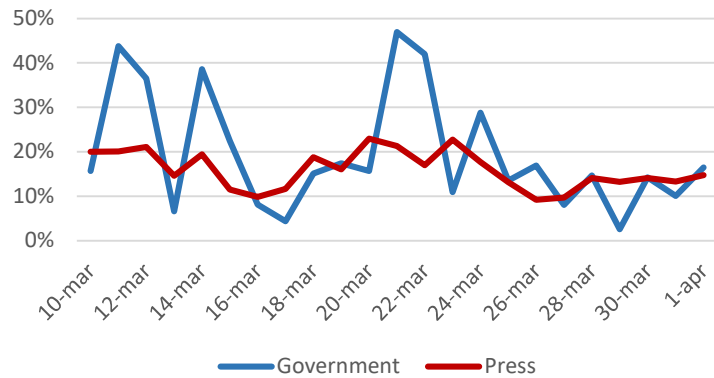


Figure 55: D&M Government vs Press maintenance phase

Furthermore, the two sources resulted positively correlated (coef. = 0,535, p-value = 0,85%). This means that, in this period, press strictly followed governmental announcements, discussing the new measures taken when the government published them, commenting decrees when they came out, and writing about other themes when government didn't cover this topic. This makes sense, and it is instead surprising that this has not been proven true in the initial phase. A possible interpretation could be that governmental communication has managed to be more precise and therefore easier to be followed by media. Also, this could be due to the lower amount of news to discuss during the lockdown (since coronavirus was known and all the activities related to normal life were suspended) that pushed press to better discuss governmental actions once they were communicated. These are only some hypotheses, that require further research.

Personal Thoughts

As in the initial phase, also during lockdown press has much more narrated the theme of the crisis seen at an individual level. Government, however, as *Figure 56* reveals, has covered this theme in particular the 25th of March, promoting an initiative (#cistodentro (Prime Minister's Office 2020a)) aimed for children that were restrained into the quarantine, in order to share their experiences.

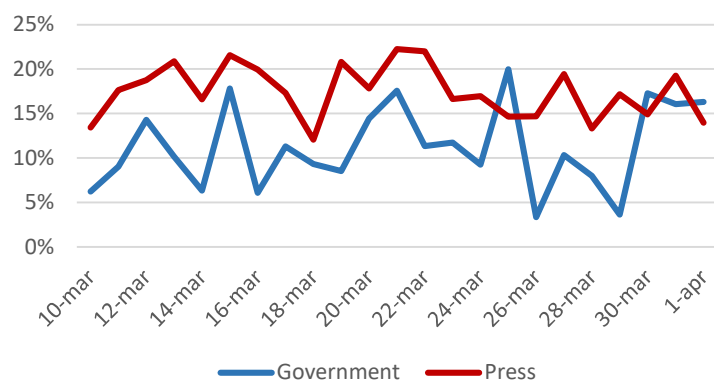


Figure 56: PT Government vs Press maintenance phase

Moreover, no correlation between Government and press was found.

Sanitary Situation

Looking at *Figure 57*, and in comparison to the initial phase, government overcame press in the coverage of health issues. This merit can be mainly attributed to Civil protection daily press conferences, that was able to provide timely updates and to clarify some doubts related to the situation. With reference to Reynolds

theory studies (Reynolds 2006), that encourage government to keep insisting on the importance of health prevention and on the risks related to the pandemic crisis, these result suggest that Government followed the instructions, even if the period covered is not enough to evaluate if this theme has been sufficiently covered also in the later stage of the emergency.

Also in this case, no correlation between press and government discussion have been found.

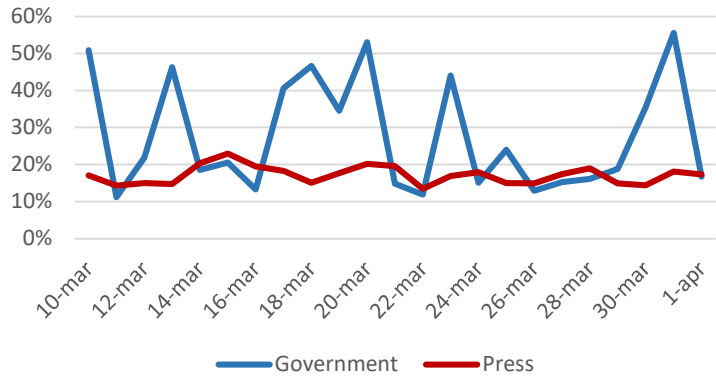


Figure 57: SS Government vs Press maintenance phase

Economic Situation

The economic situation has been most of the days discussed similarly by press and government, as *Figure 58* shows. However, the government has focused in this theme the 16th of March, when establishing the “Cura Italia” decree aimed for the economy, and the 29th of March, when the municipal solidarity fund was published.

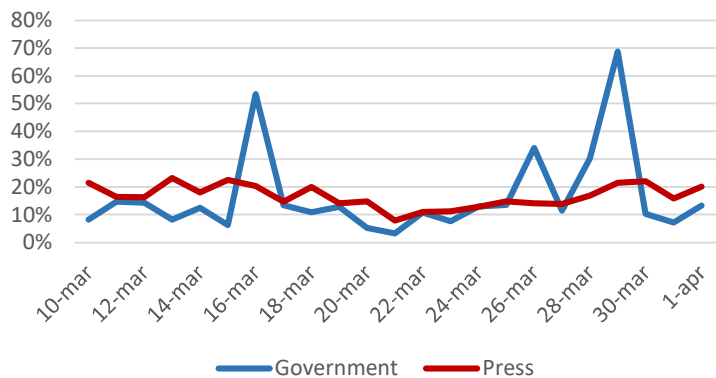


Figure 58: ES Government vs Press maintenance phase

To conclude, governmental and press discussion of the economic situation didn't reveal any correlation.

Focus on Government

Figure 59 reveals that this topic has mostly been covered by press, despite some few moments when also government explained what it has planned to do. Both sources seem to have increased their discussion of this theme over the lockdown.

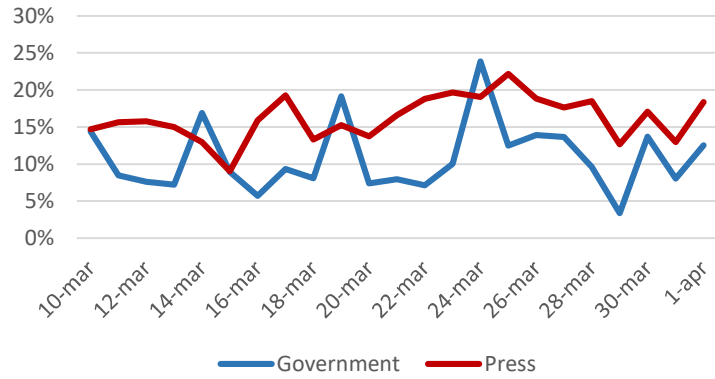


Figure 59: FoG Government vs Press maintenance phase

Among the two sources no clear correlation was found for this topic.

European Discussion and Relationship

This topic replaced pandemic evolution in the lockdown phase, and it has gradually acquired popularity as the lockdown continued. In particular, this is due to the month of March having been full of meetings, debates and negotiations within EU in order to find solutions that everyone agreed. While media talked more about

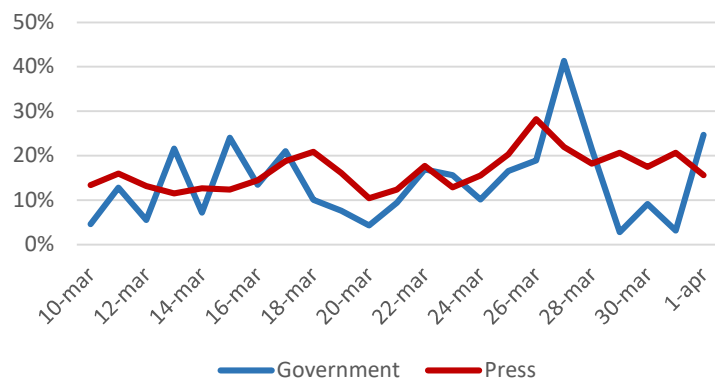


Figure 60: EDR Government vs Press maintenance phase

this topic during the days of international discussions, government preferred to mainly communicate the final result once it came out, as can be seen in Figure 60.

Finally, no clear press-government correlation was found.

The dominant themes have been fully understood and analysed in order to assess how communication during the crisis was held. At this point, in the following chapter, the goal will be to analyse fear transmitted by the different sources and, finally, reveal which communication factors have impacted fear.

5.3. Fear Analysis

Once all the ingredients regarding the communication themes during the pandemic have been extracted and studied, it is possible to proceed with core of the analysis, providing insights regarding the fear transmitted by information sources and by population, understanding how it evolved and, most importantly, what affected it. Given the texts in the datasets, thanks to the sentiment analysis tool, fear from governmental announcements, press articles and tweets has been extracted, measured and plotted over time. Since tweets have been posted only from the 8th of March (while information sources' data start on 22nd of February), the comparisons will refer to that shorter time-lapse (8th of March – 1st of April).

Fear has been measured with two different indicators, as planned in the methodological steps: total fear and relative fear. While the first one is the total count of the words that are related to fear within the texts processed, relative fear is the percentage of fear terms under the total amount of words in the document.

5.3.1. The correlation between information sources and population's fear

Firstly, the results of the sentimental analysis in the three sources will be detailed, expressed in absolute terms (tot fear) and percentage terms (relative fear). Then, the first goal is to understand if there are correlation among them, evaluating if the transmission of fear-related words by information sources has affected the fear expressed in the tweets.

Fear transmitted by government

Looking at *Figure 61*, the total fear contained in governmental official messages has registered an increasing trend during the pandemic. However, the percentage of fear-related words decreases over time. This means that the increase of terms related to fear is offset by a growth of words along the crisis. In other words, over

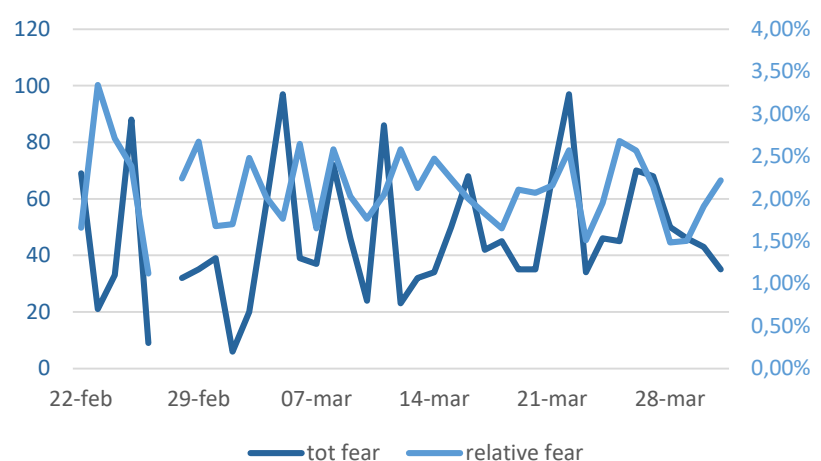
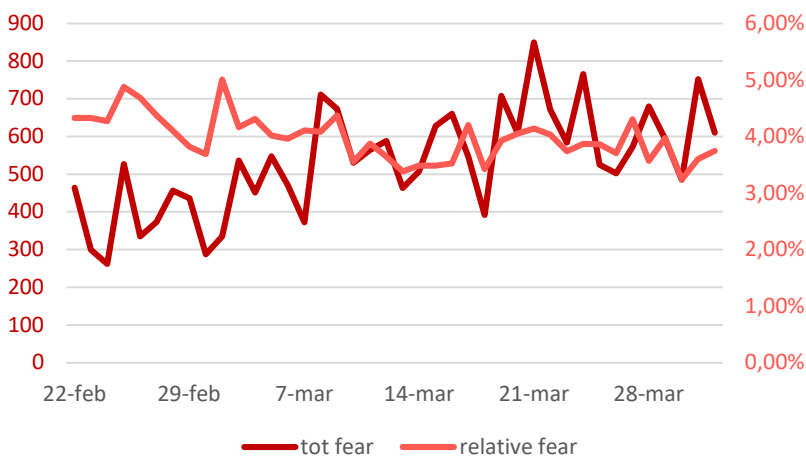


Figure 61: daily fear transmitted by government

time, government send longer messages, but that contain less fear than at the initial crisis stage. The fear plots cover the entire period from the 22nd of February to the 1st of April, excluding the 27th of February, when no observation of governmental messages have been reported, as discussed in the descriptive analysis.

Fear transmitted by press



Similarly to government, also newspaper articles as the emergency progressed used less terms linked to fear in their articles, despite the absolute count of them rose up (see Figure 62). This can be explained by considering that the number of articles published grew during the lockdown phase, and therefore also the count of words

Figure 62: daily fear transmitted by press

related to fear naturally follow up. Furthermore, the decrease of fear transmitted (in relative terms) is in line with Vasterman theories regarding the unregular sense of alarm and fear transmitted by media, which tends to be higher when the crisis definitely breaks out (Vasterman and Ruigrok 2013). The plots cover continuously the period from the 22nd of February to the 1st of April.

Fear transmitted by tweets

The daily fear extracted in tweets is represented in Figure 63. The data belong to the days going from the 8th of March to the 1st of April, a shorter time-lapse compared to the two sources of information. As can be noticed, the number of words related to that emotion has a pattern that is very similar to the trend of tweets “#iorestoacasa”

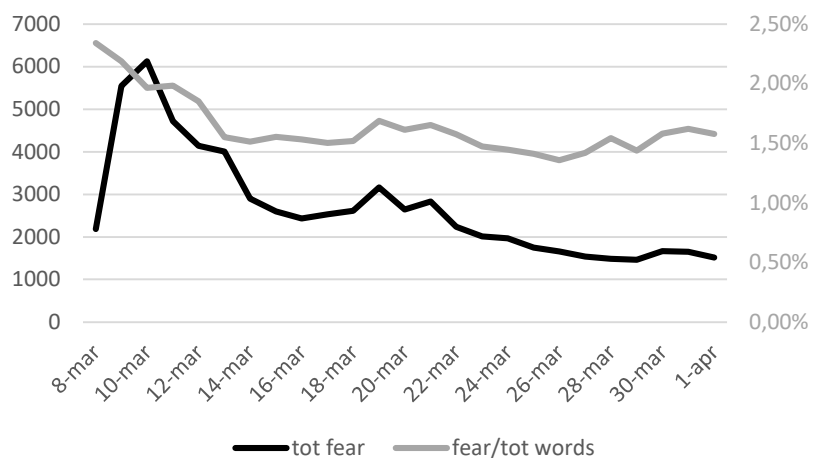


Figure 63: daily fear transmitted by tweets

posted (see Figure 63), with a peak in the 10th of march and a strong drop as the pandemic evolved. Moreover, the percentage of fear words appears to be high since the 8th of March and constantly drops, in line with the “tot fear” measure. This gives precious insights regarding the mood of population during the Covid-19 emergency, since it shows that the overall scare of citizens decreased over time. Indeed, it reflects the results of Zhao that observed a decrease of negative feeling of citizens along the crisis (Zhao et al. 2020) and, considering that the uncertainty was higher at the beginning of the crisis, these results confirm the theory of Reynolds, which relates fear with uncertainty (Reynolds 2006).

Fear indicators comparison

The average daily value of the two fear indicators in the three different sources are shown in *Figure 64*. Focusing on the absolute count of fear words (tot fear), tweets have the larger average value, before press and government. This makes sense, since there are way more tweets than articles or governmental messages.

However, the relative measure is more meaningful to compare the three sources fear's transmission. Firstly, press appears to have expressed scare than the government, in line with the results of Lee and Basnyat, which found that press tended to communicate more emotions (Lee and Basnyat 2013). However, despite expectation, the percentage of fear words contained in tweets is much lower than expectations, since citizens are more likely to share their emotions than formal information sources. This is probably be due to the vocabulary considered in the analysis, which is suitable to analyse government and press messages, but that instead don't cover all the everyday language of population, missing many "slang" terms. The fear expressed by tweets is therefore underestimated.

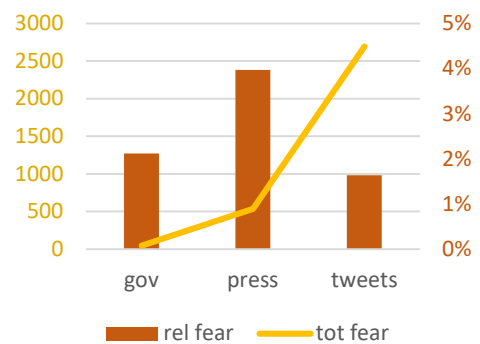


Figure 64: average daily fear in government, press and tweets

Correlations among themes

This part aims to find the relationships between the concerns expressed from one source to another. Firstly, the analysis focused on the two sources of information: government and press. Indeed, the indicators "tot fear" of both appears to be positively correlated (coef. = 0,336, p-value = 2,19%). Therefore, the amount of terms related to fear included in press articles was influenced by the empathy of government. This shows a strong link that exists between the languages of both sources and should warn public administration officers about the implications that governmental messages entail. Instead, no significant correlation was found between the relative percentages of fear-related words of the two information sources.

Regarding instead the impact that the fear transmitted by information sources have on the fear expressed in tweets, the results show no correlation. This means that, considering the data collected and processed in this study, there is no proof that there is a direct share of fear from information sources to population. In other words, communicating worries and scare has not directly affected the fear of citizens. However, a significant amount of words could have been missed in the analysis.

In order to deepen this consideration, it is then possible to see if, instead, the dominant themes impacted on population's concerns.

5.3.2. The impact of dominant themes on population's fear

The goal of this part of the analysis is to understand if daily fear words expressed in tweets are affected by the dominant themes, firstly by considering the two information sources together, and then exploring the coverage of government and press singularly. In other words, the aim is to understand if the themes discussed during the pandemic affected the worries of population. In order to match the period covered by topics of maintenance phase and tweets, and in order to assess how communication affected fear during the lockdown, the days considered in the analysis will go from the 9th (beginning of the quarantine) to the 1st of April.

Correlations between tweets' fear and information sources themes

The tool used is again simple linear correlation, already used in the previous chapters. Each of the six topics found in the topic modelling analysis has been put in relationship with fear expressed in tweets, both expressed in absolute and relative terms.

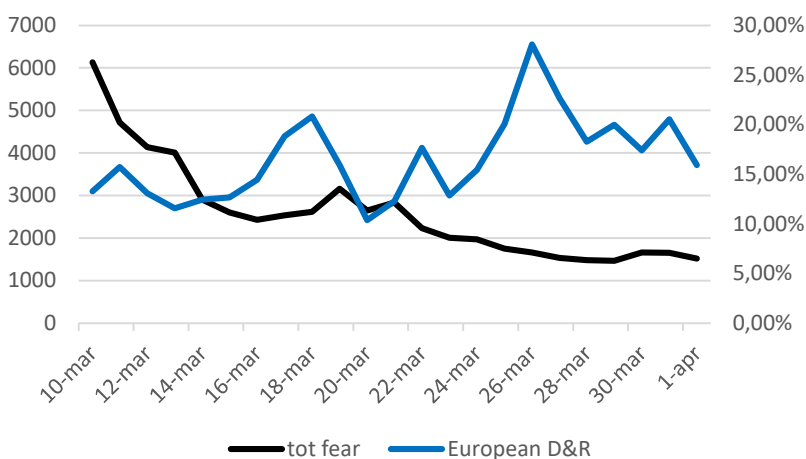


Figure 65: negative correlation between fear and EDR

Firstly, it came out that European Discussion and Relationship is negatively correlated with tweets' fear, both expressed in relative (coef. = - 0,01733, p-value = 2,78%) and absolute terms (coef. = - 14111,1, p-value = 1,41%). Therefore, there is statistical proof to believe that the more the discussion regarding European

affairs was popular, the less tweets transmitted scare. It could mean that the debates held in the EU parliament aimed at finding common solutions against coronavirus and the narration about the role of Italian government during these negotiations ended to raise a positive influence in the mood of citizens, that felt reassured. The two variables are represented in Figure 65 to be visualized.

Furthermore, a positive correlation has been revealed between D&M thematic evolution and fear (plotted together in *Figure 66*), expressed in both relative (coef. = 0,20045, p-value = 0,69%) and absolute terms (coef. = 13288, p-value = 1,62%). Therefore, the more decrees and new measures were discussed, the more tweets contained fear terms.

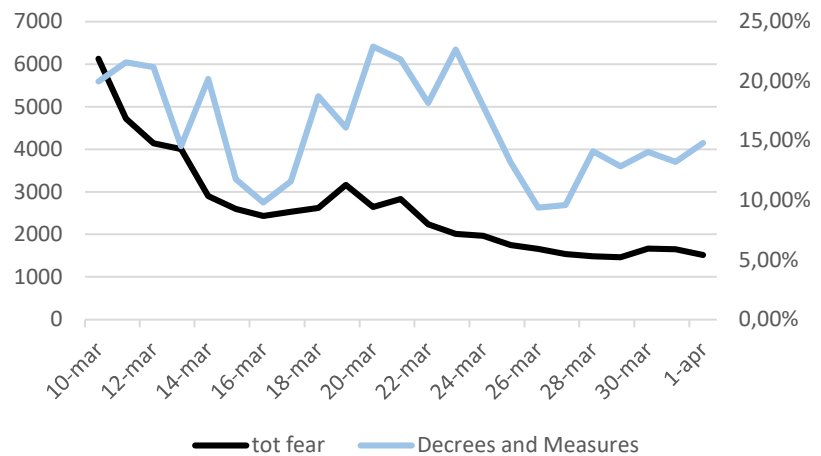


Figure 66: positive correlation between fear and D&M

This is quite surprising and it partially contradict Reynolds, which stated that at the beginning of a pandemic crisis, people want information regarding the measures made and government should provide those in order to tackle anxiety and fear (Reynolds 2006). This study already exploited this theory within the previous chapter about topic modelling while evaluating how much government covered informative theme, and the results revealed that government discussed proficiently this information theme regarding new measures. Therefore, according to Reynolds, by focusing communication on it, the uncertainty of population was expected to fall, together with fear. Instead, these findings suggest on the contrary that continuous flow of information regarding new measures could have, after some weeks, enhanced population fear and worries. Considering that the data observed belong to maintenance phase, when crisis was already settled in Italy since several weeks, a possible interpretation could be that, despite at the beginning of the crisis informing the population about the countermeasures conceived helps to reassure population, in the long run it becomes detrimental, as it generates confusion and discouragement.

Influence of governmental and press themes coverage on tweets' fear

Finally, under the assumption that the evolution of dominant topics discussed by press and government during the crisis influenced the emotional state of citizens, the goal is to build a model that explains which themes affected fear, and understand how much the significant predictors are able to explain its variability. Furthermore, the goal of the model will be interpretation, rather than prediction.

The difference from the previous part of the analysis is that, while before sources of information that reached citizens have been considered together, now press and government communication are separated, providing more precise insights and suggestions in order to understand how government and press communication affected fear during the lockdown (in particular from the 10th of May to the 1st of April).

Since fear is measured with two different measures, one expressed in absolute (Tot fear) and the other in relative terms (Rel. fear), two different linear regression models will be assessed.

Statistically, the models that will be tested can be resumed with these formulas:

$$1. Tot\ fear \propto \sum_{t=1}^6 T_t^{Gov} + \sum_{t=1}^6 T_t^{Press}$$

$$2. Rel\ fear \propto \sum_{t=1}^6 T_t^{Gov} + \sum_{t=1}^6 T_t^{Press}$$

Where “t” are the 6 topics found with the topic modelling, T^{Gov} is the percentage of discussion of the topic by government and T^{Press} is the percentage of discussion of press. Therefore, in both models, the total number of variables considered to assess which factors influenced fear words is 12. The method used to select the significant variables is backwards stepwise selection, and only the variables with a p-value lower than 5% have been kept.

“Tot fear” model

The results of the regression model are summarized with the formula (where ε is the random component of the regression, therefore the part of tot fear expressed in tweets which is not explained by the model):

$$Tot\ fear = 6.626 D\&M^{Gov} + 3.980 SS^{Gov} + 11.986 ES^{Press} + \varepsilon$$

$$R^2 = 45,86\%; \quad p - value(D\&M^{Gov}) = 0,19\%; \quad p - value(SS^{Gov}) = 1,44\%; \quad p - value(ES^{Press}) = 3,67\%$$

The regression revealed that three thematic positively affected fear in tweets, two are held by government and one by press.

In particular, governmental communication seemed to have affected fear when talking about new measures and also while describing the sanitary situation. The former confirms the results of the previous part of the analysis regarding the impact on population worries of the continuous changes in the regulations aimed at handling the crisis, and this underlines the active role of state in promoting this subject. The latter instead reveals that governmental communication regarding sanitary situation, that was primarily held by Civil Protection, also contributed to generate scare. In fact, a possible explanation could be due to the dramatic content of the topic which discussed the terrible situation in those days, covering the worst moment of the crisis where the infected people were sharply rising and the hospitals were overwhelmed. In this case, the content of this theme can be considered as exogenous, since the messages simply reported the actual

situation, and the discussion of government about this topic can't be considered as wrong or avoidable in this case.

The third component is instead related to press discussing the economic situation. Despite government tended to cover this subject more than newspapers, results show that press has negatively affected the emotional state of population, maybe because it has used more panicked terms while forecasting the possible future scenarios and detailing the actual situation.

The model captures about 46% of the variability of fear words contained in tweets (R^2), which means that the variables selected can explain almost half of the fear words of tweets, which is a significant result.

“Rel fear” model

The results of the regression model are summarized with the formula:

$$Rel\ fear = 0,0081 D\&M^{Gov} + 0,0050 SS^{Gov} + \varepsilon$$

$$R^2 = 36,81\%: p - value(D\&M^{Gov}) = 0,37\%; p - value(SS^{Gov}) = 2,93\%;$$

Focusing of the relative measure of fear in tweets, results are very similar to the other model. Once again, it appears that government discussion of new measures established and sanitary matters have positively impacted on the amount of fear expressed within tweets. Since those variables are confirmed as significant in both model, this strengthen the hypothesis that they truly impacted population's worries. The only major difference regards the absence in this model of the variable that expresses the economic situation discussed by press. This rises up some doubts about the actual significance of this last variable on population's fear, also considering that in the previous model it has the higher p-value. Looking at the R^2 , the variables in this linear regression are less able to explain the relative fear in tweets than previous model, even if it can still be considered as an important result.

However, for both models, two important considerations must be done regarding the characteristics of this model, that tell how much it is reliable and deprived from bias.

At first, looking at the residual's (ε) plots, some characteristics such as randomness and normality are not satisfactorily respected, and therefore the model must be perfected with some more advanced tools and research.

In general, surprisingly, press appears to be not very important in order to explain fear pattern expressed in tweets, despite media are believed to be able to affect citizens perception's of events and their emotional

state (Pan e Meng 2016). However, the fact that some variables are not in the model doesn't mean that they don't have a correlation, but simply it reveals that they are not able to explain the fear level alone. Indeed, previous chapter showed that information sources (and therefore also press) do have impacted on fear.

Then, it must be taken into account that topics impact on fear also strongly depend on the content that is communicated. For instance, while sanitary thematic during the first days of lockdown raised scare due to the dramatic situation, in the recovery phase it could have generated the opposite reactions. That's why the study deeply analysed the content of those topics and proficiently discussed about the most frequent words of each of them.

Finally, there is a significant difference can be noticed comparing the model's results with the correlation that have been observed between fear indicators and general topics discussed by all sources of information. Indeed, the topic about European debates in search of a common solution to the crisis is not included in linear regression model. Therefore, population has not been affected by a specific source but by the overall flux of information that was generated.

Nonetheless, the results seem promising and suggested some significant clues.

The final wrap up and all the comprehensive conclusions are detailed in the following part of the research study. Moreover, the chapter also provides the limitation encountered and some hints for future studies, concluding by extracting the main managerial implication that can be retained.

6. Conclusions

This last part of the study will firstly provide a comprehensive recap of the main results obtained in the previous chapter and then it will assess the limitations that could open up to new opportunities for future research. Finally, the main managerial insights that can be extracted are detailed.

6.1. Final communication assessment

The goal of this study was to analyse communication during pandemic and assess whether it has influenced population's fear, and the results seem promising to understand this relationship.

Within the context of Crisis Management, previous studies have acknowledged the crucial relevance of communication, especially during pandemics when it becomes the only real tool that the government can exploit waiting for the vaccines (Lee and Basnyat 2013). In fact, a proper communication builds organisation's credibility (Reynolds 2006), facilitates the adoption of the measures established by the State and is able to limit panic and fear diffusion, which would may exacerbate harm, leading to severe and sometimes deadly consequences (Espinola et al. 2016). Therefore, studying more in depth the role of communication has become increasingly important in order to improve Crisis Management Cycle processes.

The results of this study can be grouped into three main scopes. At first, text mining tools revealed promising outcomes, able to effectively describe communication patterns which can be linked, and explain partially, the fear of citizens. Then, the analysis has been able to disentangle government and press dominant themes' coverage, comparing the main differences and disclosing some information useful to evaluate governmental communication's strategy over time. Finally, the results portray an overall picture of the first weeks of Covid-19 pandemic, narrated from an Italian perspective.

Firstly, as a matter of fact, topic modelling highlighted the main thematic lines during the crisis, and even if the majority of themes remain averagely unchanged, the focus, the semantic and the discussions within the dominant frame has manifestly changed, similarly to the findings of Lee and Basnyat (Lee and Basnyat 2013), Yu (Yu et al. 2020) and Liao (Liao et al. 2020). It can be considered, therefore, an indication of how communication needs changed over time and adapted to the events.

More specifically, sixth dominant thematic have been identified and their evolution over time have been successfully recognised by the text-mining algorithms, revealing some clues about how communication needs have progressed during the pandemic.

Firstly, one topic regarded the description of measures and the details of the new decrees that were established in order to face the crisis. While in initial phase the communication effort focused on the

delimitation of red zones and of the suspension of activities, in the maintenance phase the measures were more about specific regulations for the lockdown.

Secondly, a part of messages shared personal thought, narrating the experience of coronavirus emergency at an individual level. These reflections started by analysing the crisis and the consequences on society and on citizens, but they have been deeply marked by the lockdown experience, with an increase of words such as “freedom”, “home” or “outside”.

Then, an important theme has been obviously the sanitary situation, a crucial scope within the narration of a pandemic. While providing updates regarding infected and hospitalised people, a change in communication can be noticed, since the attention shifted from a simple report of the outbreaks to the description of preventive measures and tools, such as masks.

Similarly, also economic situation had a dedicated topic during both stages of the crisis. In the initial phase the discussion turned around the crisis and its consequences and future scenarios, and then, once the governmental plans were revealed, the focus went on their description and comment.

The fifth dominant theme regarded the description of government actions and political debates and, as the crisis progressed, the attention shifted from regional actors towards centralized figures and in particular to prime minister’s Giuseppe Conte. This is probably due to the change of governmental communication strategy, which over time decided to assign the role of reporting official messages to fewer centralised actors, in order to improve the clarity and consistency of communication.

Finally, the sixth and last topic it is the one that changed the most. Indeed, in the pre-lockdown phase, it narrated the evolution of the pandemic, that was born in China and quickly extended to other countries reaching more and more Italian regions. Then, once the phenomenon became global, this topic decreased of interest, in line with the findings in the study of Yu (Yu et al. 2020), and the new thematic maintained an international level, but focusing on the relationship with EU and the debates that were held to find common solutions to the crisis.

Aside from the thematic changes, in some cases topics resulted to be significantly correlated among them (with p-value lower than 5%), providing further understandings of communication patterns during crises. Indeed, the popularity of the more political theme (Focus on Government) revealed to be negatively correlated with sanitary updates in the initial stage of the pandemic, while instead during the lockdown it has been alternated with economic matters. These results could highlight the secondary role of political debates, which seems to have gained popularity when the discussion of more concrete concerns, such as sanitary situation in the initial phase and financial consequences during lockdown, dropped. Moreover, the discussion regarding new measures revealed negatively correlated with economic matters in the pre-lockdown phase and with the topic of European negotiations afterwards. Therefore, this can be a clue to

assess that the assessment of countermeasures to tackle the emergency has been in the initial phase clearly considered as separated to the study of economy, and the design of related financial manoeuvres, while during the lockdown it has been opposed to the negotiation of measures to apply at the European level.

All the steps of the analysis revealed important details, aimed at investigating in depth how communication of information sources has been carried on and has evolved through time. Once everything has been understood in this sense, fear has been extracted from texts of government, press and tweets, its evolution along time has been discussed and, finally, the main research question can be pursued, in order to assess which communication factors have affected fear in tweets.

In particular, the topic regarding new decrees and measures (D&M) seem to positively affect the amount of fear, while on the contrary the discussion about European common actions to face the crisis (EDR) seems to have reassured the users. This means that, during the lockdown, the introduction of new measures and the update of decrees has increased fear and worries of citizens. While Reynolds theory states that in the initial stage of a crisis, providing population information about what is being done to tackle it (and therefore detailing the countermeasures) help in reassuring the population (Reynolds 2006), this outcome suggest that providing modification and further countermeasures later on in the maintenance phase will produce the opposite result. Instead, the discussions regarding European negotiations in order to establish common measures to tackle the emergency have limited population's fear. This is probably due to the stronger guarantees that a common effort can produce, together with the economic support that has been established in order to especially help the most struggling countries such as Italy.

In general terms, this study revealed how the topics identified with topic modelling techniques are able to describe the daily evolution of thematic discussion and can disclose relevant insights regarding the impact of communication on population, if provided with all the desired data.

The second scope of the results regards instead the two main sources of information, comparing press and government thematic coverage and revealing some insights about governmental communication strategy, that can be used to evaluate it and assess the direct role of the two sources on population's fear.

At first, looking at governmental communication strategy, it emerged that it has focused only on few topics, confirming the results of Lee and Basnyat, while instead press discussed evenly about each of them. Specifically, in the initial phase, the description of the measures and restriction decided to face the coronavirus sanitary crisis has been by far the main centre of attention of the state. Instead, once the legislative enactments were established, and therefore during the lockdown, governmental sources had the opportunity to cover more proficiently also sanitary and economic themes thanks to the daily conference press of Civil Protection and with a dedicated decree containing financial support.

Moreover, evaluating governmental communication according to Reynolds theories (Reynolds 2006), in the initial phase it has been able to cover sufficiently informative needs of citizens especially regarding what were the measures introduced, despite it maybe lacked to detail precisely what was going on and where. In the lockdown phase, instead, sanitary situation was covered by Civil Protection, continuing to underline the risks associated to the pandemic and therefore the importance of prevention. The decrease of fear registered in tweets can be a consequence of this strategy by government which has fairly followed the instructions from theory in the period considered.

Exploring eventual correlations between government and press discussion, in most of the cases press seems to decide which topics to cover daily regardless of what the government communicated the day before. The only significant exceptions regard Economic Situation in the initial stage, for which there is a negative correlation, and Decrees and Measures during the lockdown, for which press instead followed the governmental communication.

Regarding fear analysis, it highlighted that government expressed a more neutral tone with respect to press, as other studies have also revealed (Lee and Basnyat 2013). Looking at the overall trend of fear, both information sources have decreased the amount of worried terms in their messages (Rel. fear), in line with tweets. Moreover, the amount of fear words transmitted by the two sources of information resulted positively correlated, both for the absolute (Tot fear) and relative measure (Rel. fear). This shows how government communication can truly impact on press language and sentiments transmitted. Instead, no direct relationship was found between the information sources (government and press) and tweets' scare words.

With the aim of ultimately assess how governmental and press communication have impacted on population's fear expressed in tweets during the lockdown (in particular from the 10th of march to the 1st of April), the dominant themes discussed by the two founts has been considered separately and a linear regression model has been built.

The results of both models revealed that governmental messages have affected tweets' scare with the description of the new measures introduced and while updating the daily sanitary situation. While the former variable confirmed the previous findings, the latter can be due to the dramatic numbers that Civil Protection has announced regarding the health situation during the month of March. Furthermore, a third variable resulted significant in the model of Tot fear, representing the economic theme discussed by press. Indeed, it appears as positively affecting worries of population, probably because newspapers covered more widely and precisely the narration of the economic dynamics and its potentially dramatic future scenarios. Finally, neither of the two variables that measure the daily discussion of government and press about European

negotiations appeared as significant. This means that citizens' worries have been affected by the overall voice coming from both founts of information, rather than one single source.

Finally, this study provides an interesting representation of the first 40 days of coronavirus pandemic in Italy. Indeed, the dominant themes' evolution is able to describe the main subjects of discussion, hence revealing the main events that occurred in that period. For instance, "Decrees and Measures" topic have successfully recognised the days when the main decrees came out, and were even able to show when information leaks regarding the new measures occurred, when therefore press discussion anticipated government information regarding new measures introduced. Moreover, "Pandemic Evolution" has effectively followed the diffusion of the virus, starting from China and then discussing the firsts Covid-19 hotbeds in northern Italy, and then in the rest of Europe.

In general terms, all the thematic changes that have been observed from initial to maintenance phase should be seen also as a witness regarding how such a dramatic event has been perceived and have affected the population thoughts and lives. In fact, the outcomes of this study are providing a picture of Italy during coronavirus pandemic, described by communication themes that have been discussed by government, press and, consequently, by citizens.

6.2. Limitations and Future Research

Within the context of Governmental Crisis Management Cycle, this study analysed the dynamics and the impact of communication in the first part of crisis phase. Despite the different findings, the results are limited in terms of period covered, since a significant part of lockdown (which has been one of the world's longest (Anon s.d.)) and the recovery from the first wave is missing. Future studies could assess the complete evolution of themes until July, when the daily life came back to almost normal situation. The increase in the amount of data would also be important to reinforce the studies about correlations among themes, providing more robust evidence.

Moreover, similarly, the research could be extended also on the second wave, that occurred in autumn 2020, in order to observe similarities and dissimilarities regarding thematic covered, fear pattern and communication trends in comparison to the spring outbreak. In fact, this would give an indication of how government strategy differed, and what have been the main takeaways from the first outbreak that have been retained. The more phenomenon are described using these tools, the more it will possible to extract general guidelines and insights useful to design more targeted and effective communication strategies.

In a general perspective, the coronavirus pandemic could be also exploited in order to evaluate also pre and post crisis phases, understanding what have been done in between the waves and how a second rise of the infected people have been considered within the planning stage, which is a significant part of Crisis Management Cycle, when all practitioners agree that most of the effort and preparation should be done. Considering Gundel's model for crises classification, the improvement of processes that transform learning from past emergencies into useful knowledge could, with time, affect predictability of pandemics. In this way, their classification in the model will shift from fundamental to intractable crisis, where the system embeds the eventuality of occurrence of these events, decreasing the reaction time and the damages generated.

Then, other fonts such as television, radio, or internet have not been considered in the study, while they represent the majority of information sources (Autorità per le Garanzie nelle Comunicazioni 2018). Despite this limitation, the implicit assumption is that all sources didn't differ too much in the content shared through the crisis, also taking into account that journalists have exploited the several medias to share the same opinions. Furthermore, newspaper have the advantage of providing well diversified opinions and judgements (especially comparing them to television) and can therefore be considered as very complete from this point of view. A more extensive use of data could however reveal interesting additional insights, especially those posted on the internet, which is probably becoming the first information media in next years (Autorità per le Garanzie nelle Comunicazioni 2018).

In addition to this, newspaper articles have been retrieved by the official governmental press release, which could raise some doubts regarding the possible bias of these observation processed. However, descriptive analysis revealed that the number of articles reflect the popularity of newspapers in Italy, and even the more dissident and independent magazines have been sufficiently included. Moreover, it must be taken into account that the tools used to transcript articles (OCR converter from Pdf to Word) and government announcements (caption extractor from videos) into proper dataset could have misspelled or failed the recognition of some words, even if the margin of error has been relatively low and can be therefore neglected.

Furthermore, fear dictionaries that have been built and used did not extracted completely the fear expressed in tweets, since probably many everyday words slangs was not considered, a deeper analysis of the language is necessary to be more precise in the sentiment analysis. However, despite this underestimation od fear transmitted by tweets, the omission of terms is the same across all the period under examination, and therefore the overall pattern recognised can still be considered as reliable. Furthermore, the study has been conducted focusing on population fear as the main effect that communication can generate. However, given the promising results observed, other emotions could be extracted in order to obtain a wider spectrum of population feelings over time and to have a better

Regarding tweets, the hashtag “#iorestoacasa” has provided more than 200 thousand tweets, but since it was born on a governmental initiative, the period covered is very limited and coincides with the beginning of lockdown phase. If the analysis wants to evaluate population emotional state in a more extended period, other key words that have been used in Italy all over the crisis should be exploited to retrieve tweets.

Finally, the analysis focused on the assessment of communication content, but also the inner structure and the form of a message have an impact on the addressee. Nevertheless, a further investigation exploring this matter would require more specific theories belonging to communication science domain and more complex algorithms that are able to process deeper grammatical and logical analysis of texts.

6.3. Policy and managerial implication

From an organisational point of view, the insights revealed by this research can be embedded within the theory of Crisis Management Cycle.

The study revealed that some dominant themes discussed by information sources can affect population's fear, and government must be aware of its communication importance in order to limit panic diffusion. For instance, while at the initial stage of the pandemic Reynolds stated that population asks for timely description of what is happening and what is being done by central administration in order to face the emergency, this study found that, in the following stage of the lockdown, people's emotions were instead negatively affected by the continuous update of new measures by government. In addition to this, during the lockdown, the overall theme discussing the negotiations made within UE have reassured citizens, probably because of the stronger guarantees that being in the Union can provide a thanks to the successful achievement of a common agreement.

Therefore, while state's messages must be well designed covering the right themes in order to appease uncertainty and reduce negative feelings, it is important to consider that informative needs change over time and governmental communication should follow. In order to do so, the role of newspapers can be very helpful. Indeed, they are characterised by many voices that share different opinions and points of view, and ultimately, as demonstrated in this study, their communication can be analysed with topic modelling tools in order to recognise the changes in subject focus, and hence of informative needs.

Similarly, tweets' analysis revealed interesting results and should be performed also in future in order to assess in almost real-time how population reacted to governmental communication, allowing to optimise the messages to best suit citizens' informative needs, relieve anxiety and fear and strengthen the credibility of the State.

In general, aside from the results emerged analysing the first period of coronavirus outbreak, practitioners have taught that it is crucial to gather as much knowledge as possible from all the crisis stages. The methods and tools adopted in this study can be applied in future scenarios in order to draft some important KPIs exploiting data coming from tweets, newspapers or other sources. Indeed, the strengths of a crisis management cycle mainly come from the ability to collect data and learn from past experiences and build useful knowledge in order to improve the reaction capabilities in future detrimental events (Tokakis et al. 2019).

For instance, Reynolds forecasted that in the recovery phase news media focus on assessing the success of governmental crisis management and of measures established to tackle the emergency. Therefore, in addition to the evaluation that will be held internally, public administrations should consider those

judgements released in the post-crisis phase, collecting many feedbacks and knowledge that will be important to prepare for future outbreaks. Indeed, the resulting information produced in evaluation stage strongly affects pre-crisis phase, which is the moment in which most of the planning should be done, by considering the types of disaster that could occur, by anticipating the needs and by drafting general communication plans ready to adapt to next dramatic events.

Finally, while this study has mainly focused on public organisation as the main centre of interest to which Crisis Management Cycle has been applied, most of the insights can be reported and considered also in the private sector.

Indeed, companies as well have to face several emergencies that thread their strategic and financial position, and coronavirus crisis is a tragic example of how sudden events can undermine dramatically the well-being of entire businesses. One of the main differences with the public sector is that, while crisis management is one of the main activities for government, companies have rarely incorporated this function in their daily business.

Instead, many studies have observed that companies that prepare for crisis events are better able to handle them more efficiently and successfully (Kash and Darling 1998). Therefore, the benefits of a well-structured Crisis Management Cycle that organises prevention, preparation and intervention activities can be very important for the safeguard of a company, that is able to quickly identify risks, prepare early and adjust the right actions to recover as timely as possible.

All in all, communication has a key role also in businesses. Indeed, a company must be willing to quickly open the lines of communication to stakeholders, otherwise it will be judged “guilty until proved innocent” (Kash and Darling 1998). The information provided should address both current crisis issues and how it will affect company in the future, similarly to government that have to describe the situation and share the plans to recover. Despite the audience to be reached can be different, the communication goals, benefits and importance remain unchanged.

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