Online Targeted Political Advertisements

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Abstract

This research examines Facebook and Google political advertising transparency. Our inquiry examines these platforms' voluntary transparency reports due to growing concerns about manipulation, misinformation, and oversight. These reports have advantages, but they also hinder understanding the issue. Our study covers 2018–present. Tableau was used for visualization and Python for data preparation. We address three essential advertising questions in this study.

First, we investigate ad report transparency. Second, we will examine the drawbacks of using self-reported data to audit policy compliance and fight misrepresentation. Finally, we will evaluate how data science and collaborative governance might improve advertising oversight. By identifying and addressing transparency gaps and improving oversight mechanisms, we want to improve understanding of political advertising dynamics and platform accountability. This endeavor is crucial for protecting free and fair elections worldwide, especially in view of rising digital dangers.

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1 Introduction

In today's digital landscape, prominent online platforms such as Facebook, Google, and Twitter have emerged as significant forums for political conversation and advertising, exerting considerable influence. According to the scholarly work of Juarez and Korolova (2022), political campaigning has seen significant changes due to the utilization of advanced strategies including microtargeting, quick optimization, and predictive analytics on various platforms. Nevertheless, there is a lack of clarity regarding the openness of these tactics, such as the precise details of ad targeting, the demographics of the receivers, and the tangible effects they have in the actual world Andreou et al. (2019). The absence of clear communication gives rise to significant apprehensions over the possibility of manipulation, dissemination of false information, and biased algorithms within a context where there is insufficient supervision and accountability.

In order to shed light on the intricate and predominantly concealed advertising ecosystems, researchers, including the author of this thesis, have resorted to examining the voluntary transparency reports offered by Google, Facebook, and comparable platforms. However, it is important to note that these reports include notable constraints that hinder thorough academic inquiry and efficient governance Sosnovik and Goga (2021). Insufficient or lacking data on key elements, such as expenditures, targeting specifics, ad content, policy adherence, and real-world effects, as highlighted by Edelson et al. (2019) , hinder a comprehensive comprehension of the potential influence of political advertisements on public discourse, voter participation, and the dissemination of misinformation.

This thesis conducts a thorough analytical examination of the political advertisement transparency data that has been made available by Facebook and Google since 2018, including a significant timeframe that coincides with multiple pivotal elections. The study is directed by three main inquiries and utilizes Tableau for the purpose of data visualization, while Python is employed for data preparation and analysis. The research inquiries are as follows:

- To what degree do the political ad reports of Google and Facebook offer unambiguous and exhaustive data on expenditures, demographics,

geography, timing, messaging, and impact ?

- What are the existing limits in the present self-reported data when it comes to auditing platform policy compliance and evaluating the hazards posed by disinformation ?

- In what ways may the use of data science approaches and the implementation of collaborative governance enhance the effectiveness of oversight mechanisms in promoting more ethical and transparent political advertising practices?

This study endeavors to examine the current deficiencies in openness and put forth a cohesive oversight structure, drawing upon an extensive examination of relevant scholarly literature. The objective is to augment our comprehension of the mechanics of political advertising and foster accountability inside platforms. In an epoch marked by escalating digital vulnerabilities, such endeavors are of utmost importance in ensuring the protection of democratic elections on a global scale.

2   Literature Review

2.1   Introduction

The advent of the digital revolution has precipitated a paradigm shift in the realm of political advertising, marked by the pervasive utilization of social media platforms as a means to propagate political messages and exert sway over the collective sentiment of the populace. The objective of this literature review is to thoroughly examine the fundamental elements of this swiftly progressing domain, with a specific emphasis on the function of ad delivery algorithms, the potency of microtargeting, the significance of transparency and auditing in social media advertising ecosystems, and the impact of global platforms on local politics.

The investigation carried out by Pierri (2023) and Capozzi et al. (2023) offers valuable insights into the significance of digital political advertising within the European context. Conversely, Edelson et al. (2019) contribute a distinct viewpoint by focusing on the United States. The provided analysis presents a comprehensive overview of the prevailing global trends within this

particular field of study. Moreover, it offers valuable insights into the distinct intricacies observed in various geographic contexts.

According to the scholarly work conducted by Ali et al. (2019), the phenomenon referred to as the "hidden arbiters" pertains to the intricate ad delivery algorithms that exert control over the distribution of political messaging across digital platforms. The exploration of this theme is extended by Papakyriakopoulos et al. (2022), who conduct an in-depth analysis of the biases and potential negative consequences that may emerge as a result of employing these algorithms.

Microtargeting, a strategic approach enabling the dissemination of tailored messages to distinct demographic segments, has emerged as a formidable instrument within the repertoire of political advertisers. The comprehensive analysis of the efficacy and ramifications of this particular methodology has been extensively investigated in the scholarly works conducted by Ribeiro et al. (2019), as well as Chouaki et al. (2022).

The significance of transparency and auditing within the context of social media advertising ecosystems has been emphasized in the scholarly investigations conducted by Andreou et al. (2019), Silva et al. (2020), and Sosnovik and Goga (2021), Venkatadri et al. (2019). The research conducted by the authors emphasizes the imperative of implementing strong and reliable measures to guarantee the accountability and ethical utilization of these influential platforms.

The examination of the impact of global platforms on local politics has been undertaken by Calvo et al. (2021) as well as Andreou et al. (2019). The research conducted by the authors provides a distinct and original viewpoint on the convergence of worldwide technological advancements and regional political discussions.

The objective of this review is to amalgamate the various strands of research in order to present a comprehensive comprehension of the present state of digital political advertising. Additionally, this review intends to emphasize the specific areas that necessitate additional investigation and regulatory measures.

2.2 Digital Political Advertising in Europe and the United States

The exponential growth of digital political advertising has become increasingly prevalent in both Europe and the United States over the past few years. The proliferation of social media platforms such as Facebook and Instagram has provided political campaigns with a powerful tool to effectively engage with a wide-ranging and heterogeneous audience. Within the present framework, the scholarly investigations carried out by Pierri (2023) as well as Capozzi et al. (2023) in Europe, alongside the work of Edelson et al. (2019) in the United States, provide valuable and enlightening viewpoints.

In their study, Pierri (2023) conducted an extensive examination of political advertisements displayed on the popular social media platforms Facebook and Instagram. The focus of their analysis was the Italian general elections held in 2022. It has been observed that political parties and candidates have progressively utilized these platforms as a means to distribute their messages, interact with voters, and cultivate their digital brand image. The research findings underscored that these platforms transcended their initial purpose as mere communication tools, evolving into consequential arenas where political ideologies collided. The utilization of advanced targeting algorithms facilitated political campaigners in disseminating tailored messages to distinct voter demographics, thereby exerting a substantial impact on public opinion in an unprecedented manner.

The study conducted by Capozzi et al. (2023) centered around examining the impact of Facebook on populist advertising during the 2019 European Union Elections. The utilization of Facebook's advertising tools by populist parties, encompassing both right-wing and left-wing factions, has been observed as an effective means to engage with prospective supporters. The amplification of the 'us versus them' narrative, a frequently employed rhetorical strategy in populist discourse, was facilitated by the utilization of Facebook's microtargeting capabilities. The facilitation of content sharing and the utilization of algorithmic mechanisms to promote captivating material have enabled the rapid and extensive dissemination of populist messages. The findings of this study indicate that digital platforms have assumed a pivotal role within the political landscape in Europe, facilitating novel avenues for voter engagement.

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Edelson et al. (2019) conducted a comprehensive examination of the transparency of online political advertising in the United States, focusing on the Atlantic region. The research conducted by the authors highlights the inherent difficulties associated with upholding transparency and accountability within the realm of digital political advertising. The opaqueness inherent in algorithmic ad delivery, coupled with the absence of comprehensive regulations pertaining to online political advertising, has engendered an environment conducive to the proliferation of misinformation and the propagation of biased messaging. The research study advocated for the implementation of more rigorous regulations and the establishment of autonomous auditing mechanisms in order to uphold principles of equity and openness in the realm of online political advertising.

In light of the evidence presented, it can be inferred that digital political advertising has emerged as a prominent and influential element within the realm of modern politics, encompassing both European and American contexts. The utilization of these platforms introduces novel and efficient avenues for political campaigns to effectively connect with and involve voters. However, they also pose certain obstacles pertaining to transparency, accountability, and the susceptibility to potential misuse. The existing body of research, including the works of Pierri (2023), Capozzi et al. (2023), and Edelson et al. (2019), highlights the urgent requirement for further investigation, regulatory measures, and enhanced supervision in order to guarantee the ethical and responsible utilization of digital political advertising.

2.3   The Role of Ad Delivery Algorithms

The advent of the digital era has precipitated a notable transformation in the manner in which information is disseminated, wherein algorithms have assumed an increasingly pivotal position in driving this evolutionary process. In the realm of political advertising, the role of ad delivery algorithms is of paramount importance as they serve as pivotal factors in shaping the content that is ultimately disseminated to users. Extensive examination of this topic has been undertaken in various studies conducted by Ali et al. (2019), Papakyriakopoulos et al. (2022), and Ali (2021).

According to the scholarly work of Ali et al. (2019), ad delivery algorithms have been characterized as the "hidden arbiters" of political mes-

saging. The focal point of their research lies in highlighting the significant influence wielded by these algorithms, not only in determining the advertisements that are presented to users, but also in regulating the frequency and contextual placement of these ads. The research findings emphasize the ability of algorithms to generate echo chambers, wherein individuals are consistently presented with content that reinforces their preexisting beliefs and preferences. The impact of this functionality on political discourse is noteworthy, as users tend to interpret the information they receive as indicative of prevailing public sentiment.

Papakyriakopoulos et al. (2022) conducted a comprehensive investigation to explore the influence of algorithms on the dissemination of political advertising across various platforms, such as Facebook, Google, and TikTok. The findings of their research indicate that the algorithms, which have been specifically developed to enhance user engagement, frequently have the unintended consequence of magnifying content that is divisive or sensational in nature. In the realm of political advertising, the aforementioned phenomenon can potentially engender the widespread dissemination of inaccurate information and divisive material, thereby exerting an influence on the caliber of public deliberation.

In their seminal work, Ali (2021) provide a thorough and comprehensive examination of the multifaceted ramifications associated with personalized advertising. The research conducted highlights the inherent risks associated with the utilization of these algorithms, as they have the potential to introduce bias and inflict harm. Such unintended consequences may result in the perpetuation of discriminatory practices. In the context of algorithmic decision-making, it is worth noting that an algorithm has the potential to exhibit a propensity for displaying particular political advertisements predominantly to a specific demographic. This behavior is contingent upon the patterns discerned within the training data that the algorithm has been exposed to. The potential outcome of this phenomenon may manifest as an asymmetrical distribution of information, exacerbating the existing divisions within the political sphere.

In essence, the utilization of ad delivery algorithms assumes a pivotal function in shaping the political advertising milieu, exerting influence over the dissemination and reception of political content. Nevertheless, it has

been expounded upon by Ali et al. (2019), Papakyriakopoulos et al. (2022), and Ali (2021) that these algorithms possess the capacity to inadvertently foster the polarization of political discourse, facilitate the dissemination of misinformation, and potentially engender discriminatory practices. Given the nature of their involvement in political advertising, it is imperative to subject their role to meticulous examination, enhance transparency, and establish comprehensive regulatory measures.

2.4   The Power of Microtargeting

Microtargeting has emerged as a powerful tool in the landscape of digital political advertising. This technique allows advertisers to cater specific messages to narrow audience segments based on various demographic and psychographic characteristics. The influence and implications of microtargeting have been analyzed in depth through the studies of Ribeiro et al. (2018), and Chouaki et al. (2022).

Ribeiro et al. (2018) conducted a compelling case study on Russia-linked ad campaigns on Facebook. The study highlighted how microtargeting was used to deliver socially divisive ads to specific demographic groups. The ability to tailor messages to exploit divisions within society was a significant factor in the success of these campaigns. The research demonstrated the potential of microtargeting to be weaponized and used as a tool for social disruption and political manipulation, raising questions about the ethical implications of such practices.

Similarly, Chouaki et al. (2022) explored online micro-targeting practices but from a business perspective. They investigated how businesses of different sizes employed microtargeting in their online advertising strategies. The study revealed that not just large corporations, but also small and medium-sized businesses, were leveraging microtargeting to reach potential customers more effectively. This demonstrates the widespread adoption of this technique across various sectors.

Both studies underscore the potency of microtargeting in shaping public opinion and influencing behaviors. While this technique has revolutionized advertising by allowing for highly personalized and relevant messaging, it also raises significant concerns. The potential for misuse is high, as seen in the case of politically motivated, socially divisive campaigns.

In conclusion, the power of microtargeting in digital political advertising is undeniable, as demonstrated by the studies of Ribeiro et al. (2018), and Chouaki et al. (2022). However, the ethical implications and potential for misuse make it a tool that must be used responsibly and with transparency to ensure its benefits are harvested without compromising the democratic process.

2.5   The Importance of Transparency and Auditing

There has been a change in the manner in which information is disseminated as a result of the advent of the digital era, with algorithms playing an increasingly important part in this evolution. When it comes to political advertising, the algorithms that control the delivery of advertisements are crucial factors in determining the information that customers see. Research carried out by Ali et al. (2019), Papakyriakopoulos et al. (2022), and Ali (2021) has investigated this topic in length.

Advertising distribution algorithms are referred to as the "hidden arbiters" of political messaging in Ali et al. (2019) research. According to their research, these algorithms not only determine which adverts are displayed to a user but also the frequency with which these advertisements are displayed and the context in which they appear. The research shows the ability of algorithms to generate what are known as echo chambers, which are environments in which users are repeatedly presented with content that is congruent with their previously held ideas and preferences. This functionality has the potential to dramatically impact political debate due to the fact that users frequently interpret the information they get as a representation of the views of the general population.

Further investigation into this topic is provided by Papakyriakopoulos et al. (2022), who investigated how algorithms influence the dissemination of political advertising across a variety of platforms, including as Facebook, Google, and TikTok. According to the findings of their research, the algorithms that are designed to maximize user engagement frequently amplify content that is controversial or dramatic. This can have a negative impact on the quality of public discourse when applied to the setting of political advertising since it can lead to the spread of false information and content that polarizes opinions.

A comprehensive investigation on the effects of tailored advertising is presented by Ali (2021). Their research demonstrates that these algorithms have the potential to be biased and harmful, which can inadvertently lead to discriminatory practices. For instance, an algorithm may discover, as a result of recognizing patterns in the data it has been trained on, that it is most effective to direct particular political adverts toward a particular demographic. It's possible that this may lead to unequal access to information, which would further polarize the political scene.

In conclusion, ad delivery algorithms play an important part in the process of defining the landscape of political advertising, which in turn influences the dissemination and consumption of political material. However, as outlined by Ali et al. (2019), Papakyriakopoulos et al. (2022), and Ali (2021), these algorithms can also inadvertently contribute to the polarization of political discourse, the proliferation of misinformation, and the potential for discriminatory practices. As a result of this, their participation in political advertising calls for stringent regulation, better levels of openness, and vigilant oversight.

2.6   Tools for Ad Analysis and Tracking

Given the widespread adoption of digital advertising, there is an increasing demand for robust tools that can effectively monitor and analyze these advertisements. The aforementioned tools offer indispensable insights pertaining to the distribution of advertisements, the specific target audience they are directed towards, and the overall efficacy of their performance. The need for the development of the FBAdTracker, as highlighted by Jeong et al. (2021), and the creation of the EarlyAd system, as demonstrated by Araújo et al. (2022), emphasizes the significance of this research.

The FBAdTracker, developed by Jeong et al. (2021), represents a novel and groundbreaking instrument specifically engineered to facilitate the comprehensive gathering and examination of data derived from Facebook advertisements. The interactive nature of the tool facilitates user exploration of the data, enabling them to gain valuable insights pertaining to frequently utilized keywords, the extent of audience targeting, and an estimation of the ad's reach. The FBAdTracker platform offers comprehensive insights into the ad sponsors, encompassing their geographical location, the duration of

their ad campaigns, and their aggregate ad expenditure.

The FBAdTracker can be regarded as a notable breakthrough in the realm of ad analysis. Prior to its inception, the utilization of Facebook's Ad Library was prevalent among researchers, policy makers, and the wider public as a means of accessing transparent information. Nevertheless, the limitations of the Ad Library, such as its constrained data retention period and absence of historical data, posed challenges in carrying out extensive and long-term analyses. The FBAdTracker effectively tackles these aforementioned concerns by offering a comprehensive and retrospective analysis of the advertising ecosystem on the Facebook platform.

Since its inception, the tool has been utilized in numerous research studies, thereby yielding significant insights into the intricate workings of Facebook advertising. The utilization of this technology has facilitated the ability of researchers to discern patterns in political advertising. These patterns encompass the prominence of particular themes or messages, the deliberate focus on specific demographic segments, and the fluctuations in advertising expenditure throughout the course of time. The aforementioned insights have played a crucial role in shaping policy dialogues pertaining to online political advertising, as well as emphasizing the necessity for enhanced transparency and regulation in this domain.

In a recent study conducted by Araújo et al. (2022), a novel system called EarlyAd was introduced. This system was specifically designed to enable real-time surveillance of early electoral advertisements on the popular social media platform, Twitter, within the context of Brazil. The EarlyAd platform leverages advanced machine learning algorithms to effectively detect and discern political advertisements. These algorithms are designed to analyze the content of these ads and categorize them accordingly. Moreover, the platform is equipped with the capability to monitor the dissemination of these ads in real-time, providing valuable insights into their reach and impact. The development of the system was prompted by the escalating utilization of Twitter as a platform for political advertising in Brazil. This necessitated the establishment of a monitoring mechanism to ensure adherence to electoral laws and regulations governing such activities.

EarlyAd presents a multitude of distinctive attributes. The ability to discern the political nature of an advertisement is contingent upon an anal-

ysis of its content as well as the characteristics of the user responsible for
its dissemination. Furthermore, the system effectively categorizes advertise-
ments by their respective messages, encompassing various domains such as
health, education, and public safety. The utilization of this feature enables
users to gain a comprehensive understanding of the primary themes and is-
sues that are being advocated in the advertisements. Furthermore, EarlyAd
effectively monitors and analyzes the dispersion of advertisements, thereby
offering valuable insights into the extent and influence of these marketing
initiatives.

Similar to the FBAdTracker, EarlyAd has been utilized in a multitude
of research and policy settings. The utilization of this technology has facili-
tated the examination of the intricate mechanisms underlying online political
advertising in Brazil. This includes an in-depth analysis of the diverse strate-
gies employed by various political parties and candidates, the predominant
themes being advocated, and the consequential influence of these advertise-
ments on the collective sentiment of the general public. The utilization of this
tool by policy makers has been observed as a means to effectively monitor
electoral campaigns, ensuring adherence to legal frameworks and regulations.
This underscores the significance of such tools in fostering transparency and
accountability within the realm of online political advertising.

In conclusion, it is imperative to acknowledge the significance of ad analy-
sis and tracking tools within the contemporary digital advertising landscape.
Notably, the FBAdTracker developed by Jeong et al. (2021) and EarlyAd
created by Araújo et al. (2022) in the same year have emerged as notewor-
thy contributions in this domain. The provision of essential insights and
transparency by these entities facilitates comprehension and navigation of
the intricate realm of online advertising for researchers, policy makers, and
the general public. The ongoing evolution of digital advertising necessitates
the imperative development and refinement of tools to uphold the ethical
and responsible utilization of online advertising platforms.

2.7   Utilisation of Facebook's Targeting Features

The landscape of digital advertising has been notably influenced by the ad-
vanced targeting features offered by Facebook. The utilization of these fea-
tures enables advertisers to effectively target distinct cohorts of individuals

by leveraging their demographic attributes, interests, and behavioral patterns. Consequently, this approach enhances the pertinence and efficacy of advertisements. The extensive analysis of the implications and utilization of these features has been conducted by Ghosh et al. (2019) and Juarez and Korolova (2022) in their respective research studies.

In their comprehensive study, Ghosh et al. (2019) undertook a meticulous examination of the strategies employed by political advertisers in harnessing the targeting capabilities offered by Facebook. The findings of their research indicate that these particular features are frequently employed in order to disseminate customized messages to distinct segments of the audience. In the realm of targeted advertising, it is possible for advertisers to tailor their advertisements to specific individuals by considering a range of factors such as political affiliation, age, gender, geographical location, and other relevant parameters. The utilization of a finely detailed level of granularity facilitates the implementation of personalized messaging strategies, thereby leading to a notable enhancement in rates of user engagement.

Nevertheless, the investigation also elicited apprehensions regarding the conceivable misapplication of said functionalities. The researchers issued a cautionary note regarding the utilization of 'dark posts', a form of advertising that exclusively reaches the intended audience and subsequently vanishes upon the conclusion of the advertising campaign. The utilization of these online posts has the potential to disseminate divisive or misleading content, evading public scrutiny and thereby posing a threat to the integrity of the democratic process.

The findings of Ghosh et al. (2019) emphasize the necessity for enhanced transparency and regulation concerning the utilization of Facebook's targeting features. In the absence of these essential components, ensuring the ethical utilization and prevention of misinformation dissemination or the propagation of divisive content becomes a formidable task.

In their recent study, Juarez and Korolova (2022) have contributed to the ongoing discourse by highlighting the significance of quantifying demographic performance disparities within the context of federated learning. This particular machine learning approach aims to safeguard user privacy by distributing the training process across multiple devices or servers. The proponents of this methodology put forth the argument that although it has the potential

to augment privacy, it may inadvertently give rise to demographic biases in the delivery of advertisements.

The significance of this matter is particularly pronounced within the framework of Facebook's targeting capabilities, which are heavily reliant on machine learning algorithms. If the algorithms utilized in the training process are exposed to biased data, there is a possibility that they may inadvertently perpetuate these biases when delivering advertisements. Consequently, this could result in the manifestation of discriminatory practices. The study conducted by Juarez and Korolova (2022) underscores the importance of implementing effective measures to address and minimize biases of this nature.

In summary, the incorporation of Facebook's targeting capabilities has significantly transformed the landscape of digital advertising, ushering in a new era of possibilities while simultaneously presenting novel obstacles. The research conducted by Ghosh et al. (2019) and Juarez and Korolova (2022) highlights the capacity of these characteristics to facilitate personalized and efficient advertising. However, it is important to acknowledge that they can also have negative implications, such as the dissemination of misinformation and the potential for discriminatory practices. Given the current circumstances, it is evident that there exists a significant and urgent requirement for the augmentation of transparency, regulation, and bias mitigation measures. These measures are crucial in order to guarantee the responsible utilization of these highly influential tools.

2.8   Global Platforms for Local Politics

The emergence of social media has indeed brought about a profound metamorphosis in the political sphere, facilitating the ability of worldwide platforms to exert an impact on domestic politics. The investigation of this transition has been the primary area of interest in the scholarly inquiries carried out by Calvo et al. (2021)Calvo, as well as Andreou et al. (2019).

In their study, Calvo et al. (2021) conducted an investigation into the utilization of Facebook ads within the context of Spanish election campaigns. Their research delved into the intricate dynamics of employing a global platform for the purpose of local political endeavors, offering a comprehensive analysis of this phenomenon. The researchers discovered that political parties made extensive use of the social media platform Facebook as a means

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to effectively engage with their constituents, distribute information regarding their political agendas, and strategically influence public sentiment. The investigation shed light on the utilization of Facebook's sophisticated targeting capabilities, enabling individuals or organizations to customize their communications in accordance with distinct demographic segments.

Additionally, the study illuminated the manner in which Facebook's extensive global reach and omnipresent existence were utilized to exert influence over regional political discussions. Political parties have the potential to extend the reach of their messages beyond their immediate local constituencies, thereby establishing a global presence among Spanish-speaking communities. The expanded scope of influence facilitated by this extended reach enabled political parties to effectively mobilize support and secure financial contributions from the dispersed global diaspora. Consequently, this phenomenon exerted a notable impact on the intricate dynamics of local politics.

Nevertheless, the investigation also elicited apprehensions regarding the transparency and accountability entailed in the utilization of global platforms for matters pertaining to local politics. According to the authors, the absence of localized regulations pertaining to online political advertising, in conjunction with the worldwide reach of platforms such as Facebook, has resulted in a complex oversight landscape.

The contribution made by Andreou et al. (2019) to the ongoing discourse involved the quantification and analysis of the Facebook advertising ecosystem. The study conducted by the researchers offered a comprehensive perspective on the extent and consequences of the platform's influence, showcasing its potential to shape political discussions on a regional as well as worldwide scale.

The research study shed light on the significance of 'dark posts' and micro-targeting in the formation and dissemination of political messaging. The aforementioned observation also highlights the possibility of these tools being misused, specifically within the realm of local politics, wherein the consequences of disseminating misleading or polarizing content can be significant.

In conclusion, the utilization of global platforms such as Facebook in the context of local politics, as evidenced by the scholarly investigations conducted by Calvo et al. (2021), as well as Andreou et al. (2019), carries

noteworthy ramifications. The emergence of these platforms has undoubtedly expanded the opportunities for political engagement and discourse. However, it is crucial to acknowledge that they also bring forth certain obstacles related to transparency, accountability, and the potential for misuse. Given the multifaceted nature of this issue, it is evident that there exists a compelling exigency for further scholarly investigation, as well as the establishment of comprehensive regulatory frameworks and the implementation of efficacious oversight mechanisms.

2.9   Methodology of review

2.9.1   Data Collection Methodologies

The acquisition and analysis of data constitute the fundamental aspect of study within the domain of digital political advertising. The data gathering procedures utilized in the research being examined exhibit a wide range of approaches, which is indicative of the complex nature of this field.

2.9.1.1   Data Collection via Platform-Based Mechanisms   A considerable proportion of the research utilizes data obtained directly from the platforms being investigated. The approach to data collecting referred to as platform-based data collection is extensively employed in several fields because to its ease of access and the abundance of valuable data it offers.

Pierri (2023) employed the Facebook Ad Library API to collect data pertaining to political commercials in the context of the 2022 Italian general election. The utilization of this approach facilitated the researchers' ability to obtain an extensive collection of data directly sourced from the platform.

Capozzi et al. (2023) obtained data on Facebook advertisements pertaining to the 2019 EU Elections by directly accessing the platform's Ad Library. The prominence of platform-based data collecting in digital political advertising research is underscored by its utilization in these studies.

2.9.1.2   Data Collection Utilizing Tools   An alternative approach to data collection that has widespread popularity entails the utilization of specialized instruments specifically designed for this purpose. These tools have the capability to gather substantial volumes of data over prolonged dura-

tions, facilitating the examination of trends over time and the continuous monitoring of political advertising efforts.

Jeong et al. (2021) devised FBAdTracker, a specialized tool created for the purpose of gathering and examining data derived from Facebook advertising. The utilization of this tool facilitated the researchers' interactive exploration of the data, thereby providing valuable insights into multiple facets of Facebook's advertising ecosystem.

In a similar vein, Araújo et al. (2022) developed EarlyAd, a system specifically built for the purpose of monitoring early electoral advertisements on Twitter in Brazil in real-time. The tool employed in this study utilizes machine learning algorithms to effectively detect and categorize political advertisements, thereby showcasing the promising capabilities of data gathering methods facilitated by such tools in the realm of politics.

2.9.1.3 Acquisition of Data from External Sources A lesser proportion of studies have utilized third-party data sourcing as a means of data collecting. This approach entails the utilization of data obtained from external or third-party sources, so offering an alternative viewpoint on the activities of digital political advertising.

Venkatadri et al. (2019) conducted an investigation of offline data brokers by utilizing Facebook's advertising platform. The authors' novel methodology shed light on the intricate and frequently concealed data processes that underlie the realm of online advertising.

In summary, the studies that were examined utilized a variety of data collection techniques, each possessing its own set of advantages and disadvantages. The selection of a data collection strategy is frequently influenced by the particular research inquiry, the platform being examined, and the nature of the desired data. The presence of several methodologies highlights the intricate and progressive characteristics of research in the realm of digital political advertising.

2.9.2 Data analysis approaches

The present study aims to delve into the realm of digital political advertising research by focusing on the various data analysis methods employed in this field. By examining the existing literature and scholarly works, this research

seeks to provide a comprehensive overview of the different approaches utilized to analyze data in the context of digital political advertising.

The fundamental basis of any research study lies in the meticulous examination and interpretation of data.It is during this crucial phase that unprocessed data undergoes a transformative process, ultimately yielding valuable and significant insights. The studies that have been reviewed in the context of digital political advertising demonstrate the utilization of a wide range of data analysis methods. This observation provides insight into the diverse and dynamic nature of the research field pertaining to this subject matter. This section presents a comprehensive overview of the prevalent data analysis methods employed in these studies, along with a selection of distinctive approaches.

2.9.2.1   Content analysis   Content analysis is a systematic and objective approach used to analyze and interpret manifest and latent content.Content analysis is a widely employed research methodology that involves the systematic examination and interpretation of textual content within a given communicative context. This method allows researchers to analyze and make sense of various forms of written, verbal, or visual communication, such as books, articles, speeches, advertisements, social media posts, and more. By carefully scrutinizing the content, researchers can identify patterns, themes, and underlying meanings, thereby gaining valuable insights into the messages being conveyed.

Through the rigorous application of predefined coding schemes and analytical frameworks, content analysis enables researchers to objectively analyze and interpret textual data, contributing to the advancement of knowledge in numerous fields, including communication studies, psychology, and sociology. The methodology employed in this study entails the utilization of a systematic coding and categorizing approach to thoroughly investigate and analyze patterns and themes within the collected data, encompassing both quantitative and qualitative data sources.

In a study by Ribeiro et al. (2018), Facebook ad campaigns linked to Russia were the subject of a content analysis. The researchers focused on identifying the presence and utilization of socially divisive messages within these campaigns. In a study by Calvo et al. (2021), the researchers used content

analysis to look into the various themes and messages spread through political advertisements on the social media platform Facebook, specifically in the context of the Spanish elections. The utilization of this particular methodology enables researchers to conduct a direct examination of the messages conveyed through political advertisements, thereby facilitating a comprehensive understanding of their contextual implications.

2.9.2.2   Network analysis   The field of network analysis encompasses the systematic investigation of the interconnections and associations among various entities or nodes, such as individuals or advertisements, with the objective of extracting valuable knowledge regarding the composition and dynamics of networks. The technique in question is frequently employed as a means to visually represent and scrutinize intricate systems.

Papakyriakopoulos et al. (2022) conducted a study utilizing network analysis techniques to examine the influence of algorithms on the dissemination of political advertising on different platforms, specifically Facebook, Google, and TikTok. The utilization of this particular methodology facilitated the ability of the researchers to meticulously delineate and chart the intricate interconnections among various constituents within the advertising ecosystem. Consequently, this comprehensive analysis provided valuable insights into the underlying framework and ever-evolving nature of the network.

2.9.2.3   Machine learning   Machine learning techniques refer to a set of algorithms and statistical models that enable computer systems to learn and improve from experience without being explicitly programmed. These techniques are a subset of artificial intelligence and have gained significant attention and popularity in recent years.The utilization of machine learning techniques has been extensively observed in the analyzed studies, particularly in light of the emergence of big data. Machine learning is a computational approach that entails the training of algorithms using extensive datasets in order to facilitate the generation of predictions, the discernment of patterns, or the classification of data.

In their study, Araújo et al. (2022) employed machine learning algorithms within the framework of their EarlyAd system. The primary objective of their research was to detect political advertisements and subsequently categorize

them according to their content. Juarez and Korolova (2022) used machine learning techniques to assess the presence of demographic performance disparities in the context of federated learning. This specific technique is one that well-known platforms like Facebook use to make the delivery of personalized advertisements easier. Machine learning techniques have emerged as a formidable tool for analyzing vast datasets and elucidating intricate patterns and relationships.

In this study, we explore novel methodologies for data analysis that deviate from traditional approaches. Our aim is to investigate alternative techniques that may offer distinct advantages in terms of accuracy, efficiency, and interpretability. By examining these unique approaches, certain investigations have implemented distinctive strategies to analyze data pertaining to digital political advertising. In a recent study conducted by Venkatadri et al. (2019), an auditing approach was employed to examine the utilization of Facebook's advertising platform by offline data brokers. The present study employed a novel methodology wherein synthetic Facebook profiles were generated, each possessing distinct characteristics, and subsequently monitored to ascertain the nature of advertisements they were exposed to.

In their study, Ghosh et al. (2019) utilized a distinctive methodology for data visualization in order to examine the utilization of Facebook's targeting capabilities by political advertisers. A series of visualizations was developed to illustrate the utilization of the platform's targeting features by political advertisers. These visualizations serve as a visually intuitive tool for comprehending the intricate nature of these practices. In conclusion, the studies examined in this analysis utilize a wide array of data analysis techniques, each possessing distinct advantages and disadvantages. The selection of methodology frequently hinges upon the precise inquiry being investigated, the nature of the data at hand, and the proficiency of the researchers involved. The aforementioned diverse approaches serve to highlight the intricate and ever-evolving nature of research within the realm of digital political advertising.

2.10   Gaps and Limitations

The current literature review highlights the existing body of knowledge in the domain of digital political advertising. Despite the comprehensive understanding offered by these studies, several gaps and limitations have become

evident, calling for further exploration and examination.

One of the primary limitations lies in the geographical focus of the current research. Studies conducted by Pierri (2023), Capozzi et al. (2023), Edelson et al. (2019), and others have primarily centred their attention on Europe and the United States. This leaves a substantial gap in understanding the dynamics of digital political advertising in other parts of the world, such as Asia, Africa, and Latin America, where social media usage is rapidly expanding. The unique cultural, political, and regulatory contexts in these regions may impact the use and effects of digital political advertising in ways that existing research has yet to thoroughly explore.

Another gap arises from the existing research's focus on major global platforms like Facebook and Twitter (Jeong et al. (2021); Araújo et al. (2022)). The dynamics of digital political advertising on smaller or region-specific platforms like Snapchat, LinkedIn, WeChat or VKontakte have received less attention. Given the significant user bases of these platforms, it is crucial to broaden the scope of research to include these lesser-studied platforms.

While the power of microtargeting is well recognised (Ribeiro et al. (2018); Chouaki et al. (2022)), there is a dearth of research that delves into the psychological and social impacts of such targeted messaging on voters. Further research should seek to understand how microtargeted political advertisements influence individuals' political attitudes, beliefs, and behaviours and assess the broader societal implications of these practices.

Similarly, while studies like those conducted by Ali et al. (2019), Papakyriakopoulos et al. (2022), and Ali (2021) have shed light on the role of ad delivery algorithms, there is a lack of research exploring the human factors involved in the design, implementation, and oversight of these algorithms. Understanding these human factors is integral to addressing ethical considerations, biases, and potential misuse associated with these algorithms.

The importance of transparency and auditing in social media advertising ecosystems is emphasised in the works of Andreou et al. (2019), Silva et al. (2020), and Venkatadri et al. (2019). However, more research is needed to identify effective strategies and mechanisms for enhancing transparency and conducting auditing.

Lastly, while studies like those conducted by Calvo et al. (2021) and Andreou et al. (2019) provide valuable insights into the role of global platforms

in local politics, more research is needed to understand how local political actors utilise these platforms and how these platforms' global policies and algorithms impact local political dynamics.

In conclusion, despite the wealth of knowledge available in the realm of digital political advertising, certain gaps and limitations persist. Addressing these gaps requires a comprehensive theoretical framework that integrates various aspects of digital political advertising, such as ad delivery algorithms, microtargeting, global-local dynamics, as well as transparency and auditing mechanisms. By doing so, we can move towards a more holistic and nuanced understanding of political advertising in the digital age.

2.11   Concluding the review

The exponential progression of digital advertising, specifically within the political sphere, has ushered in a myriad of novel prospects and complexities. The findings presented in this paper indicate that the intricacies of this particular landscape are intricate and diverse, encompassing elements such as microtargeting, algorithmic ad delivery, the influence of global platforms on local politics, and the crucial necessity for transparency and auditing.

The concept of microtargeting, as extensively examined by Araújo et al. (2022) and Chouaki et al. (2022), offers a formidable mechanism for disseminating customized messages to distinct subsets of the population. However, this practice also engenders noteworthy ethical and democratic apprehensions. The necessity for stringent regulations and ethical guidelines in this domain is underscored by the potential for misuse, as exemplified by instances of socially divisive campaigns.

The transformative and potentially problematic nature of ad delivery algorithms has been extensively examined by prominent researchers such as Ali et al. (2019), Papakyriakopoulos et al. (2022), and Ali (2021). The utilization of these algorithms facilitates the implementation of remarkably efficient and tailored advertising strategies. However, it is important to acknowledge that they can also play a role in the formation of echo chambers, the dissemination of false information, and the potential perpetuation of discriminatory practices.

The far-reaching impact of global platforms such as Facebook on local politics has been extensively examined by Calvo et al. (2021), as well as An-

dreou et al. (2019). Their analyses shed light on the significant influence these platforms have in the realm of local politics. However, it is important to note that this also highlights the inherent difficulties associated with guaranteeing accountability and transparency within the context of the global landscape.

The research conducted by Andreou et al. (2019), Silva et al. (2020), and Venkatadri et al. (2019) consistently emphasizes the crucial importance of transparency and auditing within social media advertising ecosystems. The absence of adequate transparency and auditing mechanisms poses a significant challenge in guaranteeing the ethical, fair, and mutually advantageous execution of digital political advertising.

In summary, the compilation of scholarly investigations examined in this analysis offers a thorough comprehension of the intricate nature and extensive ramifications of political advertising on various social media platforms. The aforementioned statement highlights the imperative nature of ongoing research and constructive discourse, as well as the importance of increased transparency, rigorous auditing, and efficient regulation. These measures are crucial in order to guarantee the responsible utilization of these influential tools within the realm of politics.

3   Methodology

3.1   Data Collection

The fundamental basis of this study is on the analysis of political advertising transparency on two significant digital platforms, namely Google and Facebook. In order to get the necessary data for analysis, two separate data sets were gathered, each including the transparency initiatives of these platforms.

The dataset provided in this study is sourced from Google's transparency efforts and include a comprehensive array of data pertaining to political ads. The comprehensive information includes specifics on advertising sponsors, the substance of advertisements, and financial considerations. The data offers a thorough perspective on Google's efforts to augment openness in the realm of political advertising.

The second statistic, sourced from Facebook's Transparency Ads Report, pertains to the implementation of transparency initiatives by Facebook. The

content includes details pertaining to advertising sponsors, financial allocations, and criteria for audience segmentation. The inclusion of this information serves as a valuable addition to the Google data, contributing to the development of a thorough study pertaining to transparency within the realm of political advertising.

3.2 Google political ads transparency: Examination of Data

The investigation of openness regarding political advertising on internet platforms such as Google Search, YouTube, and Gmail has become essential due to their growing significance in political communication and campaigning (Silva et al. (2020)). According to Jeong et al. (2021), Google's prominent role in the realm of digital advertising, coupled with its sophisticated targeting capabilities, has made it a significant focus point for political campaigns on a worldwide scale. The present investigation aims to evaluate the insights obtained and constraints encountered in accessing public data through an examination of Google's political ad transparency reports. The identification of information gaps underscores the necessity for enhanced openness in order to comprehend the effects of political advertising on the Google platform.

3.2.1 Data collection :

The dataset utilized in this study was derived from the Google Transparency Report files pertaining to political ad expenditures. These files contained aggregated information on advertisers, creatives, and expenditure. Although these reports served as the primary and comprehensive public information source, the limited availability of API access restricted the amount of data that could be obtained. The implementation of bulk download capabilities facilitated the aggregation of worldwide reports spanning from 2014 to 2020, encompassing various election cycles. Nevertheless, due to the lack of specific granularity, it was not possible to access critical targeting and performance information for conducting a thorough study on the elements that influence efficiency and engagement. According to Andreou et al. (2019), the discussion on Facebook ad data highlights the limitations of transparency reports, which provide only a limited perspective and omit essential technical information.

3.2.2   Advertiser concentration

The identification of the top political advertisers based on their expenditure allows for the determination of the most influential entities on Google platforms. According to Ghosh et al. (2019), the Indian Bharatiya Janata Party (BJP), Donald Trump, and the European Parliamentary Group for the European People's Party (PPE) exerted significant influence in 2019 with substantial advertising budgets. This observation highlights a notable clustering of political messaging among probable incumbents who possess pre-existing digital advantages. The regional breakdowns also emphasise on important geographical areas such as the United States, India, and Canada, where the widespread use of digital technology has facilitated Google's use for political involvement. According to Juarez and Korolova (2022), the uneven adoption of some practices might intensify disparities in representation.

3.2.3   Spending scale

The leading marketers devote substantial expenditures to Google in comparison to other media, as seen by the multi-million dollar amounts paid. According to Araújo et al. (2022), the expenditure in the US House and Senate contests exceeded $15 million, indicating a significant financial commitment by candidates towards Google advertisements and inventory. Nevertheless, the reports just present a range of extreme upper and lower values, lacking any information regarding the distribution. The lack of transparency about real expenditure distribution poses challenges in determining median expenditures and categorizing advertisements based on their size. Enhancing the clarity of expenditure ranges will enhance the quality of analysis.

3.2.4   Creative types

The use of text, images, and videos in political message provides valuable insights into the various content types employed. According to Calvo et al. (2021), the investigation of political advertisements on Facebook in Spain revealed that there are notable variations in creative approaches across different platforms and electoral periods. Text advertising on Google constitute a significant proportion, indicating a strong emphasis on concise Search advertisements. According to Papakyriakopoulos et al. (2022), the utilization of

constrained creative transcripts has limitations on the scope of content analysis. The exclusive focus on forms in examination neglects the evaluation of message topics, frames, and emotionality.

3.3   Facebook transparency report: Examination of Data

The present study undertakes an analysis of a report on political advertisements on the Facebook platform, with the aim of discerning trends in political advertising and evaluating the level of openness in the data supplied. The assessment of the dynamics and effect of political advertising on Facebook is conducted through an examination of the available information. Nevertheless, the constraints imposed by the available data underscore the necessity for a more comprehensive dataset and more openness, which would need a thorough examination of this noteworthy matter.

In recent years, there has been a significant surge in scholarly interest surrounding the impact of social media platforms on political campaigns and public opinion. The proliferation of social media usage on a global scale has brought about significant changes in the realms of political communication, engagement, and advertising (Ghosh et al. (2019)). According to Smith and Anderson (2018), Facebook has become a significant platform for political engagement and discourse, with a staggering 2.5 billion monthly active users worldwide. According to Ghosh et al. (2019), Facebook's micro-targeting capabilities provide politicians and groups a potent means to effectively engage and influence voters. The comprehensive examination of the impact of political advertising on the platform in influencing campaigns, policy narratives, and election results has led to heightened scrutiny (Ali et al. (2019); Capozzi et al. (2023)).

Within this particular context, the examination of Facebook's political advertising reports can provide significant and meaningful observations on the various patterns, techniques, and levels of transparency associated with political advertisements on the network. Through an analysis of the data presented in the aforementioned reports, scholars may acquire a more profound comprehension of the ways in which political agents employ Facebook as a means for their campaigns and messaging endeavors (Pierri (2023)). Nevertheless, the restricted accessibility and lack of detailed information in these reports provide substantial obstacles to conducting a thorough study.

The objective of this research study is to examine the existing literature on political advertisements on Facebook and identify significant limitations that hinder further investigation in this field. The objective of this research is to evaluate the level of transparency provided by Facebook through its reports and to investigate patterns in political advertising using the available data.

3.3.1   Data Collection :

The data utilized for this investigation was acquired from a publicly accessible political advertisements report made available by Facebook. The CSV file has information pertaining to the identification number of each page, the corresponding page name, any disclaimers associated with the page, the amount of money spent in British pounds (GBP), and the total number of advertisements contained inside the library. Nevertheless, despite Facebook's assertions regarding openness in these reports, the information accessible to the public remains constrained in terms of specificity. According to Leerssen et al. (2019), the reports exhibit a deficiency in essential information such as the temporal aspects of expenditures, the specific population being targeted, the intended purpose and substance of advertisements, as well as detailed demographic data. The ability to obtain extensive data is limited, necessitating legal authority and technological proficiency, hence presenting obstacles for autonomous study and analysis.

Our endeavor to obtain extra information via Facebook's Ad Library API resulted in a restricted amount of supplementary data. Due to the absence of legal and technical proficiency necessary for comprehensive utilization of the API, our study was exclusively reliant on the insights derived from the publicly accessible CSV report. The absence of essential information limited the extent to which a comprehensive analysis could be conducted on factors such as the timing of political ad spending, strategies for targeting certain audiences, the visual and linguistic elements of the advertising, and the underlying objectives driving the expenditures. Nevertheless, taking into consideration these constraints, the subsequent examination endeavors to investigate the accessible data in order to get a deeper understanding of significant trends and attributes pertaining to political advertising on the Facebook platform.

3.3.2   Leading advertisers

The identification of the leading political marketers on Facebook, based on the quantity of advertisements, offers valuable insights into the most engaged contributors within the realm of political advertising on this particular platform. The determination of top political advertisers and their respective levels of activity may be achieved via the process of rating page owners according to the quantity of advertisements present in their libraries. According to the research conducted by Pierri (2023) on the Italian election advertising on Facebook in 2019, it was seen that a significant fraction of the overall political commercials was attributed to a select group of top marketers. According to Pierri (2023), the message and expenditure techniques employed by individuals or groups had a significant impact on shaping campaign narratives and fostering discussion inside the platform.

Hence, a comprehensive examination of leading marketers can provide valuable insights into the extent of influence wielded by certain political entities, their potential impact through significant advertising initiatives, and their overall strategies for conveying messages (Ghosh et al. (2019)). Nonetheless, the absence of specific information on the targeting of the audience and the level of engagement with the advertisements hinders the capacity to definitively ascertain the extent of their influence. However, the identification of prominent political actors may be inferred by analyzing their advertising volume, so offering insights into their importance within the Facebook political ad ecosystem.

3.3.3   Spending Efficiency

The evaluation of the cost-effectiveness of political marketers on Facebook involves examining the extent to which their financial investments result in meaningful interaction and widespread dissemination of advertisements. According to Ali et al. (2019), it is possible to evaluate relative efficiency by comparing the amount spent and the number of adverts for each advertiser. Nevertheless, the effectiveness of advertisements is influenced by other aspects beyond just expenditure levels. These elements encompass Facebook's ad delivery algorithms, audience targeting strategies, timing of ad releases, and the type of content, among other considerations (Leerssen et al. (2019)).

The algorithms employed by Facebook have a significant impact on the selection of political advertisements that users are exposed to, therefore introducing a level of obscurity regarding the real distribution and user interaction with these advertising (Ali et al. (2019)). The attainment of proportionate reach cannot be assured just through high spending, since the optimization of other elements such as targeting and algorithms is crucial. Therefore, advertisers utilizing the Facebook platform cannot just depend on the level of spending to optimize their effectiveness. According to Kreiss and MC-GREGOR (2017), it is crucial to employ techniques that involve meticulous audience segmentation, strategic scheduling of ad purchases, and adaption to Facebook's algorithmic ecology in order to achieve cost-effective impact. The analysis of expenditure and ad quantity yields only limited insights, which might be enhanced by incorporating specific information on the actual performance of advertisements and the targeting of users.

3.3.4 Word frequencies

By the examination of word frequencies utilised in political advertisements on Facebook can provide insights into the prevailing narratives, frames, and messaging tactics adopted by marketers. According to the study conducted by Capozzi et al. (2023) on populist Facebook advertisements during the 2019 EU elections, specific terms and phrases were extensively employed to convey exclusionary nationalism and anti-elite narratives. The language signals offered valuable insights into the message strategies employed by populist political actors on the site. The identification of dominating rhetorical frames and ideological viewpoints of advertisements may be achieved via the examination of textual content and word frequency (Oschatz et al. (2021)). Nevertheless, the lack of sufficient transparency regarding the specific content of advertisements in the publicly accessible data on political ads on Facebook hinders the ability to do thorough textual analysis.

The identification of word frequencies and important themes cannot be accomplished only through the high-level aggregate data due to the lack of access to the transcripts and pictures contained inside the commercials. Although certain preliminary observations may be derived from the disclaimer wording and page titles, conducting a more comprehensive study would need access to considerable content data that is currently not included in the re-

ports. As a result, the ability to thoroughly analyze political message and dialogue on Facebook using these reports is limited due to the restrictions on openness.

3.3.5 The relationship between the number of advertisements and the amount spent.

The correlation between the quantity of advertisements and the expenditure made by marketers offers insights into their budget allocation tactics. According to previous studies conducted by Ghosh et al. (2019), it has been observed that political marketers on Facebook do not exhibit a simple linear correlation between their expenditures and the number of advertisements displayed. The variation in expenditure patterns may be attributed to several variables, including the stage of the campaign, the tactics used for targeting, and the sort of advertisements employed. For example, several advertisers prioritize the dissemination of a substantial quantity of uncomplicated advertisements, whilst others allocate greater resources towards a smaller number of refined video advertisements (Vaccari and Nielsen (2013)).

However, the absence of temporal data in the reports hinders the capacity to establish a precise correlation between the number of advertisements and the corresponding expenditure during a given period. The absence of specific time information hinders the ability to detect fluctuations in expenditure patterns or discern changes in strategic approaches. Additional contextual information on targeting and purpose would contribute to a better understanding of the correlation between advertisements and expenditure. This would shed light on the distinction between allocating significant resources towards reaching certain demographic groups and adopting a more general approach to enhance campaign exposure. The lack of sufficient openness about advertising content also makes it challenging to ascertain whether expenditures result in the creation of more intricate and influential advertisements. Therefore, in order to thoroughly examine the link between the number of advertising and the amount spent, it is necessary to obtain more detailed and comprehensive data.

The objective of this study was to evaluate the level of openness in the data supplied by Facebook about political advertising, as well as to analyze any discernible patterns based on the information made available. The results

emphasize the notable limitations that arise from the restricted availability of complete data within these reports. The publicly accessible information lacks essential specifics pertaining to the specific content of the advertisement, its timing, the targeted audience, and its intended purpose. Although the reports contain data such as the quantity of advertisements, names of pages, and expenditure figures, the absence of contextual information significantly limits their analytical significance. As a result, the limited openness about political advertisements on Facebook presents significant challenges for doing thorough and comprehensive research on the platform's influence and effects.

Nevertheless, given the constraints imposed by the available data, this research has successfully identified prominent marketers by considering their advertising volume. Additionally, it has examined the potential associations between advertising expenditure and the number of advertisements. The research also brought attention to areas that require attention, including the lack of transparency about ad delivery algorithms, targeting, and message techniques utilized by advertisers. However, it is imperative to implement a full overhaul of Facebook's transparency procedures in order to facilitate more credible inquiries into political advertising on the network. The organization should prioritize the provision of detailed data pertaining to the content, targeting, timing, and performance of advertisements. The current limitations on independent study on political advertising will persist unless Facebook enables access to comprehensive statistics through legitimate means. The necessity for enhanced openness is of utmost importance in ensuring public accountability regarding the increasingly significant involvement of social media platforms within the political sphere.

4   Data Analysis

Note: The project contains the attachment of all data sets and files necessary for accessing the dashboard in Tableau. Additionally, all resources will be accessible on OneDrive. The link to the whole datasets and workbook are provided here : https://lunet-my.sharepoint.com/:f:/r/personal/covpb2_lunet_lboro_ac_uk/Documents/Final_CourseWork_Submission?csf=1&web=1&e=C7pt1n
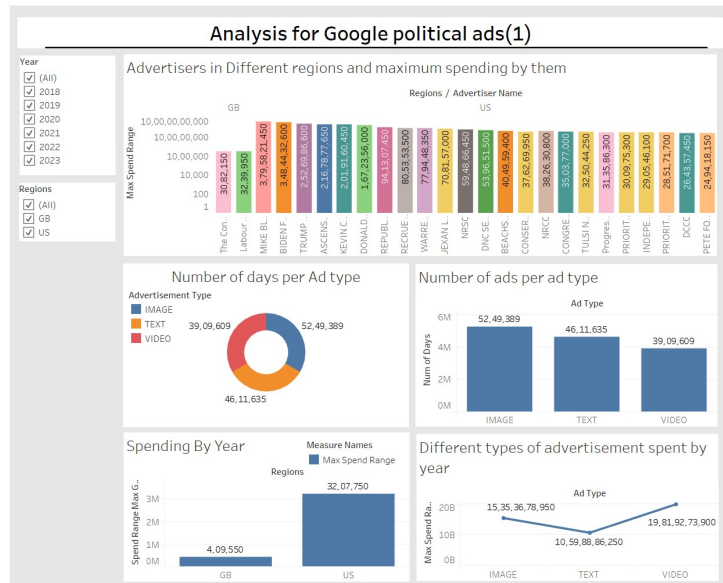
Figure 1: **Illustrates dashboard number 1 which was created for visualization of data provided by google.**

4.1 Analysis on Google political Ads transparency data:

This research will examine the Google Political Ads Transparency Data, with a specific focus on various areas and their related expenditure ranges. It is important to acknowledge that the main objective of the study was to collect political data pertaining to the United Kingdom. However, it is worth mentioning that there was a scarcity of data accessible specifically for this region. Consequently, the inclusion of political data from the United States was undertaken due to its substantial availability for study, so shedding light on the probable data deficiencies that Google encounters inside the United Kingdom region.

4.1.1 Variations in advertising expenditures among different regions.

Upon doing a more thorough analysis, it becomes apparent that the Conservative & Unionist Party and the Labour Party have emerged as the front runners in terms of highest expenditure within the United Kingdom area (GB). The data presented in the numbers spans from the year 2018 to Au-
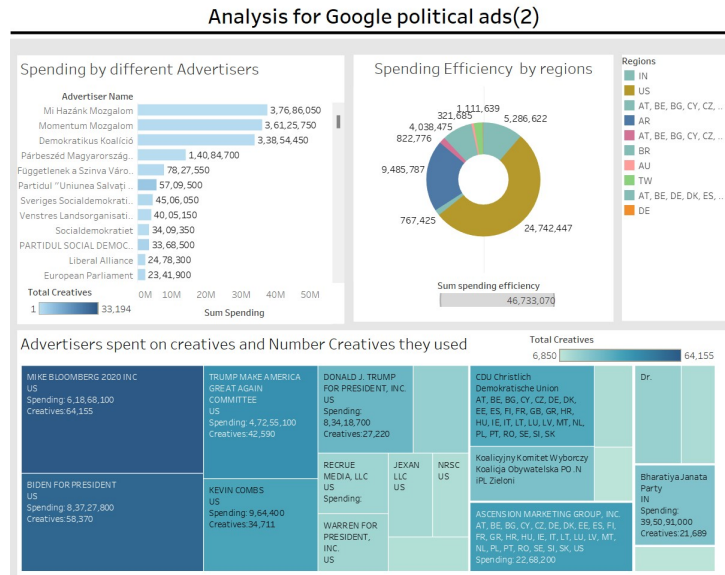
Figure 2: **Illustrates dashboard number 2 which was created for visualization of data provided by google.**

gust 2023. It is worth acknowledging that the majority of the existing data pertaining to both political parties is derived from the year 2019. During that period, the Conservative & Unionist Party reported a total expenditure of £2,907,350 (GBP), while the Labour Party reported a total expenditure of £2,764,450 (GBP). Furthermore, the data [Figure 1] indicates that the Trump campaign allocated a substantial amount of $136,459,540 (USD) towards their electoral endeavors. The evident discrepancy serves as a strong indication of the considerable differential in expenditure across regions in the United States and the United Kingdom.

The data presented by Google demonstrates inconsistencies, namely in terms of the absence of information on the specific regions and advertisers that have made expenditures throughout the course of time. This constraint impedes the attainment of a full comprehension of expenditure patterns and trends across various geographical areas.

4.1.2   Duration of each advertisement kind in terms of days.

The report presents data on the duration of ad displays, classified into three categories: Image, Text, and Video. Based on the visual representation, it is apparent from 1 that there was a higher frequency of Image type advertisements being showcased over the period spanning from 2018 to 2023.

With specific emphasis on the statistics pertaining to the year 2020, it is evident from [Figure 1] that each sort of advertisement had a substantial rise in its duration. The growth in political communication using digital media may be ascribed to the COVID-19 epidemic, which necessitated the implementation of lockdown measures and subsequently heightened the dependence on such networks.

4.1.3   Expenditure Patterns across Various Regions since 2018.

The primary objective of this study was to examine spending patterns in the United Kingdom. However, due to limited data availability, it was necessary to also incorporate the analysis of maximum expenditure in GBP in the United States. The provided data [Figure 1] illustrates that in the year 2019, both areas observed a notable surge in expenditure, mostly attributed to the heightened adoption of digital platforms for political advertising. Despite the increasing prevalence of digital advertising, there continues to be a significant disparity in expenditure between the United States and the United Kingdom, measured in GBP.

4.1.4   The Expenditure Patterns of Diverse Advertising Formats.

The expenditure on various categories of ads has witnessed a substantial rise, escalating from around 2.5 billion to 5 billion in the year 2020, starting from 2018. Significantly, there was a noticeable surge in expenditure specifically on video-type commercials. However, there is a notable decline in expenditures recorded subsequent to the year 2020, which may likely be attributed to the relaxation of restrictive measures implemented in response to the COVID-19 pandemic.

4.1.5 Efficiencies in Expenditure.

In order to assess spending efficiency, a computed field was generated within the Tableau software, taking into account the expenditure on advertisements relative to the duration of their display. Upon examination of the pie chart from [Figure 2] depicting spending efficiencies across various locations, it becomes apparent that the United States exhibits the highest level of spending efficiency, nearing 50%. Argentina, on the other hand, has a spending efficiency ranging between 15% and 20%.

4.1.6 Individuals with a creative inclination.

The term "creatives" in the context of advertising pertains to the digital components associated with advertisements, including pictures, texts, and videos, which collectively form the digital footprints of these commercials. From [Figure 2] it is not unexpected to note the United States' prominence in this domain, as evidenced by the Biden campaign's expenditure of $8,372,7800 on 58,370 creatives. Subsequently, the Trump campaign and other entities proceeded in a similar manner. In the United Kingdom and neighboring areas, the CDU (Christlich Demokratische Union) exhibited a certain level of power with regards to the creative sector and the corresponding expenditure.

4.1.7 Geographical analysis.

Although the major emphasis of this research was directed towards the United Kingdom and the United States, it is crucial to recognize the possible insights that may be derived by undertaking a broader geographical examination. Through an analysis of the geographical allocation of political advertisements across many areas and nations, a more comprehensive comprehension of the disparities in political expenditure and message tactics implemented by marketers may be attained.

4.2 Analysis of the Transparency Report on Political Ads by Facebook.

This research will exclusively concentrate on the UK area, as it benefits from the provision of comprehensive information by Facebook. Nevertheless, it
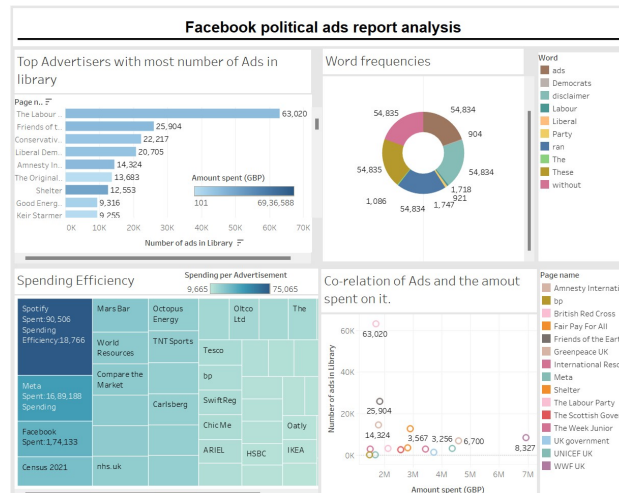
Figure 3: **Illustrates dashboard which was created for visualization of data of Facebook transparency report.**

is imperative to acknowledge that our access to more comprehensive data via Facebook's API was not authorized, hence limiting our ability to obtain specific details regarding the time and location of data utilization.

4.2.1   Top advertisers with the highest number of advertisements.

After doing an analysis of the data [Figure 3], it becomes evident that the Labour Party has emerged as the frontrunner, having deployed about 40,000 commercials, so outperforming their political competitors. The Friends of Earth organization is seen to have a total of 25,904 advertisements in the Facebook Ads Library, whereas the Conservative Party has a somewhat lower count of 22,217 advertisements. Furthermore, it is evident that WWF UK has allocated the largest expenditure in terms of Gross Rating Points (GRP), including a substantial count of 8,327 advertisements, and amounting to a total expenditure of £6,936,588 (GBP). It is important to acknowledge that the roster of marketers encompasses not just political parties, but also encompasses social groups, like environmentalists and non-governmental organizations (NGOs) dedicated to advancing social concerns.

4.2.2   Word frequencies analysis.

During the data cleaning phase of this research, a new dataframe was generated to compute the frequency of occurrence of the most prevalent terms across all adverts in the library. Despite encountering gaps and a lack of values in the dataset, the analysis persisted in identifying the most commonly utilized terms in the disclaimer column associated with each advertising.

The study was conducted using a Jupyter notebook, employing certain essential commands tailored to the specific analysis. The aforementioned commands encompassed:

The import statement "import nltk" is used to bring the Natural Language Toolkit (NLTK) library into the Python application. The Natural Language Toolkit (NLTK) is a highly utilized software library for processing human language data. It offers a diverse range of tools and resources that facilitate tasks including tokenization, stemming, tagging, parsing, and other related activities.

The process of importing stopwords from the nltk.corpus library is being executed. The NLTK library incorporates a corpus known as "stopwords," which include frequently employed words within a given language, such as "the," "is," and "are." In the context of natural language processing (NLP) activities such as text classification or sentiment analysis, it is common practice to exclude stopwords from textual input. By utilizing the stopwords module from the Natural Language Toolkit (NLTK), users are able to obtain a pre-established compilation of stopwords tailored to a particular language. This resource may be effectively employed to exclude these words from textual input.

The Counter class, which is a component of Python's collections module, is imported using the "import" statement. The function offers a practical method for determining the occurrence rate of elements within a given iterable, such as a list or a string. The utilization of the Counter module allows for the enumeration of word or character frequencies within a given textual corpus. This feature proves to be valuable in several tasks such as analyzing word frequency, identifying the most prevalent terms, and constructing word clouds.

Upon completion of the aforementioned activities, the newly generated dataframe was imported into Tableau for the purpose of presenting the out-

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comes of the conducted analysis as observed in [Figure 3]. The prevailing politically affiliated terms observed were Democrats, Labour, Liberal, Party, among others, suggesting that the commercials had a discernible political impact.

4.2.3 Efficiencies in Expenditure.

In conducting this study, a calculated field was generated inside the Tableau software to evaluate the relationship between expenditure and the quantity of advertisements in the library, with the aim of assessing the efficiency of spending. In the United Kingdom, as seen in [Figure 3] Spotify has established themselves as the frontrunner in terms of cost-effectiveness for their advertising efforts, allocating an estimated amount of £90,506. The individuals in question were subsequently pursued by Meta. It is worth noting that the sole advertisement pertaining to politics among the highest-performing campaigns was commissioned by the United Kingdom government, incurring a total expenditure of £3,720,166 .

4.2.4 The associations between advertisements and the monetary expenditure.

Regarding the association between political advertisements and their corresponding expenditure, it is observed in the [Figure 3] that the Labour Party allocated a substantial amount of £1,704,737 for the dissemination of 63,020 adverts. Another politically affiliated organization that may be identified is the United Kingdom government, which allocated a total expenditure of £3,720,166 towards the dissemination of 1,149 advertising. It is important to note that the absence of precise information on the timing of these advertising in the ad library has constrained our capacity to conduct a comprehensive network analysis.

4.2.5 Network analysis.

The absence of precise information on the timing of the commercials' placement in the ad library hindered our ability to conduct an in-depth network analysis. Nevertheless, it is imperative to delve into the prospective revelations that may arise from this study, including the identification of interaction

and influence patterns between political advertisements and their effects on the audience.

4.2.6   Demographic targeting.

Regrettably, the Facebook Political Ads Transparency Report lacks comprehensive data about demographic targeting of the advertisements. This constraint hinders our capacity to examine the precise audience segments that were the focus of each advertising. Demographic targeting plays a significant role in political advertising, enabling campaigns to customize their messaging to certain cohorts by considering variables such as age, geographic region, gender, and hobbies.

5   Results

In recent years, the topic of online political advertising has garnered significant attention in both public debate and academic study. This is primarily attributed to the emergence of microtargeting techniques, which enable the customization of political advertisements to individual voters based on their data profiles. Notably, platforms such as Facebook, Google, and others have played a prominent role in facilitating this practice (Ghosh et al. (2019); Juarez and Korolova (2022)). Nevertheless, there is a dearth of openness about the targeting of political advertisements, the intended recipients of these advertising, and their actual impact in the real world (Andreou et al. (2019); Ghosh et al. (2019)). In order to examine these processes, scholars have resorted to examining the political advertisement transparency reports that have been freely disclosed by digital platforms such as Google and Facebook. Although these reports represent progress, they are subject to some constraints such as incomplete data, absence of identifiers, and lack of demographic or geographic information (Andreou et al. (2019); Silva and Benevenuto (2021)). This study investigates the transparency data recently published by Google and Facebook in order to provide light on the spending patterns, target demographics, regulatory compliance, and ethical considerations associated with online political advertising in the United States and United Kingdom during recent election periods.

5.1 A comprehensive examination of the Google Political Ads Transparency Data.

According to the Google Transparency Report of 2022, an examination of the dataset pertaining to Google's transparency indicates that the United States accounted for the most substantial political advertising expenditures. Specifically, over the period spanning from May 2018 to August 2022, the Trump and Biden campaigns allocated $136 million and $101 million respectively towards this endeavor. According to the Google Transparency Report of 2022, the expenditure of the Conservative and Labour parties in the United Kingdom during the same period amounted to £2.9 million and £2.8 million, respectively. This figure significantly exceeds the spending of other entities. According to the Google Transparency Report (2022), the data indicates that picture advertisements were the most prevalent form of advertising. Additionally, there was a significant rise in the duration of video commercials in 2020, which may likely be attributed to the increased digital engagement resulting from the COVID-19 lockdown. Nevertheless, the lack of specific location identifiers beyond the country code presents difficulties when examining regional differences, an important aspect highlighted by Jeong et al. (2021). According to the scholarly work of Papakyriakopoulos et al. (2022), the examination of regional trends might provide insights into the utilization of demographic targeting strategies.

Furthermore, the Google report does not include detailed information on policy compliance, which hinders the assessment of whether advertisements contain misinformation or hate speech, as highlighted by Andreou et al. (2019). According to Ribeiro et al. (2018), although the transparency data offers a superficial examination of expenditure, it lacks quantifiable indicators that may assess the impact of advertising on voting patterns or public sentiment, which they argue is necessary. The datasets provided by Google serve as a preliminary measure in shedding light on the political advertising ecosystem. However, in order to facilitate more comprehensive academic study, these datasets would benefit from enhanced granularity, consistency, and the inclusion of effect indicators.

5.2 A comprehensive examination of the transparency data pertaining to political advertisements on the Facebook platform.

Comparable constraints are evident in the political advertisement dataset of Facebook, wherein the Labour Party has been seen to have disseminated more than 63,000 advertisements during the period spanning from 2018 to 2022. In contrast, the UK government has allocated a financial expenditure exceeding £3.7 million for the same purpose (Facebook Ad Library, 2022). In contrast to Google, Facebook offers a greater level of specificity about impression volume and optimization aims. According to Andreou et al. (2019), this allows for the examination of expenditure efficiency, with Spotify emerging as the frontrunner among UK marketers in terms of this metric. Nevertheless, the report provided by Facebook does not provide temporal and geographic identifiers, which limits the feasibility of doing network and spatial analysis, as suggested by Araújo et al. (2022). The study of word frequency uncovers the prevalence of political phrases, however it is important to note that there are some gaps in the data that provide issues, as highlighted by Capozzi et al. (2023). A significant ethical challenge, as highlighted by Ali (2021), arises from the lack of demographic information, which hinders the identification of the specific audience who viewed each advertisement.

The absence of age, gender, or geographical breakdowns renders the task of auditing for biases or discriminatory patterns unfeasible, as highlighted by Juarez and Korolova (2022). Similar to Google, Facebook provides a limited perspective, although it lacks the necessary level of transparency to fully comprehend the intricacies of ad targeting and its consequential effects in the real world. According to Edelson et al. (2019), the implementation of robust auditing capabilities and impartial oversight procedures is important in order to effectively oversee the practice of political microtargeting and safeguard democratic principles.

5.3   Adherence of Facebook and Google to policy regulations.

One significant constraint of the transparency datasets is to the challenge of assessing the extent to which Facebook and Google adhere to their own policies on the prohibition of advertising material. The need of comprehending policy adherence in order to address misinformation is emphasized by Andreou et al. (2019). However, there is currently a lack of tools for conducting audits on enforcement. According to the advertising policies of Facebook (2022), advertisements containing information that is deceptive, inaccurate, or misleading are strictly prohibited. This includes claims concerning voting methods that have been discredited or assertions regarding public health problems such as COVID-19 that lack substantiation. Nevertheless, the lack of advertising information inside the report renders it unable to investigate any potential infringements. The lack of transparency in the rules of political discourse implies that advertisements containing harmful disinformation may be evading detection inside the Facebook ecosystem.

In accordance with its advertising policies, Google prohibits the dissemination of election advertisements that contain verifiably misleading assertions capable of substantially eroding public engagement or confidence in electoral procedures (Google Advertising Policies, 2022). However, the transparency data provided by them does not encompass textual or visual content, hence impeding external examinations of potentially misleading assertions. According to the research conducted by Ghosh et al. (2019) on Russian misinformation efforts, it is seen that malicious entities take use of these deficiencies in enforcement. Enhanced regulatory supervision and increased responsibility for adherence to policies will positively impact the integrity of political advertising landscapes. However, now, researchers have limitations in their ability to comprehensively examine adherence due to the limited amount of data available.

5.4   Examination of geographic and temporal factors.

The databases lack specific geographic and temporal information, which limits the ability to analyze the targeting of adverts in terms of their specific locations and timeframes. According to Araújo et al. (2022), the utilization

of network analysis in examining spatial patterns can provide insights into political clustering and facilitate the comparison of different constituencies. The study conducted by Andreou et al. (2019) emphasizes the significance of temporal sequencing in understanding various methods related to election cycles, issue activation, and the influence of external events. However, given the absence of specific location stamps or temporal metadata, scholars are unable to recreate the actual real-world circumstances in which advertisements were disseminated. This statement highlights the presence of crucial advertising dynamics that are likely to differ across urban and rural locations, as well as fluctuate in response to news events and the election calendar. Ensuring the protection of user privacy is of utmost importance. However, the utilization of methods such as aggregation and anonymization can provide more comprehensive spatial and temporal research, while simultaneously safeguarding personal data from exposure.

5.5   The Impact of Advertising on Public Opinion.

The primary limitation of transparency reports is in their failure to provide comprehensive insights into the influence of political advertisements on public opinion and voting patterns. According to Ribeiro et al. (2018), it is crucial to consider real-world impact rather than only focusing on perceptions when examining this ecosystem. However, both Google and Facebook do not offer engagement metrics or surveys as means to assess the success of advertisements. The lack of effect data is equally applicable to advertisements that may include disinformation and have the potential to cause harm. The assessment of the impact of misleading statements on belief formation and voting intentions is crucial in order to accurately evaluate the tangible consequences, as highlighted by Ali (2021). Although there have been some small-scale studies undertaken by independent academics to measure the effect of advertisements, there is a notable absence of comprehensive national assessments in this area. The implementation of standardized success indicators and the allocation of resources towards impartial field studies on voting behavior would significantly enhance the effectiveness of monitoring and accountability measures.

6   Conclusion

This study centers on the transparency reports that have been recently released by Google and Facebook. It aims to emphasize significant limitations that greatly hinder thorough academic examination of online political advertising (Andreou et al. (2019); Ghosh et al. (2019)). Despite some initial attempts to shed light on these intricate ecosystems, significant shortcomings persist in various crucial aspects. These deficiencies encompass the identification of precise target populations and demographics, the provision of comprehensive spatial and temporal information, the assurance of compliance with platform policies, the measurement of real-world engagement and influence, and the facilitation of external auditing.

6.1   Regarding the three fundamental research inquiries that directed this investigation.

6.1.0.1   Research Question 1:   The voluntary reports exhibit a deficiency in providing critical information on expenditures, targeting, messaging substance, and effect metrics, which are crucial for researchers to comprehensively examine and comprehend the real-world consequences of political advertising campaigns. The absence of key identities, demographic segmentation, granular temporal and geographic targeting data, and engagement statistics is evident.

6.1.0.2   Research Question 2:   The continuous external auditing of platform policy compliance and the identification of disinformation concerns are significantly impeded by the substantial constraints imposed by the limited availability of data. The existing conditions make it unachievable to independently evaluate ethical violations, adherence to openness, growth of hate speech, and enforcement.

6.1.0.3   Research Question 3:   The urgent need for a collaborative framework including industry, government, academia, and civil society to establish legislation that mandates disclosures, platform improvements facilitating access, participatory auditing systems, and governance innovations. The persistence of existing opacity, in the absence of systematic reform, poses a

significant threat to election integrity on a global scale.

Upon analysis of the Google dataset, it is evident that political marketers in the United States have significantly increased their financial expenditures, surpassing £2.9 million for major spenders in the UK (Google Transparency Report, 2022). Nevertheless, the absence of precise location data, beyond the country code, hinders the ability to analyze significant regional variations (Jeong et al. (2021)). According to Andreou et al. (2019), the lack of specific information about policy compliance hinders the ability to effectively audit misinformation. The opacity around the impact on voting is a key topic of discussion, as highlighted by Ribeiro et al. (2018).

According to Araújo et al. (2022), the limited availability of temporal and geographic data on Facebook significantly hampers the ability to do network and geographical analysis. The limitations also impose restrictions on fundamental frequency analysis (Capozzi et al. (2023)). The absence of demographic information is a significant limitation that hinders the ability to assess microtargeting strategies for potential inequities and discriminatory outcomes (Ali (2021); Juarez and Korolova (2022)). According to Edelson et al. (2019), the establishment of robust and inclusive auditing frameworks is of utmost importance.

In brief, whereas voluntary reports indicate some initial advancements, significant shortcomings persist in key aspects, impeding the effective investigation and regulation of online political advertising. The attainment of requisite transparency necessitates the implementation of comprehensive reforms and innovative measures that foster the advancement of the public interest, necessitating considerable collaboration across several sectors. The significance of democracy on a global scale is of utmost importance.

7   Requirements

To conduct the computational analysis integral to this research, two key software tools were utilized:

First, Tableau data visualization software enabled interactive exploration of the datasets, allowing for on-the-fly generation of charts, graphs, and dashboards to discern trends and patterns. Tableau's calculated fields provided the ability to derive new metrics for deeper analysis. Visual encodings sig-

nificantly enhanced the identification of transparency gaps across dimensions such as expenditures, targeting attributes, and temporal patterns.

Second, the Python programming language and Jupyter Notebook environment afforded extensive capabilities for loading, assessing, and transforming the data. Python's pandas library provided flexible data frames to store, manipulate, and analyze the raw datasets. Custom Python scripts engineered new datasets suited for techniques like word frequency analysis to evaluate political messaging. The Python IDE facilitated rapid iteration for computational analysis.

8   Recommendations

To significantly expand the research possibilities and provide answers to the core questions posed in this study, obtaining access to the full advertising data application programming interfaces (APIs) of Google, Facebook, and other platforms emerges as an essential next step. The current reliance on limited transparency reports constrains analysis, whereas unfiltered API access would unlock new techniques and insights.

However, securing such access will require navigating complex legal and regulatory permissions around data sharing. Constructive engagement and transparency from the platforms will be critical. The researcher could submit formal requests to platform policy teams proposing a scope for controlled API access, highlighting existing gaps that such data would help address. Approval may necessitate legal agreements governing data usage and privacy.

Once API access is obtained, computational analysis techniques could be applied at far larger scale and specificity. Network analysis could map the interconnectivity of political ads to uncover geographic and demographic clustering. Natural language processing could evaluate ad content and claims in granular detail. Unsupervised learning could surface latent relationships and anomalies for human investigation.

However, API access should include oversight from an ethics review board to ensure public benefit and prevent misuse. All analysis techniques would require informed consent and transparency. Partnering with civil society groups would help balance platform interests with the greater social good.

In summary, the single most transformative step for future research would

be gaining platform API access, enabling orders-of-magnitude more sophisticated analysis. But enacting this will require navigating complex legal and ethical terrain. If undertaken responsibly, computational interrogation of full-fidelity advertising data could illuminate the true workings of online political influence as never before. The potential benefits for electoral integrity worldwide are profound.

9   Future work

The present examination of the political ad transparency data of Facebook and Google highlights significant deficiencies that impede scholarly investigations into the influence of online advertisements on voter attitudes, beliefs, and behaviors. Although the voluntary self-disclosures represent progress, they do not possess the necessary level of detail, uniformity, and supervision required for a thorough academic investigation (Andreou et al. (2019); Ghosh et al. (2019)). Achieving transparency objectives necessitates collaborative endeavors across many stakeholders, including industry, government, and civil society, to implement more stringent disclosure mandates, construct impartial auditing frameworks, and build novel mechanisms of accountability inside digital platforms (Edelson et al. (2019); Andreou et al. (2019)).

Data science techniques like machine learning, natural language processing, and network analysis, when combined with experimental investigations, have the potential to provide light on complex advertising ecosystems. However, the realization of this promise requires enhancements in data quality and accessibility, the expansion of technological analytical capabilities, and the establishment of democratic supervision systems. The maintenance of enduring partnership that effectively reconciles the objectives of openness and privacy safeguards is crucial for the advancement of constructive political participation on digital platforms, while simultaneously upholding democratic principles.

9.1   Enhancing the Quality and Accessibility of Data.

The study of crucial targeting variables such as geography, demographics, timing, and message is hindered by significant deficiencies in self-reported

transparency data, as highlighted by previous studies (Andreou et al. (2019); Capozzi et al. (2023)). According to Silva et al. (2020), the implementation of legislation that requires more detailed disclosures has the potential to enhance reporting standards. The establishment of platform APIs and open data standards would facilitate the participation of competent academics in conducting evaluations, while simultaneously minimizing the risk of public disclosure of potentially sensitive information (Andreou et al. (2019)).

The utilization of differential privacy methods to integrate aggregated demographic data while safeguarding individual identities has the potential to provide valuable insights into biases and disparities (Ali (2021)). According to Andreou et al. (2019), the use of multi-stakeholder auditing methods has the potential to effectively tackle concerns related to consistency and data gaps. It is crucial to prioritize ethical monitoring and get informed permission while striving to enhance accessibility. However, the empowerment of more rigorous scholarship may be achieved through boosting openness, data quality, and availability through collaborative initiatives.

9.2   Examining Ad Targeting and Influence.

By enhancing the quality of inputs, data science methodologies such as natural language processing and machine learning can offer enhanced insights into the strategies employed by political advertisements to target and influence voters. The utilization of natural language processing (NLP) techniques in the examination of advertising text and images has the potential to provide valuable insights on the various message strategies employed across different demographic groups, geographical locations, and political affiliations (Ghosh et al. (2019)). The utilization of machine learning-based classifiers has the potential to aid in the detection of disinformation and address ethical problems. This approach can assist platforms and researchers in identifying instances of policy infractions (Capozzi et al. (2023)). The utilization of network analysis in the modeling of spatial and temporal clustering of ad campaigns has the potential to unveil political advertising techniques (Araújo et al. (2022)).

Nevertheless, the exclusive reliance on computational tools is insufficient for quantifying real-world impact. According to Ribeiro et al. (2018), surveys, interviews, field experiments, and observational studies continue to be crucial in evaluating the impact of exposure on attitudes and behaviors.

Collaborating with electoral authorities to establish a correlation between advertisements and voting data has the potential to quantitatively measure the influence of commercials, while also safeguarding individuals' privacy. The integration of qualitative and quantitative methodologies can yield more comprehensive insights into the intricate dynamics between microtargeted messages, beliefs, and identity. The presence of continuous, collaborative research involving several parties is crucial for comprehensively understanding intricate processes within political advertising.

9.3   Oversight and governance.

In order to further enhance openness, it is necessary to establish and implement participatory monitoring and governance mechanisms. According to Juarez and Korolova (2022), the utilization of simulation and adversarial testing techniques can effectively detect vulnerabilities in platform policy enforcement and targeting systems before they are exploited. According to Andreou et al. (2019), the implementation of autonomous auditing boards that encompass a wide range of expertise and community participation will enhance accountability and enhance the legitimacy of monitoring procedures. According to Andreou et al. (2019), the utilization of dashboards that consolidate various data pertaining to advertising expenditure, deceptive claims, and benchmarks for transparency has the potential to augment public dialogue.

The many challenges presented by internet political advertising cannot be effectively resolved by a single solution. The integration of legislative measures, business restructuring, scholarly investigations, and engagement of civil society under inclusive governance is crucial for achieving a harmonious alignment between transparency objectives and social requirements. Through strategic coordination, the field of data science has the potential to significantly contribute to the facilitation of constructive political involvement on digital platforms, all the while safeguarding the principles of democratic participation.

In the contemporary digital landscape, political communication is progressively taking place within obscure, privately-managed domains that are subject to restricted scrutiny. Achieving transparency within online ecosystems necessitates enhancing the quality and accessibility of data, employing

contextual analytical methods, and implementing participatory auditing and accountability mechanisms. By fostering collaboration across many sectors and disciplines, the utilization of data-driven techniques can provide valuable insights into the ethical aspects of political advertising, therefore facilitating the restoration of this domain as a platform for constructive democratic conversation. However, the establishment of transparent ecosystems necessitates the presence of cooperation and inclusion in order to guarantee that research endeavors are conducted in a manner that serves the public interest. Multi-stakeholder collaborations continue to be the most effective approach in advancing data science methodologies, enhancing election integrity, and facilitating productive discourse.

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