



Article

The Polarization Loop: How Emotions Drive Propagation of Disinformation in Online Media—The Case of Conspiracy Theories and Extreme Right Movements in Southern Europe

Erik Bran Marino ¹, Jesus M. Benitez-Baleato ^{2,*} and Ana Sofia Ribeiro ¹

¹ CIDEHUS—Centro Interdisciplinar de História, Culturas e Sociedades, Universidade de Évora, Palácio do Vimioso, Largo do Marquês de Marialva, n.º 8, 7000-809 Évora, Portugal; erik.marino@uevora.pt (E.B.M.); asvribeiro@uevora.pt (A.S.R.)

² Political Analysis Research Group (Grupo de Investigaciones Políticas), Universidade de Santiago de Compostela, 15705 Santiago de Compostela, Spain

* Correspondence: jesusmanuel.benitez.baleato@usc.gal

Abstract: This paper examines the influence of emotions on political polarization, looking at online propagation of conspiracy thinking by extreme right movements in Southern Europe. Integrating insights from psychology, political science, media studies, and system theory, we propose the ‘polarization loop’, a causal mechanism explaining the cyclical relationship between extreme messages, emotional engagement, media amplification, and societal polarization. We illustrate the utility of the polarization loop observing the use of the Great Replacement Theory by extreme right movements in Italy, Portugal, and Spain. We suggest possible options to mitigate the negative effects of online polarization in democracy, including public oversight of algorithmic decision-making, involving social science and humanities in algorithmic design, and strengthening resilience of citizenship to prevent emotional overflow. We encourage interdisciplinary research where historical analysis can guide computational methods such as Natural Language Processing (NLP), using Large Language Models fine-tuned consistently with political science research. Provided the intimate nature of emotions, the focus of connected research should remain on structural patterns rather than individual behavior, making it explicit that results derived from this research cannot be applied as the base for decisions, automated or not, that may affect individuals.

Keywords: disinformation; polarization; emotions; conspiracy; artificial intelligence; natural language processing; media; digital; extreme right; Italy; Portugal; Spain



Citation: Marino, Erik Bran, Jesus M. Benitez-Baleato, and Ana Sofia Ribeiro. 2024. The Polarization Loop: How Emotions Drive Propagation of Disinformation in Online Media—The Case of Conspiracy Theories and Extreme Right Movements in Southern Europe. *Social Sciences* 13: 603. <https://doi.org/10.3390/socsci13110603>

Academic Editors: Concha Pérez Curiel, José Rúas Araujo, Talia Rodríguez-Martelo and Isaac Maroto-González

Received: 19 August 2024

Revised: 18 October 2024

Accepted: 21 October 2024

Published: 5 November 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Conspiracy theories have been associated with the rise of extremist political movements capable to challenge societal cohesion in democratic countries. For example, the Great Replacement Theory (GRT), a type of Population Replacement Conspiracy Theory (PRCT), claims that native populations in Western countries are being systematically replaced by minorities such as African, Arabic, or Roma groups. First proposed by French writer Renaud Camus in 2011, the theory argues that a deliberate, orchestrated plan exists to replace the European population with non-European immigrants, particularly from Africa and the Middle East, through migration and differential birth rates (Camus 2012). Like other conspiracy theories—such as those involving 5G chips in COVID-19 vaccines, Annunaki extraterrestrial governance, or Illuminati control—Population Replacement Conspiracy Theories (PRCTs) can be debunked with empirical evidence. However, such evidence is only effective when people engage in logical thinking, whereas decision-making often involves emotional reactions, religious beliefs, or ethnic identity as well (Máiz Suárez 2010). Those dimension of rationality render many regulatory and technical approaches inefficient,

as they wrongly assume decisions are based solely on logical reasoning and empirical evidence. To counter the harmful effects of conspiracy theories, especially in the online realm where disinformation spreads rapidly and threatens democratic processes like elections, new approaches are needed.

This paper proposes a theoretical framework to explore the role of emotions in the spread of conspiracy theories like PRCTs and their influence on extremist political movements. Drawing from psychology, media studies, political science, and systems theory, we introduce the ‘polarization loop’, a causal mechanism explaining how emotions, such as fear, anger, hate, nostalgia, and insecurity, shape public perceptions and political behavior on the basis of a cyclical and self-reinforcing relationship between extreme messages, emotional engagement, media amplification, and societal polarization. In order to illustrate how the polarization loop works, we examine the case of extreme right movements in Italy, Portugal, and Spain, exploring how emotional engagement may have played a role in their rise, gathering anecdotal evidence useful to illustrate the analyzed cases. Our goal with that analysis is not to empirically validate our polarization loop, but to demonstrate the utility of our theoretical framework to articulate hypotheses that can be empirically tested using established social science methods.

In addition to contributing to build a more robust theoretical foundation to understand the spread of conspiracy theories, our research can be useful for policy-makers and technologists looking to address the spread of online disinformation. Empirical or logical debunking alone is insufficient, as these narratives thrive on emotion, beliefs and identity. By dissecting the emotional mechanisms driving the spread of conspiracy theories such as PRCT we can better understand how to neutralize their divisive effects and foster better substantiated deliberation. This implies that beyond possible interventions on the information distribution chain, such as public oversight of algorithms and data, or engagement of social science and humanities in computational research, our paper emphasizes the centrality of the receiving end of online information and, therefore, the utility of policy interventions aimed at enhancing education, media literacy, critical thinking and resilience against emotional manipulation.

We deploy our research as follows. First, we present our theoretical framework looking at the interplay of disinformation, emotions and polarization, evaluating the impact of online echo chambers, and the normalization of extremist narratives. This theoretical discussion provides the basis to articulate the ‘polarization loop’, a causal mechanism explaining the role of emotions on online polarization. Then we illustrate how the polarization loop can be used to empirically evaluate the role of emotions online. For this purpose, we first explain how it can be used both in the context from statistical studies and qualitative research, and we then explore the case of PRCT in extreme right movements of Italy, Portugal and Spain. We close the paper with a final discussion, presenting our main findings, explicitly noting the limitations of this research, and identifying possible directions to further improving our understanding of how emotions play a role in the spread of online disinformation.

2. Theoretical Framework

2.1. Online Disinformation, Emotions and Polarization

The rise of extreme right movements and conspiracy theories in contemporary politics has garnered substantial scholarly attention. A comprehensive understanding of these phenomena requires a multidisciplinary approach, incorporating insights from psychology, media studies, systems theory, and political science. While existing theories address aspects such as emotions in political behavior, misinformation dynamics, and social media’s role in polarization, they often fail to explain the cyclical, self-reinforcing interactions among these elements. This literature review examines key theoretical models on emotions in political communication, the dissemination of conspiracy theories, and the influence of social media, identifying limitations that the proposed feedback loop model seeks to address.

2.1.1. Emotions in Political Behavior and Social Media Engagement

The centrality of emotions in politics is now a widely accepted tenet in the discipline (Rivera Otero and Lagares Díez 2022). Affective Intelligence Theory (AIT), developed by Marcus et al. (2000), provides foundational insights into how emotions influence political behavior. AIT differentiates between two emotional systems: the dispositional system, which is linked to routine behaviors and emotions like enthusiasm, and the surveillance system, triggered by fear and anxiety, prompting individuals to seek new information and potentially reconsider their political choices (Marcus et al. 2000). Although AIT has been pivotal in illustrating the impact of emotions on political decision-making, it does not address the role of social media in amplifying emotional content or in spreading conspiracy theories.

Additional insights are provided by Ekman (1992), who categorizes emotions into primary types, such as fear and anger, which are universal, and secondary types, such as pride and insecurity, which are influenced by social and cultural contexts. Political actors frequently exploit these emotions, using fear to provoke feelings of insecurity and anger to evoke pride among followers. Emotions like fear, anger, and anxiety play a significant role in political engagement and in supporting conspiracy theories. For instance, Zmigrod and Goldenberg (2020) demonstrate that emotional reactivity and cognitive rigidity are linked to support for extreme political actions. Similarly, Bakker et al. (2020) found that individuals with extreme political views exhibit increased emotional arousal in response to political rhetoric, which can lead to changes in attitudes.

Social media amplifies these emotional responses through emotional contagion, a phenomenon in which emotions spread across networks (Kramer et al. 2014). This is particularly relevant to conspiracy theories, which often rely on emotional engagement to gain traction. For example, during the COVID-19 pandemic, Peitz et al. (2021) observed that emotions such as anger and anxiety were associated with behaviors like non-compliance with government restrictions, demonstrating how disinformation is often embedded with emotions. In this way, social media not only facilitates emotional contagion but also accelerates polarization by encouraging users to engage with emotionally charged content, which can drive individuals toward more extreme positions.

2.1.2. Echo Chambers, Filter Bubbles, Algorithmic Curation and Machine Habitus

Social media platforms are especially effective at spreading misinformation due to their structures, which foster ideological isolation and encourage selective exposure. Echo chambers and filter bubbles play a central role in this process. Echo chambers, as described by Sunstein (2001), refer to environments where individuals are primarily exposed to information that aligns with their existing beliefs. This human dynamic—not only restricted to online environments—reduces exposure to differing perspectives, reinforcing users' preconceptions. Expanding on this concept, Pariser (2011) introduces the idea of filter bubbles, where social media algorithms curate content based on users' previous behaviors, further narrowing the diversity of information encountered.

However, Bruns (2019) offers a more critical perspective, arguing that these concepts may oversimplify the complexities of online behavior. He notes that while algorithms do influence content exposure, the role of human agency is often underestimated, and the impact of these so-called "information cocoons" may not be as pervasive or deterministic as initially believed. According to Bruns, users still frequently encounter a range of perspectives, even in environments that seem ideologically homogeneous, and the emphasis on echo chambers and filter bubbles might distract from the more significant drivers of polarization, such as broader societal forces and human choices.

Social media also facilitates rapid dissemination of content without traditional editorial gatekeeping, distinguishing it from conventional media (Stein et al. 2014; Vosoughi et al. 2018). Algorithms on these platforms prioritize emotionally engaging and often sensational content, which frequently includes extremist narratives and conspiracy theories. Studies by Benítez-Baleato (2021) and Calderón et al. (2020) highlight that algorithmic curation

systematically amplifies polarizing narratives, increasing the visibility of content likely to evoke emotional responses. As a result, social media not only fosters the spread of disinformation but also entrenches users within filter bubbles that reinforce their existing beliefs, although [Bruns \(2019\)](#) cautions against assuming that these bubbles are as impermeable or universal as some theories suggest.

Further deepening our understanding of these dynamics, the concept of machine habitus offers a sociological perspective on how algorithms influence online behavior beyond simple content curation. As introduced by [Airoidi \(2021\)](#), machine habitus draws from Pierre Bourdieu's theory of habitus, which explains how individuals internalize societal norms and structures. In a similar manner, algorithms also absorb cultural and social patterns from the data they process, thus perpetuating existing biases and inequalities. By embedding societal biases within their predictive models, algorithms contribute to the reproduction of social and ideological structures, reinforcing the effects of echo chambers and filter bubbles, though Bruns' critique reminds us to view such effects within the broader context of user agency and social forces. Through machine habitus, algorithms act as social agents, shaping user behavior in a way that both reflects and amplifies existing cultural dispositions, ultimately contributing to polarization ([Airoidi 2021](#)).

The rapid spread of misinformation on social media, particularly conspiracy theories, is largely driven by the novelty and emotional appeal of such content. [Vosoughi et al. \(2018\)](#) demonstrate that false news spreads more quickly than factual information on social media, capturing users' attention through emotionally provocative content. This finding aligns with systems theory, which posits that interconnected components like emotional responses and media amplification produce self-reinforcing feedback loops ([Meadows 2008](#); [von Bertalanffy 1969](#)). In political systems, these feedback loops contribute to polarization and ideological entrenchment, as [Easton \(1965\)](#) explains. Social media platforms thus act as amplifiers of emotionally engaging misinformation, facilitating rapid dissemination and reinforcing users' ideological positions, though, as Bruns suggests, the extent to which this leads to isolation from opposing viewpoints remains a matter for further empirical investigation.

2.1.3. Discursive Shifts and the Normalization of Extremist Narratives

The role of social media in amplifying emotionally charged content also contributes to the normalization of extremist and conspiratorial narratives. [Krzyżanowski \(2020\)](#) explores the phenomenon of discursive shifts, which involve gradual changes in language and rhetoric that enable extremist and racist narratives to enter mainstream discourse. Social media facilitates these shifts by fostering repeated exposure to extreme messages, which can make previously fringe ideas seem more acceptable. However, while [Krzyżanowski \(2020\)](#) provides valuable insights into how radical ideologies gain traction, their model does not address the role of emotional engagement or the ways social media drives these dynamics.

Polarization, as defined by [Sunstein \(2009\)](#), is a significant consequence of this feedback loop involving emotional engagement and media amplification. It reflects a growing ideological divide between groups, which decreases mutual understanding and entrenches extreme positions. [McCarty et al. \(2006\)](#) argue that repeated exposure to extreme messages normalizes fringe ideas and embeds them within mainstream political discourse. Social media accelerates this polarization by continuously promoting emotionally engaging content, which further entrenches users in polarized narratives ([Calderón et al. 2020](#)).

2.2. The Polarization Loop Model

To clarify the interplay between extreme messages, emotions, algorithmic dynamics, and polarization, we drew from systems theory. Systems theory is particularly useful for explaining the cyclic intricacies of political communication and the spread of disinformation. In systems, interconnected components interact to produce emergent behaviors ([Meadows 2008](#); [von Bertalanffy 1969](#)). This perspective illuminates how interactions among extreme messages, emotional responses, media amplification, and societal polarization contribute

to self-reinforcing feedback loops. Within political systems, such interactions can lead to unpredictable outcomes, including heightened polarization and divisive public debates (Easton 1965).

We propose a Feedback Loop model that integrates the emotional mechanisms underpinning the spread of conspiracy theories and the rise of extreme right movements. This model emphasizes how emotions—especially fear, anger, and insecurity—interact with media amplification and polarization, generating a self-reinforcing cycle. Incorporating these emotional factors allows for a deeper understanding of how conspiracy theories and radical political movements, once introduced, solidify their presence in the public sphere.

The feedback loop can be visualized in four primary stages: **Extreme Message**, **Emotional Engagement**, **Media Amplification**, and **Polarization**. Each stage perpetuates the cycle, as illustrated in Figure 1.

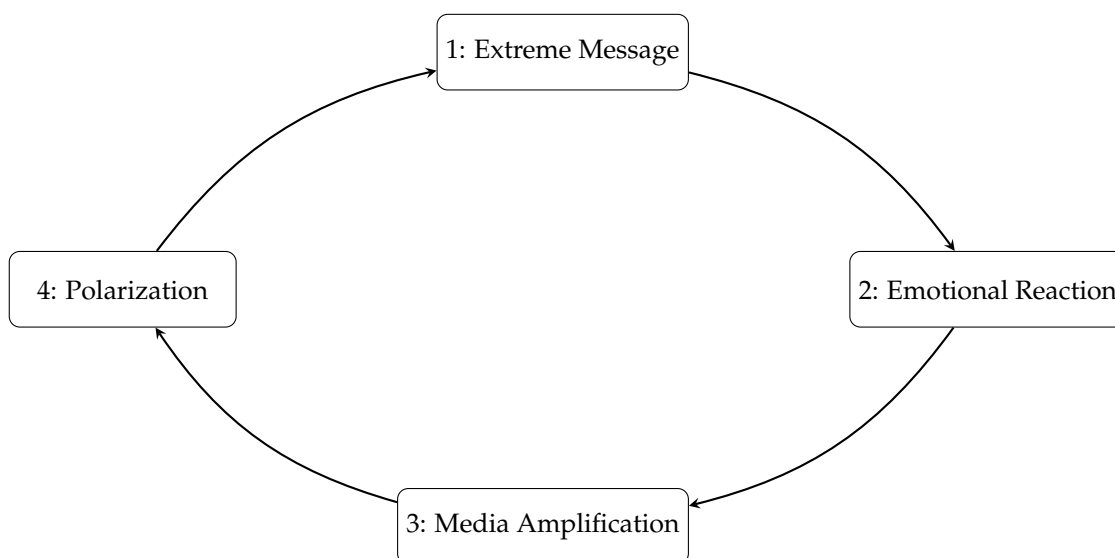


Figure 1. The Feedback Loop in Political Communication.

- Extreme Message** The feedback loop begins with the dissemination of an extreme message. These messages may arise naturally in polarized environments or be crafted intentionally by political actors or interest groups. Regardless of their origin, they tend to represent highly polarizing viewpoints that challenge or oppose the mainstream consensus. Extreme messages can take many forms, from ideological stances on social or political issues to conspiracy theories, and are often characterized by their divisive, uncompromising nature. While they are not always designed to manipulate emotions, their inherent polarizing content often triggers strong reactions, contributing to the deepening of societal divisions. By promoting rigid and antagonistic positions, these messages marginalize moderate perspectives and fuel conflict, which can perpetuate the cycle of polarization.
- Emotional Engagement** Emotional engagement is key in spreading extreme messages. Emotions like fear, anger, *ressentiment*, or outrage significantly boost the likelihood of sharing content, amplifying its reach. This can be explained by emotional contagion, where emotionally charged content becomes more memorable and shareable (Kramer et al. 2014). Additionally, as attention spans have become shorter due to increased media consumption, individuals are more prone to quick, visceral reactions, aligning with the “Thinking Fast” mechanism described by Kahneman (2011). Studies show that the fragmented nature of digital interactions leads to shorter attention spans and heightened emotional responses, particularly among heavy internet users (Medvedskaya 2022), as well as users addicted to short-form videos (Tian 2023). These rapid, emotional responses drive the immediate engagement—whether for sharing, debunking, comment, react—with extreme messages across social networks. This

collective emotional response drives further dissemination of the message, reinforcing its reach and impact. The virality of emotionally charged content ensures that extreme messages move quickly across social and media platforms.

- **Media Amplification** Media amplification is crucial in the feedback loop. Social media platforms prioritize content that generates high engagement, aligning with the emotionally charged nature of extreme messages (Calderón et al. 2020). Algorithms effectively promote content that triggers strong emotional responses, resulting in wider dissemination (Benitez-Baleato 2021). As extreme messages gain traction, traditional media outlets often amplify them, further increasing their reach. This media exposure not only spreads the message but also normalizes it, embedding it into mainstream discourse and giving it legitimacy.
- **Polarization** The widespread dissemination of extreme messages fosters polarization. Exposure to polarizing content hardens attitudes and pushes individuals toward ideological extremes. As moderate positions diminish, societal divisions grow deeper. Repeated exposure to extreme messages, through the illusory truth effect, increases the likelihood that individuals begin to accept fringe ideas as credible, making them seem more mainstream (Hasher et al. 1977). This entrenches polarized views and marginalizes moderate perspectives, reducing the potential for compromise and balanced discussion. Polarization creates an environment where extreme ideologies thrive, further complicating societal cohesion and constructive dialogue.

The feedback loop is self-reinforcing. As extreme messages become normalized and widely accepted, there is a growing demand for similar content. Political actors, recognizing the effectiveness of such messages, are incentivized to produce even more extreme content. This escalates the cycle, intensifying the extremity of the messages, which further polarizes society. As this process continues, the political and social landscape becomes more radicalized. Each iteration of the loop pushes the boundaries of acceptable discourse, making it increasingly difficult to revert to more moderate or cohesive societal discussions. The continual escalation creates an environment in which radical ideologies can flourish, further eroding democratic norms and societal cohesion.

The feedback loop model we present offers a cyclical and holistic approach to understanding how extreme messages, emotional engagement, media amplification, and societal polarization feed into each other, creating a self-reinforcing cycle. It helps us see how extreme messages do not just spread on their own but thrive within a broader system where emotions play a key role, and media structures are designed to amplify the most engaging content. At its core, the model emphasizes how emotions act as powerful drivers of engagement. These emotions not only attract attention but also push people to share and interact with extreme content, propelling it through social networks. The way social media platforms are designed, with algorithms that prioritize content generating the highest engagement, means that emotionally charged messages are systematically favored. These platforms accelerate the spread of such content, increasing its visibility and embedding it deeper into public discourse, leading to its gradual normalization.

The real insight of the feedback loop model lies in its cyclical nature. Unlike straightforward models that suggest a linear progression, this framework highlights how emotional engagement, media amplification, and polarization work together in a repeating loop. When extreme messages provoke strong emotions they get receive greater exposure in social media platforms with business models from increased engagement. As more people are exposed to these extreme messages, the emotional reactions intensify, pushing the messages to even greater extremes. This creates a cycle where messages grow more radical over time, contributing to deeper societal polarization.

3. Empirical Evaluation

We have developed a model that seeks to explain how political polarization emerges from the spread of online disinformation by integrating theoretical insights mainly from political science, psychology, and communication studies. If our hypothesis is accurate,

this model could assist researchers in more effectively identifying instances of disinformation online, potentially enabling the development of AI-based models to analyze public discourse on a large scale. Moreover, policymakers could use this model as a foundation to design corrective interventions within the media landscape as necessary.

Existing research on social media use by extreme right groups supports the feedback loop model. Studies, such as those by Klein and Muis (2019) and Ben-David and Matamoros-Fernández (2016), demonstrate how these groups use platforms like Facebook to create echo chambers and spread extreme views. Similarly, Ribeiro et al. (2020) highlights how YouTube algorithms contribute to radicalization by recommending increasingly extreme content, aligning with the media amplification phase of the feedback loop. However, an empirical evaluation of our model is still necessary to avoid keeping it in a speculative stage. In this article, we present an initial attempt to evaluate the theory's validity by applying the concept of observable implications, as proposed within causal inference frameworks for social science research (King et al. 2021). Observable implications refer to empirical facts that should manifest within contexts consistent with a theory. The more frequently these implications appear under stringent conditions and across diverse cases, the more plausible and generalizable the tested hypothesis becomes. Although this approach is typically associated with statistical studies, it can also apply to qualitative research, provided the study's design allows for falsifiability by other scholars (Popper 1963). This methodological approach provides a useful tool not just to evaluate the plausibility of our model, but also to allow other scholars to apply it in their own research, looking at whether or not the polarization loop is playing a role in their observed phenomenon of interest, from more qualitative analysis like case studies to statistical longitudinal studies or time series proper of quantitative analysis.

A crucial component of this empirical evaluation lies in understanding how far-right movements in Southern Europe—specifically in Spain, Portugal, and Italy—leverage social media to propagate emotionally charged, polarizing narratives. The data for this study was collected from X (formerly Twitter), focusing on official accounts belonging to the far-right parties and their leaders in these three countries. These included Vox and its leader Santiago Abascal in Spain, Chega and André Ventura in Portugal, and both Lega and Fratelli d'Italia in Italy, led by Matteo Salvini and Giorgia Meloni respectively. The time frame for the data collection extended from the creation of these accounts up to the present day, capturing not only the chronological development of each party's online activity but also their political trajectory—from when their ideologies were considered too extreme for mainstream discourse to their current status as significant, and in some cases, majority political forces in their respective countries.

To ensure a structured and reproducible approach to data collection, we first identified and filtered tweets that explicitly referenced themes of immigration, demographic change, or PRCTs. These themes are central to the political strategies of far-right movements, especially when engaging with the emotionally charged rhetoric that contributes to polarization (Mudde 2019). The filtering process involved both manual screening and keyword-based searches to isolate relevant posts. The keywords used in the filtering process were carefully selected to capture the primary rhetorical tools employed by far-right parties. These included terms related to immigration (such as “invasion”, “immigrants”, “borders”, and “migrants”), language specifically associated with replacement theories (like “replacement”, “ethnic substitution”, and “demographic shift”), and broader “us vs. them” narratives that reflect exclusionary ideologies (such as “threat to culture”, “protect our people”, and “foreigners”).

Once the relevant posts were identified through this systematic process, the tweets were further refined to include only those that exhibited or conspiracy-related themes or polarizing rhetoric—which is characterized by strong emotional appeals, divisive “us vs. them” narratives, exaggerated claims, dehumanization of out-groups, and fear-mongering. This step was critical to align the data with the Critical Discourse Analysis (CDA) framework employed in this study Van Dijk (2015). Our approach to CDA is grounded in the

work of Norman Fairclough, who conceptualizes discourse as both reflecting and shaping social power relations (Fairclough 2013). Fairclough's model emphasizes the dialectical relationship between discourse and society—how language is used not only to communicate but also to maintain and challenge power structures. In this context, the CDA framework is particularly effective in revealing how far-right movements use language to perpetuate societal divisions, legitimize ideologies, and evoke emotional responses like fear, anger, and resentment toward immigrants. By focusing on the interplay between discourse, ideology, and power, Fairclough's approach helps us understand how these tweets contribute to the broader dynamics of political polarization and disinformation.

The selection criteria for these tweets were carefully designed to reflect the key rhetorical strategies of far-right parties in Southern Europe, with a particular focus on replacement theories and anti-immigration rhetoric. While the selected tweets are thematically focused, this approach was necessary to explore how emotionally charged, polarizing content propagates on social media platforms. The themes of population replacement and immigration were chosen because they represent the most salient and emotionally charged narratives used by these movements to mobilize their base. The goal was not to cherry-pick examples but to systematically focus on a set of key narratives that are central to far-right discourse in Southern Europe. By being transparent about the selection process and the focus of the analysis, we aim to provide a framework that is both reproducible and open to falsifiability by other researchers.

Additionally, given the multimodal nature of far-right social media strategies, we incorporated Multimodal Discourse Analysis (MDA), which examines how different modes of communication, such as text, images, and other visual elements, interact to create meaning (Kress 2001). Many posts combined written language with images, memes, or infographics, all of which serve to reinforce the emotional impact of the underlying message. Posts containing visual elements were tagged and analyzed using MDA to ensure that the full rhetorical and emotional scope of these tweets was captured. This combined approach allows for a deeper understanding of how far-right movements employ not just textual but also visual strategies to amplify their message.

3.1. PRCTs in Extreme Right Movements in Southern Europe

This section applies the theoretical framework of conspiracy theories and emotional manipulation to the context of Southern Europe, focusing on how PRCT narratives are used by extreme right movements in Spain, Portugal, and Italy. These countries offer unique socio-political landscapes where radical right populist and extreme-right parties have employed emotional rhetoric to mobilize support and gain political traction. Before delving into the specific case studies of these countries, it is essential to clearly define the nature of the extreme right in Southern Europe and its use of PRCT narratives. The following subsections provide a foundation for understanding the key actors, their ideological distinctions, and the mechanisms they use to reinforce extreme messages and exploit emotions for political gains.

3.1.1. Delimiting the Concepts

Understanding the distinctions between “extreme-right”, “far-right”, “radical right”, and “populist radical right” is essential for analyzing Southern European politics. These terms reflect ideological differences (Carter 2018). Radical right populists, like Lega in Italy and Chega in Portugal, advocate for nativism, ethno-nationalism, and anti-immigration policies, using populist rhetoric to portray themselves as defenders of the ‘true’ people against corrupt elites (Marino et al. 2024; Mudde 2000). In contrast, the old extreme right, exemplified by groups like Golden Dawn in Greece and CasaPound in Italy, promotes authoritarianism, openly rejects democratic values, and often supports the use of violence, rooted in fascist ideologies. Others, such as Vox in Spain and Chega in Portugal, may align in issues such as opposition to political rights for women and alternative gender identities, but diverge in central issues such as national identity or political reform (Benitez-Baleato

et al. 2024). Common themes among these parties include nationalism, anti-immigration, and the protection of national identity (Betz 1993). While not all far-right parties seek to dismantle democratic institutions, they often advocate centralizing power and restricting civil liberties in the name of national security (Lubbers et al. 2002). These groups frequently oppose multiculturalism and promote ethnocentrism, positioning themselves as protectors of national culture against foreign influence. Mudde (2019) distinguishes between “radical right populists” and “old extreme right” parties. Contemporary parties like Vox (Spain), Chega (Portugal), Fratelli d’Italia (FDI), and Lega (Italy) employ nationalist and anti-immigration rhetoric (López and Colomé 2021). FDI, with its ties to Italy’s fascist past, straddles the line between the new far-right and old extreme right. In conclusion, Vox, Lega, and Chega align with populist radical right characteristics, while FDI represents a blend of the new far-right and populist radical right, maintaining cultural ties to fascism. CasaPound, by contrast, exemplifies the old extreme right.

Conspiracy theories claim that significant events are caused by hidden plots. According to Aaronovitch (2010), these theories unnecessarily assume conspiracy when other explanations are more plausible (Brotherton 2015). Byford (2011) places conspiracy theories within broader social and ideological contexts, showing that they serve political and ideological functions by offering alternative narratives that challenge mainstream beliefs (Coady 2007). For this paper, we adopt Douglas et al. (2017)’s definition: conspiracy theories [attempt to] explain significant events through claims of secret plots by powerful actors. This perspective is useful in analyzing how these theories weave complex narratives to influence public perception, as they are known for attributing blame for societal issues, as highlighted by Goertzel (2010).

PRCTs assert that indigenous populations in Western countries are being deliberately replaced by non-European, non-white immigrants through immigration, supposed weakening of native populations and differential birth rates (Hernandez Aguilar 2024). These narratives serve extreme-right ideologies by justifying xenophobic and anti-immigration policies (Nefes et al. 2024). PRCTs emphasize ethnic homogeneity as a core element of national identity, framing demographic changes as threats to national survival (Ekman 2022). Related conspiracy theories, like the Kalergi Plan and Eurabia, claim that European elites are intentionally promoting immigration to undermine European identity, with Eurabia specifically focusing on Muslim migration. The Great Replacement Theory similarly posits that mass immigration is a deliberate attempt to replace native populations, framing it as an existential threat to Western societies. Embedded in strong racist and eurocentric perspectives, these theories fuel xenophobia and reshape political discourse, portraying immigration as a threat to national identity and stability (Bracke and Aguilar 2023; Krzyżanowski et al. 2021).

3.1.2. Mechanisms Involved

Extreme right movements in Southern Europe not only adopt PRCT narratives but also utilize emotional manipulation to foster fear, anger, and insecurity, thereby deepening societal polarization. The following subsections explore how these mechanisms reinforce extreme messages, mobilize support, and drive radicalization within the broader feedback loop model.

The emotional appeal of PRCTs lies in its ability to evoke fear, anger, a sense of injustice, insecurity, and a target to vent one’s resentment toward. These emotions are powerful drivers, making individuals more receptive to PRCT’s narrative of demographic and cultural erosion. The theory frames immigration as an existential threat to the ‘native’ population, creating a stark us-versus-them dynamic. This framing stirs fear and loss, particularly among those who feel their cultural identity or economic security is under threat, a phenomenon that could be explained by the concept of *relative deprivation*. Relative deprivation refers to the perception of being deprived of something one feels entitled to, in comparison to others, which amplifies the sense of injustice and loss. Those who perceive themselves as losing out—whether culturally, economically, or socially—are more likely to respond emotionally to narratives of decline and invasion (Gurr 1970). Fear acts

as a powerful motivator, making individuals more likely to support extreme policies or leaders who promise to preserve their way of life (Lerner and Keltner 2001). Psychological research also shows that fear and anger simplify complex issues into black-and-white choices, enhancing the appeal of conspiracy theories (van Prooijen 2020). Insecurity further heightens emotional vulnerability. Those who feel insecure are more susceptible to the emotional manipulation inherent in conspiracy theories, as they seek stability and certainty. This emotional exploitation makes PRCTs particularly effective at mobilizing support for extreme right ideologies, which promise solutions to these anxieties through exclusionary and nationalist policies.

The extreme right skillfully manipulates emotions, particularly fear, anger, insecurity, hope, and nostalgia, to strengthen its appeal. By constructing narratives of existential threat, such as population replacement, these movements tap into deep-rooted anxieties about survival and cultural preservation. Simplifying complex issues into binary choices, they make these narratives emotionally potent and widely resonant. Rhetorical strategies, including inflammatory language and vivid imagery, evoke strong emotional reactions. For instance, phrases like “invasion” and “flood” are used to describe immigration, creating an immediate sense of threat. This emotional rhetoric can transform fear into anger and resentment, which can be directed toward perceived out-groups, such as immigrants or political elites (Salmela and von Scheve 2017).

Online propaganda further fuels emotional manipulation. Social media platforms allow extreme right groups to spread emotionally charged content, reinforcing group identity and hostility toward out-groups. This continuous exposure to emotive content within online communities radicalizes individuals, deepening their commitment to extreme ideologies (Bliuc et al. 2020). Charismatic leaders amplify this effect by positioning themselves as protectors of the ‘native’ population. This blend of fear, anger, and hope creates a powerful emotional cocktail, securing loyalty and support.

3.2. Comparative Analysis: Italy, Portugal and Spain

Understanding how the feedback loop operates in varied socio-political contexts is essential for grasping the ways extreme messages and emotional manipulation take hold in different regions. Italy, Portugal, and Spain each present unique environments where this model plays out, shaped by their particular political, historical, and cultural landscapes. In these countries, the effectiveness and impact of extreme right movements are not uniform. The socio-political environment—whether shaped by economic distress, regional tensions, or historical legacies—determines how successfully these movements use emotional engagement and media strategies to achieve their aims. While the examples provided here are anecdotal and used solely for illustrative purposes, they help to demonstrate the broader applicability of the feedback loop model across different political landscapes.

3.2.1. Italy: Lega and Fratelli d'Italia

The far-right parties Lega and Fratelli d'Italia (FdI) have capitalized on Italy's economic stagnation and immigration concerns. Lega, originally a regionalist party, transformed into a nationalist force under Matteo Salvini's leadership, focusing on anti-immigrant sentiment and Euroscepticism. FdI, led by Giorgia Meloni, also has a very skeptical view on migration and European Union. It draws on Italy's post-fascist tradition, balancing this extreme rhetoric with a more moderate public image to appeal to both extreme and conservative voters (Baldini et al. 2022; Maccaferri and Mammone 2022).

Both parties have leveraged the concept of ethnic replacement to fuel the *extreme message* phase of the feedback loop, portraying demographic changes as existential threats. Salvini, in particular, has effectively used social media to dehumanize immigrants, pushing the narrative that they threaten Italian culture and public safety (Capecchi 2021). Meloni employs strategic ambiguity, avoiding overt links to fascism while still appealing to far-right voters through subtle nationalist rhetoric, effectively moving into the *emotional engagement* phase (Pietrucci 2023).



Figure 2. Giorgia Meloni’s Tweet on Ethnic Substitution.

In the context of Italy’s economic and social challenges, Giorgia Meloni of Fratelli d’Italia effectively utilizes social media to advance her political narrative. An illustrative example is her tweet from 6 October 2016, during Matteo Renzi’s administration, where she exploits the politically charged theme of “ethnic substitution” to provoke public anxiety about demographic changes allegedly undermining Italy’s national identity. In this tweet (Figure 2), Meloni constructs a narrative that links the emigration of Italians with the immigration of non-Europeans, predominantly from Africa. She simplifies complex socio-economic issues into a direct causal relationship, suggesting that the outflow of Italians and the inflow of immigrants are part of a deliberate policy failure. This rhetoric is aimed at discrediting the government by labeling it as incompetent and connecting its policies to national decline, thereby tapping into public fears of cultural and social displacement. This approach not only vilifies immigrants but also catalyzes polarization by framing immigration as a zero-sum game, where the native population’s loss is seen as immigrants’ gain.

Meloni’s strategic use of emotive language such as “invasion” and “protection of our people” amplifies this polarizing message, ensuring deep resonance with her base. By depicting these issues in terms of existential threats, her posts promote strong in-group solidarity among her followers while demonizing perceived out-groups. This tactic is crucial in reinforcing societal divides, making her use of social media a potent tool for shaping public opinion and further entrenching polarization within Italian society. This discourse analysis underscores how Meloni’s social media strategy aligns with the broader polarization loop model, demonstrating how far-right leaders leverage digital platforms to amplify divisive content and emotionally charge political discourse, significantly contributing to societal polarization.

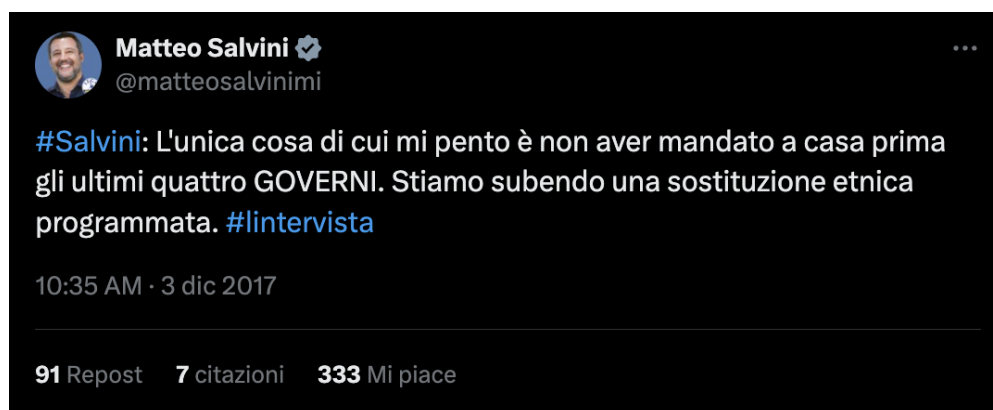


Figure 3. Tweet by Matteo Salvini on Ethnic Substitution.

In this analysis of a tweet by Matteo Salvini (Figure 3), leader of the Lega party, from 3 December 2017—at the time of Gentiloni’s government, Salvini expresses regret for not having ousted the last four governments, accusing them of facilitating what he terms a “programmed ethnic substitution”. This phrase is deliberately provocative, designed to instigate fear and urgency among followers by suggesting a deliberate undermining of Italian ethno-cultural makeup by previous administrations. This messaging taps into deep-seated fears about cultural dilution and is intended to resonate strongly with Salvini’s base. Such rhetoric is a clear manifestation of the emotional engagement phase of the polarization loop, where polarizing language is used to evoke strong emotional responses, thereby galvanizing public support and deepening societal divisions.



Figure 4. Tweet by Matteo Salvini on Ethnic Substitution.

In this tweet from 21 June 2017 (Figure 4)—during Gentiloni’s government, Matteo Salvini continues to propagate themes of existential threat and demographic change that are central to his party’s messaging. Salvini states, “Gli immigrati che sbarcano servono a sostituire gli italiani che non nascono”, which translates to “The immigrants who arrive are here to replace the Italians who are not being born”. This rhetoric sharply intensifies the narrative of replacement and invasion, characteristically used to stoke fear and mobilize his base by framing immigration as a direct threat to the survival of the native population. Salvini further declares, “SOSTITUZIONE ETNICA in corso”, meaning “ethnic substitution underway”, and uses the hashtag #stopinvasione to enhance the urgency and immediacy of his message. The use of such language is not merely descriptive but is strategically crafted to provoke an emotional reaction that aligns with the emotional engagement phase of the polarization loop. It characterizes the issue of immigration as a crisis orchestrated against the Italian people, thereby simplifying complex socio-political issues into a narrative that is easily digestible and emotionally charged. This tweet exemplifies how Salvini leverages social media to amplify a polarizing message, thereby catalyzing stronger in-

group cohesion against a constructed enemy. The strategy is designed to resonate deeply with his base, solidifying and expanding his support through the use of fear-mongering rhetoric that highlights demographic changes as a clear and present danger to the Italian way of life. This approach underscores how social media can be utilized by political figures to enhance existing societal divisions, contributing to increased polarization within the public discourse.

3.2.2. Portugal: Chega and the Anti-Immigration Sentiment

Chega, founded in 2019 by André Ventura, has rapidly grown into a significant political force, capitalizing on anti-immigration and nationalist sentiments. Ventura's leadership, marked by populist rhetoric, appeals to voters disillusioned with traditional politics, positioning Chega as a defender of Portuguese identity and sovereignty (Braz 2023; Dias 2022).

Chega effectively taps into the *extreme message* phase of the feedback loop, using ethnic replacement rhetoric, particularly targeting immigrants from Africa and the Middle East, to galvanize support. Ventura frames immigration as an existential threat to Portugal's cultural integrity, aligning with PRCT narratives (Garcia-Jaramillo et al. 2023). This fosters an *emotional engagement* that amplifies societal fears, leveraging media platforms for the *media amplification* of these messages. By framing themselves as the protectors of Portuguese heritage, Chega reinforces the *polarization* phase, spreading fear and deepening societal divisions (Antón and Baptista 2022).

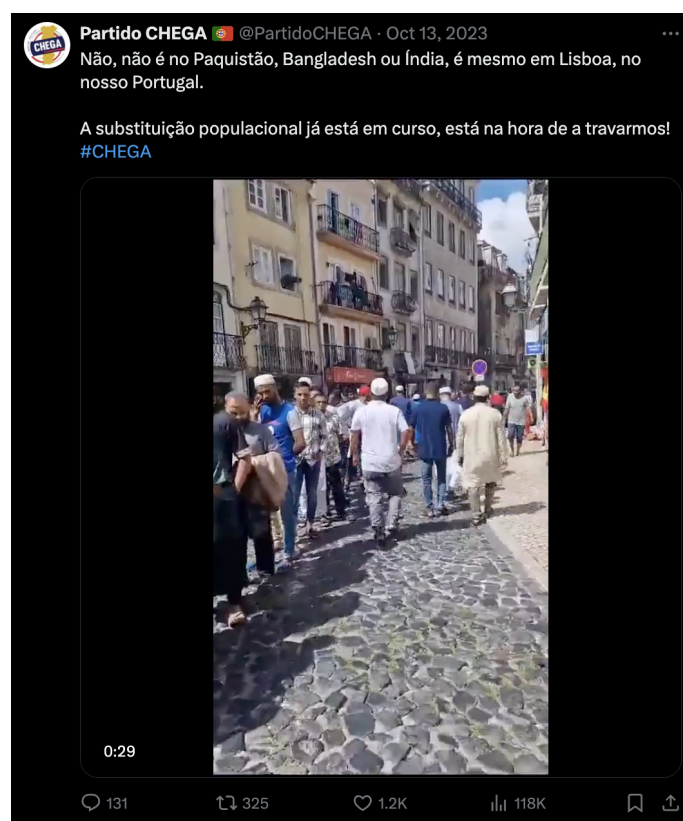


Figure 5. Chega's tweet on alleged population replacement in Lisbon.

On 13 October 2023—during the third Antonio Costa's government, the Chega party posted a tweet (Figure 5) that starkly illustrates their strategic use of ethnic and cultural fear-mongering. The tweet states: "No, it's not in Pakistan, Bangladesh or India, it's right here in Lisbon, in our Portugal. The population replacement is already underway, it's time to stop it. #CHEGA". Accompanied by a video showing a street scene in Lisbon with visible presence of people presumed to be immigrants, this post aims to provoke a

visceral reaction about the changing demographics in Portugal. Chega uses this visual and textual representation to amplify the narrative of an ongoing population replacement. By suggesting that Lisbon could be mistaken for cities in Pakistan, Bangladesh, or India, the party employs a shocking comparison meant to alarm viewers about the supposed scale of immigration and its impact on the national cultural identity. This fear of ‘the other’ and the loss of ‘Portuguese’ identity is designed to evoke a strong emotional response, driving the narrative that immediate action is required to halt these changes. The tweet underscores Chega’s consistent theme that Portuguese culture and heritage are under threat from external forces, which they claim are facilitated by liberal or ineffective immigration policies. This portrayal taps into xenophobic sentiments by suggesting that the presence of immigrants equates to a zero-sum game and thus a loss of national character and sovereignty, a tactic intended to polarize public opinion and strengthen in-group cohesion among native Portuguese. This use of social media to disseminate such a charged message exemplifies how Chega leverages the emotional engagement phase of the feedback loop. By presenting a stark visual of cultural displacement, they aim to reinforce the polarization phase, where societal divisions are deepened, making the native population feel besieged and more likely to rally behind Chega’s exclusionary policies. The strategic framing of the tweet calls for direct action, moving supporters from passive consumption of content to active participation in the political discourse proposed by Chega.



Figure 6. Chega tweet emphasizing cultural conflicts over religious constructions.

On 20 May 2024—during Luis Montenegro’s government, in a tweet by the Chega party (Figure 6), a clear manifestation of their anti-immigration and nationalist sentiment is displayed. The tweet states: “In Portugal, their culture and religion must be tolerated, especially the construction of mosques. But they do not respect the religion of others! What kind of equality is this, where we respect them, but they do not respect us?” This rhetoric is part of Chega’s broader strategy to amplify societal fears regarding cultural and religious changes purportedly threatening Portugal’s identity. Chega utilizes this type of messaging to evoke a sense of injustice and victimhood among its followers, suggesting a one-sided tolerance that disadvantages the native population. This aligns with the party’s consistent

narrative that positions the Portuguese people as being under threat from foreign influences, which they claim are not reciprocating the respect and tolerance supposedly shown to them. The reference to mosque construction acts as a symbol of these fears, serving as a focal point for Chega's argument against the perceived encroachment of Islamic culture. By questioning the reciprocity of respect and tolerance, Chega not only challenges the integration policies but also stokes the flames of cultural conflict. This approach is effective in solidifying a strong in-group identity among its supporters, reinforced by a perceived out-group threat, thus deepening societal divides. Furthermore, the strategic use of social media amplifies this message, ensuring it reaches a wide audience to elicit strong emotional reactions, which are crucial for maintaining engagement with the party's platform. This tactic of framing cultural integration as a threat to national identity and societal values is a classic example of how Chega continues to exploit social and cultural issues for political gain, thereby reinforcing existing societal polarization.

3.2.3. Spain: Vox and the National Unity Narrative

Vox emerged amidst political and economic turmoil, capitalizing on dissatisfaction with mainstream parties (Mellón and Boado 2024). Founded in 2013, Vox's growth was accelerated by the Catalan independence crisis, allowing the party to position itself as a staunch defender of Spanish unity (Arana 2021; Benitez-Baleato et al. 2024). By tapping into disillusionment with traditional politics, Vox strategically used the crisis to evoke fear, anger, and nostalgia, reinforcing the party's anti-immigration and nationalist agenda (Cuevas 2019; Mendes and Dennison 2020).

In the context of the feedback loop model, Vox uses *extreme messages* as a starting point. These messages, particularly related to the Catalan crisis, tap into emotions like fear and anger toward regional separatism, which are amplified in media platforms, both traditional and social, creating emotional engagement. The party's leader, Santiago Abascal, employs "us vs. them" rhetoric to vilify immigrants and political rivals, framing them as existential threats to Spain's cultural identity (Navarro and Yeh 2022). This strategy deepens societal divisions, reinforcing the *polarization* phase of the feedback loop, with social media algorithms amplifying these messages, as seen in studies on disinformation and emotion-driven rhetoric (Benitez-Baleato and López-López 2023; Castro Martínez and Jaráiz Gulías 2022; Fernández-García and Salgado 2022).



Figure 7. Tweet by Vox questioning the rationality of demographic replacement theories.

In this tweet from 19 October 2021 (Figure 7)—during the second Sanchez’s government, Vox challenges the perception of population replacement as a mere conspiracy theory, asserting a direct link between the actions of the “socialist mafia” and the alleged facilitation of immigration, which they claim undermines the Spanish populace. This communication exemplifies Vox’s strategic use of social media to disseminate extreme messages that align with their broader nationalist and anti-immigration narrative. The tweet begins by questioning the dismissal of population replacement theories as irrational, suggesting that there is legitimate evidence of such activities. Vox claims that the socialist government’s policies, specifically referencing a plan purportedly to facilitate documentation for 15,000 unaccompanied foreign minors, are part of a broader agenda to replace the native population. The language used, such as “mafia socialista” (socialist mob) and “compra de votos” (vote buying), is designed to evoke a sense of corruption and betrayal by the government, thereby exploiting public fears of demographic and cultural changes. Moreover, the tweet intensifies the narrative by stating, “Si antes había efecto llamada, ahora es un reclamo a gritos para que miles de africanos sigan invadiendo nuestras fronteras”. This translates to, “If there was a call effect before, now it is a loud claim that thousands of Africans continue invading our borders”. This choice of words, especially “invading”, contributes to a hostile portrayal of immigrants, depicting them as a force overwhelming the nation, rather than individuals seeking refuge or better opportunities. Such language not only reinforces fears of an ‘invasion’ but also serves to rally the party’s base by framing the issue as a direct threat to their way of life. This tweet is a clear manifestation of the emotional engagement phase of the polarization loop, where Vox employs polarizing language to evoke strong emotional responses—specifically fear and anger—thereby galvanizing public support and deepening societal divisions. This method of communication ensures that the message resonates deeply with their base, strengthening in-group cohesion while simultaneously demonizing perceived out-groups, which in this context are immigrants and the socialist government.



Figure 8. Tweet by Vox claiming widespread recognition of demographic replacement in Spain.

In a tweet from 25 May 2024 (Figure 8)—at the time of the third Sanchez’s government, Jorge Buxadé, a prominent figure of Vox, speaks at a rally in Barcelona, where he addresses the topic of demographic change, specifically the concept of “population replacement”. The tweet captures Buxadé’s speech, in which he states, “When we talked about population replacement, they called us conspiracy theorists. And now no one in Spain doubts that there is a replacement of the native population with a foreign population”. This statement highlights Vox’s strategic use of charged political narratives to validate their stance on immigration and demographic changes. Buxadé’s words reflect Vox’s continuous effort to shift public discourse from skepticism towards acceptance of their views on demographic change. By framing their previously dismissed claims as now undeniable, Vox seeks to position itself as a foresighted entity that understands and reacts to the so-called threats against the Spanish populace. This tactic not only vindicates their earlier statements but also attempts to normalize the discourse around population replacement, making it a legitimate concern rather than a fringe theory. This method of communication leverages the “emotional engagement” phase of the polarization loop effectively. It taps into the fear and resentment toward demographic changes, portraying Vox as the defender of the native population. By claiming vindication in the face of past skepticism, Buxadé enhances the us-vs-them narrative, fostering a deeper emotional connection with the audience who may feel alienated or threatened by these demographic shifts. Furthermore, the setting of the speech—public and highly visible—along with the use of social media to disseminate his message, amplifies the reach and impact of his words, ensuring that the emotional resonance is not just limited to the attendees of the rally but is spread across the digital landscape. This strategy exemplifies how Vox utilizes both direct public engagement and digital platforms to reinforce their populist messages, driving the polarization deeper within Spanish society.

4. Discussion

4.1. Main Findings

Analyzing extreme right movements in Spain, Portugal, and Italy reveals both common strategies and unique national approaches, each shaped by its socio-political context. Applying the feedback loop model across these case studies provides a clearer understanding of how emotional manipulation, media strategies, and PRCT narratives operate in different environments. Despite their national differences, the extreme right parties in Spain (Vox), Portugal (Chega), and Italy (Lega and Fratelli d’Italia) employ similar strategies that align with the feedback loop model. By portraying certain non-white groups as existential threats to national identity, culture, and security, they tap into deep-seated anxieties. This emotional engagement simplifies complex societal issues into stark binaries, making their narratives more resonant. For instance, Vox often frames Spain as facing deliberate demographic replacement, inciting fears of cultural erosion. Chega, meanwhile, directs its rhetoric more narrowly against the Roma community, portraying them as a societal threat. In Italy, both Salvini and Meloni leverage “ethnic substitution” narratives to stoke fear and urgency among voters.

Social media is another crucial tool for these parties. All three have skillfully used platforms like X, Facebook, and Instagram to bypass traditional media gatekeepers and reach larger, more engaged audiences. These platforms, which prioritize high-engagement content, serve to rapidly disseminate emotionally charged messages, amplifying their impact. The repetition of divisive narratives contributes to the normalization of extreme ideas, shifting the *Overton window* and bringing once-fringe discourse into mainstream discourse. This strategy not only deepens societal divides but also marginalizes more moderate perspectives, creating a political landscape polarized around extremes. However, while the strategies these parties use are broadly similar, their effectiveness varies due to each country’s unique socio-political landscape.

In Spain, Vox has capitalized on national unity and the contentious issue of Catalan independence. By positioning itself as the defender of Spanish sovereignty against separatism and immigration, it resonates with voters concerned about national fragmentation. Vox effectively intertwines fears of internal division with external threats, strategically using PRCT narratives to secure electoral gains and intensify societal polarization.

In contrast, Chega, which was founded in 2019, represents a newer force in Portuguese politics. While Portugal's political landscape has traditionally been less receptive to extreme right ideologies, since the Democratic Revolution in 1974, Chega has gained rapid traction by tapping into national anxieties. Unlike Vox and the Italian parties, Chega focuses more specifically on the Roma community, exploiting existing prejudices and directing societal frustrations toward this minority group. In the last elections, the rhetoric has moved against Muslim Southeast Asian immigration in certain areas of the country, such as the Algarve.

Italy also provides a fertile ground for extreme right narratives due to its economic stagnation and concerns over immigration. Lega and Fratelli d'Italia have skillfully capitalized on these issues by invoking PRCT narratives and emphasizing the need to protect national sovereignty. The emotional engagement with these narratives is heightened by economic anxieties and a sense of disenfranchisement among voters, leading to significant societal polarization. Through effective media amplification, both parties have managed to deepen these divides and normalize extreme narratives within the Italian political discourse.

The effectiveness of the feedback loop model can be seen in how these parties' strategies correlate with their political success and the degree of societal polarization in each country. In Spain, Vox's use of emotional manipulation and PRCT narratives has contributed to substantial electoral gains and a marked increase in societal polarization. Similarly, Chega's rise, though more recent, has been driven by its anti-Roma rhetoric and adept use of social media, signaling its growing influence in Portugal. In Italy, Lega and Fratelli d'Italia have experienced significant success, with their PRCTs messaging resonating deeply with economically anxious voters and contributing to a more polarized political environment.

Several contextual factors influence how the feedback loop operates in each country. Historical legacies, such as each nation's experience with authoritarianism, shape societal receptiveness to extreme right narratives. Economic conditions also play a key role; societies facing greater economic hardships are more vulnerable to messages that attribute societal problems to specific groups, thereby amplifying the emotional resonance of such narratives. Additionally, cultural attitudes toward immigration, multiculturalism, and minority groups affect how PRCT narratives and other extreme messages are received. Finally, the responsiveness of political institutions and mainstream parties to these movements can either mitigate or amplify their influence. This comparative analysis underscores both the adaptability of the feedback loop model and its varied effectiveness across different socio-political contexts.

4.2. Limitations

Our research proposed a causal mechanism capable to explain the impact of disinformation online on societal polarization as the result of the interplay between emotions and economic incentives of digital social media platforms that are used by extreme political movements to bypass traditional information gatekeepers. While our analysis provides a plausible explanation which is consistent both with prominent theoretical insights and with preliminary empirical analysis, several limitations must be acknowledged.

First, our empirical validation strategy was able to find observable implications supporting the utility of our model in different countries, but we do not recommend our evaluation to be interpreted as a definitive empirical validation of the polarization loop mechanism. Our research has proved to be useful for the purpose of providing support to the plausibility of the model, but further research would be required to improve the generalizability of our model. Extending the observed cases with countries in different geographical areas and over time would be necessary for that purpose.

We also acknowledge that the focus on social media may overlook the role of traditional media and offline interactions in shaping political beliefs and emotions. While social media is crucial in modern communication, it exists within a broader media ecosystem that includes—among others—television, radio, newspapers, and face-to-face interactions. Future studies may benefit from incorporating multi-platform analyses, integrating data from both social and traditional media to assess how they interact within the feedback loop. It is important to note that while both traditional media and social media disseminate extreme political messages, the emotional engagement and responses of their audiences may differ significantly. These differences in emotional reactions could, in turn, influence the utility of the polarization loop model.

In addition to that, the model assumes a generalized user experience across online social media platforms, but platforms differ significantly in user demographics, content algorithms, and engagement features. They have distinct cultures that influence content sharing and consumption. This shortcoming may be remediated in future studies by taking into account the different demographics of the platforms, conducting platform-specific analyses to account for these differences, examining how algorithmic and user behaviors impact emotional engagement and message amplification.

The model also presumes that emotional engagement directly leads to message amplification and polarization. However, this relationship could be bidirectional and shaped by factors like cultural context, offline events and dissemination of such posts in traditional media, must more scrutinized by the public and experts. Future research could use longitudinal studies and experimental designs to test the causality of these relationships, refining the model by accounting for external influences. A connected challenge is how to accurately measure emotional engagement on social media. Likes, shares, and comments, or sentiment analysis of posts, may not fully capture users' emotional states. These proxies are limited in reflecting the complexity of emotions, and there is a risk of misinterpretation.

Finally, ethical considerations are crucial in studying the emotional engagement of extreme political messaging. Our model involves the analysis of emotions, implying the need to interpret and quantify expressions that are uniquely expressed by individuals, therefore introducing all the risks connected to privacy and data protection. This requires taking extreme care in ensuring that analysis is fully compliant with data protection and privacy law provisions, reaching out the correspondent ethical review boards and applying any necessary technical means to avoid personal data breaches or re-identification in shared data, such as differential privacy; and focusing on structural patterns rather than individual behavior, making it explicit that results of research cannot be applied as the base for decisions, automated or not, that may affect individuals. Researchers should be careful with minimizing the risk of amplifying existing inequalities or introducing new ones by critically assessing the quality of the data, avoiding to perform data analysis disconnected from explicitly articulated theoretical framework to prevent external validity issues.

4.3. Future Directions

An important extension to this research involves integrating historical analysis with computational methods to trace the evolution of polarization online over time and across different contexts. This interdisciplinary approach would shed light on how emotionally charged, polarizing messages adapt and endure over time, offering critical insights for tracking and mitigating the real-time spread of disinformation online, and facilitating empirically testing of relevant assumption and hypothesis, such as the idea that emotionally charged content is more likely to be amplified by social media algorithms, or discerning between PRCT-related and non-conspiracy-related content, offering insights into different narrative types.

Natural Language Processing (NLP) techniques, including sentiment analysis, emotional analysis, and topic modeling, exemplify computational methods that can be useful to evaluate the emotional impact on online polarization, trace the evolution of the political discourse, and link emotional content to engagement metrics. The use of Large Language

Models (LLM) providing the basis for ‘artificial intelligence’ systems could boost this interdisciplinary approach, as they can be fine-tuned to work across different cultural contexts and digital platforms, supporting cross-country comparison capable to help in evaluating how factors like national history, economic conditions, and media environments influence the polarization loop’s operation in different contexts. In order to overcome existing limitations of LLMs (Bender et al. 2021), researchers need to build quality training datasets that are enriched with politically relevant data, such as content from political parties and leaders in social media, political speeches, news outlets, or parliamentary debates. As LLM are already built on the basis of large datasets, researchers should aim for quality instead of quantity, working to create datasets that are cross-validated. This implies the production of gold-standard corpora that have been manually tagged on the basis of annotation guidelines theoretically substantiated consistently with the relevant political science or sociological research, and iteratively refined looking at both the theory and the data. This will enable researchers to systematically study how political narratives evolve and interact with the polarization loop, especially in the stages of emotional engagement and media amplification, while mitigating the risks derived by the use of LLMs. Provided the intimate nature of emotions, the focus should remain on structural patterns rather than individual behavior, making it explicit that results derived from this research cannot be applied as the base for decisions, automated or not, that may affect individuals.

Together, the integration of historical analysis with theoretically substantiated computational methods and data will allow for a more precise understanding of the interplay between emotions and online polarization, improving understanding of pivotal issues such as how conspiracy theories bolster support for extreme-right movements and deepen societal divisions. A valuable addition to this approach would be the integration of Critical Discourse Analysis (CDA), as this would enable both qualitative and quantitative insights into the rhetorical strategies employed by polarizing political movements, such as those building on far-right ideologies or PRCTs. This interdisciplinary approach provides a comprehensive framework for understanding how emotionally charged narratives contribute to political polarization, equipping scholars, policymakers and citizens with the tools needed to address the impacts of online disinformation connected to conspiracy theories.

5. Conclusions

This paper introduced the polarization loop, a causal mechanism that explains the effects of online disinformation on polarization on the basis of a four-step repeated cycle: extreme messages, emotional engagement, media amplification, and societal polarization. The model is articulated as a feedback loop where emotional engagement on social media amplifies the impact of extremist narratives. As the model was drawn from the intersection of political science, history, and social psychology, it represents not only a theoretical contribution but also a practical tool that can be applied across various contexts to study the broader effects of polarization in contemporary society.

We have evaluated the utility of the polarization loop by examining the impact of conspiracy thinking looking at the case of Population Replacement Conspiracy Theories (PRCTs) in the discourse of extreme-right movements in Southern Europe. Our exploration illustrated how emotions are central to the success of these movements. By manipulating emotions, extreme-right actors exhibit similar patterns across various socio-political context, simplifying complex societal issues and creating a more receptive environment for their ideologies. These political movements are particularly effective when they tap into existential anxieties, frame immigration as a threat, and evoke nostalgia for a perceived better past. However, the resonance of these appeals is moderated by each country’s unique historical and political environment. In nations with a strong historical aversion to far-right ideologies or where immigration is less politically salient, emotional manipulation may have a more limited impact.

Although embedded in nationalist cultural perspectives and national historical fears, we have observed that the discourse of far-right parties in Southern Europe shares some

common communication strategies on their social media platforms and in their public narratives: the use of visual evidence (whether more or less contextualized or manipulated) to depict the presence of non-white groups, the binary “us vs. them” rhetoric, and the repeated use of socially divisive statements. This constant repetition triggers irrational emotions that lead to widespread message propagation and polarized discussions. Over time, the discourse is assimilated and perceived as normal. These social media tactics exemplify the effectiveness of the polarization loop model in explaining how far-right communication successfully spreads disinformation about PRCTs.

From a policy perspective, it is important to note that the effects of the polarization loop are not universal, but they depend on the specific characteristics of the different political systems. Understanding these nuances is crucial for developing strategies to mitigate polarization driven by emotionally charged extreme narratives online. Interventions in national information distribution chains should be considered, including regulatory measures to prevent and mitigate dysfunctions in algorithmic decision-making, such as ‘artificial intelligence’ systems or social media platforms designed to maximize engagement by prioritizing emotionally-driven content. Making these algorithms and the underlying data public, or subject to public scrutiny by democratically elected institutions, with the assistance of independent expert bodies as needed, could ensure that the content promoted by digital platforms aligns with broader societal values. Alignment will only be effective if implemented at the design stage, requiring relevant experts and academics from social science and humanities to take part in the process from early research, as those are the disciplines better equipped to understand and address the relevant societal risks. This approach could help maintain the integrity of public discourse while preserving the essential democratic values of open communication, privacy and personal data protection. If democracy represents the mechanism that is capable to solve societal issues on the basis of deliberation, online polarization represents the opposite strategy, emphasizing the importance of keeping citizens in the first stage of any mitigation strategy. Therefore, in addition to addressing dysfunctions in the information distribution chain, policy-makers should take into account that emotionally-driven polarization is only effective when the receiving end is vulnerable: promoting critical thinking, digital literacy, and emotional intelligence are pivotal in addressing the emotional triggers and media mechanisms that fuel polarization online.

Author Contributions: Conceptualization, E.B.M. and J.M.B.-B.; literature review, E.B.M., J.M.B.-B. and A.S.R.; resources, E.B.M., J.M.B.-B. and A.S.R.; writing—original draft preparation, E.B.M.; writing—review, E.B.M., J.M.B.-B. and A.S.R.; writing—editing, E.B.M., J.M.B.-B. and A.S.R.; plotting, E.B.M. and J.M.B.-B. All authors have read and agreed to the published version of the manuscript.

Funding: This research and publication was funded by the Horizon Europe HYBRIDS project (Grant Agreement No. 101073351) a Marie Skłodowska-Curie Doctoral Network funded by the European Union (EU) and UK Research and Innovation (UKRI) (Grant Number: EP/X036758/1). Authors retain sufficient copyright to meet Open Access Requirements for publication in Horizon Europe. The research has been funded as well by CIDEHUS—Centro Interdisciplinar de História, Culturas e Sociedades da Universidade de Évora (UIDB/00057/2020), financed by the Fundação para a Ciência e Tecnologia (Portuguese Science Foundation).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding authors.

Conflicts of Interest: The authors declare no conflicts of interest.

References

- Aaronovitch, David. 2010. *Voodoo Histories: How Conspiracy Theory Has Shaped Modern History*. New York: Random House.
- Airoidi, Massimo. 2021. *Machine Habitus: Toward a Sociology of Algorithms*. Hoboken: John Wiley & Sons.
- Antón, Rubén Ramos, and Carla Baptista. 2022. Populism and social media in the iberian peninsula: The use of twitter by vox (spain) and chega (portugal) in election campaigning. *International Journal of Iberian Studies* 35: 125–53. [\[CrossRef\]](#)
- Arana, Arantza Gomez. 2021. Politics of discontent in spain: The case of vox and the catalonian independence movement. *Cambridge Journal of Regions, Economy and Society* 14: 439–56. [\[CrossRef\]](#)
- Bakker, Bert N., Gijs Schumacher, and Matthijs Rooduijn. 2020. Hot politics? Affective responses to political rhetoric. *American Political Science Review* 115: 150–64. [\[CrossRef\]](#)
- Baldini, Gianfranco, Filippo Tronconi, and Davide Angelucci. 2022. Yet another populist party? Understanding the rise of brothers of italy. *South European Society and Politics* 27: 385–405. [\[CrossRef\]](#)
- Ben-David, Anat, and Ariadna Matamoros-Fernández. 2016. Hate speech and covert discrimination on social media: Monitoring the facebook pages of extreme-right political parties in spain. *International Journal of Communication* 10: 1167–93.
- Bender, Emily M., Timnit Gebru, Angelina McMillan-Major, and Shmargaret Shmitchell. 2021. On the dangers of stochastic parrots: Can language models be too big? Paper presented at the 2021 ACM Conference on Fairness, Accountability, and Transparency, Virtual Event, March 3–10. pp. 610–23.
- Benitez-Baleato, Jesus M. 2021. *Los Algoritmos y su Influencia en la Opinión Pública. Claves para la Ciudadanía en la Democracia Digitalizada*. Sevilla: Comunicación Social Ediciones y Publicaciones, pp. 33–64.
- Benitez-Baleato, Jesus M., and Paulo Carlos López-López. 2023. *Las redes Sociales y los Electores en el Espacio Digital*. Montalbán: CIS.
- Benitez-Baleato, Jesus M., Manuel M. Artaza Montero, and Susana Sotelo Docío. 2024. Return of history or ex-novo politics? A computational institutionalist perspective on the surge of vox in spain and chega in portugal. *International Journal of Iberian Studies (IJIS)* 3.
- Betz, Hans-Georg. 1993. The two faces of radical right-wing populism in western europe. *The Review of Politics* 55: 663–86. [\[CrossRef\]](#)
- Bliuc, Ana-Maria, John Betts, Matteo Vergani, Muhammad Iqbal, and Kevin Dunn. 2020. *The Growing Power of Online Communities of the Extreme-Right: Deriving Strength, Meaning, and Direction from Significant Socio-Political Events 'In Real Life'*. The Hague: International Centre for Counter-Terrorism.
- Bracke, Sarah, and Luis Manuel Hernández Aguilar. 2023. *The Politics of Replacement*. Boca Raton: TAYLOR FRANCIS Limited.
- Braz, Carlos Morgado. 2023. Chega! A sceptre of the mainstream portuguese parties' disaggregation or a spectre of fascism? *Journal of Populism Studies*. [\[CrossRef\]](#)
- Brotherton, Rob. 2015. *Suspicious Minds: Why We Believe Conspiracy Theories*. London: Bloomsbury Publishing.
- Bruns, Axel. 2019. *Are Filter Bubbles Real?* Hoboken: John Wiley & Sons.
- Byford, Jovan. 2011. *Conspiracy Theories: A Critical Introduction*. Heidelberg/Berlin: Springer.
- Calderón, Carlos A., Guillermo de la Vega, and David Blanco Herrero. 2020. Topic modeling and characterization of hate speech against immigrants on twitter around the emergence of a far-right party in spain. *Social Sciences* 9: 188. [\[CrossRef\]](#)
- Camus, Renaud. 2012. *Le Grand Remplacement: Suivi de Discours D'orange*. Plieux: Renaud Camus Publisher.
- Capecci, Erica. 2021. The aesthetics of dehumanization: Anti-roma narratives in italian far-right propaganda, 2017–2022. *Storyworlds: A Journal of Narrative Studies* 13: 115–79. [\[CrossRef\]](#)
- Carter, Elisabeth. 2018. Right-wing extremism/radicalism: Reconstructing the concept. *Journal of Political ideologies* 23: 157–82. [\[CrossRef\]](#)
- Castro Martínez, Paloma, and Erika Jaráiz Guliás. 2022. *La construcción emocional de la extrema derecha en España*. Madrid: Centro de Investigaciones Sociológicas (CIS).
- Coady, David. 2007. Are conspiracy theorists irrational? *Episteme* 4: 193–204.
- Cuevas, Pedro Carlos González. 2019. *Vox: Entre el Liberalismo Conservador y la Derecha Identitaria*. País Vasco: La Tribuna del País Vasco.
- Dias, João Ferreira. 2022. Political messianism in portugal, the case of andré ventura. *Slovak Journal of Political Sciences* 22: 79–107. [\[CrossRef\]](#)
- Douglas, Karen M., Robbie M. Sutton, and Aleksandra Cichocka. 2017. The psychology of conspiracy theories. *Current Directions in Psychological Science* 26: 538–42. [\[CrossRef\]](#) [\[PubMed\]](#)
- Easton, David. 1965. *A Systems Analysis of Political Life*. New York: John Wiley & Sons.
- Ekman, Mattias. 2022. The great replacement: Strategic mainstreaming of far-right conspiracy claims. *Convergence: The International Journal of Research into New Media Technologies* 28: 1127–43. [\[CrossRef\]](#)
- Ekman, Paul. 1992. An argument for basic emotions. *Cognition and Emotion* 6: 169–200. [\[CrossRef\]](#)
- Fairclough, Norman. 2013. *Critical Discourse Analysis: The Critical Study of Language*. London: Routledge.
- Fernández-García, Belén, and Susana Salgado. 2022. Discourses about fake news, conspiracies and counterknowledge in spain. *Western Journal of Communication* 86: 561–80. [\[CrossRef\]](#)
- García-Jaramillo, Daniel, Tânia R. Santos, and Maria Fernandes-Jesus. 2023. "Not wanting to see it is hypocrisy, it's denying what is obvious": Far-right discriminatory discourses mobilised as common sense. *Journal of Community & Applied Social Psychology* 33: 1413–25. [\[CrossRef\]](#)
- Goertzel, Ted. 2010. Conspiracy theories in science: Conspiracy theories that target specific research can have serious consequences for public health and environmental policies. *EMBO Reports* 11: 493–99. [\[CrossRef\]](#)

- Gurr, Ted Robert. 1970. *Why Men Rebel*. Princeton: Princeton University Press.
- Hasher, Lynn, David Goldstein, and Thomas Toppino. 1977. Frequency and the conference of referential validity. *Journal of Verbal Learning and Verbal Behavior* 16: 107–12. [\[CrossRef\]](#)
- Hernandez Aguilar, Luis M. 2024. Memeing a conspiracy theory: On the biopolitical compression of the great replacement conspiracy theories. *Ethnography* 25: 76–97. [\[CrossRef\]](#)
- Kahneman, Daniel. 2011. Thinking, fast and slow. *Farrar, Straus and Giroux*.
- King, Gary, Robert O. Keohane, and Sidney Verba. 2021. *Designing Social Inquiry: Scientific Inference in Qualitative Research*. Princeton: Princeton university press.
- Klein, Ofra, and Jasper Muis. 2019. Online discontent: Comparing western european far-right groups on facebook. *European Societies* 21: 540–62. [\[CrossRef\]](#)
- Kramer, Adam D. I., Jamie E. Guillory, and Jeffrey T. Hancock. 2014. Experimental evidence of massive-scale emotional contagion through social networks. *Proceedings of the National Academy of Sciences* 111: 8788–90. [\[CrossRef\]](#)
- Kress, Gunther. 2001. *Multimodal Discourse: The Modes and Media of Contemporary Communication*. London: Edward Arnold.
- Krzyżanowski, Michał. 2020. Discursive shifts and the normalisation of racism: Imaginaries of immigration, moral panics and the discourse of contemporary right-wing populism. *Social Semiotics* 30: 503–27. [\[CrossRef\]](#)
- Krzyżanowski, Michał, Mattias Ekman, Per-Erik Nilsson, Mattias Gardell, and Christian Christensen. 2021. Uncivility, racism, and populism: Discourses and interactive practices in anti- & post-democratic communication. *Nordicom Review* 42 (Suppl. S1): 3–15.
- Lerner, Jennifer, and Dacher Keltner. 2001. Fear, anger, and risk. *Journal of Personality and Social Psychology* 81: 146–59. [\[CrossRef\]](#) [\[PubMed\]](#)
- López, Alfonso, and Gabriel Colomé. 2021. La extrema derecha hoy: De europa a españa. In *El auge de la extrema derecha en España*. Edited by Tirant lo Blanch: Barcelona: BCN, ES, pp. 21–52.
- Lubbers, Marcel, Mérove Gijssberts, and Peer Scheepers. 2002. Extreme right-wing voting in western europe. *European Journal of Political Research* 41: 345–78. [\[CrossRef\]](#)
- Maccaferri, Marzia, and Andrea Mammone. 2022. On italy's populism(s). *Modern Italy* 27: 1–3. [\[CrossRef\]](#)
- Máiz Suárez, Ramón. 2010. La hazaña de la razón: La exclusión fundacional de las emociones en la teoría política moderna. *Revista de Estudios Políticos* 149: 11–45.
- Marcus, George E., W. Russell Neuman, and Michael MacKuen. 2000. *Affective Intelligence and Political Judgment*. Chicago: University of Chicago Press.
- Marino, Erik Bran, Renata Vieira, Jesus Manuel Benitez Baleato, Ana Sofia Ribeiro, and Katarina Laken. 2024. Decoding sentiments about migration in portuguese political manifestos (2011, 2015, 2019). Paper presented at the 16th International Conference on Computational Processing of Portuguese, Santiago de Compostela, Spain, March 12–15, vol. 2, pp. 149–59.
- McCarty, Nolan, Keith T. Poole, and Howard Rosenthal. 2006. *Polarized America: The Dance of Ideology and Unequal Riches*. Cambridge: MIT Press.
- Meadows, Donella H. 2008. *Thinking in Systems: A Primer*. White River Junction: Chelsea Green Publishing.
- Medvedskaya, Elena I. 2022. Features of the attention span in adult internet users. *RUDN Journal of Psychology and Pedagogics* 19: 304–19. [\[CrossRef\]](#)
- Mellón, Joan Antón, and Ismael Seijo Boado. 2024. *La Nostalgia Fascista del Futuro: La Derecha Radical Europea*, 1st ed. Spain: Icaria.
- Mendes, Marina, and James Dennison. 2020. Explaining the emergence of the radical right in spain and portugal: Salience, stigma and supply. *South European Society and Politics* 25: 169–99. [\[CrossRef\]](#)
- Mudde, Cas. 2000. *The Ideology of the Extreme Right*. Manchester: Manchester University Press.
- Mudde, Cas. 2019. *The Far Right Today*. Cambridge: Polity Press.
- Navarro, Francisco, and Aiden Yeh. 2022. The dangerous discourse of “us” vs. “them”: Spain's vox discursive practices. *Journal of Nationalism, Memory & Language Politics* 16: 211–33. [\[CrossRef\]](#)
- Nefes, Türkay Salim, Jasna Milošević Đorđević, and Milica Vdović. 2024. With god we distrust! The impact of values in conspiracy theory beliefs about migration in Serbia. *Sociological Research Online*. [\[CrossRef\]](#)
- Pariser, Eli. 2011. *The Filter Bubble: How the New Personalized Web Is Changing What We Read and How We Think*. Harmondsworth: Penguin.
- Peitz, Linus, Fanny Lalot, Karen Douglas, Robbie Sutton, and Dominic Abrams. 2021. COVID-19 conspiracy theories and compliance with governmental restrictions: The mediating roles of anger, anxiety, and hope. *Journal of Pacific Rim Psychology* 15: 183449092111046646. [\[CrossRef\]](#)
- Pietrucci, Pamela. 2023. Neofascist “thugs”, pandemic protests, populisms: Giorgia meloni's cerchiobottismo and the rise of fratelli d'italia during the pandemic. *Javnost—The Public* 30: 51–66. [\[CrossRef\]](#)
- Popper, Karl R. 1963. Science as falsification. *Conjectures and Refutations* 1: 33–39.
- Ribeiro, Manoel Horta, Rodrigo Ottoni, Robert West, Virgílio Almeida, and Wagner Meira, Jr. 2020. Auditing radicalization pathways on youtube. Paper presented at the 2020 Conference on Fairness, Accountability, and Transparency, Barcelona, Spain, January 27–30. pp. 131–41.
- Rivera Otero, Xosé Manuel, and Nieves Lagares Díez. 2022. Emociones y política: Introducción. *Revista Española de Ciencia Política* 58: 13–18.

- Salmela, Mikko, and Christian von Scheve. 2017. Emotional roots of right-wing political populism. *Social Science Information* 56: 567–95. [[CrossRef](#)]
- Stein, Louisa, Henry Jenkins, Sam Ford, Joshua Green, Paul Booth, Kristina Busse, Melissa Click, Xiaochang Li, and Sharon Ross. 2014. Spreadable media: Creating value and meaning in a networked culture. *Cinema Journal* 53: 152–77.
- Sunstein, Cass R. 2001. *Echo Chambers: Bush v. Gore, Impeachment, and Beyond*. Princeton: Princeton University Press.
- Sunstein, Cass R. 2009. *Going to Extremes: How Like Minds Unite and Divide*. Oxford: Oxford University Press.
- Tian, Xiaoxu, Xinhua Bi, and Hao Chen. 2023. How short-form video features influence addiction behavior? Empirical research from the opponent process theory perspective. *Information Technology & People* 36: 387–408.
- Van Dijk, Teun A. 2015. Critical discourse analysis. In *The Handbook of Discourse Analysis*. Hoboken: John Wiley & Sons, pp. 466–85.
- van Prooijen, Jan-Willem. 2020. An existential threat model of conspiracy theories. *European Psychologist* 25: 16–25. [[CrossRef](#)]
- von Bertalanffy, Ludwig. 1969. *General System Theory: Foundations, Development, Applications*. Brooklyn: George Braziller.
- Vosoughi, Soroush, Deb Roy, and Sinan Aral. 2018. The spread of true and false news online. *Science* 359: 1146–51. [[CrossRef](#)]
- Zmigrod, Leor, and Amit Goldenberg. 2020. Cognition and emotion in extreme political action. *OSF Preprints* [[CrossRef](#)]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.