News, Media, and Brexit: The Effects of News Consumption on Voting Behaviour and Identity Formation in British Politics



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Abstract

Rising populism and political polarization has raised critical questions about media's role in shaping voter behaviour and driving electoral outcomes. Brexit, serves as an important case, with its close and surprising referendum result often attributed to media influence and its long-lasting polarization of the British public into 'Remainers' and 'Leavers'. This thesis addresses questions on both voting behaviour and the formation and development of Brexit identities, focusing on how media consumption during election campaigns shaped these dynamics. This thesis answers these questions using a combination of browsing history data, representative survey data, and advanced statistical methods.

The key findings challenge the echo chamber narrative, showing that online news consumption exposes active readers to diverse sources, reducing polarized information environments. Sporadic but notable media effects were observed: the Internet, radio, and Remain-leaning newspapers positively influenced shifts toward the Remain side, while television was associated with support for the Leave side. Leave-leaning newspapers demonstrated strong associations with Leave supporters but lacked persuasive effects during campaigns. Interpersonal communication did not determine which Brexit side individuals supported but played a critical role in reinforcing existing Brexit identities, with mass media serving a supportive role.

To test the popular echo chamber conjecture, this thesis employed multifaceted network analyses to uncover patterns in online news consumption. Methodological frameworks for causal inference with observational data were applied to test the relationship between political news consumption, voting behaviour, and

identity formation, yielding robust causal estimates.

In doing so, this thesis advances the literature on media effects, electoral behaviour, and social identity, while developing methodological improvements for studying media effects in contemporary politics. While rooted in Brexit politics, this research—suggesting that media effects are generally limited and context- and source-dependent—provides broader insights on the limited and variable influence of media in shaping political behaviour, which may be applicable to other contexts.

Declaration

This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the preface and specified in the text. It is not substantially the same as any work that has already been submitted before for any degree or other qualification except as declared in the preface and specified in the text. It does not exceed the prescribed word limit for the DPhil in Sociology Graduate Studies Committee.

Clemens Jarnach, 05.01.2025

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Marie Curie once wrote in a letter to her brother, 'One never notices what has been done; one can only see what remains to be done' (Ratcliffe, 2018). This sentiment perfectly encapsulates my doctoral journey at Oxford, where every accomplishment unveiled new challenges, questions, and avenues for further exploration. It is an attitude and method of scientific inquiry that I hope to carry with me always.

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'If the abysm

Could vomit forth its secrets–but a voice

Is wanting, the deep truth is imageless;

For what would it avail to bid thee gaze

On the revolving world? What to bid speak

Fate, Time, Occasion, Chance and Change? To these

All things are subject but eternal Love.'

– Percy Bysshe Shelley

'Prometheus Unbound'

Chapter 1

Introduction

'Are you one of them or one of us?' Picking sides is an increasingly conspicuous phenomenon with a growing global tendency toward binary divisions. While not a new phenomenon, polarization has become more visible and pervasive in an era shaped by the Internet and social media. These platforms allow like-minded individuals across the globe to connect, enabling the rapid dissemination of political events and current affairs—not just through journalism and traditional media, but also via public figures, private citizens, friends, and even bots. Issues that once felt distant now arrive through more personalised and perhaps personal pathways.

'Are you a Trump supporter or not?' 'Are you a vaxxer or anti-vaxxer?' 'Do you support lockdowns or oppose them?' 'Are you a Leaver or a Remainer?' Over the past decade, public discourse has increasingly centred on stark dichotomies, splitting people through binary questions. In this context, fears of populist politics, uncontrollable social media algorithms, and the growing entrenchment of social and political divides have come to define modern time.

The year 2016 sent shock waves through the political world, with Donald Trump's victory in the US presidential election and British citizens voting to leave the EU in a referendum. In the aftermath, political scientists, journalists, and the public alike have been grappling to make sense of these seismic developments. The role of the Internet, and social media in particular, quickly emerged as a central topic of debate, driven by concerns about its influence in shifting entire elections.

Norris et al. (1999) note that party consultants, strategists, and journalists

often emphasize their own roles as pivotal in determining election outcomes. This observation raises an important point about how election results are interpreted and framed in the immediate aftermath. A similar narrative emerged following the 2016 EU Referendum, with journalists and analysts quickly attributing social media as a significant factor in shaping the outcome.

This thesis seeks to provide empirical evidence to evaluate such claims by exploring the broader question of whether the news media exert a strong influence on voters during election campaigns. Using Brexit as a case study, the thesis addresses the following central research question: How did media consumption during the Brexit Referendum campaign, and the subsequent 2017 and 2019 General Election campaigns, influence voting behaviour and the formation and intensity of Brexit identities?

A popular narrative in both academic and public discourse cast platforms such as Twitter and Facebook as crucial actors in the election of Trump, for example, and the success of Brexit (e.g. Allcott et al., 2017; BBC, 2020; Beckett, 2017; Bogost and Madrigal, 2020; Francia, 2018; Hänska and Bauchowitz, 2017; Olson, 2016). Terms such as 'echo chamber' (Sunstein, 2009), 'filter bubbles' (Pariser, 2011), and 'fake news' rose to prominence as researchers raced to uncover evidence for or against their role in these electoral outcomes.

However, the scrutiny extended beyond social media to traditional news outlets, such as the press and broadcast media. For example, the *BBC* faced criticism for its approach to 'balanced reporting', which some argued amplified misleading narratives and undermined public understanding.

This evolving media landscape highlights the critical importance of studying the dissemination of political information and exposure to political news. Understanding how traditional and digital media shape public opinion, voter behaviour, and the development of political identities enables us to better navigate the complexities of contemporary democracy and confront the challenges of polarization and misinformation.

The concept of 'democracy', derived from its Greek roots *dēmos* and + *krátos*—meaning 'rule by the people' (Brown et al., 2018)—has undergone a theoretical evolution with the rise of the Internet. Political theorists and philosophers have since been busy with nomenclature, introducing terms such as 'digital democracy' (van Dijk, 2012), 'e-governance', 'e-democracy' (Kersting and Baldersheim, 2004), and 'wiki government' (Noveck, 2009) to describe how democratic practices are transformed or enhanced by the digital era. The Internet has particularly impacted three key elements of democratic systems: information, communication, and participation. Voters can now register online to vote, participate in digital polling, and initiate online petitions. Communication has been transformed through emails, online discussions on social media, and blogs. Perhaps the most significant change, however, has been in the diffusion of political information. News is now disseminated via online newspapers, newsletters, and even directly by political actors through social media platforms (Kersting and Baldersheim, 2004). Democratic theory describes this communication and dissemination of information as an important function of democracy. News providers allow voters to become informed and make reasoned choices about electoral options (Norris, 1999). It is through media that voters familiarise themselves with electoral events, candidates, platforms, and party issues, and the springboard from which they begin to conceptualise the potential outcomes of voting one way over another. Van Dijk (2012) singles out political communication as the primary and earliest achievement of the Internet's integration into democratic processes. However, the same technologies that enable broader participation and faster communication also raise concerns. The rise of populist politics, the role of social media in amplifying misinformation, and the impact of digital information-sharing on elections have emerged as critical issues.

Brexit, the withdrawal of the United Kingdom from the European Union, provides a fascinating and rare case in which the political elite entrusted the *krátos* (rule, or power) fully to the *dēmos* (the people). In this monumental

referendum, British citizens were directly invited to decide on the UK's future relationship with the European Union. This marked an unprecedented scale of public engagement, with citizens actively participating not only in discourse but also in decision-making. Everyone was invited to pick a side, to choose 'Leave' or 'Remain'.

Against this backdrop, the study of political communication, issue salience, agenda setting, and news exposure has become increasingly important. Understanding how these factors influence political behaviour is critical for understanding the evolving dynamics of democracy in the digital age.

1.1 The Case of Brexit

Brexit was the outcome of the EU Referendum held on 23 June 2016, which was narrowly won by a majority of the British population (51.9%). Two years later, on 26 June 2018, the European Union (Withdrawal) Act 2018 was passed by the UK Parliament. However, it took another four years of intense political turbulence until the UK formally departed the EU on 31 January 2020[1]. This period of political turmoil and transformation (Bale, 2023) sets the stage for this thesis.

A plethora of research has attempted to explain the factors that led to this momentous political juncture. Much of this literature concentrates on the campaign period and months leading up to the referendum, and aims to decipher the causes for the result. However, the referendum result itself merely served as the political equivalent of a starting gun, initiating not a sprint, but a prolonged marathon of political uncertainty. This period was marked by closely-contested general elections in 2017 and 2019 and three successive Conservative prime ministers who grappled with the challenge of delivering Brexit. Even after the UK's formal withdrawal from the EU, the ramifications of Brexit have continued to reverberate, producing far-reaching consequences for both the UK and the EU.

[1]For a detailed timeline of events leading to the UK's exit from the European Union, refer to Commons Library Briefing Number 7960, 6 January 2021 (Walker, 2017).

Acknowledging the long impact and persistent phenomenon of a nation divided by Brexit, this thesis examines the role of political information in the Brexit divide from the 2016 EU Referendum campaign through the official exit of the United Kingdom from the European Union on 31 January 2020. It places particular emphasis on significant electoral events within this period, specifically the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election.

The research presented in this thesis focuses on one critical aspect of this unprecedented Brexit period—the influence of political information conveyed through mass media, the Internet, and interpersonal communication on shaping public opinion, electoral behaviour, and social identity.

The divisions within the British population on issues such as distrust in the political class, immigration, national identity, 'Euroscepticism', identity conservatism, and authoritarianism have been brewing for decades (Carl et al., 2019a; Evans & Mellon, 2016; Mellon et al., 2018; Sobolewska & Ford, 2020). With 'Euroscepticism' historically a defining feature of British attitudes toward the European Union, identification with Europe among UK citizens has consistently been weaker than in other EU countries (Carl et al., 2019a; de Vries & Hobolt, 2020). Brexit was not merely the cause of the polarization that followed but, as Sobolewska and Ford (2020) argue, a moment of 'awakening' when underlying divisions erupted into the political mainstream, creating stark and enduring polarization around two words with new meaning: 'Leave' and 'Remain'.

The referendum campaign exploited these divisions, with the Leave side focusing on immigration and cultural anxieties, while the Remain side leaned on rational economic arguments that resonated less effectively (Fisher & Renwick, 2018). What emerged was a profound shift in political behaviour and identity, where demographic divides, particularly by education and age, became starkly visible. Brexit thus marked a turning point in British political life, where identity politics came to the fore, and the referendum's polarizing effects extended beyond the vote itself, transforming Brexit into a lens through which citizens judged

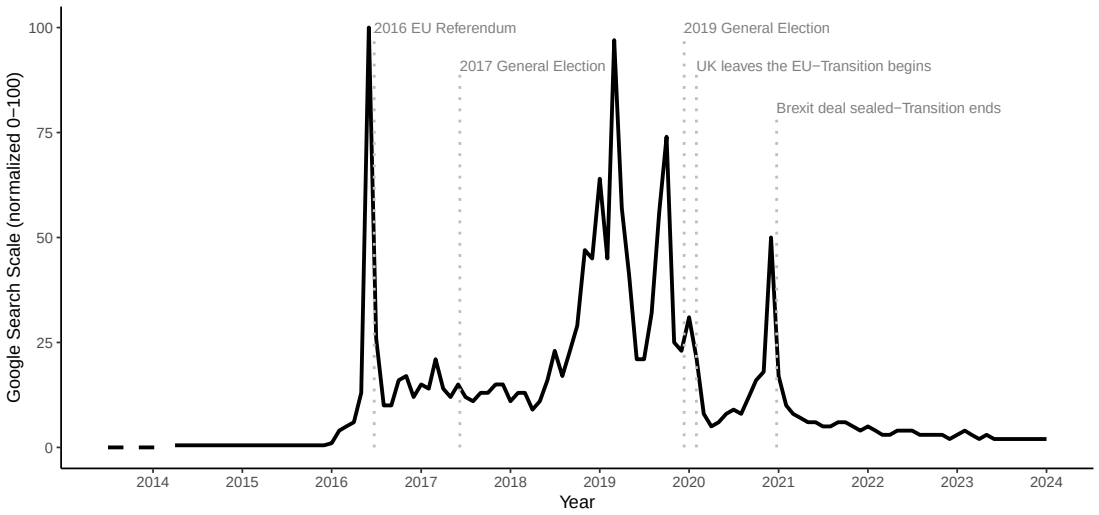


Figure 1.1: Google Trends search scale for interest over time for the search term 'Brexit' from 1 January 2014 to 1 January 2024. Data are sourced from Google Trends.

politics, economics, and society. Remarkably, identities associated with 'Leave' and 'Remain'—which were previously non-existent—developed into pervasive and persistent social identities with significant political consequences and clear social in-group versus out-group dynamics (Evans and Schaffner, 2019). This shift is particularly notable given the decline in the proportion of people in the UK who identify with a political party in recent years (S. Hobolt and Tilley, 2019; Evans and Schaffner, 2019), which is now far outnumbered by those identifying with their side of the Brexit vote.

The simple plot in Figure 1.1, which uses Google Trends data to show relative search interest in the word 'Brexit' over 10 years, vividly demonstrates just how suddenly public interest in Brexit arose, with a sharp spike in searches just two days before the referendum day (Figure A.1 in the Appendix shows a zoomed-in version of this plot, focusing on the search interest between 1 February and 1 July 2016. Figure A.2 presents a corresponding choropleth map to Figure 1.1).

Until April 2014 there were too few searches for Google to include the data in its Trends data. Following April 2024, there is a steady and low search frequency. With the referendum date announced in February 2016, the interest also rose slightly but really spikes on the day of the referendum and the day before and

after.[2]

This clearly illustrates how a new political issue, accompanied by newly-defined political sides and vocabulary (e.g. 'Brexit', 'Leavers', 'Remainers'), emerged seemingly out of nowhere. This new political issue rapidly gained salience in just a few days as the British population cast their votes at the ballot box, dramatically shaping the years to follow. Somewhat surprisingly, neither the subsequent elections nor the actual date of the UK's exit on January 31, 2020 marked the next highest peaks in search interest. Instead, 2019 saw heightened interest in Brexit, with a significant peak on March 29—the day Britain was originally scheduled to leave the EU—as ministers voted against the proposed Brexit deal. Another notable peak occurred around October 28, when further delaying the exit became necessary. Smaller peaks followed in December 2019 and January 2020, coinciding with the 2019 General Election and the UK's official departure from the EU, entering a transition period that concluded on December 31, 2020. This marked the final major surge in search interest for the term 'Brexit'. Since then, search interest has steadily declined. In other words, the salience of the term 'Brexit' was event-driven, beginning largely with the referendum date itself and concluding largely with the end of the transition period.

1.2 Literature and Contribution

In addition to providing some cursory insights on the rapidity with which Brexit—and its emergent political identities—sprung to the forefront of British politics, the Google Trends plot hints at one way in which the electorate was engaging with political information. While traditional news sources, such as television, radio,

[2]Google Trends data is a search index that measures the frequency of Internet searches on Google for a particular word or group of words over a specified time period and location. Data is not provided in absolute terms, but on a scale that normalises the data from 0 to 100, where 100 represents the highest observed search volume over the specified parameters (Google, 2024). To assess relative popularity, each data point is divided by the total number of searches for the time period and geography in the query. Google Trends data only provides an indication of how popular a search term was during the selected time period in relative terms. It provides some indication of salience, if one accepts and is aware of its limitations (see Mellon, 2014; Weeks and Southwell, 2010).

and print newspapers, were reporting on Brexit—and some voters certainly opted for these news media—others turned to search engines and online news sources. The rise of online news sources prompts new political and democratic questions. The growing use of social media for news is creating a new type of information source that is rapidly changing as new platforms emerge and algorithms designed by platform developers influence user experiences (Das et al. 2007; Hannak et al. 2013). Recent work by Fletcher et al. (2024), after conducting a longitudinal comparative study of how trust in news has changed in 46 countries (including the UK), assert that there is in half of all countries studied a notable linear decline in media trust since 2015. This is possibly associated with increasing levels of social media news use, which is consistently linked to lower levels of trust compared to other media sources, such as television (Metzger et al., 2003; Ceron, 2015; Park et al., 2020). The Internet, and social media in particular, have been widely blamed for increasing bias, misinformation and polarization (Conover et al., 2011, 2012; Flaxman et al., 2016; Sunstein, 2017). Other research also finds evidence to contradict this narrative (Dubois & Blank, 2018; Fletcher and Nielson, 2017; Messing & Westwood, 2014), with the overall literature on the subject being rather mixed.

Criticism of media, particularly new digital forms, highlights its complex role in shaping political attitudes and identities, underscoring the importance of updating our understanding of continuously evolving media landscapes and examining electoral behaviour in cases like Brexit, where identity formation and polarization are central issues.

For the study of electoral behaviour and political socialisation, this thesis examines Brexit as a theoretically significant case of identity formation and polarization in the context of modern British politics. It argues that the singularity and significance of Brexit lies in the creation of two dominant, opposing political sides and social identities seemingly overnight. Terms like ‘Leave’ and ‘Remain’, which were virtually meaningless before the referendum, became cornerstones of political affiliation. These affiliations, tied closely to views on immigration and na-

tional identity, shaped subsequent electoral outcomes as well as social interaction. This shift represents a broader transformation in the role of political identities in electoral behaviour, moving beyond traditional party allegiances to new, more polarized forms of affiliation, and tells us about the emergence and key determining factors for such trends of non-partisan political identity development and political polarization.

The broader objective of this thesis, grounded in the positivist tradition of sociology, is to examine the effects of X on Y, where X represents exposure to political information through three primary sources: mass media, the Internet, and interpersonal communication. Y encompasses electoral behaviour—specifically voting in the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election—as well as the development and change of political identity. Accordingly, this thesis aims to make a predominantly empirical contribution.

Extensive research has examined several possible factors to explain how voters decided where to put their cross on the EU Referendum ballot paper. While much of this work has focused on socio-demographic (M. J. Goodwin and Heath, 2016), cultural (Chan et al., 2020), identity (S. Hobolt and Tilley, 2019), class (Evans and Tilley, 2017), status (Richards et al., 2021), and issue-based explanations (Curtice, 2017), less attention has been given to the mechanisms of information diffusion—a critical component for understanding how voters acquire and process information, shaping public opinion and related behaviours, such as voting or forming strong political identities. The Brexit Referendum presents a unique and theoretically important case for studying how political information reaches voters and the effects of different information pathways on individual decision-making.

As a newly introduced concept, 'Brexit' lacked many of the cues voters can typically rely on for decision-making, making political communication particularly crucial in this context. The terms 'Leave' and 'Remain' gained prominence only shortly before the referendum, leaving voters with limited shortcuts for making their decisions. This context provides an ideal scientific setting for examining

how political opinions are formed, affiliations established, and social identities developed, all mediated through various news sources. The Brexit Referendum thus offers a rare opportunity to investigate the role of information diffusion in shaping political behaviour under conditions of uncertainty and novelty.

While some research has examined the political communication related to Brexit, it is notable that the majority of studies in this field have been based on data derived from social media, have concentrated on the press, or presented correlations between news consumption and vote choice. Relevant literature examined Brexit discussions and information diffusion on Twitter (e.g., Gorodnichenko et al., 2018; Šimunjak, 2022; Tong and Zuo, 2018), online news sources (e.g., Fletcher and Selva, 2019), changing newspaper preferences among Leavers and Remainers (Brandenburg, 2019), propaganda in the press regarding Brexit (e.g., Rawlinson, 2019), the Brexit agenda setting role of tabloids (Simpson and Startin, 2023), and even how Brexit was covered in European media outside the UK (Borchardt et al., 2018). However, there remains a significant gap in the literature: no empirical study to date has tested the effects of various political information sources—including mass media, the Internet, and interpersonal communication—on Brexit voting behaviour and the formation of Brexit identities. This thesis addresses this gap using rigorous quantitative methods, offering a significant empirical contribution to the field.

Existing studies on Brexit, news media, and voter choice overlook several critical dimensions. First of all, there exists no comprehensive quantitative analysis of the various Brexit-relevant information sources or a comparative evaluation of political information sources. Most studies focus either on the press or social media in isolation. Further, current scholarship does not apply inferential statistics to estimate causal relationships between information exposure and Brexit voting behaviour or, similarly, the use of inferential methods to analyse the impact of information exposure on Brexit identity formation. Lastly, there has not been an investigation of the effects of news exposure over time, to include not just Brexit

but the subsequent general elections.

This thesis seeks to address these gaps both methodologically and theoretically. For example, by using browsing history data, this study goes beyond social media to capture a more comprehensive view of online browsing activities. It employs network analysis alongside traditional statistical methods to account for the complex effects of information exposure from various websites. The data are meticulously cleaned to include only Brexit-relevant news articles, ensuring that the analysis focuses on material directly related to the topic.

Furthermore, this study follows an inference-oriented research design that focuses on news sources and their effects. Using population-representative panel data, this research applies advanced quantitative methods to estimate causal links between news exposure and changes in electoral behaviour, public opinion, and identity formation. It uses quasi-experimental research designs and longitudinal models to assess these effects over time.

In doing so, this thesis provides the most comprehensive comparative analysis of various political news sources and their effects on Brexit-related electoral behaviour and identity formation. It not only furthers our understanding of how media and other news sources influenced the Brexit vote and the critical years that followed, but it also offers an empirical contribution to the broader study of political information dynamics. By examining political information diffusion, exposure, and the relative influence of different sources, this work advances our understanding of which news sources are most impactful in shaping voter behaviour and political identities.

Beyond its empirical contributions, this research adds to a broader theoretical framework for understanding the interplay between political communication and social identity in contemporary democracies. Brexit provides a compelling example of how the modern media landscape and political campaigns shape and solidify public opinion. The findings have implications that extend beyond the context of Brexit. They offer valuable insights into the dynamics of polarization

and identity politics in an era defined by shifts in the supply and demand of political communication. By examining the emergence and entrenchment of Brexit sides and identities, this thesis adds to the broader field of political sociology, providing a deeper understanding of the forces driving division and cohesion in modern societies.

1.3 Thesis Outline

This thesis comprises four empirical chapters, each of which aims to advance our understanding of political information and its effect on the electorate. Specifically, it focuses on Brexit and the period most affected by it, i.e. the period from the EU Referendum campaign to the UK's official exit from the European Union in January 2020. Although all presented studies collectively adhere to a consistent research area, and progressing logically from one study to the next, each chapter is structured as an independent article, addressing a specific research question and offering a distinct empirical contribution. Consequently, this thesis can be regarded as a compilation of stand-alone research articles. Finally, before outlining each empirical chapter, a brief note on the methodological approach used in this thesis. I use observational data in a variety of ways using advanced quantitative methods to test sociological and political theories in real-world contexts. The first empirical chapter uses a multifaceted network analysis, drawing on works such as Harary (1969), Borgatti et al. (2018), and Latapy et al. (2008), to investigate online news consumption behaviour. In contrast, the subsequent chapters follow methodological frameworks for causal inference with observational panel data, following the principles outlined by Angrist and Pischke (2008), Morgan and Winship (2007), Shadish et al. (2002), and Singer and Willett (2003). I have carefully designed the research to achieve accurate and reasonable causal estimates within the constraints of the available data and methods. While recognising the inherent limitations of observational studies in establishing causality, I have taken the utmost care and necessary steps to ensure the robustness and reliability of the

findings presented in this thesis.

The first empirical study presented in Chapter 2 is concerned with testing the conjecture that online political news consumption was highly polarized along Brexit lines. Specifically, it examines whether online political news consumption during the run-up to the Brexit Referendum was sharply polarized along Leave and Remain lines. It seeks to characterize online news consumption behaviour and test for evidence of selective exposure consistent with the Brexit divide. To address this, I employ a multifaceted network analysis approach.

In the wake of the Brexit Referendum, public discourse seemed to make a notable shift in terminology, with the increased use of concepts such as 'fake news', 'post-truth politics', and 'echo chambers'. These terms were frequently employed to describe the growing polarization in British society, with a particular focus on the role of the Internet, particularly social media. These discussions reflected the findings of emerging studies on American social media environments, which revealed significant political divides. Motivated by this backdrop, I investigated the way in which people consumed online news during the EU Referendum campaign period.

I anticipated clear differences between Leave and Remain supporters in their online news consumption portfolios. To test this hypothesis empirically, I used a combination of survey and browsing history data, which I analysed using a range of methods from statistics and graph theory, also referred to as network analysis.

The study analyses the browsing history of British individuals to explore patterns of political online news consumption. The data is modelled as a two-mode network, where one mode represents individuals and the other represents news domains clicked by those individuals. Each click establishes a user-to-domain connection, forming an 'audience network' in which both users and domains function as network nodes.

By combining statistical methods and network analysis, this approach enables the exploration of distinct characteristics of Leave and Remain supporters. The

study integrates hypothesis testing through regression analysis with exploratory network analysis to uncover clusters and unexpected consumption patterns. This dual approach makes the study both descriptive and explanatory. While prior research has provided valuable insights into online media consumption behaviour using either statistical or network analysis alone, this study demonstrates that combining these methods yields a more comprehensive understanding.

A methodological innovation in this analysis involves examining both direct and projected forms of the two-mode network. While research often focuses solely on domain-projection networks to identify shared audiences, this study also analyses the individual-projection network. By considering both projections in tandem, I capture the full scope of the observed data. Ignoring one projection risks overlooking key structures and relationships. This multidimensional approach ensures a more holistic analysis, akin to viewing a landscape from multiple perspectives rather than a single vantage point.

Using network analysis offers significant advantages, such as directly examining the relationships between individuals and the domains they access, providing granular insights into patterns often obscured in aggregate statistical methods. Network analysis identifies clusters or communities, such as subgroups with similar preferences or domains favoured by specific groups, while metrics like centrality and modularity reveal how news consumption patterns are structured. This approach captures the heterogeneity of user behaviour and addresses the contextual interdependence of choices, such as how domain popularity shapes individual preferences.

Due to the complexity and breadth of this analysis, Chapter 2 is significantly longer than a typical journal article. It includes a comprehensive literature review covering theories relevant to this and subsequent studies, particularly on theories relevant to the study of media effects on political behaviour, such as cognitive dissociation, selective exposure, and echo chambers, and on the evolving media landscape and its implications for democracy. The chapter also provides

detailed methodological descriptions, extensive descriptive network analysis of the observed data, and explanatory analysis to characterize the different types of consumers and the similarities and differences in Leave and Remain supporters' news consumption behaviour.

Overall, consumption of referendum-related news was relatively low during the campaign period, with only around a quarter of participants engaging with Brexit-related online news during this period. While Leave and Remain supporters showed distinct preferences for primary news sources, further analysis revealed no consistent avoidance of opposing views. Instead, active online news readers tended to access content from a variety of sources beyond their preferred outlets, exposing themselves to a wider range of political perspectives. This behaviour suggests that frequent online news consumption reduces the likelihood of echo chambers.

Before I move on to the subsequent chapters, it is useful to highlight a key difference between the research in Chapter 2 and the remaining chapters, which stems from the distinct datasets used. In Chapter 2, I analysed browsing history data at the domain level, focusing on online news sources, such as newspaper websites, the *BBC News* website, news aggregators, and blogs. In contrast, the subsequent chapters (3, 4, and 5) use British Election Study Internet panel data (BES) to examine newspapers and the Internet as political news sources alongside other mass media. The BES data defines news categories differently than the dataset from Chapter 2. Specifically, in the BES data, and therefore in Chapters 3, 4, and 5, any reference to newspapers includes both print and online newspapers, while references to the Internet pertain to news accessed online, excluding online newspapers. The exact formulation of the BES question is 'Internet (not including online newspapers)'.

Chapter 2 demonstrates that the most visited online news sites are the *BBC News* website and traditional newspaper websites. However, in later chapters, the *BBC* as a broadcaster, is not included in the 'newspaper' variable. Consequently, the 'Internet' variable, which excludes online newspapers, is likely dominated by

the *BBC* website, other major news sites that do not have a print edition, news aggregators, social media, and blogs. In the UK, the most popular non-newspaper news websites during the period of this study were *BBC News*, Huffington Post (HuffPost since 2017), and Sky News (N. Newman et al., 2017, N. Newman et al., 2019; also see Chapter 2). This distinction is crucial for interpreting the results of the thesis as a whole, as references to the impact of Internet use in Chapter 2 differ slightly from references to Internet use in Chapters 3, 4, and 5.

Building on the preceding study, Chapter 3 examines whether the type of news sources and the amount of political news people consumed during the 2016 EU Referendum campaign affected shifts between UK citizens' intended and actual votes in the EU Referendum. Using data from the British Election Study Internet Panel, this study is able to provide findings that are representative of the population. The results show that while television news consumption increased the likelihood of shifts to vote Leave, online political news consumption (excluding newspapers) was positively associated with voting Remain. Newspapers with a pro-Leave bias were primarily associated with an audience that voted to leave the EU, yet demonstrated limited persuasive influence in motivating a shift towards Leave. In contrast, newspapers with a pro-Remain bias exerted considerable influence over their readership, persuading them to vote in favour of the Remain side. These results demonstrate the significant impact of medium-specific media consumption on voting behaviour. The study's findings show that certain news media sources exerted greater influence on voters than others, with the direction of influence varying by source and partisan-leaning media.

In Chapter 4, I shift my focus from voting behaviour to social identification. Brexit brought about a new type of political identity, and this study investigates the impact of political news sources on the formation and evolution of those identities during three significant electoral events—the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election—this study adds to the body of research on Brexit and political identity. As with the preceding chapter, this study

investigates the following media: television, the Internet (excluding newspapers), newspapers (including online newspapers), radio and interpersonal communication. The analysis indicates that the influence of the media on Brexit identity switching was relatively limited. There is some evidence that news accessed via the Internet increased the likelihood of developing or switching to a Remain identity during the 2016 EU Referendum and the 2017 General Election campaigns. Additionally, extensive reading of Leave-leaning newspapers was associated with a shift toward Leave identity in the 2017 General Election, while radio consumption during the same period showed an association with Remain identifiers. Somewhat surprisingly, media effects are largely absent during the referendum period, with most significant impacts emerging during the 2017 snap General Election. Lastly, no notable media effects were identified for the 2019 General Election.

Chapter 5, the final empirical chapter of this thesis examines the relationship between media and Brexit identity in greater depth, focusing on changes in the strength of identification. In order to address the question of whether mass media and interpersonal communication influenced changes in the strength of Brexit-related identities, this study builds on the approach presented in Chapter 4. It examines the same news sources across three political events: the campaign periods of the 2016 EU Referendum and the 2017 and 2019 General Elections. The findings demonstrate that interpersonal political communication was the primary driver of Brexit identity reinforcement for both Leave and Remain supporters. While some media sources, such as radio and newspapers, exhibited patterns consistent with those observed in earlier chapters, their effects were largely non-significant. Overall, mass media played a minimal or supporting role in strengthening Brexit identities.

Together, these chapters demonstrate that voting choice, identity choice, and identity strength are distinct concepts, with media effects varying across each. The evidence presented shows that the media's impact differed significantly across these aspects, reinforcing the importance of examining them separately.

Table 1.1 offers an overview for each empirical chapter, listing the news media analysed, the main electoral events studied, and the research questions addressed. For a summary of each chapter's key findings organized by news source, readers are advised to refer to the concluding chapter of this thesis, which includes a comprehensive summary in Table 6.1.

Table 1.1: Chapter Overview

Chapter	**Media Studied**	**Electoral Event(s) Studied**	**Research Question**
2	Online News (news websites, online newspapers)	2016 EU Referendum	To what extent was online news consumption during the Brexit campaign characterised by selectivity and polarization?
3	TV, Internet (non-newspaper), Radio, Newspaper, Interpersonal Communication	2016 EU Referendum	To what extent do the sources and volume of political information consumed during the 2016 EU Referendum campaign influence changes in voting intentions and subsequent votes?
4	TV, Internet (non-newspaper), Radio, Newspaper, Interpersonal Communication	2016 EU Referendum; 2017 and 2019 General Elections	What role have different media sources played in the formation and development of Brexit identities?
5	TV, Internet (non-newspaper), Radio, Newspaper, Interpersonal Communication	2016 EU Referendum; 2017 and 2019 General Elections	Did mass media and interpersonal communication influence changes in the strength of Brexit-related identities?

Chapter 2

Beyond Polarity: Paucity, Promiscuity, and Public Service in Online News Consumption in the Brexit Campaign

Digital media has been criticised for fostering echo chambers and deepening political polarization, particularly in the context of major political events, such as Donald Trump's 2016 election in the US and the Brexit referendum in the UK. Using browsing history data and survey responses of Leave and Remain supporters during the lead-up to the 2016 EU Referendum combined with advanced statistical and network analysis techniques, this study challenges this prevailing narrative by examining whether active online news readers are confined to attitudinally-congruent news exposure, or whether the internet facilitates access to a diverse range of political information. Notably, overall consumption of referendum-related news was low—only 27% of study participants clicked on referendum-relevant online news. Of those who clicked on at least two websites containing Brexit-relevant news, only 11% exclusively accessed domains with a pro-Leave or pro-Remain bias. While Leave and Remain supporters demonstrate distinct preferences in primary news sources, further analysis shows a lack of systematic avoidance of opposing viewpoints. Instead, online political news behaviour is characterised by a pattern in which active news readers often consume content from sources in addition to their preferred outlet, thereby diversifying their exposure to different political perspectives. This study argues that such 'promiscuous' online news habits significantly reduce the risk of echo chambers compared to traditional print media, furthering our understanding of digital news consumption and positing that online news habits of active news readers are not as strongly polarized as prior research relying on social media data or self-report surveys often suggest.

2.1 Introduction

This study investigates whether, in the absence of prior political experience to guide decision-making, individuals' political attitudes on new and current issues

influence their online news consumption. Specifically, in the context of the Brexit campaign, this study tests the selective exposure hypothesis, which suggests that news consumption behaviour is strongly influenced by individual predispositions (Klapper, 1960; Stroud, 2008). This hypothesis is based on cognitive dissonance theory (Festinger, 1962), which suggests that individuals are more likely to seek out and select news that is consistent with their existing beliefs, while avoiding information that contradicts them in order to avoid the psychological discomfort that accompanies experiencing opposing cognitions. The analysis of this study focuses on the theoretically significant case of the 2016 EU Referendum, during which the British population was asked to decide whether to leave or remain in the European Union. Previous research, primarily with a US focus, and based on survey data or social media activity, has consistently supported the presence of partisan selective exposure and posited phenomena such as echo chambers (e.g. Adamic and Glance, 2005; Conover et al., 2011; Flaxman et al., 2016; Stroud, 2008). However, this study makes a novel contribution to the rich literature on selective exposure theory in that it uses browsing history data collected during the referendum campaign to analyse actual online news behaviour, and examines whether online news consumption exhibits patterns of selective exposure in a context characterised by relatively new and non-partisan political sides. This unique dataset provides detailed behavioural insights into the news consumption habits of British online users leading up to the historically significant Brexit vote, offering an empirical perspective on selective exposure in the digital age.[1]

Since the UK's decision to leave the EU, there has been considerable debate about a divided country (Hobolt, 2016), the influence and role of media, particularly digital media, and whether voters were sufficiently informed prior to the referendum (Suiter, 2016; Rose, 2017; Carl et al., 2019a). Recent studies in the field of online communication and social influence have increasingly brought attention to polarization, fragmentation, and isolation. Early findings of such seg-

[1]In this study, I will use the terms United Kingdom European Union Membership Referendum, EU Referendum, and Brexit Referendum interchangeably.

regation, especially along ideological lines or political sides, led to concerns about the Internet impeding democracy (Sunstein, 2009; Pariser, 2011; Warner, 2010) and increasing political polarization and extremism (Sunstein, 2009). Due to the vast amount of choice the Internet and digital media offer, individuals must preselect information to create their personal news diet/portfolio. 'Selective exposure', a term I define further in the 'Theory' section of this paper, occurs when people select news content that confirms their political predisposition while avoiding information that contradicts their ideologies. However, selective exposure is not a phenomenon new or exclusive to digital media and can be traced back to research by Lazarsfeld, Berelson, & Gaudet in 1948, Lipset et al. (Lipset et al., 1954), Klapper (1960), and Sears & Freedman (1967). However, with the increasing role of digital media in overall news consumption, an important research question arises of whether selective exposure and digital audience fragmentation exist online to any greater extent than in non-digital media (Margetts, 2019).

Some democratic theorists agree that traditional media, such as newspapers, television, and radio, are an effective instrument for a stable and successful democracy (Dennis and Snyder, 2021; Lupia and McCubbins, 1998). The Internet and the rise of digital media, however, have dramatically changed the distribution and consumption of political information, raising the question of whether this digital transition fosters exposure to diverse perspectives or amplifies political polarization. Some early theoretical papers discuss the relationship between the Internet and politics and emphasise the increased choice and accessibility of information as providing potential for a digital public sphere (Papacharissi, 2002); others raise concerns that the Internet leads to fragmentation into homogeneous groups that could pose obstacles for a deliberative democracy (Dahlberg, 2007; Sunstein, 2009; Van Alstyne & Brynjolfsson, 2005). Numerous subsequent empirical studies investigated blogs (Adamic & Glance, 2005; Lawrence, Sides, & Farrell, 2010) and social media and found signs of political polarization and fragmentation along ideological or party lines (Barberá, 2015; Conover et al., 2011, 2012; Williams et

al., 2015).

The relationship between mass communication and public opinion has been central to democratic theorising (e.g. Dahl, 1989; Lazarsfeld & Merton, 1948; Habermas, 1989) since the 1920s and Walter Lippmann's Public Opinion (1922), which posited that citizens in big, complex societies depend on others to provide them with news and information about political affairs. Lazarsfeld and his colleagues (Berelson, Lazarsfeld & McPhee, 1966; Lazarsfeld, Berelson, & Gaudet, 1948; Lazarsfeld & Merton, 1948) established the importance of the relationship between mass communication and politics. Further, Lazarsfeld and Merton (1948) notably suggested that mass media plays a central role in stimulating citizens' opinions and beliefs and has measurable effects on society, such as agenda setting. Similarly, Cohen (1965) describes the press as more than mere information sellers but as prescribers of the topics for public thought. According to Berelson et al. (1966), democratic citizens are expected to be interested and well-informed, and to participate in political affairs (Berelson et al., 1966). Mass media plays a central role in enabling citizens to meet such expectations. Brandenburg (2002), in his study on the interplay between party agendas and the news media, emphasises the sequential process in which successfully influencing the media agenda benefits a political party (or campaign) only if the media's agenda setting effectively increases issue salience, ultimately shaping voter behaviour. Therefore, understanding the extent to which mass media can successfully influence voters is a critical component of analysing political communication.

Undoubtedly, digital media plays an important role in shaping our information environment and extending and maintaining social networks, which also shape our information diet (Margetts, 2019). News consumption and the exposure to a certain political news diet contribute to political opinion formation and a person's political participation or electoral behaviour. Exposure to a limited range of political information—and particularly missing exposure to attitude-challenging content—may increase political polarization and radicalisation. With the rise

of online news consumption, traditional theories of mass communication and its relationship to politics must be tested in the digital media setting.

The accessibility of news online provides the opportunity to read articles from different political perspectives. However, the great amount of information may also have the opposite effect and motivate individuals to choose only content that aligns with their existing political views. Sunstein (2009) introduced the term 'echo chamber' in order to describe and warn that the Internet and digital media facilitate individuals' exposure to news content and people who echo their beliefs and political opinions. Echo chambers, then, may amplify and reinforce existing political opinions by simultaneously isolating individuals from opposite views. According to Dubois and Blank (2018), exposure to a diverse range of media reduces the risk of being trapped in an echo chamber. They argue that echo chambers are not as prominent as previous scholars suggested. In addition to echo chambers, another phenomenon often attributed to the Internet and discussed in relation to risks to deliberative democracy is the concept of 'filter bubbles'. Filter bubbles are often neither deliberately nor wittingly chosen. Search engines, news aggregators, and social media platforms increasingly provide personalised content due to machine-learning algorithms (Das et al. 2007; Hannak et al. 2013). These filtering algorithms base their recommendations on the user's browsing history and could lead to filter bubbles (Pariser, 2011), where individuals are only exposed to media content that confirms their existing beliefs (Flaxman et al., 2016).

Bruns (2019) argues, the two concepts of 'echo chamber' (Sunstein, 2007) and 'filter bubble' (Pariser, 2011) are not clearly defined by the authors who introduced them. A lack of clear definitions and methodological approaches to test for those concepts leads to confusion among scholars (Bruns, 2019).

I will clearly differentiate between the two concepts by defining them as follows: 'echo chamber' refers to a situation, mainly applied to online media, in which individuals seek out and engage with information sources that match their pre-existing attitudes. Individual choices and behaviours play a central role in

the formation of echo chambers, although these behaviours are influenced by the structural characteristics of the Internet. The mechanisms that drive echo chambers can be rooted in the theory of selective exposure, using Klapper's (Klapper, 1960) concept, which emphasises selective exposure, selective perception, and selective retention as three main conditions. In contrast, the term 'filter bubble' describes a similar outcome but emphasises the intermediary role of algorithms employed by search engines, news aggregators and social media platforms. These algorithms curate and present information to users based on their past behaviour, preferences, and online activity, potentially limiting exposure to diverse perspectives.

However, in this study, I will rely on clearly defined and empirically tested theoretical frameworks, such as cognitive dissonance theory (Festinger, 1962) and selective exposure theory (Klapper, 1960), as the foundation for my hypothesis. These social psychology theories are applicable across media, whether offline or online. Although these concepts were introduced before the invention of the Internet, they provide the best basis for my hypothesis and inform my methodological approach; however, it is important to note that this study is situated within and contextualised by the modern literature on the discussion of echo chambers and its relationship to democracy. The phenomenon of echo chambers and selective exposure is based on attitudinally motivated behaviour of individuals in selecting information, usually explored along partisan lines.

However, as Brexit was a new political debate, voters would need to learn about the different sides and adjust their behaviour during the campaign period to minimise cognitive distance. This raises the question of how quickly patterns of selective exposure emerge, and whether even newly introduced political sides can motivate such behaviour.

Given that most of the literature on selective exposure has been conducted on partisan divisions, and that no study has examined the presence of selective exposure in the EU Referendum campaign period, I pose the following research

question.

RQ *To what extent was online news consumption during the Brexit campaign characterised by selectivity and polarization?*

The Brexit Referendum represents a notable departure from typical political processes, as it delegated to the public a critical national choice. British citizens were given the opportunity to decide the UK's future within or outside the European Union. This event generated widespread public discourse and placed the power of decision-making with the voters. As a consequence, the referendum campaign was a period of heightened political news supply and demand, and a significant period of opinion formation, as the electorate had to make up its mind on which way to vote. The campaign involved intensive media coverage, strategic framing by political actors, and increased discourse—important factors on opinion formation. Public discourse frequently claims that political news on the Internet during the Brexit Referendum campaign was characterised by misinformation and the prevalence of echo chambers (Hanska & Bauchowitz, 2017). Empirical research on social media provides some support for the echo chamber hypothesis. For instance, Del Vicario et al. (2017) examined Brexit-related news consumption on Facebook during the referendum campaign and found support that Facebook users formed Brexit echo chambers. In addition, a defining feature of the campaign period was the overwhelming dominance of Brexit in British political news. Using a mixed-methods approach, Moore and Ramsay (2017) systematically analysed national media coverage and found that more than one-third of national newspaper front pages during the official campaign were devoted to Brexit. This extensive coverage underscores the issue's centrality in public discourse and highlights the extent to which the Brexit debate shaped the political landscape during this period. Moreover, the Brexit Referendum, with its stark binary choice between 'Leave' and 'Remain,' presented voters with an exceptionally polarized political decision. This unique period forced individuals to navigate an intensely divisive issue, often without the familiar guidance of traditional political heuristics and

clear party cues typically present in general elections. These dynamics suggest that the effects of media, and especially mechanisms such as selective exposure, echo chambers, and filter bubbles, may be different in such a campaign period compared to non-campaign periods. Due to the salience of this exceptional political event and its highly polarized nature, I expect to see active news seeking behaviour and distinct patterns between Leave and Remain supporters, as they are likely to seek online news from different sources. For these reasons, the referendum provides a valuable and theoretically significant case study for examining political online news consumption and whether it is characterised by selectivity and polarization.

If individuals engaged in motivated information seeking, I should find audience fragmentation, *id est*, distinct differences in news consumption patterns between Leave and Remain supporters.

The digital audience structure can be analysed and characterised on a spectrum ranging from 'fragmented' to 'duplicated' (Fletcher and Nielsen, 2017). A 'fragmented audience' is characterised by very little or no overlap between media outlets, and media users group together into homogeneous clusters. In this study, I am particularly interested in such clusters that correspond to the Brexit sides: Leave and Remain. Conversely, a 'duplicated audience' structure shows a high degree of audience overlap between media outlets. This arises when individuals show diverse consumption habits by accessing several different outlets.

For this empirical examination of the relationship between online news consumption and political polarization leading up to the EU Referendum, I combine data from survey responses and web-browsing history to create a two-mode network.[2] I conduct extensive research on this two-mode network, which represents

[2]This audience network, derived from individual online behaviour (i.e. online news users clicking on news domains), forms a two-mode network (or bipartite graph), as the nodes are not uniform but instead consist of two distinct types: individual nodes and domain nodes. Two-mode networks can be analysed in their original structure, or alternatively, they can be projected into one-mode networks. In a one-mode projection network, nodes of the same type are connected if they share a tie to a common node of the other type. Figure A.3 in Appendix A.2 provides a visual representation illustrating the process of projecting a two-mode network into one-mode networks.

the structure of readers and online news outlets, in order to examine the extent to which online news clicking behaviour during the campaign is clustered into Leave and Remain groups.

The first part of this article provides a discussion of relevant theory, starting with selective exposure, cognitive dissonance, and motivated reasoning theory. This section also formulates the hypothesis that I will subsequently test. The following section introduces the EU Referendum, followed by a detailed discussion of media consumption and democracy. The 'Literature and Theory Review' section is followed by a description of the 'Data and Methods'. The 'Results' section presents the findings of my analysis, followed by a discussion of the study results. The final section draws some conclusions.

2.2 Literature and Theory Review

The central focus of this study is the principle of selective exposure, the tendency of individuals to seek information that is attitudinally congruent with their own ideas, while avoiding information that opposes their predisposition (Klapper, 1960; Sears and Freedman, 1967). Following concerns of the potentially negative implications of audience fragmentation on politics and democratic systems (Sunstein, 2009; Pariser, 2011; Warner, 2010), this study is motivated by previous observations of audience fragmentation in traditional media and, most recently, social media (Barberá, 2015; Conover et al., 2011, 2012; Williams et al., 2015). When investigating digital news consumption to determine its consequences on and role in modern politics, it is vital to acknowledge the duality of media and audience in terms of Giddens' (1984) 'theory of structuration'. Fragmentation in the digital media environment is a result of, and constructed from, the interaction between supply (media providers) and demand (media users) (Webster and Ksiazek, 2012). This study will recognise this interaction of media and audience by using network analysis methods to investigate audience fragmentation. 'Selective exposure' theory and related concepts, such as 'cognitive dissonance', 'motivated

reasoning', and 'homophily', help to explain mechanisms behind phenomena of audience fragmentation. It is first necessary to discuss the relevant concepts of selective exposure theory, as it is upon this theory that I form my hypothesis and, thereby, the basis for this study. Research on selective exposure began with the pioneering 'People's Choice' study of the 1940 US Presidential Election, in which Lazarsfeld, Berelson and Gaudet (1948) conducted a panel study, focusing on one county in Ohio, in order to investigate how individuals form their voting decisions. In doing so, Lazarsfeld et al. (1948) investigated the role of mass media, which at that time included newspapers and radio. They find that political campaigns activate and reinforce pre-existing predispositions. One's exposure to propaganda or media, they posit, is selective and based on an individual's opinions. A few years later, Lipset, Lazarsfeld, Barton, and Linz (1954) reiterated that most people select media that confirms their pre-existing opinions. Though Lazarsfeld et al. (1948) did not explore the mechanism behind selective exposure or coin the term, a field of research emerged in their wake wherein the term 'selective exposure' came to describe the phenomenon where individuals prefer and seek out exposure to information that is congruent with their pre-existing disposition, while avoiding attitude-challenging information (Sears & Freedman, 1967). Sears and Freedman (1967) state that the term selective exposure describes any systematic bias in audience composition. However, selective exposure theory is mostly discussed with regard to partisan bias. Proposed explanations behind selective exposure are general psychological mechanisms, such as preferences for compatible information (Sears and Freedman, 1967), which can occur as both deliberate and unconscious behaviour (Berelson and Steiner, 1964).

A related concept is the theory of 'cognitive dissonance,' established by Leo Festinger (1962). Cognitive dissonance theory proposes that individuals avoid the psychological discomfort that results from experiencing conflicting cognitions. In this context, the term 'cognitive' can stand for any conscious state, such as beliefs, desires, or emotions (Elster, 2015). According to the theory, the coexistence of any

two such conscious states generates an internal imbalance, leading to unpleasant tension, which Festinger (1962) describes as cognitive dissonance. The theory suggests that individuals experiencing such dissonance can resolve the tension in various ways: changing their cognitive state, such as their opinion or perception, or changing the behaviour that has a direct effect on the dissonance-creating state.

Furthermore, individuals experiencing cognitive dissonance will try to seek dissonance reduction and cognitive consistency. For example, someone who has strong right-wing political views might feel an internal imbalance by exposure to left-wing arguments. The individual might change their behaviour in order to avoid such information and therefore reduce cognitive dissonance. This search for attitudinally congruent information and avoidance of oppositional information is selective exposure. Thus, selective exposure acts as a prime mechanism for reducing and preventing cognitive dissonance (Sears and Freedman, 1967). If individuals, then, do not consult a breadth of information in order to form their opinions, but rather, seek information that confirms the views they already have, the question arises how opinions and attitudes are formed. The theory of 'motivated reasoning' suggests that individuals have prior motivations and goals that bias and influence them in their reasoning process, attitude formation, judgement, and decision-making (Kunda, 1990). In other words, when it comes to forming principles, beliefs, or attitudes, people reach the conclusions that serve them.

Thus, in a political context, individuals often have the desire to protect predetermined attitudes and ideologies. Taber and Lodge (2006) find, based on two experiments, that individuals are prone to overly accommodate supportive evidence and, at the same time, dismiss evidence and statements that challenge prior attitudes. Moreover, their findings suggest that, due to motivated reasoning, even individuals that are exposed to a balanced set of political media (i.e. media presenting all political viewpoints) may not moderate their political views but strengthen their pre-existing attitudes (Taber and Lodge, 2006). In other words, an EU Referendum Leave or Remain supporter who has read a diverse set of news

might still be biased if he or she accepts the pieces that confirm a pre-existing stance while rejecting the others outright. Stroud (2008; 2010) investigates the relationship between partisan selective exposure and political polarization and finds evidence, based on representative panel survey data collected in the context of the 2004 U.S. presidential election, supporting the hypothesis that partisan selective exposure is related to political polarization, although the causal direction between the two is not entirely clear.

Furthermore, Druckman et al. (2012) conducted an over-time experiment that allowed participants to choose their information themselves, in order to study framing effects and public opinion. Their results provide supporting evidence theories of biased information seeking, selective exposure, and motivated reasoning. Another important individual-level mechanism for the theoretical explanation of political media fragmentation is the principle of 'homophily' (e.g. Barberá, 2015). Other than in random networks, nodes in social networks have the tendency to cluster together. The homophily principle explains that individuals tend to meet and stay in contact with people that share beliefs or have similar sociodemographic, behavioural, or intrapersonal characteristics (Burt, 2004; Lazarsfeld & Merton, 1954; McPherson et al., 2001). Since distance in social characteristics translates into network distance, the diffusion of information between two characteristically heterogeneous individuals or groups takes longer and is harder to achieve. Hence, network structures with high levels of homophily make information diffusion difficult and slow. This principle can also help to reveal patterns of political fragmentation in audience networks, as people with similar views will seek others with the same opinion. In this way, homophily is closely connected to selective exposure theory.

Based on the theory discussed above, especially cognitive dissonance and selective exposure, I anticipate distinct differences in the news sources accessed by Leave and Remain supporters during the run-up to the EU Referendum. I posit the following hypothesis:

H1 *Leave and Remain supporters read online news from different sources during the Brexit campaign.*

If individuals seek information that affirms rather than contradicts their a priori beliefs, it follows that selective exposure could impact how the electorate forms political opinions. Such motivated information-seeking leads individuals to acquire more knowledge and arguments of their own political position while ignoring the opposition's arguments. In this study, I will test for signs of selective exposure by analysing participants' online news consumption behaviour. If individuals preferentially select those news-outlets that are more likely to accord with attitudinal priors, news consumption behaviours should structurally differ between two opposing political groups, such as Leave and Remain voters.

2.2.1 The Case of the EU Referendum

The UK and the Brexit Referendum provide valuable insights into the interplay between media and democratic systems, making it an appropriate case for my study. Soon after the referendum, in which UK citizens voted by a slight majority to leave the EU, many scholars, such as Hobolt (2016), spoke of a deeply divided country. In this study, I investigate whether this divide can be observed in news consumption behaviour during the campaign period and test the selective exposure theory in the digital media setting. The 23 June 2016 Referendum, a major event in UK political history, sparked much debate and led scholars who investigated patterns among Brexit voters to mixed results. Some studies support that social class, education, age, and geography seemed to have played a significant role (Goodwin and Heath, 2016; Hobolt, 2016), while others show that the profile of citizens who voted Leave is not as homogeneous as many suspected (Antonucci et al., 2017). As Fisher and Renwick (2018) argue, many factors had small effects on the narrowly-won referendum, and trying to pinpoint a single reason why Leave won the referendum is not sensible. The Remain campaign, they claim, lost votes due to an inability to effectively convince voters that leaving the EU would

harm the economy (Fisher and Renwick, 2018). Mass media's role in conveying political content to the electorate and its potential impact on public opinion is a key motivation for this study on media consumption.

To address whether voters were well-informed prior to the referendum, Carl et al. (2019a) compared levels of EU knowledge among Leave and Remain voters. Their results in an online quiz presented to a nationally representative sample shows that there was no average difference in EU knowledge between Leave and Remain voters. However, Carl et al. (2019a) find that both Leave and Remain voters were more likely to answer questions correctly that were 'ideologically convenient' to them. Both motivated reasoning and selective exposure could be mechanisms behind such a result. By analysing voters' news consumption patterns, this study aims to shed light on whether one of those mechanisms were present.

Del Vicario et al. (2017) examine news consumption on Facebook during the Brexit campaign, analysing engagement with Brexit-related posts. Their findings show the emergence of two distinct communities, suggesting polarization in patterns of news engagement on Facebook.

To summarise, previous research based on survey or social media data has identified strong polarization during the emerging Brexit debate. This study aims to test whether such polarization is also evident in general online news consumption. The findings aim to provide empirical insights that extend beyond the UK or the Brexit Referendum, as digital media is becoming a popular source of news globally, and the results of this study contribute to understanding the emergence of polarized sides and the role online news may play in shaping them.

2.2.2 Media Landscape

Habermas' (1989) concept of the public sphere is defined as an accessible social space open for public debate, where general concerns and opinions are discussed and exchanged. Moreover, for Habermas, the public space is a vital building

block for a stable and effective democratic society. In an increasingly digitalised world, online news consumption and digital media play an important role in a modern public sphere; however, some scholars are concerned about an increasingly ideologically-segregated population due to new technological changes in online media consumption (Adamic & Glance, 2005; Bozdag & Hoven, 2015; Conover et al., 2011; Sunstein, 2009).

Technological developments in the media industry altered the way the public consumes news in that modern news does not necessarily come from curated news sources. Platforms such as Twitter made it possible for individuals to receive first-hand information even directly from politicians. As digital media increasingly dominate the media ecosystem, the question arises as to how this shift influences politics and how political opinions are formed and discussed.

The Internet facilitates a high-choice media environment, since individuals can choose from a wide array of media sources for political information (Van Aelst et al., 2017). People progressively consume news via the Internet and social media, though legacy media brands maintain a strong position as news producers. In the UK, the public broadcaster (*BBC*) maintains its leading position as the most-read news outlet, even with the transition to more online news (Newman et al., 2017).[3] The *BBC*'s dominance is interesting in light of the ongoing debates about echo chamber effects and sceptical views of journalists and media bias in regard to political opinions and electoral behaviour. As a public broadcaster, the *BBC* is committed to providing impartial news articles, whereas highly competitive private media are often positioned along the political spectrum. Historically, neutrality and non-partisanship are valued as the ideal of journalistic work. Yet, recent scholars criticise that objectivity as an unattainable standard in journalism (Boudana, 2011). Most UK newspapers took a position in the Brexit debate. An analysis at the article-level by Levy et al. (2016) revealed that articles published in the *Daily Mirror*, *Financial Times*, and the *Guardian* were predominantly pro-

[3]In this study, I define 'legacy' media organisations as mainstream media organisations that predate the widespread adoption of digital media (e.g. the *BBC*, the *Times*, etc.).

Remain, while the *Daily Express*, the *Times*, *Daily Telegraph*, the *Sun*, and the *Daily Mail* supported the Leave position (Levy et al., 2016). The *Daily Star* had relatively few referendum-focused articles, but those that were published were slightly more pro-Leave (Levy et al., 2016).

In this study, I will assume that reading only one news website leads to a narrowed exposure of political opinions and an unbalanced presentation of the Brexit debate. Exposure to newspaper articles that primarily support only one political position on the EU Referendum may influence political opinion formation and voting behaviour.

2.2.3 Online Media Consumption and Democracy

Pluralism, viewpoint diversity, and a public sphere are building blocks for a well-functioning democracy. Many political theorists argue that citizens of a modern deliberative democracy must be exposed to a wide spectrum of different viewpoints in order to make an informed choice (Downs, 1957; Dryzek, 1990; Lassen, 2005; Held, 2006). However, many theorists raise the concern that citizens are increasingly segregated in their political attitudes with little communication between individuals with opposing political standpoints. More generally, the arguments relating to echo chambers, filter bubbles, and political polarization suggest that mechanisms that limit an individual's exposure to a balanced and diverse range of political media may threaten deliberative democracy and the public sphere, thereby increasing political polarization. Scholars such as Huckfeldt and Sprague (1995) consistently find evidence to support that people tend to segregate themselves into politically like-minded groups. As media provide political information to citizens, it follows that the media landscape must be heterogeneous in order to support a healthy democracy. If a news source only publishes news with a certain political slant, individuals who read only one such newspaper are exposed to biased information. Levendusky's (2013) research on partisan media suggests that media which is opinionated results in greater political polarization. Katz and

Lazarsfeld (1955) introduced the concept of the two-step flow of communication, according to which information from the media reaches audiences in two stages: first, it flows from the media to opinion leaders, and then from those leaders to the broader public. Druckman, Levendusky, and McLain (2018) extend this idea by arguing that partisan media outlets influence political opinions not only among their direct audience but also through a two-step communication flow. In other words, individuals can be indirectly influenced by media content through their social network. Interacting with several news sources, however, prevents this single-sided exposure. Therefore, in theory, reading articles from different sources, each with a different political orientation, should prevent one-sided news exposure, audience fragmentation, and support a well-functioning democracy.

Most research focusing on the relationship between digital media and political polarization is divided into two camps, with very different implications: one side argues that the Internet increases exposure to diverse perspectives, while the other side claims that it leads to increased political segregation. The first argument, which is often associated with the term echo chamber, focuses on the idea that individuals reading news content online segregate themselves into politically like-minded groups and read mostly politically-confirming news, while at the same time, avoiding dissimilar perspectives and discussions with individuals who have a different political orientation (Sunstein, 2009; Van Alstyne and Brynjolfsson, 2005). This argument is closely connected to mechanisms of cognitive dissonance, selective exposure, and homophily. If individuals seek mainly confirming, homogenous information and avoid news with opposing political arguments, online news consumption patterns should demonstrate signs of segregation along ideological lines. Therefore, I predict to see two separate clusters in the audience network, where each cluster maintains a homogeneous political orientation towards Brexit.

The second group argues that the Internet and online media provide an online sphere that offers the opportunity to encounter non-redundant information and a broader, more diverse set of views. Accessibility and increased choice can lead to

greater exposure to different political opinions, thereby facilitating the formation of moderate positions and fostering an active exchange of opinions (Papacharissi, 2002). Messing and Westwood's (2014) study provides empirical evidence that social networks and social media increase individuals' exposure to heterogeneous perspectives. Other studies, focusing on online social networks, found evidence that on social network service platforms, such as Facebook, a considerable proportion of ties between individuals exist among those with opposite political views, which provides the opportunity for diverse discussions and information exchange (Goel, Mason and Watts, 2010).

I seek to identify whether individuals read news outlets with mostly politically-confirming information or consult a diverse set of news outlets. Although an active debate exists, there is a slight majority of studies conducted heretofore that support the first argument that digital media, and especially social media, show signs of selective exposure and political polarization. However, most recent studies find support for the second argument, stating that digital media can provide the opportunity to access a wide array of information. Studies which employed a social network analysis approach to examine online social networks have often found that the online social network sphere is highly polarized (Adamic and Glance, 2005; Conover et al., 2011, 2012; Del Vicario et al. 2017; Williams et al., 2015). For instance, Adamic and Glance (2005) studied the US political blogosphere and found evidence of a very strong segregated network structure between political bloggers. Similarly, Conover et al. (2011, 2012), by analysing Tweets in the run-up to the 2010 US Congressional midterm elections, find strong signs that online political debates are often highly polarized. Williams et al. (2015) also find that social networks and discussion groups on climate change on Twitter show strong attitude-based homophily and polarized segregation.

To identify drivers of political fragmentation on social media, Bright (2018) conducted a large-scale comparative study of political discussion groups on Twitter, which focused on the 2014 European Parliament elections, in 26 EU member

states. The results show that those groups that have a greater ideological distance between them interact less with each other. Especially groups with extreme ideological views tend to have very low interaction with groups of opposing or moderate ideologies (Bright, 2018). Hence, the strength of the ideological belief plays a significant role in isolation and political fragmentation. Studies employing controlled experiments, focusing on US samples and context, such as those by Iyengar and Hahn (2009) and Muson and Resnick (2010), provide evidence in support of ideological segregation, showing that study participants would rather choose news articles and newspapers which resonate with their existing political orientation than newspapers with contradicting views.

Flaxman et al. (2016) examined the effects of information segregation created by filter bubbles and echo chambers on democratic societies by studying online news consumption with an analysis of clickstream data of active, US-located online news readers. The result of their study verifies that technological changes in the media industry and digital media lead to higher ideological segregation. They find strong empirical evidence that shows that the majority of active online news readers read publications that are ideologically similar to their political views and rarely choose to read articles with opposing perspectives (Flaxman et al., 2016). Their findings also suggest that the vast majority gets their political information from only one source.

Other scholars claim that there is no persuasive empirical evidence that supports concerns about filter bubbles threatening democratic societies (Zuiderveen Borgesius et al., 2016). Takikawa and Nagayoshi (2017) investigated whether Twitter in Japan serves as a public sphere or, rather, an echo chamber. Their findings indicate that especially individuals with radical or conservative political opinions are more likely to form homophilic ties than left-wing and liberal networks. These findings correspond with results by Boutyline and Willer (2017) about the US Twitter community.

Although social media seems to provide a platform that could facilitate the

formation of echo chambers, further evidence has shown that such isolated clusters might not exist among voters overall. Lee et al. (2014) studied relationships between social media network heterogeneity and opinion polarization by using a US national survey. Their findings suggest that social media facilitate exposure to diverse perspectives, since frequent social media users are more likely to have a diverse social network. Motivated by selective exposure theory, Garret (2009) conducted an online behaviour-tracking experiment study in the US with a sample of active partisan news readers to examine how the political content of news might affect the reader's interaction with that news article. He finds no compelling supporting evidence that individuals avoid attitude-challenging political information. Garret (2009) points out that the Internet provides individuals with more choice and control over their political news exposure but disagrees with the notion that this would lead to increased segregation and isolation along ideological lines. Further, Webster and Ksiazek (2012) applied a network analysis approach on a data set of television and Internet exposure of US-residents to investigate the degree of audience fragmentation. Their findings reveal high levels of audience overlap across media sources and no evidence of isolated groups.

Fletcher and Nielson (2017) conducted a comparative study by analysing self-report online survey data for six countries (i.e. UK, US, Germany, Denmark, France, Spain) with ca 2,000 participants in the sample for each country, to examine the degree of news audience fragmentation. The key finding of the study is that they find no evidence that the online news audience, which arguably provides more choice and is easier to access than traditional news, is more fragmented than offline news audiences. Thus, the audience duplication (i.e., high level of online news audience overlap across sources) for all the examined countries seemed to be higher in the online media environment than the offline media environment.

Dubois and Blank (2018) argue that the risk of echo chambers threatening democracy is overstated. By analysing a UK nationally representative survey of adult Internet users with hierarchical regression models, Dubois and Blank (2018)

find that individuals with higher interest levels in politics and those who showed diverse online media portfolios managed to evade echo chambers. They conclude that most citizens read a variety of news sources, which dilutes the risk of echo chambers. According to Dubois and Blank (2018), greater media diversity is the best way to avoid echo chambers.

To answer the question of whether audience fragmentation of online news is increasing and to test for selective exposure, Yang et al. (2020) used observational data of online news exposure from the US that captured data from both desktop and mobile devices. Their results show that ideological segregation is present among US online news consumers. Yang et al. (2020) argue that the more substantial finding is that mainstream online news sources show high levels of shared audiences, and increased news consumption on a mobile device is associated with higher exposure to heterogeneous news content. In addition, their findings show that half of the US online population does not use the Internet for online news, which points to another important divide in news consumption, not by choice of news sources but between individuals who seek online news and those who do not.

Most studies of digital media consumption testing for homophily, echo chambers, and political segregation focus on social media. In the US, for instance, social media was used more for news-seeking than print newspapers before 2015 (Newman et al., 2017). Since 2017, more than three-quarters of the US population access news online. The trends in the UK look very similar, with 75% of UK citizens consuming digital news on the Internet. However, only 41% of UK citizens use social media as a news source. Although the consumption of news via social media platforms is increasing, most individuals inform themselves by visiting news websites directly. Moreover, individuals consider legacy news brands as more trustworthy than social media (Newman et al., 2017). In order to take account of the multi-choice media environment, this study uses clickstream data, which enables a comprehensive analysis of online news consumption behaviour, including information accessed on both mainstream newspapers and smaller emerging

media platforms. Compared to self-report studies or studies that focus only on social media, this study will contribute to a better understanding of how an individual's media consumption is shaped by ideological preferences and whether signs of political polarization can be observed.

In summary, this study examines whether online news consumption during the referendum campaign exhibits evidence of Brexit-related selective exposure. Drawing on the literature and the selective exposure hypothesis, I anticipate to find a polarized network structure characterised by distinct Leave and Remain clusters. Consequently, I predict that online news sites will attract predominantly politically homogeneous audiences that are aligned with their respective orientations.

2.3 Data and Methods

In order to investigate patterns of online news consumption and political polarization, I will empirically examine survey responses and web-browsing history data of UK-located individuals. The analysis of this study is based on two data sources: clickstream data and survey data. The data were collected by Banducci et al. (2018) in collaboration with ICM Unlimited and made available by Banducci et al. at the Exeter Q- Step Centre, University of Exeter (Banducci et al., 2018, 2018). Combining survey data and clickstream data provides a rich dataset and enables detailed analysis. However, this approach also limits the number of participants eligible for the analysis. Combining two datasets enriches the depth of the analytical power, but also requires substantial data preparation. Although I acknowledge the limitations of the data, especially with regards to the sample and sample size, I will focus on a well-classified and cleaned dataset that is best suited for answering my research question, given the data format. Thus, I will base my analysis on a smaller but also more robust dataset and sample. Although a small sample size introduces limitations to the analysis, it also allows for manual verification of classifications and the content of some of the articles accessed.

This study combines statistical methods and network analysis to explore the distinct characteristics of Leave and Remain supporters. The study integrates hypothesis testing through regression analysis with exploratory network analysis to uncover clusters and unexpected consumption patterns. While previous studies have used statistical or network analysis alone to provide insightful information about online media consumption behaviour, this study shows that combining these approaches results in a more thorough understanding of online news consumption. A key innovation in this analysis is the use of both direct and projected forms of the audience two-mode network, examining both domain-projection and individual-projection networks to capture the full scope of the data. This multi-dimensional approach ensures a holistic analysis, revealing patterns that might be missed by focusing on only one projection. Network analysis allows for a detailed examination of relationships between individuals and the domains they access, identifying subgroups, clusters, and how preferences are shaped by domain popularity. It offers a granular view of news consumption patterns that traditional statistical methods often overlook.

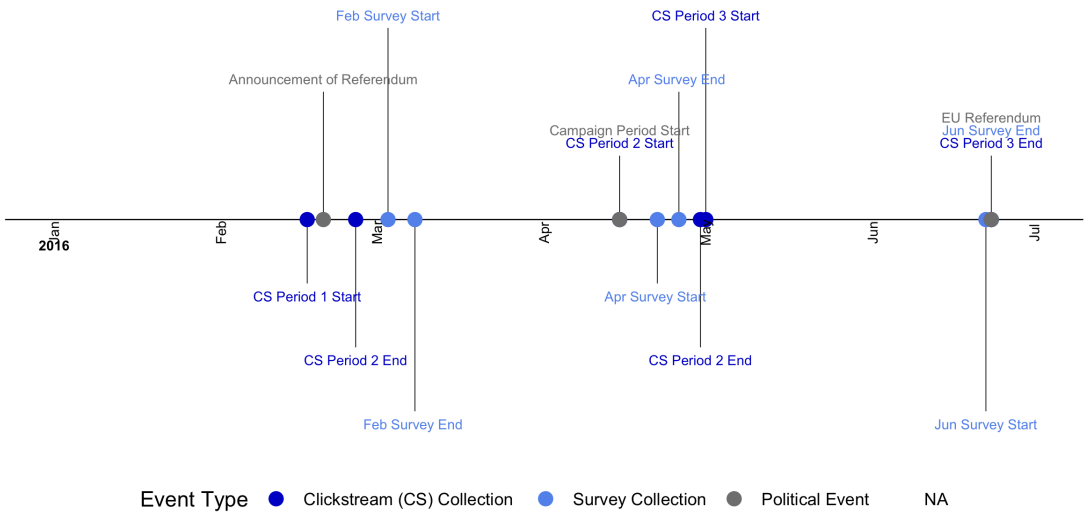


Figure 2.1: Data Collection Timeline

2.3.1 Survey Data

In February, April, and June 2016, ICM Unlimited conducted three online surveys to capture the relationship between media exposure and attitudes on the EU Referendum (see Figure 2.1). The data obtained provides socio-demographic as well as attitudinal data. Over all three waves, the survey has close to 1000 respondents. However, due to participant dropouts (panel attrition), each survey wave was supplemented with a new sample. Hence, the data does not provide a consistent sample across all waves, and the composition of each sample varies. Respondents may have been in one, two, or three waves. Therefore, a typical panel analysis is not possible, as the data does not provide repeated measures from the same sample. Moreover, the questions asked in each wave vary considerably. The only consistent questions present in all three surveys were basic socio-demographic questions and voting intention for the EU Referendum.

Because this type of analysis is not possible given the nature of the data, my study employed a combination of statistical measures and network analysis in order to exploit the depth of the data and enable a detailed examination of online news exposure of study participants. My analysis combines the survey data with clickstream data, meaning that participants had to be in both the survey and clickstream collection sample.

2.3.2 Clickstream data (CS)

ICM Unlimited collected web browsing history data from its Reflected Life panel. The Reflected Life Panel is ICM Unlimited's digital toolkit for tracking the digital profile of online panel members. Users downloaded the Reflected Life app to their phones, tablets, and desktops, which enabled the app to track and share every URL they visited (Banducci, 2020). The original clickstream data is comprised of browsing histories of 672 participants. The data collection began three days before the EU Referendum announcement (17 February 2016) and ended on the day of

the vote. The clickstream data has three collection periods: 7 to 26 February, 1 to 30 April, and 1 May to 23 June 2016. The participants in each collection period differ, and only very few individuals participated in all three collections. As the sample sizes for the first two collection periods are rather small and as my study focuses on the campaign period, I will focus on the last collection period only. The last collection period has gaps in the data from 11 to 14 May, 23 to 26 May, and 3 to 13 June 2016. My final sample consists of those individuals that participated in both the survey waves and the May to June clickstream collection period. The resulting sample size is 517 participants, a number that is reduced even further after the classification of the accessed URLs. This classification and its effects on the sample are described in the next section entitled 'CS data cleaning'.

2.3.3 CS Data Cleaning

The clickstream data from Banducci et al. (2018) limited the full browsing history data to domains that provide news information. However, the data still included sport news, celebrity news, weather forecasts, and other news information that was not relevant for my analysis. Given that my analysis focuses on the EU Referendum and identifying potential differences in news consumption between Leave and Remain supporters, I limited my analysis to news exposure that is relevant to the EU Referendum. To achieve this, I employed a rule-based classification approach that uses keywords and regular expressions to classify URLs according to whether their corresponding article contained news information, whether that news information related to politics or other topics, and whether those URLs were also relevant to the EU Referendum. To identify URLs as EU Referendum-relevant news, I created a list of keywords related to the EU Referendum e.g. 'Brexit', 'referendum', and 'European Union' (List of Keywords in Appendix A.2). After manually identifying URL structures of relevant websites in the dataset, I identified the best-performing regular expressions for classifying URLs into EU Referendum-relevant news. As an additional step, I also classified the dataset into

soft-news and hard-news categories. Again, using regular expressions, I filtered all URLs that were identified as soft-news articles. For each URL in the dataset, my model checked whether it contained any of the news-related keywords in the EU Referendum-relevant list or any of the non-news-related keywords in the soft-news list. By using both lists, I was able to improve the accuracy of the classification and reduce false positives. After this filtering and classification step, I manually checked the remaining EU Referendum-relevant URLs to ensure their accuracy. Any URLs that did not fit into either category were also manually compared and classified. I want to acknowledge that my classification of websites is based solely on the URLs and does not systematically include an analysis of article content. Therefore, I can only confidently speak of successful classifications at the URL level. To manually verify and classify URLs that were not captured by the regular expression rule-based classification, I visited a cross-section of articles for manual classification. However, this was only necessary for a few URLs.

In summary, my approach for URL classification involved a combination of regular expression-based classification, keyword filtering, and manual verification to accurately identify and classify EU Referendum-relevant news URLs. For my main analysis, I kept only those URLs that have been classified as EU Referendum-relevant news.

The original dataset consists of 959 individuals who participated in the clickstream data collection. However, the sample size decreased by 30%, as some participants did not visit any domains classified as containing general news content. Additionally, three users were excluded due to their online activity displaying signs of automated or 'non-human' behaviour, which did not align with typical news consumption patterns. After this data cleaning process, the final sample of online news users—defined as those who clicked at least once on classified news-containing domains—comprised 517 participants during the May-June clickstream collection period. Before excluding Brexit-unrelated articles, the May-June CS period data had 30,084 user-article observations, 306 unique domains, and 16,023

accessed URLs/articles by 517 users. After the classification, only 202 users remained in the sample, and 969 EU Referendum-related URLs were clicked on from 75 domains. Thus, from the original sample of 517 online news readers that participated in May-June CS collection period, only 39% were identified as having clicked on at least one EU Referendum-relevant article in the time period between 1 May to 23 June. This will be the sample for my main analysis, as those individuals show exposure behaviour to EU Referendum-relevant online news. The study is restricted to individuals who voluntarily shared their browsing history for research purposes, which may introduce selection issues to the data. Participants, for instance, may be less concerned about privacy on the Internet. Since the data is based on an Internet panel survey, the sample is a non-probability sample. One limitation of the data (additional limitations are discussed in a separate section) is that the survey included only a few socio-demographic questions. I compared the available data—such as age, working status, region of residence, and Brexit support—to British population statistics. The sample of online news readers under represents individuals aged 65 and over, with only 13% of the sample in this age group, compared to 18% of the population in mid-2016 (Office for National Statistics, 2017). This discrepancy is likely due to a self-selection effect, as only individuals who clicked on online news are included in the data, and this group is likely to be younger and more digitally literate. As I focus on news media consumption within the context of the EU Referendum campaign, I then limit analysis to individuals who clicked at least once on an online news article that has been classified as EU Referendum-relevant. Although the data cleaning process reduces the size of the initial sample, the remaining sample contains the most relevant data to the research question. Moreover, the sample of online news readers includes 50% who intend to vote Remain and 45% who intend to vote Leave. After filtering for those who clicked at least once on Brexit-related news, the proportions shift to represent 52% Remain and 36% Leave. A two-proportion z-test revealed a statistically significant difference (with 95% confidence), with a z-value of 2.19

and a p-value of 0.028, suggesting that the proportion of 'Leave' voters differs significantly between these groups. However, when comparing the proportion of 'Remain' voters in the same samples, the test indicated no significant difference. See Appendix A.2 for more details.

2.3.4 Network Construction

I constructed a two-mode network based on the clickstream dataset which is hereafter called the Audience Network. A two-mode network (also affiliation network; bipartite graph) is a network which comprises two kinds of vertices, and ties can only occur between, and never within, modes (Borgatti and Halgin, 2011). In this study, the first mode are participants of the study and therefore represent online news consumers, and the second mode are news outlets/domains that individuals visited. Ties in the two-mode network indicate what websites have been visited by which individuals. I selected relevant information, such as EU Referendum Attitudes, from the survey data and merged it with the clickstream data in order to add vertex attributes to the network. I examine the observed two-mode network (Audience Network) in two different ways. Initially, I analyse the network directly as a two-mode network. Thereafter, I examine two projections by converting the two-mode data into one-mode data. This approach allows me to study the two-mode network using an array of different tools and methods designed for one-mode networks and those for two-mode networks. In this study, with focus on audience fragmentation and individual online news consumption behaviour, two-mode network projections provide valuable information worth analysing. However, conversion to one-mode projections may lead to the loss of some structural information originally present in the original two-mode data (Latapy et al., 2008). Thus, to prevent misinterpretation and loss of data, I analyse both the Co-Domain as well as the Co-Individual projection networks, as both are derived from the two-mode Audience Network, and are not independent from each other (Borgatti, et al., 2018). Moreover, for the examination of potential clustering and homophily

in the projection networks, I use a community detection approach. Established community detection methods for unipartite networks are often not well suited for detecting communities in bipartite networks, and specific methods for bipartite networks are less developed. For example, the commonly-used Louvain method by Blondel et al. (2008) assumes that each node can theoretically be attached to any other node. However, this assumption is not met in two-mode networks, as ties can only occur between modes and not within them. The most common method for identifying communities in bipartite networks is by first projecting the two-mode network into two one-mode networks. The one-mode networks can be derived by constructing ties among nodes based on co- affiliation (Borgatti and Halgin, 2018; Everett and Borgatti, 2013). I follow the guidance by Everett and Borgatti (2013) in constructing and analysing dual-projections of the two- mode data. The method transforms ties that occur between modes to ties within one mode, as ties in the projection networks represent co-affiliation. In this paper, that means that the Audience Network consisting of nodes that are either of the mode Domain or the mode Individual is projected to two one-mode networks. Thus, the projection method results in one network that consists only of nodes in the mode Domain (hereafter referred to as 'Co-Domain Network') and a second unipartite network that consists only of Individual nodes (hereafter referred to as 'Co-Individual Network'). In the Co-Domain projection, ties between domains exist when they share a common audience, and the strength/weight of a tie represents the size of that shared audience. The second projection, the Co-Individual Network, shows ties between individuals when those users visited the same domains for EU Referendum news. The modularity value measures the density of edges inside communities to the density of edges outside, or between communities, and therefore indicates whether and to what degree a network shows clustering (Blondel et al., 2008). An important consideration when analysing two-mode projections are the creation of edges and their weights (Borgatti et al., 2018). For example, more popular nodes will have a bigger impact on the projection

networks than less popular nodes. In this study, online news outlets that are more frequently visited will have more common users, and therefore, stronger edge weights in the Co-Domain projection. However, this could simply be the result of chance, as popular Domains have a great audience size. In some cases, the absolute numbers of audience overlap are interesting; however, they might also contribute to 'noisy' data hiding interesting patterns. When converting the two-mode Audience Network into one-mode projections, highly popular nodes, in this case very popular mainstream domains, such as the *BBC*, will create a lot of 'noisy' edges, potentially hiding significant structures. Systematically removing edges in order to reveal significant structures, i.e. the method of graph pruning, can help as a preconditioner to identify community structures (Dianati, 2016).

There are several approaches to filtering out spurious edges and identifying the most relevant edges for a given projection network. A common and relatively simple approach is to set an edge-weight threshold and remove edges that do not meet the set criteria. Often, low-weight edges are removed in order to retain stronger associations/connections. I will refer to this method as edge-weight thresholding. The edge-weight thresholding approach reduces the number of edges in the network significantly by excluding low-weight connections; however, it discounts low-degree nodes and favours high-degree nodes (Dianati, 2016). This is particularly important to consider when analysing networks with highly skewed degree distributions, as in this study, since high-degree nodes dominate the network construction. In order to address this problem, one might consider pruning methods that take into account the distribution of and relationship between edges and their connected vertices. Such methods compute significance levels for all edges according to a generative null model and retain only those edges that meet a given significant threshold, thus attempting to remove those connections that are likely to have formed due to pure chance. Dianati (2016) proposed such a method called Marginal Likelihood Filter (MLF). The MLF method estimates the significance of an edge based on the properties of the vertices it is connected to. The null

model assumes that more popular nodes, i.e. nodes with a high degree, are more likely to be connected to each other purely by chance. Thus, the model judges the edge between two nodes as significant if this edge is unlikely to have occurred randomly. The higher the degrees of the edge's adjacent nodes the higher the edge's weight must be in order to be considered significant. The Marginal Likelihood edge filter results in a subgraph that retains only the topmost significant edges, and therefore, tries to reveal the most significant substructures of the network. Of course, potentially hidden communities and structures of the network, if there are any, are not known a priori. This means that there are no objective measures of success, and filtering edges as well as interpreting the resulting subgraph requires utmost care and awareness of the method used.

In summary, I take the approach of investigating and comparing various projection models, as each method provides a slightly different focus of analysis. For example, the original network provides the observed data and allows the investigation of the observed online news exposure to EU Referendum news. A pruning method can allow the investigation of potentially hidden substructures. I will describe the observed network and a pruned network in detail in the Results section. In addition, other filtering methods, such as edge weight thresholding, are presented and described in Appendix A.2.

2.3.5 Methodological Approach of the Analysis

After constructing the Audience Network (two-mode network) and two derived projection networks (Co-Domain-Network and Co-Individual-Network) representing online news consumption behaviour with regards to EU Referendum online news articles, I now analyse those networks to determine whether online news consumption shows signs of audience fragmentation and distinct differences between Leave and Remain supporters. To do so, I use both standard statistical methods and methods specific to network analysis. First, I investigate participants' online news consumption activities relevant to the EU Referendum over the campaign

period, leading to a presentation of the most visited online news sources for the EU Referendum. In doing so, I investigate the relationship between individuals' online news consumption and level of interest in the EU Referendum campaign and attitudes towards the EU Referendum. Secondly, I analyse the Audience Network to present topological properties and centrality measures. The focus lies on a comparison of online news consumption patterns and preferences for online news sources between Leave supporters, Remain supporters, and individuals who were Undecided. Lastly, I analyse the Co-Domain Network and the Co-Individual Network. I describe and compare five models for each projection, which are the result of different 'graph pruning' approaches. For the analysis, I use standard network analysis methods, such as centrality measures, community detection, and assortative coefficient measures.

2.4 Results

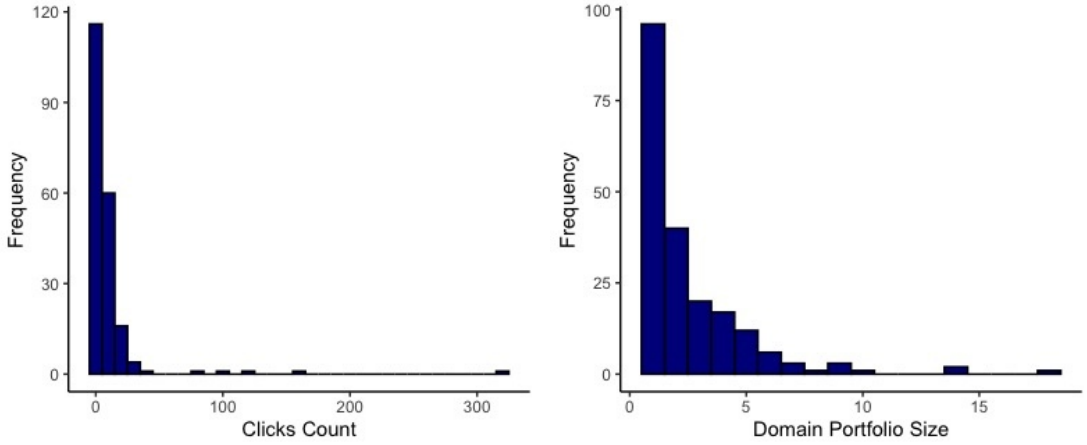
In order to examine whether media exposure and news consumption behaviour show signs of segregation along political lines, I provide in the next section a detailed description of the study participants and their online news consumption behaviour, followed by a detailed examination of online news exposure patterns through an Audience Network analysis.

2.4.1 Descriptive Information about Online News Consumption

This section provides descriptive information about the individuals in the sample and their online news consumption behaviour in order to show characteristics of online news exposure during the Brexit campaign. First, I will examine the news consumption activity of participants over the campaign period, leading to a description of the most accessed Domains. Then, I will compare the online news consumption behaviour of Leave and Remain supporters. The sample of my

analysis contains 202 individuals, whose online browsing behaviour was recorded from 1 May 2016 to 23 June 2016 (i.e. the day of the EU Referendum). Of these individuals, 36% were Leave supporters, 52% were Remain supporters, and 12% were Undecided.[4]

Figure 2.2a shows the distribution of clicks on EU Referendum online news per user and demonstrates that the distribution has great variation and is extremely right skewed. Thus, online clicks on EU Referendum news follow a power-law distribution, as the vast majority of individuals clicked on very little EU Referendum online news during the campaign period, and most clicks on EU Referendum online news came from a few very active online news-clickers.[5][6]



(a) Clicks distribution. **(b)** Portfolio size distribution.

Figure 2.2: Distribution of Clicks and Portfolio Size for EU Referendum News. n=202.

Power-law distributions are common in both natural and social sciences, so this finding is not unexpected. Biggs' 2005 and 2018 studies show that the size distribution of labour strikes also follow a power law as most strikes are small and warrant little attention, but a few large strikes contribute the majority of total participants. Furthermore, many occurring network structures (especially

[4]See Figure A.4 in the Appendix for more descriptive information about the active EU Referendum online newsreader sample.

[5]To test whether the distribution really reveals a power-law, or Zipf's law, I plotted the observed data on a logarithmic scale, i.e. a log-log plot with 'rank' and 'frequency' axes. The approximate straight-line form of the histogram implies that the distribution conforms to Zipf's law (see Figure A.15 in the Appendix).

[6]Further explanation of 'mechanisms' (Elster 1989) and the relationship of online news clicks, or audience reach, with a power-law distribution could be an interesting extension to this article.

those online), such as the World Wide Web (Adamic et al., 2000), are scale-free networks, meaning their connectivity/degree distribution follows a power-law (Barabási et al., 1999). In such networks, highly connected nodes grow more over time and gain more connections than those with smaller links. This effect of preferential attachment, and what Merton (1968) called 'The Matthew Effect' will bear heavily on this article.

80% of the individuals in the sample clicked on ten or fewer articles. Half (i.e. 54%) of the individuals clicked on four or fewer EU Referendum online news. Only 8% of the individuals clicked on 20 or more articles. Nevertheless, the data also shows a few very active users who clicked on more than 50 EU Referendum online news articles. For example, one individual had 317 clicks over the period. Thus, though there are a few extremely active political news readers that clicked on EU Referendum online news regularly and frequently over time and accounted for many clicks on topical political news, most individuals visited EU Referendum online news articles infrequently and rarely.

Figure 2.2b shows a similar story for Portfolio Sizes of individuals who accessed EU Referendum online news. Very few individuals demonstrated online news consumption from a broad set of online sources—most individuals visited only one or very few online news sources for EU Referendum online news. Almost half of the individuals (i.e. 48%) visited only one online news domain, and three-quarters (i.e. 77%) visited three or fewer news domains for EU Referendum news throughout the campaign period. Again, a few individuals on the long-tail of the distribution had a very broad portfolio, with 14% of the individuals visiting five or more domains. In other words, only half of all individuals accessed several different online news domains for EU Referendum news prior to the referendum. This suggests that almost half of the individuals got information about the EU Referendum from only one online source, which could potentially make those individuals more susceptible to receiving a one-sided portrayal. The average number of clicks per user per day is relatively stable over time. On average, users clicked on three EU Referendum-

relevant online news articles per day. The average number of clicks per person per day on such articles fluctuated from one to five clicks.

Figure 3 shows the number of clicks on EU Referendum online news and the number of active users per given day over the collection period from 1 May to 23 June 2016. There is a clear trend of more individuals accessing EU Referendum-relevant online news articles closer to the vote. As the increasing number of website clicks suggests, the demand for EU Referendum-relevant online news increased over time.

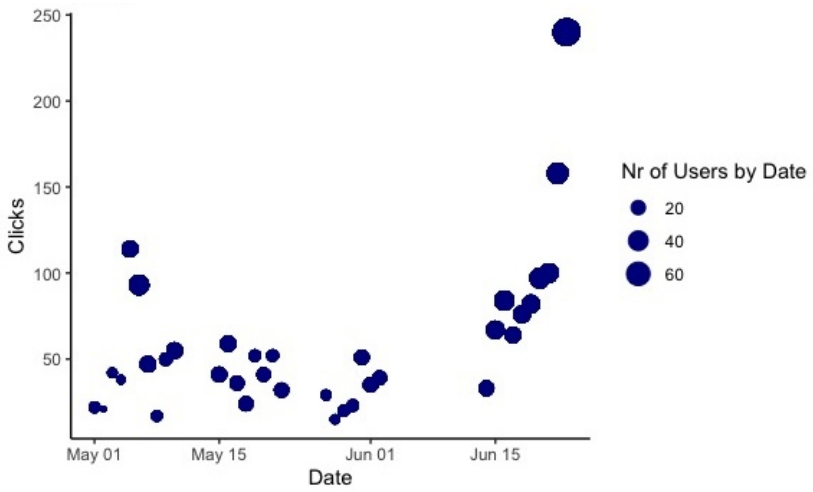


Figure 2.3: Number of Clicks on EU Referendum News by Date. Note: User sample size = 202; The clickstream collection period starting on 1 May to 23 June 2016 has gaps in the data from the 11 to 14 May, 23 to 26 May, and 3 to 13 June 2016.

Whereas in May the number of individuals clicking on EU Referendum online articles is moderate (an average of 9% of the sample), more people accessed such online news articles in the days leading up to the referendum. It is not surprising that demand and interest for EU Referendum articles increased closer to the vote; however, it is interesting that although this sample already excludes those individuals that never accessed any EU Referendum online news articles, there is still relatively low news consumption activity until just before the referendum. One notable exception is that demand for topical, political online news, and therefore articles relevant to the EU Referendum, rose on 5 and 6 May 2016. On 5 May, the 'Super Thursday' elections took place across the UK, and the results were announced in the media on the following day (*BBC*, 2016b). Together with days

surrounding the EU Referendum, demand for online news was the highest during the 'Super Thursday' Elections.

As mentioned in the 'Data and Methods' section, after excluding URLs that did not classify as relevant to the EU Referendum, 75 domains remained in the data, with 2049 total clicks over the collection period. Figure 2.4 shows that the audience reach of domains for topical political news also follows a power-law distribution. In other words, a few mainstream domains, in this case legacy media, account for most of the traffic to online news about the EU Referendum, while many smaller news sources were visited by only one or very few people.

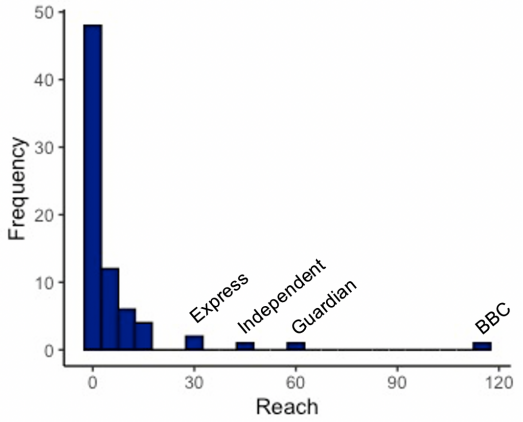


Figure 2.4: Total Audience Reach of EU Referendum Active Online News Readers in the Sample for Domains

The *BBC* was the most popular news domain for EU Referendum online news, with 57% of individuals visiting the *BBC*, followed by the *Guardian*, the *Independent*, and the *Express*, respectively (see Figures 2.4 & A.7a). Moreover, the *BBC* website accounts for more than one-third of all EU Referendum online news website clicks (Figure A.7a). Additionally, of the increased clicks on EU Referendum online news on the day before and the day of the referendum, the *BBC* accounted for the majority of those clicks. This suggests that many people relied on the public broadcaster for news of the current political event. The most visited URL was the *BBC* political news 'LIVE' page, which provided live updates and summary information on the referendum.

The *BBC*, however, did not dominate only referendum-related content during

the collection period. Figures A.8a & A.8b verify the *BBC* as the dominant news outlet for all news content—not just EU Referendum-relevant news—followed by the *Telegraph*, the *Daily Mail*, the *Guardian*, and the *Mirror*. This conclusion corresponds to findings presented by Fletcher and Selva (2019), who find that 75% of UK news users access the *BBC* for news each week. A comparison of EU Referendum-related online news consumption with overall news consumption reveals that tabloids like the *Mirror*, *Daily Mail*, and *The Sun* rank highly in general online content but fall to lower positions when only political news is considered. See Appendix A.2 for a more detailed description of clicks and portfolio distributions.

In summary, based on the available data, of those clickstream data participants who clicked at least once on a domain classified as containing news, only 39% clicked on an article which was classified as relevant to the EU Referendum. This corresponds to approximately 27% of all study participants accessing Brexit news online during the campaign period.[7] An important finding is that online news consumption with regards to the EU Referendum, at the time of the campaign period, can be divided into two groups: the majority of individuals who did not access EU Referendum online news and the remaining 39% of online news users who clicked on at least one EU Referendum online news article. The latter group can be further divided into a majority of less active online political news readers and a small group of very active online political news readers, which I have termed 'Super-Readers'. Most individuals began clicking on EU Referendum online news only a few days before the day of the referendum. Further, most of the individuals in this group did not consult a large list of domains. On the other hand, there is a small group, characterised mostly by outlier behaviour, with individuals who are very active newsreaders, i.e. the 'Super-Readers'. Those individuals frequently accessed EU Referendum online articles throughout the campaign period.

In the survey fielded in June 2016, 285 participants were asked, 'How interested

[7]It is important to note, however, that these figures are estimates, as the clickstream data contains gaps in its continuous collection during the campaign period.

are you in the EU Referendum campaign?'. Of all the participants in the survey (n=285), 44% claimed to be 'very interested' in the EU Referendum campaign. 34% identified as 'somewhat interested,' and 20% said they were 'not very' or 'not at all' interested in the campaign. Only 44% (i.e. n=123) of individuals clicked on at least one EU Referendum online news article. Thus, of all the participants who claimed to be interested in the EU Referendum campaign, only 46% clicked at least once on an EU Referendum online news article. This means that 54% of those individuals claiming to be interested in the EU Referendum campaign never clicked on an EU Referendum online news article during the time of the data collection.

Further analysis shows a positive association between high interest in the EU Referendum campaign and frequent online news clicks, but this applies mainly to outliers who are very active news readers (See Appendix A.2 for details). For most participants, click frequency did not significantly differ across interest levels, suggesting that while participants claimed to be very interested, high interest does not necessarily predict frequent online news consumption. Moreover, additional analysis (See Table A.1 in Appendix A.2) shows no significant relationship between interest in the EU Referendum campaign and supporting Leave or Remain. However, individuals who were 'not very interested' were more likely to be undecided rather than holding a defined Brexit stance.

There is no significant difference in click frequency or domain portfolio size between Leave and Remain supporters. Both groups include highly active readers with many clicks. However, undecided individuals were, on average, less active in their news consumption and accessed fewer sources than those with a defined Brexit stance. For a detailed analysis and regression tables of click frequency and portfolio size by Brexit stance, see Appendix A.2).

2.4.2 Audience Network Analysis

In this study, I use clickstream data that captures participants' online behaviour to investigate online news exposure to EU Referendum-relevant content. In order to examine patterns in news exposure and distinct audiences, I generated an Audience Network, which is based on the interaction between individuals and news content. A network, or in mathematical terms, a graph, consists of nodes (or vertices) which share a tie (or edge) if they are linked to each other. In this study, the Audience Network refers to the two-mode network (also bipartite network) that is directly derived from study participants' online news clicking behaviour. The network has two types of modes. Type 1 equals individuals, and type 2 news websites. Ties between an individual node and a website node exist when an individual accessed that website by clicking on a news article. Thus, ties in the network represent website clicks. Hence, co-audiences or groups can arise based on individuals' similar consumption behaviour. In the data preparation, I identified EU Referendum-relevant news articles and kept only clicks on those URLs. Thus, my analysis is focused on individuals' exposure to EU Referendum-relevant digital news. It is important to note that in the data there is agency in only one direction, since individuals choose and click on news sources; domains are merely passive and have no agency. Moreover, the network derived from the two-mode data does not represent direct social interaction. Two individuals who accessed the same news source do not directly interact with each other; they only share aspects of their news consumption behaviour.

In this section, I will describe topological properties and centrality measures of the Audience Network. The graph comprises 277 total vertices and 512 edges between them. Of all vertices, 202 are individuals, and 75 are news websites. Figure 2.5 shows a visualisation of the complete Audience Network. Grey nodes stand for news websites, whereas coloured nodes represent individuals and their corresponding political stance regarding the EU Referendum. Yellow, blue, and green nodes indicate that the individual stated his or her support Remain, Leave,

or was Undecided, respectively. The node size represents the degree centrality, i.e. the number of edges of the node. In this case, a website with a bigger audience has a larger node than a website visited by only a few individuals for Brexit news. Over the collection period, there were a total of 2,049 visits to EU Referendum-relevant classified articles. The network has edge weights defined by how many times a given individual visited a certain website. By definition, there are no edges within one mode, and the graph is treated as undirected.

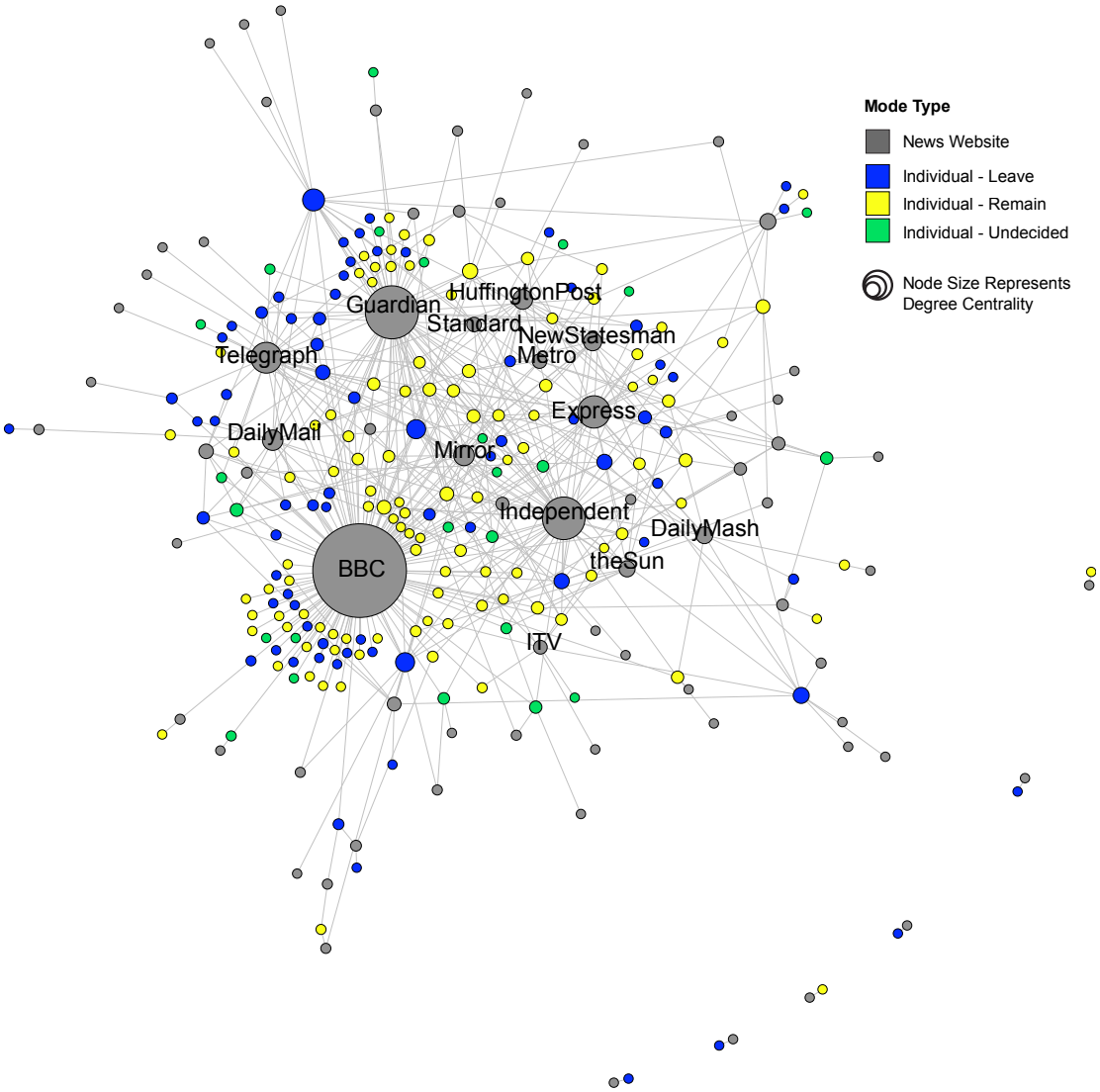


Figure 2.5: Two-Mode Audience Network: Individuals and News Domains; Nodes = 277, with Individual-Nodes = 202 and Domain-Nodes = 75; Layout: Forced Atlas

The Audience Network shows that 48% of all websites in the sample have been visited by only one individual each. Only nine out of all 75 domains have an audience that is greater than 5% of the sample. *BBC* alone has 37% of all clicks,

and 57% of the participants clicked on the public broadcaster website. Table 2.1 shows that the *BBC*, the *Express*, and the *Guardian* are the most-visited websites and account for 69% of all traffic for EU Referendum-relevant news in the sample. The *Telegraph*, *Independent*, and the *Mirror* have 5%, 4%, and 3% of all website clicks, respectively. Thus, those six websites together account for 80% of all online clicks on EU Referendum-relevant news in the data, and the remaining 69 domains that were accessed in the collection period contribute the residual. Those figures demonstrate the highly skewed distribution of website clicks for EU Referendum-relevant news and audience sizes, where big players, especially the *BBC*, are responsible for most news exposure to EU Referendum news. The *BBC* is clearly the most visited website and has the biggest audience from the sample. Thus, the public broadcaster was a very central player for EU Referendum news. The *Guardian*, *Independent*, *Express*, and *Telegraph* also played a substantial role, while most domains had a much lower demand for EU Referendum news, and 21 websites (i.e. 10%) were visited only once.

Table 2.1: Degree Centrality of Top Domains; n=202

Rank by Audience Size	Domain	Audience Size	Audience Share of Sample	Clicks	Clicks/Sum
1	BBC	115	57%	756	37%
2	Guardian	60	30%	225	11%
3	Independent	46	23%	91	4%
4	Express	32	16%	426	21%
5	Telegraph	30	15%	99	5%
6	Daily Mail	16	8%	35	2%
7	Mirror	16	8%	52	3%
8	Huffington Post	15	7%	18	1%
9	New Statesman	13	6%	31	2%
10	Daily Mash	11	5%	14	1%

When we look at the individuals in the sample, we can also see a skewed distribution in terms of website clicks (Total number of clicks per user: mean=10.14; median=4; SD=27.8). Whereas a few individuals very actively clicked on EU Referendum news, the majority visited only one or two websites in the entire collection period. While five study participants (i.e. 2% of the sample) are re-

sponsible for 38% of all clicks on EU Referendum news, 41 individuals clicked only once on an EU Referendum classified article in the entire collection period.

47% of all edges have an edge-weight equal to one. An edge-weight of one in the Audience Network means that there was only one click from the given individual to the domain during the collection period. Hence, almost half of all clicks on Domains for Referendum-relevant articles were a one-off event.[8] Only a few individuals show behaviour of frequent and continuous online news exposure to EU Referendum news.

As mentioned above, the *BBC* website is the most popular news outlet for EU Referendum news. It has the highest number of readers and clicks, making it the most central node in the network. It also has the highest Betweenness Centrality measure, which indicates that the *BBC* is a very popular and central node. Betweenness centrality measures the frequency to which a node lies on the shortest paths (i.e geodesic paths) between other nodes (Freeman, 1979). Nodes with a high Betweenness measure act often as bridges, connecting other nodes together, and their removal from the network can cause major disruption and dispersion. More than half of all individuals share the *BBC* as a common news source, making the *BBC* a crucial element in the Affiliation Network. User nodes from almost all clusters are connected to the *BBC*. The network without the *BBC* joining groups together is considerably more dispersed. The widespread popularity of the *BBC* is an important contributor to creating such a large audience overlap between outlets. My results show that almost 60% of all study participants visited the *BBC* for EU Referendum news during the campaign period. Thus, the majority of those individuals who voted in the referendum are likely to have been exposed to *BBC* news at least once.

[8]Setting an edge-weight limit and, for example, eliminating edges with an edge-weight equal to one is a common practice to reveal stronger, more significant connections. However, since the user activity in this data is generally quite low and the data has been significantly pre-processed in order to keep only relevant occurrences, i.e. clicks on articles that were classified as EU Referendum-relevant content, I suggest that every occurrence in the data of analysis, including links between domain and user of strength one, are important and should be kept for parts of the analysis.

Table 2.2 and Table 2.3 show the same information presented in Table 2.1 but separated by Leave and Remain stance. Table 2.2 lists the ten domains that had the biggest audience out of all Leave supporters in the sample. Table 2.3 presents the same for all Remain supporters in the sample. Comparing the two tables, we can see that the *BBC* is the most popular domain regardless of attitudes towards the EU Referendum. However, demand for the *BBC* in terms of clicks was slightly higher among Remain supporters than Leave supporters, as the *BBC* accounted for 54% of all clicks by Remain supporters compared to only 21% of all clicks by Leave supporters. In addition, 65% of all Remain supporters and 49% of all Leave supporters turned to the *BBC* for online news about the EU Referendum. It should be noted that the particularly high number of clicks on the *Express* website was supported by one very active participant who only accessed the *Express* for EU Referendum online news. The *Guardian* has the second biggest audience in all three categories. The *Independent* is in the third position among Remain supporters, since 32% of all Remain supporters in the sample accessed the *Independent* website for EU Referendum-relevant online news, whereas only 12% of the Leave supporters in the sample accessed the same website. The *Daily Mail*, on the other hand, is more popular among Leave supporters, as 12% of all Leave supporters in the sample and only 5% of all Remain supporters accessed the D*aily Mail* website. Thus, the *Daily Mail* ranks 5th in the Leave supporters sample and 11th in the Remain supporters sample measured by relative audience size.

Overall, the analysis of online news frequency, measured by a count of clicks and portfolio size, shows that there is no statistically significant difference between Remain supporters and Leave supporters (see Table A.2 and Table A.3 above). However, the main focus of analysis is whether the composition of individuals' news portfolios differs between Leave and Remain supporters. Although there are slight differences in domain preferences and portfolio compositions, the strong dominance of the *BBC* is present regardless of stated attitudes toward the EU

Referendum.

Table 2.2: Degree Centrality: Leave Voters Only; n=73

Rank by Audience Size	Domain	Audience Size out of Leavers	Audience Proportion of Leave Sample	Clicks	Clicks/Sum
1	BBC	36	49%	213	21%
2	Guardian	20	27%	54	5%
3	Express	16	22%	392	39%
4	Telegraph	15	21%	74	7%
5	Daily Mail	9	12%	20	2%
6	Independent	9	12%	28	3%
7	Spectator	7	10%	18	2%
8	Sky News	5	7%	34	3%
9	Huffington Post	5	7%	6	1%
10	Mirror	5	7%	22	2%
11	Sun	5	7%	8	1%

Table 2.3: Degree Centrality: Remain Voters Only; n=105

Rank by Audience Size	Domain	Audience Size out of Remainers	Audience Proportion of Remain Sample	Clicks	Clicks/Sum
1	BBC	68	65%	522	54%
2	Guardian	35	33%	165	17%
3	Independent	34	32%	60	6%
4	Express	11	10%	25	3%
5	Telegraph	11	10%	21	2%
6	Huffington Post	9	9%	11	1%
7	New Statesman	9	9%	25	3%
8	Daily Mash	9	9%	12	1%
9	Mirror	8	8%	25	3%
10	Metro	5	5%	14	1%
11	Daily Mail	5	5%	11	1%
12	Inter. Business Times	5	5%	8	1%
13	ITV	5	5%	9	1%

In order to better evaluate and compare domains' audience compositions with regards to Leave and Remain attitudes, I propose the following 'Leave-Remain Index', which is formulated as follows:

$$\text{Leave–Remain Index} = \frac{N_{\text{Leave}} - N_{\text{Remain}}}{N_{\text{Leave}} + N_{\text{Remain}} + N_{\text{Undecided}}} \tag{2.1}$$

N_{Leave}, and N_{Remain} are the number of individuals who accessed the given domain and support Leave and Remain, respectively. $N_{\text{Undecided}}$ represents the number of individuals who stated to be Undecided. The index takes values between

−1 and +1, where −1 indicates that all individuals that accessed the particular domain support a Remain vote. A score of +1 states that the entire audience of the domain support Leave. The score will equal zero if an equal proportion of both Leave and Remain supporters exists. Thus, this index can help to evaluate the Leave-Remain balance of a domain's audience. The number of individuals who stated to be Undecided were accounted for in the denominator of the formula, and it is assumed that there is an equal split of undecided individuals to potentially support Leave or Remain. Moreover, the index makes comparisons between domains easier, since the measure, as a ratio, does not depend on the density or size of the audience. Nevertheless, particular care must be taken when interpreting results of domains with small audience sizes. Table 2.4 lists the most popular domains in the data and their audience distribution with regards to EU Referendum attitudes.

Table 2.4: Leave-Remain Index

Rank by Audience Size	Domain	Audience size	Leavers Proportion	Remainer Proportion	Undecided Proportion	Leave-Remain Index
1	BBC	115	31%	59%	10%	-0.28
2	Guardian	60	33%	58%	8%	-0.25
3	Independent	46	20%	74%	7%	-0.54
4	Express	32	50%	34%	16%	0.16
5	Telegraph	30	50%	37%	13%	0.13
6	Daily Mail	16	56%	31%	13%	0.25
7	Mirror	16	31%	50%	19%	-0.19
8	Huffington Post	15	33%	60%	7%	-0.27
9	New Statesman	13	23%	69%	8%	-0.46
10	Daily Mash	11	18%	82%	0%	-0.64
11	The Sun	10	50%	30%	20%	0.20
12	IBTimes	10	40%	50%	10%	-0.10
13	Metro	8	25%	63%	13%	-0.38
14	Spectator	8	88%	0%	13%	0.88
15	Standard	8	88%	50%	13%	0.38
16	Sky News	7	71%	14%	14%	0.57
17	ITV	7	14%	71%	14%	-0.57
Sample Average		202	36%	52%	12%	-0.16

Note: The sample used for the analysis includes individuals who accessed EU-Referendum-relevant online news.

Popularity is again measured by audience size. For each domain, Table 2.4 lists the proportions of individuals from the sample that stated to support Leave, Remain, or were Undecided. For example, 31% of *BBC*'s audience supported

Leave, whereas 59% supported Remain, and 10% of those individuals that clicked on *BBC* were Undecided. Thus, *BBC*'s Leave-Remain Index is -0.28, indicating that slightly more Remain supporters accessed the public broadcaster.

The overall sample average has values for Leave supporters, Remain supporters, and Undecided individuals of 36%, 52%, and 12%, respectively, and the average Leave-Remain Index equals -0.16. We can see that the sample of 202 individuals who accessed online EU Referendum-relevant news in the collection period has a slight Remain surplus overall. A comparison of the *BBC* figures to the sample average shows that the *BBC* audience has only a slightly higher proportion of Remain voters than the overall average. The *Guardian*'s audience shows similar figures to the *BBC*, whereas the *Independent* website has a Leave-Remain Index value of -0.54, indicating a strong majority of Remain supporters. 74% of those individuals that accessed the *Independent* for EU Referendum online news stated to support Remain. In comparison, *The Express*, *Telegraph*, and *Daily Mail* have more Leave than Remain supporters in their audiences, with positive Leave-Remain Index values of 0.16, 0.13, and 0.25, respectively. Thus, all three domains show a Leave tendency in their audience composition compared to the overall sample. The *Mirror* and the *Huffington Post* both have more Remain supporters in their audiences, whereas the Leave-Remain Index is smaller for the former and slightly stronger for the latter. The *New Statesman* and the *Daily Mash* have a clear Remain surplus in their audiences. Due to the small sample of participants who accessed EU Referendum news online and the resulting small audience sizes for most domains, interpreting the Leave-Remain Index must be done with caution. Despite the small sample, the directions of the Leave-Remain Index seem plausible for most news outlets. However, I would caution against over-interpreting the strength of the index. The index is only intended to be a directional indicator. A generalized linear mixed model (GLMM), specifically a series of mixed-effects logistic regressions, is employed to analyse the domain preferences of Leave and Remain supporters. Mixed-effects logistic regression is

particularly suited for modelling binary dependent variables while accounting for clustering within the data at the individual level. It is important to point out that not all observations are strictly independent, due to the fact that some individuals clicked on more than one news article. Such individual-level variation of observations (i.e. within-cluster variation) is often correlated and more alike than observations from different individuals (i.e. between-cluster variation). Ordinary analyses that ignore the difference of within-cluster variation and between-cluster variation are likely to result in invalid standard errors (Agresti, 2013). Thereby, to account for some of the propensity of individuals to have individual-specific news clicking behaviour, I fit a series of mixed effects logistic regression models with clicks on EU Referendum online news articles as the unit of analysis and, consequently, the dependent variable being the Choice of Domain and the explanatory variable the EU Referendum attitude of the Clicker. The clicks-observations are treated as clustered by users. Thus, the model includes individual-IDs as random effects variables. Over the clickstream collection period, 202 participants accounted for a total number of observations of 2,049 clicks on EU Referendum online news. For increased accuracy given the relatively small sample size, I use the adaptive Gauss-Hermite quadrature method with 10 integration points for parameter estimation and approximation of the true likelihood of the generalised linear mixed models (GLMMs). Results for the models are reported in Table 2.5.

Table 2.5: Mixed-Effects Logistic Regression Analysis of Domain Choice

	Dependent variable: Domain Choice									
	BBC		Guardian		Independent		Express		Telegraph	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
EU-Ref. Attitudes fixed effects (reference = Remain)										
Leave	−1.132 **	(0.571)	−0.619	(0.643)	−1.270 ***	(0.469)	2.109 ***	(0.785)	1.796 **	(0.701)
Undecided	−1.492 *	(0.888)	−0.903	(1.075)	−0.988	(0.819)	1.825	(1.151)	1.499	(1.088)
Intercept	−0.564	(0.354)	−3.355 ***	(0.479)	−3.154 ***	(0.295)	−6.385 ***	(0.825)	−6.033 ***	(0.747)
Variance of random effects										
Intercept (Std.Dev.)	9.409	(3.067)	9.236	(3.039)	2.419	(1.555)	9.001	(3.000)	6.916	(2.63)
Observations (i.e. Clicks)	2,049		2,049		2,049		2,049		2,049	
Clusters (i.e. Users)	202		202		202		202		202	
Log Likelihood	−769.54		−467.03		−334.57		−313.45		−295.13	
AIC	1,547.08		942.06		677.14		634.91		598.25	

Note: ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Table (Continued)

	Daily Mail		Mirror		Huffington Post		New Statesman	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
EU-Ref. Attitudes fixed effects (reference = Remain)								
Leave	1.623 *	(0.926)	−0.008	(0.947)	−0.390	(0.715)	−1.461	(1.035)
Undecided	1.733	(1.333)	2.124 *	(1.256)	0.093	(1.252)	−0.225	(1.524)
Intercept	−7.495 ***	(1.173)	−7.056 ***	(1.160)	−5.487 ***	(0.726)	−6.392 ***	(1.015)
Variance of random effects								
Intercept (Std.Dev.)	7.789	(2.791)	8.580	(2.929)	2.796	(1.672)	7.089	(2.662)
Observations (i.e. Clicks)	2,049		2,049		2,049		2,049	
Clusters (i.e. Users)	202		202		202		202	
Log Likelihood	−143.75		−177.23		−97.37		−111.24	
AIC	295.51		362.45		202.74		230.48	

Note: ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

The results show that individuals who support Leave are statistically significantly less likely to click on the *BBC* and the *Independent* compared to individuals who stated to support Remain. On the other side, Leave supporters are more likely to access the *Express*, the *Telegraph*, and the *Daily Mail* for EU Referendum news compared to Remain supporters, with statistical significance at the 0.01, 0.05, and 0.1 levels, respectively. Results for the *Guardian*, the *Mirror*, the *Huffington Post*, and the *New Statesman* are not statistically significant. The results of the mixed effects logistic regressions resonate with the findings of the Leave-Remain Index while taking the number of clicks on articles into account. Thus, I find some evidence that individuals' preferred online news sources align with their political attitudes.

To test whether individuals actively avoid other sources, a straightforward metric was constructed to ascertain the proportion of the sample that viewed at least one article of news from different Brexit perspectives. Table 2.6 shows a list of the proportions of Cross-Perspective News Consumption Among Brexit Online News Readers.

Table 2.6: Proportions of Cross-Perspective News Consumption Among Brexit Online News Readers. Note: Categories reflect combinations of domain stances: Leave, Remain, and Neutral/Unclassified.

News Consumption Combination	All Consumers (n=202)	> 1 Domain Consumers (n=106)
Leave Only	6%	2%
Remain Only	12%	0%
Neutral/Unclassified Only	35%	9%
Both Leave and Remain	18%	33%
Leave and Neutral/Unclassified	10%	20%
Remain and Neutral/Unclassified	19%	36%
All Three Categories	14%	25%

I classified domains in the data into three positions: Leave, Remain, and Neutral/ Unclassified. The classification has been done on the basis of the following sources: Brandenburg, 2019; Deacon et al., 2016; Jackson et al., 2016; Levy et al., 2016; Simpson and Startin, 2023; University of Oxford, 2016. For the purposes of this analysis, it was assumed that the political stance of a newspaper also applied to its corresponding website, given the lack of information and evidence suggesting a divergence between the print and online editions. A list of all classifications

is presented in the Appendix A.2 Table A.6. It is noteworthy that only a subset of websites could be distinctly categorised, as many either lacked a clear political stance or aimed to maintain a neutral perspective. Websites without a clear alignment were classified as 'Neutral/Unclassified.' This category includes both neutral websites and those that do not clearly align with either side, but these two types should not be considered equivalent.

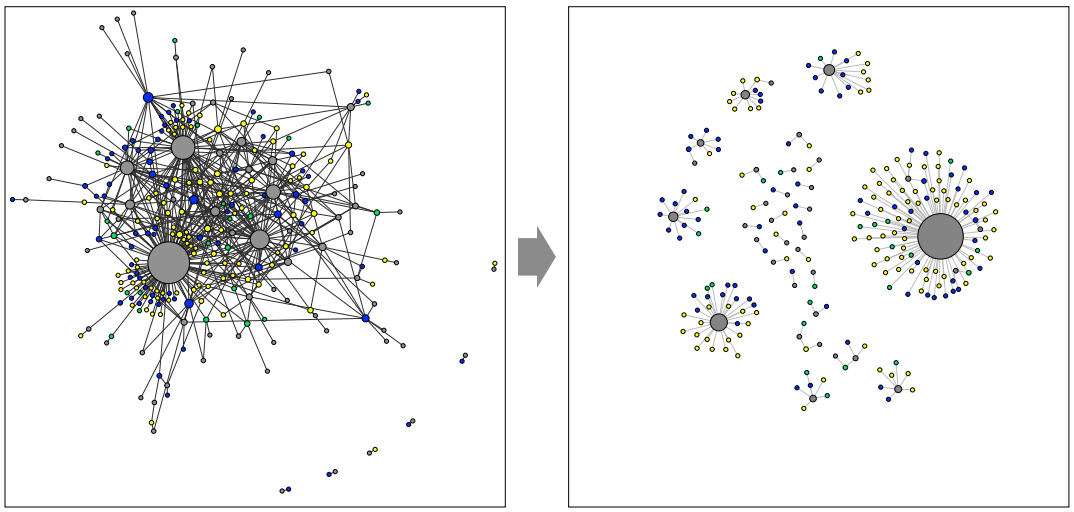
In Table 2.6, 'All consumers' in the first column represents the full sample of individuals who engaged with Brexit-related news. The second column shows results for a sub-sample that includes individuals who clicked on at least two different domains for Brexit-related news.

I focus on individuals who visited more than one website for news, as those visiting only a single website were inherently limited to one-sided exposure. Please note that the sample of online news readers who accessed at least one Brexit-related article during the collection period is almost evenly divided between individuals who accessed only a single news domain and those who visited multiple domains.

Among the sample of online news readers who accessed multiple websites, 11% visited websites exclusively aligned with one category—Leave, Remain, or Neutral/Unclassified. In contrast, 89% accessed content from at least two distinct categories, reflecting broader information exposure. Notably, one-third of this subgroup visited both Leave-leaning and Remain-leaning websites, while 25% engaged with websites from all three categories. In comparison, those who only accessed Leave-leaning or Remain-leaning websites are rare. This provides evidence that the majority of active online news users are exposed to at least two different domains with varying political views.

Summarizing the results so far, the findings from the regression analysis shown in Table 2.5 reveal that Leave supporters and Remain supporters do exhibit differences in their preferred news sources. However, further analysis on cross-perspective news consumption, shown in Table 2.6, suggests that there are no

Figure 2.6: Transformation of Two-Mode Audience Network When Only Looking at Individuals' Favourite Websites. Nodes = 277, with Individual-Nodes = 202 and Domain-Nodes = 75; Layout: Forced Atlas.



(a) Original Two-Mode Audience Network:

This shows the complete network, including all connections between individuals and domains.

(b) Modified Network:

This displays only individuals' favourite news domains and their connection to it.

strong signs of avoidance of attitude-opposing websites. Active political news readers accessed news from various domains, resulting in relatively diverse online news portfolios.

The primary conclusion from the analysis thus far is that while individuals demonstrate clear preferences for specific news sources—similar to favouring a particular print newspaper—those who engaged with more than one source (approximately half of the participants) exhibited a more diversified media consumption pattern. To illustrate this, I modified the original two-mode audience network data by excluding all but each individual's most frequently clicked news source, assumed here to represent their 'favourite' news domain. Figure 2.6 compares the original network structure (Figure 2.6a) with this modified network (Figure 2.6b). The transformation reveals a stark difference, as the original network is densely connected, while the modified version is much more sparsely connected and exhibits higher modularity, reflecting clusters of individuals linked to their favourite domains. For a larger visualisation of the modified network, refer to Figure A.12

in the Appendix.

This finding reveal a key strength of using browsing history data to analyse news consumption. Traditional surveys often ask respondents to identify their most-read or daily newspaper, which inherently yields a more clustered and less nuanced view of media consumption. In contrast, browsing history data captures an individual's full online news diet or portfolio, providing a more comprehensive and accurate representation of their exposure to diverse news sources.

In this case, the data reveal that half of online Brexit news readers typically clicked on multiple news sources, resulting in a media landscape that is far less clustered and polarized than would be suggested by focusing solely on preferred news domains. This demonstrates the broader, more diverse exposure facilitated by digital media consumption.

To further analyse differences in Leave and Remain supporters' online news exposure, paying particular attention to news portfolio compositions, I will present in the next section the results of a projection network analysis. Focus lies on community detection results to investigate potential clusters and groups along political lines in the audience.

2.4.3 Projection Networks Analysis

So far, we have looked at the two-mode Audience Network directly, which is derived from participants' news consumption behaviour and shows individuals as well as the domains they accessed. In order to further analyse news exposure patterns, I will next analyse one-mode projections from the two-mode Audience Network. An analysis of the projection networks, i.e. Co-Domain Network and the Co-Individual Network, allows a broader set of analytical tools and better illustrates shared audiences of Domains and common news consumption behaviour of individuals, respectively. In order to prevent misinterpretation or loss of data arising from the conversion, I analyse both Co-Domain and Co-Individual projections. Furthermore, I will describe in detail two versions of each network projection, i.e.

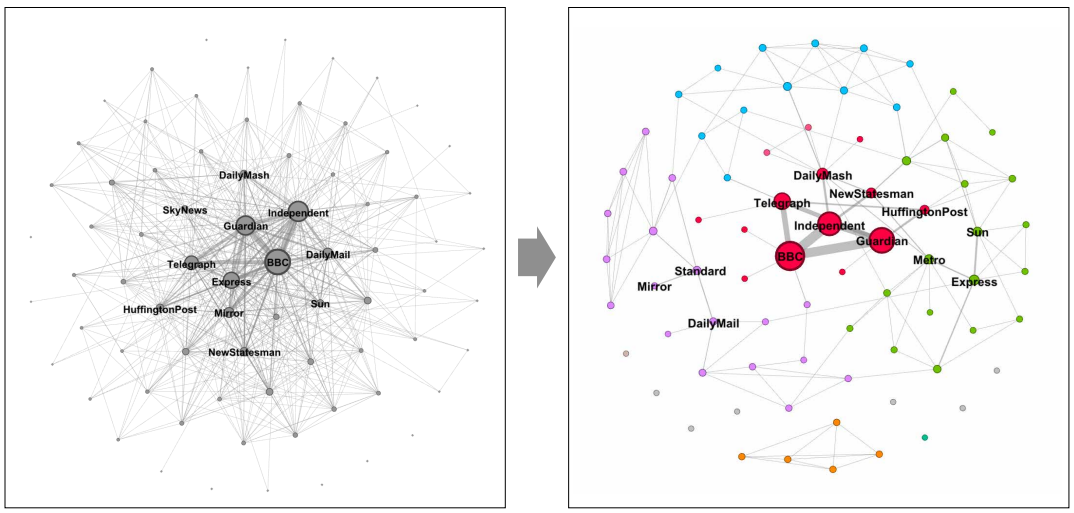
a simple projection model and a pruned projection model. Further variations of both projections are given in the Appendix A.2, each with three additional models using different methods of graph pruning, annotated with detailed descriptions, visualisations, and tables.

First, I present Model (a) which is the Simple Projection (SP), i.e. the direct projection from the original two-mode network. To identify whether the network has hidden structures and clusters that are unlikely the result of random connections, I apply the above described Marginal Likelihood Filter (MLF) method. The resulting networks with the most significant edges are presented in Model (b).

2.4.4 Co-Domain Network Analysis

The network visualisation in Figure 2.7 shows how the Co-Domain network changes from its simple form to its filtered version. Summary information for each Model is presented in Table 2.7.

Figure 2.7: Co-Domain Projection Model Visualised as Simple Projection (SP) and as Pruned Projection (PP). Node Size Indicates Degree Centrality; All Nodes Represent News Domains



(a) Co-Domain Simple Projection (SP) Retaining All Information

(b) Pruned Projection using Marginal Likelihood Filter (MLF) method; the top 25% of the edges are retained. Colours represent community membership.

Table 2.7: Co-Domain Network Models

	(a) Simple Projection (SP)	(b) Pruned Projection
Nodes	75	67
Edges	528	132
Isolates	6	8
Average Degree	14	4
Average Weighted Degree	26	9
Communities Detected	11	6
Modularity	0.14	0.57

The directly derived simple Co-Domain projection has 75 nodes, which correspond to the Domains the study participants accessed for EU Referendum-relevant news. Within those nodes exist 528 ties. A tie between two domains exists when those outlets share at least one individual in their audiences. The strength of the audience overlap is presented as an edge weight. The graph has six isolates, which are domains that have not been clicked on alongside other news sources and are therefore not connected to any other domain in the network. In the simple Co-Domain network (a), 391 edges out of the total 528, have an edge weight of 1. The edge-weight distribution of the Co-Domain Network is highly right-skewed, which demonstrates that the bulk of ties between domains in the network arise from an audience overlap of one individual (See Figure A.16 in the Appendix A.2). The edge-weight distribution provides insight into the most popular combinations of dyads. Thereby, it shows which two domains have been visited the most often alongside each other. Table 2.8 shows the ten most popular dyadic Domain combinations. The *BBC-Independent* combination was the most popular, followed by the *BBC-Guardian* combination. Investigating the edges with the highest edge weights shows that the *BBC* was visited the most often alongside other websites for EU Referendum online news. Moreover, popular combinations occur among the most popular online news sources for EU Referendum news. Next to the *BBC*, the *Independent*, the *Guardian*, the *Telegraph*, and the *Express* were often accessed together or with a second source.

As we are interested in analysing overlap patterns, the focus of analysis lies on the largest connected component. The Giant Component of a network is a

Table 2.8: Top Edges in Co-Domain Network Model (a)

Edges ID (Rank)	Source	Target	Edge Weight
1	BBC	Independent	33
2	BBC	Guardian	32
3	Independent	Guardian	20
4	BBC	Telegraph	19
5	BBC	Express	16
6	Telegraph	Guardian	15
7	BBC	Mirror	11
8	Express	Independent	11
9	Express	Guardian	11
10	BBC	Daily Mail	9

maximal set of nodes, in which each node is connected to the other nodes and can be reached through a path (Borgatti et al., 2018). The connected component of the Co-Domain Network has 33 domains and 137 ties among the most popular domains, which are well-connected (See Figure A.13 in Appendix A.2). This structure indicates a strong audience overlap for the most popular online news outlets. The *BBC* is the most central node in the network and is connected to 27 out of all 33 domains. This verifies the central role of the public broadcaster and shows that the *BBC* shares a common audience with the most popular online news outlets. Table 2.9 shows a list of the most connected domains in the network's giant component, ranked by their weighted degree. The Degree figure gives the number of connections a domain has to other domains in the network, and the Weighted Degree takes the tie strength, i.e. the number of shared individuals, into account. The *BBC*, again, has the highest Betweenness and Eigenvector centrality measure, demonstrating its influential and popular role in the network.

Table 2.9: Model (b) Co-Domain Network Centrality Measures

Rank	Domain	Degree	Weighted Degree	Betweenness Centrality	Eigenvector Centrality
1	BBC	27	200	96.30	1.00
2	Independent	24	152	72.34	0.83
3	Guardian	24	152	72.62	0.83
4	Express	22	108	45.20	0.55
5	Telegraph	17	87	38.59	0.54
6	Mirror	14	58	18.20	0.36
7	Daily Mail	15	58	34.90	0.34
8	New Statesman	11	44	7.78	0.28
9	Huffington Post	8	38	1.70	0.28
10	Daily Mash	8	31	1.03	0.20
11	The Week	9	30	5.25	0.21
12	The Sun	8	29	9.51	0.20
13	Spectator	10	29	22.11	0.18
14	IBTimes	9	25	19.87	0.16
15	Standard	8	23	19.29	0.15
...					
Average		8	36	17.86	0.22

The public broadcaster is an online news outlet that is commonly visited alongside other outlets. The *Independent* and the *Guardian* are the next most popular domains and have very similar Centrality measures. The *BBC*, the *Independent*, and the *Guardian* create, together with the *Express* and the *Telegraph*, the densest and most central cluster in the network. They are identified as the most popular and important online news outlets for EU Referendum online news. Those central domains are surrounded by a group of the second most accessed domains, including the *Mirror*, *Daily Mail*, *New Statesman*, *Huffington Post*, *Daily Mash*, the *Week*, the *Sun*, the *Spectator*, *IBTimes*, and the *Standard*. At the periphery are the less popular online news outlets that have been accessed alongside some of the more popular domains located at the centre of the graph.

In summary, the Co-Domain network has a strong core-periphery network structure as described by Borgatti and Everet (2018). The network has a dense, cohesive core of popular news outlets that show strong audience overlap with each other, and a sparse periphery formed by less popular and sometimes niche domains that are connected to the core but not as connected with each other. Thus, the Co-Domain network shows a hierarchical partition of nodes into well-connected core nodes and peripheral online news sources visited alongside popular domains.

This finding corresponds with and verifies the description of the UK online media audience network by Mukerjee et al. (2018). Their audience network analysis of a similar dataset also identified the *BBC* as the most popular and well-connected domain and found a very similar network structure and composition of the core online news sources. For identifying communities, I use the Louvain algorithm proposed by Blondel et al. (2008; 2023). This method estimates the optimal community partition in a network based on modularity maximisation. However, the Co-Domain network is very dense and interconnected. The modularity score of the Co-Domain network is very low, suggesting that the network shows a high level of connectivity. The Co-Domain Network demonstrates that domains do have audience overlap and that especially popular online news outlets are visited alongside each other. Nevertheless, we know from previous analysis that most individuals visited very few online news sources for their EU Referendum online news, and only a few (i.e. 14%) very active news readers had online news portfolios that were larger than four domains. 67% of the participants who accessed EU Referendum online news visited a maximum of two domains, and almost half (i.e. 48%) of all participants who accessed online EU Referendum-relevant news visited only one website. As those individuals accessed only one domain, they do not contribute to any tie formation between two domains and are not part of the information presented in the Co-Domain network. The Co-Domain network, therefore, presents information that comes from more widely engaged online newsreaders only (i.e. only 52% of the sample).

Model (a) demonstrate the hierarchical structure regarding popularity of domains in the Co-Domain network, as well as the strong audience overlap between popular domains. Since very active individuals as well as very popular domains might contribute to a lot of 'noise' in the network, I will next describe Model (b) to uncover potentially hidden structures.

The MLF pruned Co-Domain network shows the top 25% of the original edges. That means that the most significant ties, compared to the null model, are re-

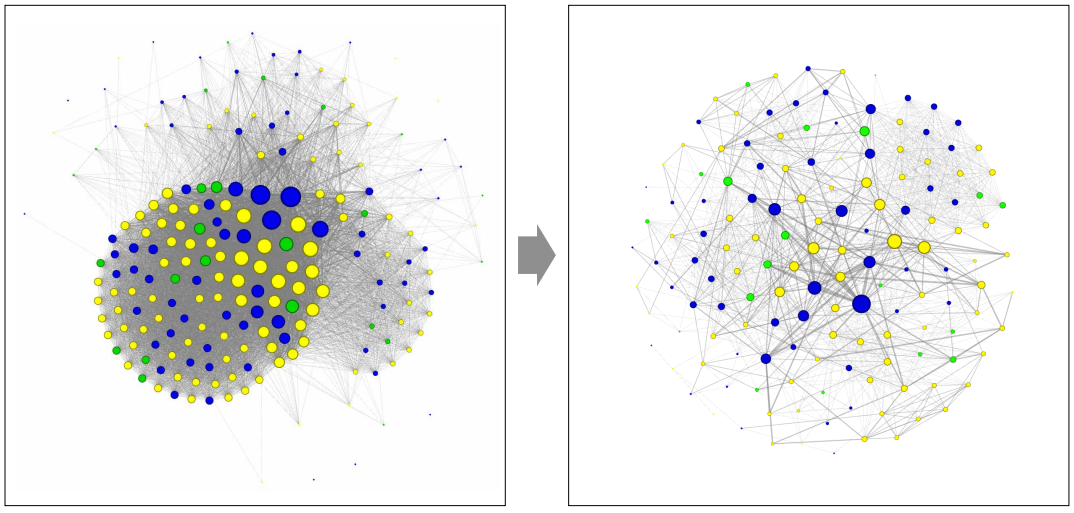
tained to reveal those network structures that are the least likely to have occurred due to pure chance. After applying the MLF, the network has 8 isolate domains and 67 connected nodes with 132 ties among them. The visualisation of Model (b) in Figure 2.7 shows that the network looks slightly sparser compared to the previous model, but the most popular domains remain strongly connected. The most central outlets are again the *BBC*, the *Independent*, the *Guardian*, and the *Telegraph*. Only the *Express*, which was part of the core in the Model (a), drifted slightly away from the most central domains. It is now more strongly connected to other tabloids such as the *Sun* and the *Metro*. The *Huffington Post*, the *Daily Mash*, and the *New Statesman* similarly surround the dense core. The Community Detection algorithm now identifies six communities with a significantly higher modularity score of 0.57, suggesting that Model (b) does show tendencies of grouping. Community membership is indicated by different coloured nodes in the visualisation. However, the composition of the communities is not entirely straightforward. From a political orientation perspective, the groupings present some puzzling patterns. For instance, a community comprising *the Metro*, *the Express*, and the *Sun* does not exhibit clear political homogeneity, nor does a grouping that includes the *Mirror*, the *Evening Standard*, and the *Daily Mail*. These combinations challenge expectations based on traditional political alignments of these outlets. Since Model (a) does not yield high modularity scores, and the communities detected in Model (b) lack political homogeneity, I conclude that the Co-Domain network does not exhibit substantial or meaningful clustering based on political orientation. The most notable finding is the core-periphery structure of the Co-Domain network, which indicates that more popular and, particularly, mainstream online news outlets remained the primary sources of political news. These outlets were the most significant sources for EU Referendum-related online news during the campaign period. To conclude, mainstream news providers, such as the *BBC*, the *Independent*, the *Guardian*, the *Express*, and the *Telegraph* were the most important news sources for EU Referendum news during the cam-

paign period and show substantial audience overlap. These findings correspond to results from previous studies (e.g. Fletcher and Nielsen, 2017; Fletcher and Selva, 2019; Mukerjee et al., 2018). More widely engaged online news readers exhibit signs of diverse online news exposure; however, they represent a relatively small segment of the overall population. It is therefore crucial to consider the online news exposure patterns of both less active and more widely engaged readers. To further explore whether a potential divide exists between Leave supporters and Remain supporters in their online news consumption, I will next analyse the corresponding Co-Individual network.

2.4.5 Co-Individual Network Analysis

Figure 2.8 shows the Co-Individual network in its simple projection and the accompanied filtered version. Summary information for each model is presented in Table 2.10.

Figure 2.8: Co-Individual Projection Model Visualised as Simple Projection (SP) and as Pruned Projection (PP). Node Size Indicates Degree Centrality; Blue = Leave Supporters, Yellow = Remain Supporters, Green = Undecided



(a) Co-Individual Simple Projection (SP) Retaining All Information

(b) Pruned Projection using Marginal Likelihood Filter (MLF), the top 15% of the edges are retained

Table 2.10: Co-Individual Network Models

	(a) Simple Projection (SP)	(b) Pruned Projection
Nodes	202	146
Edges	9180	1377
Average Degree	91	19
Average Weighted Degree	110	26
Communities Detected	9	7
Modularity	0.17	0.45
Assortativity Coefficients:		
Degree	−0.04	0.22
Brexit Attitudes	0.00	0.04
Leavers Dummy		0.03
Remainers Dummy		0.07
Undecided Dummy		−0.04

Following the selective exposure hypothesis, I expected to see audience fragmentation along Brexit lines. Thus, I hypothesised that Leave and Remain supporters would show substantially different news consumption behaviours, fragmenting the audience of online news outlets accordingly. The second one-mode projection derived from the two-mode Audience Network is the Co-Individual Network, which shows ties between individuals when those users visited the same domains for EU Referendum-relevant online news. The analysis of the Co-Individual Network aims to answer whether individuals who share the same attitudes toward the EU Referendum are also more likely to share common news exposure due to similar online news consumption behaviour. The simple projection, Model (a), has 202 individual nodes and 9180 edges (see Table 2.10). Many of the edges between individuals exist because they shared only the *BBC* as a common source in their online news portfolio. To address this and identify stronger similarities between individuals' news portfolios, I applied the MLF method to filter the edges in the Co-Individual Network. The resulting network is displayed on the right-hand side of Figure 2.8.

Model (a) shows one big and very dense cluster of connected individuals. This circle is the k-core of the Co-Domain Model (a) network; in other words, it represents the maximal connected subgraph of the network wherein all nodes are connected with each other with at least a degree of k (Seidman, 1983). The

k-core of Model (a) consists of 115 individuals (i.e. 57%) which are the study participants that visited the *BBC* for EU Referendum news. In this case, k equals a degree of 114, as the subgraph comprises 115 nodes that are all connected to each other due to the *BBC*. Nodes surrounding the k-core are individuals that did not visit the *BBC*. Thus, there is a clear distinction between individuals who accessed the *BBC* and individuals who did not. At the bottom left part in the k-core are individuals that visited only the *BBC*, whereas at the top right in the k-core are individuals that have wider news portfolios. Outside of the k-core, a group of individuals that predominantly visited the *Guardian* but not the *BBC* is located as a distinct cluster at the bottom right of the Model (a) visualisation. Slightly less organised and sparser are the nodes positioned at the most outer circle and top of the network. Those nodes are a mix of individuals who accessed only one or very few domains for EU Referendum news and did not visit the *BBC* or the *Guardian*.

Only very few individuals had a wider domain portfolio but did not access the *BBC*. The 48% of individuals in the network that visited only one domain for their EU Referendum online news are equally divided into Leave supporters and Remain supporters, with 42% Leave supporters, 45% Remain supporters, and the remaining individuals being Undecided. Of those individuals who only visited one domain, 44% visited only the *BBC*, and 17% visited only the *Guardian*. The remaining individuals visited other domains, among which are the *Mirror*, the *Express*, the *Telegraph*, the *IBTimes*, and other less popular domains. There are no clear differences between Leave and Remain supporters who visited only one online news source for their EU Referendum online news. Model (a) has a relatively low modularity score of 0.17, indicating that the network is very dense and does not reveal multiple distinct communities. The community detection identified three communities which can be summarised as mainly one community of individuals who only or predominantly visited the *BBC*, individuals who visited predominantly the *BBC* and the *Guardian* or only the *Guardian*, and a

third community of others. However, those communities are not strictly defined, and those descriptions of the communities are not applicable to every individual therein. Overall, Model (a) mainly shows the divide of individuals who accessed the *BBC* for EU Referendum-relevant online news and those that did not. My findings reveal the dominance of the *BBC* and other legacy media outlets and therefore correspond with results by Newman et al. (2017).

The *BBC* definitely acts as an important bridge and connection point for individuals. The public broadcaster connects the majority of individuals, demonstrating its popularity as well as dominant role as an online news provider for EU Referendum-relevant news during the campaign period. Individuals often visited the *BBC* alongside one or more additional outlets. Excluding the *BBC* from the original data results in slightly more distinguishable groups, revealing communities that can be allocated to specific domains. Model (a) shows that the *BBC* connects a lot of individuals that would be less strongly, if at all, connected if the *BBC* were excluded. The *BBC* represents an impartial information source many individuals use in addition to other news outlets. Hence, the *BBC* plays a vital role in providing unbiased information and facilitating an overall balanced exposure to political opinions and news. However, that also means that the *BBC* is in a sensitive and influential position, holding great power over the supply of political news. In this study, I assume that the *BBC* does, in fact, provide impartial news information. If, however, the *BBC* would favour one political position over the other, this could have a strong impact on segregation as well as electoral behaviour. Due to the *BBC* creating many connecting ties, other potentially distinct patterns are difficult to observe.

I hypothesised that I would see homophily structures in the network because of an observable segregation between individuals with Leave and Remain attitudes due to different online news outlet preferences. In order to test for homophily, I calculate assortativity coefficients as defined by Newman (2003). Results are presented in Table 12 above. Assortativity coefficient r lies between -1 and $+1$.

An r equal to zero indicates that there is no assortative mixing present in the network, whereas an $r = 1$ reveals perfect assortative mixing, and negative values suggest disassortative mixing.

As shown in Table 2.10, Model (a) shows no assortative mixing with regards to EU Referendum attitudes, suggesting that individuals with Leave or Remain attitudes and individuals who are Undecided are evenly spread in the network. Overall, individuals accessing more than one domain for EU Referendum news show more diverse online news consumption than previously expected. Most political online news activity centres on legacy news providers with large shares of audience overlap and relatively politically diverse users.

Next, I will describe the Co-Individual network Model (b), which is the result of applying the Marginal Likelihood edge filter (MLF) to the original Co-Individual network. This time, I retained the top 15% of edges that were the least likely to have formed purely by chance. Thereby, the model tries to reveal significant substructures in the Co-Individual network. The MLF removed a significant proportion of ties between individuals that resulted from having the *BBC* in common, since the *BBC* has the highest audience size and is therefore likely to be visited due to its popularity. After applying the filtering, Model (b) retains 146 connected individuals, with 56 isolates resulting from the removal of less significant edges. Among these 146 individuals, 1,377 edges remain. As a consequence, the subgraph has a far lower density (Graph Density = 0.13) than the original Model (a) (Graph Density = 0.45). Figure A.14 shows a visualisation of Model (e), with node size representing the node's weighted degree and colours representing attitudes towards the EU Referendum. Isolated individuals have been removed from the figure for clarity. The community detection method has identified seven distinct communities with a modularity score of 0.45 (see Table 2.10). This demonstrates that Model (b) exhibits substantially greater modularity. Analyzing the communities depicted in Figure A.14, Model (b) reveals that some communities are dominated by a specific online news outlet. Nodes located

at the centre of the network predominantly represent individuals with larger news domain portfolios who share common news sources with a broader range of people. These individuals typically maintain more balanced news portfolios, making them harder to assign to a single domain or group. Model (b) suggests that after filtering out less significant edges, distinct domain preferences among individuals become apparent. This finding is not particularly surprising, as it would be unreasonable to assume that preferences for news outlets are randomly distributed across the media landscape. Previous models, however, show that measured online news exposure is less clustered and exhibits a high degree of portfolio overlap. This effect is particularly pronounced due to the *BBC*'s popularity, which creates extensive connectivity between otherwise distinct or separate groups and individuals.

Although Model (b) shows distinguishable communities formed due to news domain preferences, those communities do not necessarily represent segregation in regard to EU Referendum attitudes. Seven communities were detected using the Louvain method with a modularity score of 0.45. The only relatively homogenous community with predominantly Remain voters is a community formed of individuals with a strong preference for the *Independent*. This finding aligns with the Leave-Remain Index discussed earlier, which highlighted a significant surplus of Remain voters within the audience of the *Independent*. All other communities identified in Model (b) are less homogeneous in terms of EU Referendum attitudes. The assortativity coefficient for EU Referendum attitudes in Model (b) equals 0.04, suggesting a slight tendency toward assortative mixing based on these attitudes.

In summary, the Co-Individual network does not reveal strong evidence of political polarization among more active online news readers. The high-choice, easily accessible online media environment appears to facilitate diverse news consumption, mitigating extreme clustering based on political preferences. Although Leave voters and Remain voters do have slightly different preferences for online news sources, at the audience level, there are no significant signs of audience

fragmentation.

2.4.6 Limitations

This study has a few limitations that need to be addressed. Due to limited engagement with politically relevant online news, many participants did not click on any EU Referendum-related articles and were therefore not included in the final sample and network of news clickers. This posed challenges for more complex statistical network models (such as Exponential Random Graph Models), as they were systematically underpowered.

Another important limitation of my analysis arises from the data directly. I am only able to analyse clicks on news articles and websites, without capturing additional dimensions of user behaviour such as: 1) the time spent on a particular article or website; 2) the click path taken to reach the website or article; and 3) exposure to content that is not the result of a click. For example, users may be exposed to titles or summaries of news articles while browsing platforms such as Facebook or other social media platforms. However, such exposures are not recorded unless the user actively clicks on the article or website. As a result, while articles accessed via social media are included in the dataset, mere scrolling or passive exposure is not captured.

Despite these limitations, the data used in this study has the advantage of being less prone to mis-classification. It specifically reflects instances of active engagement, accurately documenting the Brexit-related articles that users deliberately chose to access. This focus on deliberate clicks provides a robust basis for analysing patterns of actual online news consumption behaviour from the 2016 EU Referendum campaign period.

The limitations of this study indicate promising areas for future research. For example, future studies could adopt a more comprehensive set of behavioural metrics by collecting additional measures, such as time spent on articles, scrolling behaviour, and the click path leading to a given article. These factors could pro-

vide deeper insights into how individuals engage with online news and help further understand the underlying mechanisms driving political news consumption.

2.5 Conclusion

Digital media has been widely criticised for fostering echo chambers and deepening political polarization. The empirical analyses presented in this study challenge the view put forth by previous literature (e.g., Sunstein, 2009; Mutz, 2002; Dahlberg, 2007; Van Alstyne and Brynjolfsson, 2005) that the Internet fosters divisions by enabling individuals to isolate themselves in like-minded groups, thereby creating obstacles for deliberative democracy. In using browsing history data to investigate whether individuals demonstrate selective exposure behaviour based on Brexit attitudes, I find that the real divide in news consumption behaviour is not between Leave supporters and Remain supporters, but between those who read news and those who do not.

Grounded in theory of cognitive dissonance and selective exposure, I hypothesised (H1) that Leave and Remain supporters read online news from different sources during the Brexit campaign. The results show that active online news readers accessed a relatively diverse set of news sources. While this is consistent with recent work investigating audience fragmentation and selective exposure in the high-choice digital media environment (e.g. Dubois & Blank, 2018; Fletcher & Nielson, 2017; Fletcher, et al. 2020; Garret, 2009; Lee et al., 2014; Webster & Ksiazek, 2012; Yang et al., 2020), my findings provide an important contribution to our understanding of the complex nature of online news consumption, as I find that although Leave and Remain supporters tend to prefer different domains as their primary source of online news, the most popular domains show significant audience overlap from people accessing more than one source. The results therefore show evidence of selective exposure when it comes to primary news source preferences, but once the overall online portfolio of active news readers is considered, there is no evidence of news avoidance. Based on these findings, future

research should, whenever possible, consider the duality of an individual's Internet news consumption with attitudinally motivated preferences and heterogeneous overall online news browsing behaviour when addressing issues of selectivity and user segregation.

Mainstream news sources, especially the *BBC*, which account for the biggest share of political online news activity, show high degrees of audience overlap and audience diversity in terms of political orientation. The *BBC* was the most accessed and most popular news source for Brexit-relevant news, thereby establishing a shared point of reference across consumers. Besides the *BBC*, other mainstream and legacy news providers, namely the *Guardian*, the *Independent*, the *Express*, and the *Telegraph*, were the most important news sources for EU Referendum online news during the campaign period and show substantial audience overlap. I would, therefore, argue that overall online news consumption of EU Referendum-relevant news during the campaign period was more diverse than previously hypothesised for those individuals who consumed online political news. Moreover, I claim that online news consumption does not threaten a well-functioning democracy. In fact, the presence of an impartial dominant public service broadcaster in combination with the Internet's enabling access to a diverse set of media facilitates a democratic political system, since it allows citizens to be informed about political issues.

Political news attention and interest is another important form of selectivity in political online news engagement, one that corresponds with the conclusion of Yang et al. (2020) based on an analysis of online news consumption of a representative sample of the US online population. Political news attention and interest may be more significant determinants for online news exposure and news consumption patterns than political ideology (Yang et al., 2020). My corresponding findings based on online news consumption in the UK prior to the EU Referendum resonate with that statement.

Based on the available data, only 39% of online news users engaged with

Brexit-related news, reflecting the paucity of such engagement. This corresponds to approximately 27% of all study participants accessing Brexit news online during the campaign period. This suggests that information apathy was of greater prevalence during the referendum campaign than political segregation in the consumption of digital news. Half of all online Brexit news readers accessed only a single domain for such news. This group, corresponding to 19% of general online news users, characterised by a paucity of political online news engagement, is most likely to be at risk of echo chambers or one-sided news exposure.[9] In contrast, the other half—those who accessed multiple news domains for Brexit news—exhibited more heterogeneous news portfolios than anticipated, and makes up 20% of general online news users. 89% of these individuals clicked on at least one neutral or opposing domain in addition to a clearly Leave- or Remain-supporting domain. In summary, individuals willing to engage with more than one news domain are significantly more likely to be exposed to a diverse range of political perspectives.

Among those who actively sought Brexit-related news online and accessed at least two websites, only 11% exclusively accessed domains with a clear pro-Leave or pro-Remain bias. Although there were notable differences in the primary news sources used by those in favour of the UK leaving the European Union (EU) and those in favour of remaining in the EU, further analysis revealed no evidence of a systematic avoidance of opposing viewpoints. Instead, the online political news behaviour of active readers is characterised by engagement with additional sources beyond their preferred outlets, which results in greater exposure to diverse political perspectives.

This study posits that such 'promiscuous' online news habits, whereby indi-

[9]My analysis concentrates on the population of online news readers, which is most reliably represented in my dataset, although it naturally excludes a significant portion of the general public. The main analysis focuses on the sub-sample of individuals who clicked on Brexit news—that is, active political online news readers—who constitute 39% of the overall online news readership. It is important to note that I have refrained from estimating the proportion of Brexit online news readers who only accessed a single domain for Brexit news, or other such sub-groups, in the overall UK population, as the clickstream data predominantly captures active online news users, rendering the sample limited in its ability to make reliable generalisations beyond this group.

viduals frequently engage with sources outside their preferred domain, serve to substantially mitigate the risk of echo chambers. Therefore, I conclude that a critical behavioural characteristic for determining whether someone is at risk of falling into an echo chamber is their willingness to access multiple domains rather than relying exclusively on a single news source. This determinant is analogous to print media consumption. Individuals who consistently read the same print newspaper are also more likely to encounter a single political perspective, while those who read a variety of newspapers are exposed to a broader range of opinions. However, a notable difference between print and online media is the ease and cost of accessing diverse sources. Online news consumption, being both more accessible and less costly, theoretically enables broader exposure to varied news perspectives compared to traditional print media. Thus, online platforms may have the potential to encourage more diverse news consumption habits. As such, particular attention for future analysis should lie on the investigation of the large group of individuals who do not access political news online, as well as their propensity to accept or be subject to misinformation, propaganda, and echo chamber effects.

To conclude, the findings of my study contribute to the literature by providing important empirical evidence based on browsing history data, rather than relying on survey responses or social media data. This evidence challenges the initial hypothesis that echo chambers are highly predominant. In addressing my original research question about the extent of selective and polarized online news consumption during the Brexit campaign, my results offer an updated understanding of online news behaviour during this period. Specifically, online news consumers can be characterised by two extremes: 1) Individuals who showed no or a paucity of engagement with Brexit-related news during the campaign period. 2) Individuals who exhibited heterogeneous news consumption patterns, by engaging with selective domains as their preferred sources, while also demonstrating more diverse, 'promiscuous' behaviour by consuming content from a variety of outlets.

These findings have significant implications for understanding the role of dig-

ital media in a modern democratic society. They prompt a reevaluation of judgments about digital news consumption and its perceived role in driving political polarization. My analysis demonstrates that individuals who actively seek politically relevant news online are more likely to encounter diverse perspectives. The greater threat to single-sided news exposure does not arise from deterministic mechanisms inherent to online media or the Internet but from individual behaviours—specifically, news apathy. Those who rarely sought out news and thus consumed only a single article or relied on a single source were at the highest risk of being exposed exclusively to one-sided, like-minded information. However, even news portfolios of two or three sources showed considerable diversity for most users. This was further influenced by the dominant role of public service broadcasting, as the *BBC* website served as a key point of reference for more than half of all online news users. It accounted for over one-third of all EU Referendum-related online news website clicks, contributing significantly to the diverse online news exposure experienced by people during the Brexit campaign.

2.6 Acknowledgement

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Chapter 3

Media made me do it?! Assessing the Effect of Various News Sources on Brexit Voting

Whether media are able to shape public opinion has been at the front of political research, and Brexit, in particular, has sparked discussion around the impact of various media sources. Using representative data from the British Election Study Internet Panel, this study examines how different media sources influenced shifts from voting intentions to voting behaviour in the 2016 EU Referendum. Employing a pretest-posttest design, explanatory variables were measured in separate panel waves from the response variables, with an added lagged dependent variable to capture changes from pre-treatment voting intentions to post-treatment vote recall. The findings show that online political news consumption (excluding newspapers) increased the likelihood of changing vote intentions toward Remain during the campaign, while television news consumption was linked to a shift toward Leave. The effect of newspaper reading depended on the Brexit stance of an individual's preferred newspaper. Leave-leaning newspapers were primarily associated with an audience that voted Leave but showed limited persuasive impact in driving a switch to Leave during the campaign. In contrast, Remain-leaning newspapers had a significant influence in persuading their readers to vote Remain. These findings demonstrate the substantial influence of media-specific consumption patterns on electoral behaviour.

3.1 Introduction

Following the UK's vote to leave the European Union, much debate emerged over whether voters, particularly Leave voters, had received sufficient, unbiased information during the campaign period before casting their votes. A narrative arose that the Internet, particularly social media, potentially played a role in the

outcomes of recent elections, including the EU Referendum, in how it disseminates news information. However, the same interest in other media sources, such as television and radio, has not received as much attention in relation to Brexit, leaving an important gap in the literature that this study aims to fill.

The primary objective of this study is to examine the relationship between political opinion formation and news consumption by media type, specifically in the case of the 2016 EU Referendum. The contribution of this paper is that it provides empirical evidence, based on a representative sample, of how media effects—specifically television, newspaper, and Internet consumption—influenced Brexit voters' opinion formation. Specifically, the study addresses the following research question: To what extent do the sources and volume of political information consumed during the 2016 EU Referendum campaign influence changes in voting intentions and subsequent votes? Using data from the British Election Study (BES) Internet Panel and a representative sample of the British population, I investigate individuals' engagement with news during the EU Referendum campaign to understand the effects of consuming media from different media types on political opinion formation and vote switching. By incorporating a lagged dependent variable into the model, I account for participants' prior voting intentions, allowing for an assessment of whether media consumption during the campaign is associated with a shift from Remain to Leave, Leave to Remain, or from undecided to a definitive stance.

A significant disparity in the type of news source accessed (e.g. television, radio, Internet), volume of news consumed, and level of political knowledge between Leave and Remain could have significant implications on election outcomes. The underlying question and motivation of this study stem from the counterfactual question of whether the referendum results would have been different if voters had had more information or consumed different types of information sources. Fisher and Renwick (2018), for example, argue the Leave victory was due, at least partially, to the Remain campaign's failure to persuade swing voters that

leaving the EU would negatively impact the economy. Whereas the Leave campaign's expectation that Brexit would reduce immigration was widespread and clear among voters, the expectation of a suffering economy as a result of leaving the EU was not as pervasive (Fisher & Renwick, 2018). The question arises whether the referendum results would have been different if voters expected the economy to suffer from Brexit as much as they expected immigration to decline. Moreover, where did this imbalance come from? Did the Remain campaign fail to reach voters effectively? Was it a problem with demand, wherein individuals did not seek information? Or was it an issue of the meso level, i.e. the news broadcaster and media sources which curate and frame political information?

3.1.1 Expectations of Media Effects

The UK's media landscape is uniquely characterised by the *BBC*'s position as a public broadcaster. As such, it is seen as an unbiased news source. Yet, the *BBC* was criticised for the impartiality of its EU Referendum campaign coverage (Bennet, 2016; Harding, 2016; Newman et al., 2017). This line of argument criticised the *BBC* for treating the Remain and Leave arguments equally, presenting evidence-based arguments alongside less factual ones as equally valid and evidential, and giving equal airtime to both sides, thereby failing to properly inform the public. This criticism of the *BBC*'s referendum coverage likely applies to other broadcasters, such as Channel 4, Channel 5, ITV, and SkyNews, among others, which strive to present a relatively neutral news style. Cushion and Lewis (2017) analysed the impartiality and balance in UK television news reporting during the 2016 EU Referendum campaign using a quantitative content analysis approach. The study found that UK television news channels adhered to a notion of impartiality by providing roughly equal airtime to both the Remain and Leave campaigns. Cushion and Lewis (2017) concluded that reporters failed to examine the credibility of opposing arguments, which may have hindered the public's understanding of the complex issues surrounding the referendum. Impor-

tantly, the *BBC* is not just a public broadcaster but the most-used news outlet in the UK (Newman et al., 2017). If it is true that the *BBC*'s 'too balanced' EU Referendum campaign coverage favoured Leave, it would be reasonable to expect that increased television news consumption during the campaign time would have a positive effect towards a Leave vote, as *BBC News* dominates television news coverage (Newman, et al., 2017). Additionally, the *BBC* is by far the dominant provider of radio news, accounting for around 70% of all radio news consumption (Newman et al., 2017; Office of Communications, 2017), and as with its written and television news, is expected to be impartial and balanced. However, it follows that similar criticisms of the *BBC*'s written and television news also apply to radio. It is possible, therefore, that consumption of *BBC Radio* news during the campaign could also have a positive impact on the Leave vote.

Brandenburg and Van Egmond (2012), using data from the BES 2005 General Election panel, examined the influence of UK newspapers with varying political leanings on changes in partisan attitudes during the campaign. Their findings strongly support the claim that newspapers exerted a direct influence on partisan attitudes. Specifically, newspapers positively reinforced attitudes aligned with their editorial stance while simultaneously diminishing support for rival parties. I expect to see analogous mechanisms at play for Brexit support, where newspapers likely reinforce Leave or Remain attitudes in a similar manner.

The Internet, on the other hand, is often associated with the dissemination of radical, biased, and false news, which has prompted critics within and outside academia to highlight its potential for polarization and information isolation (Sunstein, 2009; Pariser, 2011; Warner, 2010; Van Alstyne and Brynjolfsson, 2005). This narrative is particularly relevant for information disseminated not by established traditional newspapers, but by blogs and other social media platforms. While the *BBC* is also one of the top providers of online news (Office of Communications, Great Britain 2017), it is important to note that the online media environment is vast, offering a diverse range of news sources. The choice and acces-

sibility of the online media environment can facilitate diverse news consumption (Dubois & Blank, 2018), but if claims about selective consumption on the Internet hold true, it is reasonable to suggest that increased consumption of Internet news (excluding online newspapers) is likely to reinforce, rather than challenge, existing Brexit attitudes. As demonstrated in Chapter 2, this type of news consumption is probably dominated by platforms such as the *BBC News* website, news aggregators, and social media, which tend to attract a slightly more Remain-leaning audience (see Fletcher et al. 2023; N. Newman et al., 2017). Consequently, Internet news consumption may subtly skew toward reinforcing Remain attitudes.

3.2 Theory and Literature Review

3.2.1 Information Seeking and Public Opinion

The relationship between mass communication and public opinion has long been a popular issue for democratic theorising (e.g. Dahl, 1989; Habermas, 1989; Lazarsfeld & Merton, 1948; Sunstein, 2009); the same is true with the issue of public ignorance regarding politics—a phenomenon certainly not new to the digital age—and its consequences for democratic practices (e.g. Schumpeter, 1950; Somin, 2010). Research by Andersen et al. (2002) concludes that the electorate's political knowledge matters, as individuals with higher knowledge are more likely to match their issue preferences to party platforms. Moreover, they argue that this means that election outcomes may be different if the electorate as a whole were better informed (Andersen et al., 2002).

News consumption can be seen as a two-sided coin, determined both by the supply side of a diverse set of news outlets and media types that shape our media landscape, and individual behaviour on the demand side. Therefore, it is crucial to examine both individual-level mechanisms associated with media effects on public opinion formation and the media landscape responsible for delivering and framing political news.

A 2013 study by Soroka et al. investigates how public broadcasters influence knowledge on current affairs compared to commercial broadcasters in Canada, Italy, Japan, Norway, Britain, and South Korea, to assess whether public broadcasters, often considered reputable and neutral news sources, contribute to a more informed citizenry compared to private media outlets. They find that individuals who watch news from private broadcasters are more likely to be exposed to soft news (entertainment, human-interest, etc.), whereas those who watch news from public broadcasters are exposed to more hard, political news. Thus, individuals who consume news from public broadcasters tend to have higher levels of current affairs knowledge compared to those who rely on private media outlets. Public broadcasting, they contend, is important in some countries, including the UK, in facilitating informed political knowledge. Their study also raises the question of the impact of other media types, such as newspapers, on educating the public on political events. An analysis conducted by Levy, Aslan, and Bironzo (2016), which examined 2,378 articles specifically focused on the EU Referendum from nine popular British newspapers, found that there was a notable bias in the British press in favour of the Leave campaign during the Brexit debate. Of all the articles examined, 41% were in favour of leaving the EU, while only 27% were in favour of remaining. Some 24% of articles were mixed or undecided, while 8% took no position at all (Levy, Aslan & Bironzo, 2016). These findings suggest that press coverage of the Brexit debate was far from balanced, with the majority of articles supporting one side over the other.

Levy et al. (2016) looked at the Brexit stances of different newspapers leading up to the EU Referendum. The *Daily Express*, the *Daily Mail*, the *Sun*, the *Sunday Times*, and the *Daily Telegraph* endorsed Leave, while the *Mail on Sunday*, *The Times*, the *Guardian*, the *Daily Mirror*, and the *Financial Times* (FT) endorsed Remain. It is noteworthy that while many papers left little doubt as to their Brexit position, most of them did not explicitly declare their support of one side until the weekend before the vote. There were some inconsistencies: the *Daily*

Mail encouraged its readers to support the Leave campaign, while the *Mail on Sunday*, which is owned by the *Daily Mail*, urged its readers to vote for the Remain campaign. In addition, *The Times* showed its support for the Remain campaign, while its sister paper, the *Sunday Times*, advocated for the Leave campaign (Levy et al. 2016). This illustrates the intricacy of categorising newspapers by party affiliation, even on the basis of an article-level analysis.

3.2.2 Selective Exposure and Cognitive Dissonance

Lazarsfeld and Merton's hypothesis that the mass media play a central role in shaping citizens' opinions and beliefs, particularly through the process of agenda setting, has become a cornerstone of mass communication research. Nevertheless, the media's ability and strength to influence public opinion remains highly contested. One school of thought, predominantly initiated by Lazarsfeld and colleagues, claims that the media is crucial in providing the public with the information it needs to develop informed opinions about political topics (Berelson, Lazarsfeld & McPhee, 1966; Lazarsfeld & Merton, 1948), and another argues that media does not actually influence public opinion, but simply reinforces a consumer's pre-existing beliefs (Sherrod, 1971; Shrum, 2009). Selective exposure refers to the human tendency to seek out information that confirms pre-existing beliefs and attitudes while avoiding information that challenges them (Lazarsfeld, Berelson, & Gaudet, 1948; Sears & Freedman, 1967). An over-time framing experiment by Druckman, Fein, and Leeper (2012) found that repeated exposure to a consistent frame can reinforce opinions and promote stability and that individuals tend to selectively seek out frames that are consistent with their prior opinions, rather than considering counterframes, which reinforces their existing attitudes and makes them more resistant to opposing views. The principle of homophily provides another important mechanism for understanding political media fragmentation on the individual level. Homophily explains that individuals with similar beliefs or socio-demographic, behavioural, or interpersonal characteristics

group together (Burt, 2005; Lazarsfeld & Merton, 1954; McPherson et al., 2001). As people tend to spend more time with people who are socially and ideologically similar to them, there is a lessened likelihood that new political information is raised in political discussions within someone's direct social network. In their study on the boycott in Meyerside of the Eurosceptic newspaper *The Sun*, Foos and Bischof (2022) demonstrate that choosing to engage with certain sources and not with others can lead to a change in public opinion. Their findings show that the public's lack of exposure to *The Sun* led to a significant decrease in Euroscepticism in the area.

Huckfeldt and Sprague (1987, 1995) provided early evidence that the structure of social networks plays a crucial role in determining the extent of political communication, with individuals more likely to discuss politics with those who share similar political views and also ignore dissonant information they receive. Baldassarri and Bearman's (2008) study supports the notion that individuals are more likely to engage in political discussions and form connections with others who share their political views, a phenomenon which plays a crucial role in shaping the dynamics of political polarization. Despite a declining trend of newspaper consumption in the UK, it remains an important source of political news for many people (Newman, 2017). In 2016 newspaper consumption was dominated by tabloids, with *The Sun*, *Daily Mail* and *Daily Mirror* among the most-read newspapers. In contrast, broadsheet newspapers generally have a lower audience share (Office of Communications, Great Britain 2017). Political research on newspaper consumption has consistently found support for the selective exposure theory since the work of Lazarsfeld et al. (1948), who examined the impact of newspaper and radio news on political campaigns. They found that selective exposure was an important factor in activating and reinforcing pre-existing predispositions. Similarly, Lipset, Lazarsfeld, Barton, and Linz (1954) emphasised that most people seek out media that confirms their pre-existing opinions. It can be argued that selective and motivated exposure effects are particularly evident in the consump-

tion of print or subscription-based newspapers, as individuals tend to stick to their preferred source, which, according to cognitive dissonance (Festinger, 1962) and selective exposure theories, is likely to be politically and attitudinally congruent with the reader, resulting in singular information (Klapper, 1960).

3.2.3 The Specific Case of the EU Referendum

Snow (2022) used data from the British Election Study Internet Panel to examine the impact of traditional grassroots campaign methods, such as leafleting and door-knocking, on voting decisions during the EU Referendum campaign. Snow's findings show that grassroots campaigning had little effect on referendum vote choices. One explanation offered by the study suggests that the high salience of the referendum meant that other information sources may have reached voters before campaigners did. I will contribute to this debate by investigating the effect of media consumption on referendum vote choice.

Carl et al. (2019a) used an online quiz to determine whether there was a significant disparity in EU knowledge between Leave and Remain voters. While their findings suggest that there was no substantial difference in EU knowledge between Leavers and Remainers, they show that both Leave and Remain voters were more likely to answer questions correctly that were 'ideologically convenient' to them. The study was conducted in 2018, well after the referendum date, and showed that average knowledge of the EU does not seem to have been particularly high.

For political communication and the diffusion of campaign messages, mass media, and increasingly, digital media, play an important role. However, it is equally important to look at the demand side for political information, in order to investigate any information inequality arising from different news-seeking behaviour. Considering cognitive dissonance and selective exposure theory, we would expect that individuals who have already formed an opinion before the official campaign period (pre-treatment at the time of Wave 7) would not change their opinion as a

result of media exposure, leading to null effects. However, this expectation presupposes that users have sufficient options to choose from. The Internet, with social media platforms and blogs, provides users with a 'high-choice media environment' (Van Aelst, et al., 2017). The market of traditional newspapers is sufficiently large and varied in the UK to allow for motivated selection of sources along ideological lines. While radio and television do provide different programmes, they do not offer the same level of choice, and big players such as the *BBC* dominate the political news market (see Newman, 2017). Based on the nature and level of choice offered by the various media types, I expect media such as television and radio to have a higher chance of influencing vote switching, whereas high choice media environments, such as the Internet and newspapers, are more likely to reinforce and stabilise existing voting intentions. Information obtained through people in one's social network is likely to be redundant and align with the receiver's attitudes and beliefs; thus, we would not expect vote switching to be associated with political information obtained through conversations with other people in one's social network.

Moreover, Goffman and Berger's (1986) concept of framing should be considered when analysing media effects of various media sources. This concept suggests that the contextual position of information is important to the audience's perception of a given piece of information. The media can select, curate, and frame topics, thus providing a framework within which information is presented and perceived. The user experience, degree of selectivity, and framing mechanisms differ significantly between media types.

While both television and Internet news consumption are dominated by the *BBC*, this study hypothesises opposing effects on vote choice in the referendum due to platform structure, framing differences, and audience composition. Internet news consumption is more determined by active selection by the user and other individual-specific factors, such as algorithmic curation and user-personalised feeds. Moreover, online news consumption was more common among younger, more edu-

cated audiences, who were also more likely to support the Remain side. I therefore hypothesise that higher levels of online news consumption lead to Remain support. In contrast, TV and radio offer a more uniform and passively consumed news experience, with fewer opportunities for selective exposure. The format and framing of TV coverage was criticised to give disproportionate visibility to Leave campaign messages (Cushion, 2017). Therefore, I expect that television news consumption is likely to be positively associated with a Leave vote.

In this study, I explore how political news consumption during the 2016 EU Referendum campaign influenced the voting behaviour of UK citizens, and to what extent this effect differed according to different types of media sources consumed. Based on the literature and theory discussed above, my initial hypotheses are as follows:

> H1 *Television news consumption during the campaign had a positive effect on the likelihood of opting for a Leave vote.*
>
> H2 *Internet news consumption (not including online newspapers) during the campaign had a positive effect on the likelihood of opting for a Remain vote.*
>
> H3 *Radio news consumption during the campaign had a positive effect on the likelihood of opting for a Leave vote.*
>
> H4a *Consumption of Leave-leaning newspapers (including online newspapers) during the campaign had a positive effect on the likelihood of opting for a Leave vote.*
>
> H4b *Consumption of Remain-leaning newspapers (including online newspapers) during the campaign had a positive effect on the likelihood of opting for a Remain vote.*

I do not formulate a formal hypothesis regarding the influence of interpersonal political communication on vote choice, as I expect that discussions about politics or current affairs will primarily reinforce individuals' existing referendum attitudes rather than drive change. However, I will include 'People' as a source of information in the empirical analysis.[1]

[1]Note that the hypotheses draw on both the structural characteristics of each medium (e.g.

3.3 Method and Data

This study relies on the YouGov-administered British Election Study (BES) Internet panel data. The focus lies on Waves 7 to 9 of the multilevel panel study, spanning from 14 April to 4 July 2016.[2]

The rolling campaign Wave 8 was collected from 6 May 2016 to 22 June 2016 and therefore spans the last two months of the referendum campaign. The detailed and comprehensive dataset allows rigorous analysis of changes in voting patterns and opinions over time, together with information on news consumption habits. The period of interest for this study spans from 20 February 2016, when David Cameron announced that the UK would hold a referendum on its EU membership, to the EU Referendum polling day on 23 June 2016. Legal guidelines for the referendum and campaign were set by the 'European Union Referendum Act 2015' and amended by the UK Statutory Instrument 2016 No. 278, 'The European Union Referendum (Date of Referendum etc.) Regulations 2016', which set 23 June 2016 as the polling day. The official campaign period for the referendum was therefore limited to 15 April 2016 to 23 June 2016. The analysis of this study will focus on the formal EU Referendum period and corresponding campaign period beginning on 15 April 2016 and ending on the date of the referendum by using the BES data from Wave 7 to Wave 9. Waves 7 and 8 of the data collection period overlap perfectly with the EU Referendum campaign period (see Figure A.17 in

television offers less choice and constitutes a more passive exposure compared to the active exposure of Internet news) and the ideological leanings and audience profiles typical of these platforms during the campaign period. For instance, although television news is formally impartial, it was criticised for granting disproportionate visibility to Leave voices and for framing Brexit in terms of sovereignty and immigration, which were core Leave topics. Likewise, print and digital news sources displayed identifiable partisan biases likely to influence opinion formation asymmetrically. Moreover, Internet news consumption is largely shaped by platforms, such as the *BBC News* website, aggregators, and social media, which represent outlets that tend to attract a younger, more educated audience, likely more predisposed to a Remain vote (Fletcher et al., 2023). These patterns inform the direction of hypotheses based on the intersection of media format (passive vs. active consumption), ideological content, and audience composition during each campaign.

[2]Wave 7: 14th April to 4th May 2016. Sample size = 30,895 respondents.
Wave 8: 6th May to 22nd June 2016. Sample size = 33,502 respondents.
Wave 9: 24th June to 4th July 2016. Sample size = 30,036 respondents.

Appendix A.3). Wave 9, which was collected on the subsequent days of the EU Referendum polls, is used to measure individuals' votes in the EU Referendum.

I adhere to principles for causal inference with observational data, as outlined by Angrist and Pischke (2008), aiming to generate robust and reliable causal estimates while recognizing the inherent limitations present.

In the following regression models, the dependent variable is EU Referendum vote choice. However, this variable does not represent a static measure of vote preference; instead, by using a lagged dependent variable, it captures change from Brexit vote intentions to the actual referendum vote, thereby allowing analysis of shifts in vote choice during the campaign period. The BES asked participants in Waves 7 and 8: 'If you do vote in the referendum on Britain's membership of the European Union, how do you think you will vote?' In Wave 9, it asked: 'Which way did you vote in the EU Referendum?' Possible answers were 1) Remain in the EU, 2) Leave the EU, and 3) Don't know. This question provides a good estimate of participants' actual EU Referendum Vote, as the data for Wave 9 was collected between 24 June to 4 July 2016, immediately after the referendum polling day. Since it is unlikely that a large number of participants would change their mind in the few days between polling day and the Wave 9 survey, it is reasonable to assume that this is the most accurate measure of actual voting behaviour. The inclusion of a lagged dependent variable, in this case the respondent's pre-campagign vote intention, serves two purposes: 1) to specifically measure within-individual change in vote choice (and not just association between the use of certain media choices and Brexit vote), and 2) to control for omitted variables by controlling for time-invariant unobserved heterogeneity that correlates with prior vote intentions (Morgan and Winship, 2007; Wooldridge, 2014). In order to maintain a causal timeline, data from Wave 9 comprises the dependent variable, data from Wave 7 the lagged dependent variable, and date from Wave 8 all explanatory variables, to separate the time of cause (i.e. time spent consuming political news, or 'treatment') and effect (EU Referendum vote choice). This study

design limits the sample size to those individuals who participated in all three BES waves (i.e. Waves 7, 8, and 9). This leaves a sample size of 20,918 participants. I use cumulative panel weights specific to respondents who participated in all three waves—pre-campaign, campaign, and post-referendum (W7, W8, W9). These weights account for the sample structure and adjust for panel attrition, aiming to provide estimates representative of the British population.

The borrowing of causal language and application of the term 'treatment' to media exposure, such as television news consumption measures via observational survey data, warrants careful consideration. While I adopt the terminology of 'treatment' for ease of exposition and to align with the broader causal inference literature, it is crucial to acknowledge the distinction from interventions in randomized controlled trials. In the context of observational studies, and particularly in designs like this one-group pre-test post-test, the 'treatment' (i.e. the media exposure) is not randomly assigned. Individuals self-select their level of exposure, which may be based on various factors, some of which may be correlated with the outcome variable. However, in line with the principles discussed by Angrist and Pischke (2008) or Shadish et al. (2002), a thoughtful research design and model choice can facilitate causal estimation, although true causality cannot be definitively claimed. Therefore, while I use the terminology of a 'treatment effect' to clearly explain the model and research design–which involves taking a pre-test measure of the outcome variable (EU-Referendum Vote) and comparing it to a post-test on the same measure after the campaign period, during which certain media consumption was reported (i.e., the so-called 'treatment' in this case)–the inherent limitations of observational data must be acknowledged.

The selection of control variables takes into account this study's design and targets two types of variables. The first are variables that may confound the relationship between media exposure and vote choice—that is, factors that could influence both the likelihood of consuming certain types of media during the campaign and the propensity to shift one's Brexit vote (e.g. political interest, national

identity, and party identification). The second are additional controls that have shown substantial influence on Brexit-related attitudes in previous research and can improve model efficiency and robustness (e.g. age, education, employment status).

The explanatory variables of interest in this study capture political news consumption. The BES asks survey participants how much time per day, on average, they spent during the last seven days following news about political or current affairs. The question addresses five different news sources, i.e. Internet (excluding online newspapers), Television, Newspaper (including online), Radio, and talking to other people. The level of intensity of news consumption per source was measured on an interval variable with six options, ranging from 'none, no time at all', 'less than 1/2 hour' to 'more than 2 hours,' with a 'don't know' option.

The BES profile question, which asks about the most frequently read daily newspaper, and the question about average daily newspaper reading encompass both print and online newspapers. However, the question on Internet news consumption does not include online newspapers, meaning it is likely dominated by the *BBC* website, news aggregators, as well as social media and blogs.

Voting decisions can be influenced by a variety of psychological and social factors, as noted by Campbell et al. (1976). To determine which socio-demographic and identity variables to include as controls in my model, I relied on previous research on general voting behaviour by Campbell et al. (1976) and more recent studies specific to the EU Referendum context, such as those conducted by Curtice (2017), Hobolt (2016), Fisher and Renwick (2018), and Carl et al. (2019a). Education and social class were highly correlated with both turnout and voting in the EU Referendum (Evans & Tilley, 2017). To approximate social class and associated variation in news consumption behaviour, regression Model 2 controls for educational attainment, employment status, and household income. Additional control and explanatory variables used in the study are described in greater detail in Appendix A.3.

For the inferential statistical analysis, I rely on logistic regression models with the dependent and independent variables described above. To realistically capture the effects of voters' uncertainty about their news consumption and other key variables, I use separate dummy variables to include 'don't know' responses in the model.

In summary, I use a quasi-experimental pretest-posttest design with observational data from the BES dataset. Although, I am not able to assign a formal control group, the study design allows for an approximation of the treatment effect (News consumption) by capturing a pre-test measure of the outcome variable (EU-Ref.Vote) and comparing it to a post-test on the same measure after the treatment has occurred. To assess the impact of political news consumption during the EU Referendum campaign, I will analyse changes in voting intentions from the pre-campaign period (pre-treatment) to the recall vote after the referendum (post-treatment). I include a lagged-dependent vote intention variable which was measured in the pre-referendum Wave 7. This approach allows for a better estimation of the causal relationship between news exposure through media consumption and vote change, with the general null hypothesis (H0) that there is no significant relationship between news consumption and changes in voting behaviour.

3.3.1 Newspaper EU Referendum Stance

In order to test the impact of reading newspapers on voting intentions during the campaign, it is crucial to distinguish between newspapers with a clear pro-Leave or pro-Remain stance. Grouping all newspapers together could potentially negate the effects of their biased coverage and lead to null results in the model output. In order to observe discernible effects on either the Leave or Remain side, it is necessary to examine news outlets separately and group them along ideological lines. Studies by Levy et al. (2016), Jackson et al. (2016), and Deacon et al. (2016) looked at major UK newspapers and their coverage of the EU Referendum. These studies found that certain newspapers consistently took a clear position on

the issue, either supporting Leave or Remain (see Appendix A.3 for a summary Table A.12 of the newspaper classification). According to all three studies, the *Daily Mail*, the *Sun*, and the *Daily Star* were in favour of leaving the EU. The *Mirror*, *Guardian*, *FT*, and *Independent* were classified as pro-Remain by all three studies. The *Times* was classified as pro-Remain by Levy et al. (2016) and Deacon et al. (2016) but as having a more balanced stance with a slight Leave preference by Jackson et al. (2016). The *Telegraph* and the *Express* were classified as pro-Leave by all three studies. It is important to note that some newspapers, such as local newspapers, were not analysed by any of the studies, and their stance on the EU Referendum is treated as unclassified. In addition, the stance of some newspapers, such as the *Times*, was not consistent across the different studies, so I have coded the *Times* as unclassified.

3.4 Results

To present my findings, I begin with an overview of the EU Referendum vote intention and recall vote throughout the campaign period, followed by a description of the audience share and classification of daily newspapers by EU Referendum stance. After the preliminary analysis, I test the aforementioned hypotheses using regression models. I present the results for the logistic regression analyses, including two models predicting a Leave vote as opposed to Remain. The first model contains the political information source variables and a lagged vote intention variable. The second model adds further controls by including demographic and identity variables.

3.4.1 EU Referendum Vote Intention Over Time

The data presented in Table 3.1 shows the distribution of Leave and Remain supporters as recorded in British Election Study (BES) Waves 7, 8, and 9, which were conducted between 14 April and 4 July 2016. The EU Referendum Vote

Intention, obtained in pre-election Waves 7 and 8, and the EU Referendum Vote, approximated through the responses collected in post-election Wave 9, serve as the primary dependent variables in this analysis.

Table 3.1: EU Referendum Vote Intention Over Time (%)

Period	BES wave	Leave	Remain	DK
Pre-campaign	W7	45	47	8
Campaign period	W8	47	46	6
Post-referendum	W9	50	50	0

Source: British Election Study Internet panel; Waves 7-9; weighted; 14 April to 4 July 2016; n = 19,701.

This table presents data from the BES sample of referendum voters, illustrating the pattern of vote intention changes.[3] The trends observed in the table align with those in the opinion polls (BBC, 2016a; Fisher and Renwick, 2016), though the final distribution does not exactly mirror the 52:48 split seen in the referendum results. In April, the sample shows a slight majority of Remain supporters over Leave supporters, with 47% of respondents saying they would vote to remain in the European Union if they were to vote. However, in the last six weeks of the campaign, this Remain majority was replaced by a slight Leave majority. The analysis of changes from Wave 7 to Wave 9 suggests that individuals' voting intentions changed somewhat, but not substantially, with no statistically significant difference in the days around the polling day. The proportion of undecided individuals fell from 8% to 6% over the course of the campaign. In order to measure the impact of different media sources on changes in voting intentions, I test for the effects of media exposure on vote change. To do so, I examine the following possible permutations of vote switching from vote intentions collected at campaign Wave 7 to recall votes at post-election Wave 9: from Remain to Leave, from Leave to Remain, from Remain to Don't Know, from Leave to Don't Know, from Don't Know to Remain, and from Don't Know to Leave. Among those who voted in the referendum, 84% reported no change in their vote preference. Only 16%

[3]For voters and non-voters, see Table A.15 in Appendix A.3.

altered their response to the question of how they would vote in an EU Referendum between the pre-campaign Wave 7 and the post-referendum recall in Wave 9. Of those respondents who changed their stance on Brexit between Wave 7 and Wave 9, the largest proportion (4.3%) shifted from Remain to Leave, followed closely by 3.8% who moved from Leave to Remain. Additionally, 3.7% of respondents changed from Don't Know to Leave, while 3.5% moved from Don't Know to Remain. By contrast, the proportion of voters who changed their position from either Remain or Leave to Don't Know was negligible, accounting for a combined total of just 0.2%.

These findings demonstrate the need to examine whether different media sources influenced those who changed their vote from Leave to Remain and vice versa, as well as those who had no clear voting intention before the campaign period but ultimately voted Leave or Remain. Understanding the role of media's various forms in shaping these shifts in voting behaviour provides important insights into the factors that drive changes in public opinion.

Table 3.2: Contingency table showing pre-campaign referendum voting intentions (W7) and EU Referendum votes (W9); given in row-%

	Post-Referendum (W9)		
	Remain	Leave	DK
Pre-Campaign (W7)			
Remain	91	9	0
Leave	8	91	0
DK	48	50	3

Source: British Election Study Internet panel; Waves 7-9; weighted; 14 April to 4 July 2016; n = 20,918.

Table 3.2 shows a contingency table of pre-campaign referendum voting intentions (W7) and EU Referendum votes (W9) given in row percentages. This table shows the detailed changes in voting intentions for the EU Referendum. 91% of Remainers and 91% of Leavers maintained their view on Brexit from April to the referendum. Thus, few voters changed their opinion from April to July, with only 8% of those who supported Leave in Wave 7 switching to Remain in Wave

9. 9% of those who supported Remain in Wave 7 switched to Leave in Wave 9. A Pearson chi-squared test with a second-order Rao-Scott correction points out that there is no statistically significant difference between people who responded with 'Don't know' in Wave 7 and eventually voted Leave, and those who eventually voted Remain.

In summary, the BES data shows that the Wave 7 to Wave 8 (April-May) vote swing was slightly towards Leave, while there was a small late swing to Remain just before the referendum polling day, corresponding to results by Fisher and Renwick (2018).

3.4.2 Daily Newspaper by EU Referendum Stance

Figure 3.1 shows popular UK newspapers as of April 2016 alongside their EU Referendum stance (classified as described above and shown in Table A.12 in Appendix A.3) and the proportion of the sample that selected that newspaper as their preferred daily newspaper. About 23% of respondents said that they do not use newspapers to follow news about politics or current affairs, and 5% of those who do use newspapers reported having no preferred daily newspaper. As a result, these individuals are not visualised in Figure 3.1.

Tabloids have the largest audience share. The most popular newspaper is the *Sun*, with 18% of all respondents listing the Leave-supporting paper as their favourite daily newspaper. The predominantly Remain-supporting *Mirror* is the second most-read newspaper, followed by the Leave-supporting *Daily Mail*, with 14% and almost 13%, respectively. Various local newspapers follow, accounting for 4% of the total audience share. Broadsheets have much smaller shares. The *Times*, *Telegraph*, and *Guardian* have 4%, 4%, and 3%, respectively. This general picture of the newspaper landscape (print and online) in Britain is comparable to market research conducted by the Office of Communications, Great Britain (2017).

When asked prior to the campaign, 'Which daily newspaper do you read most

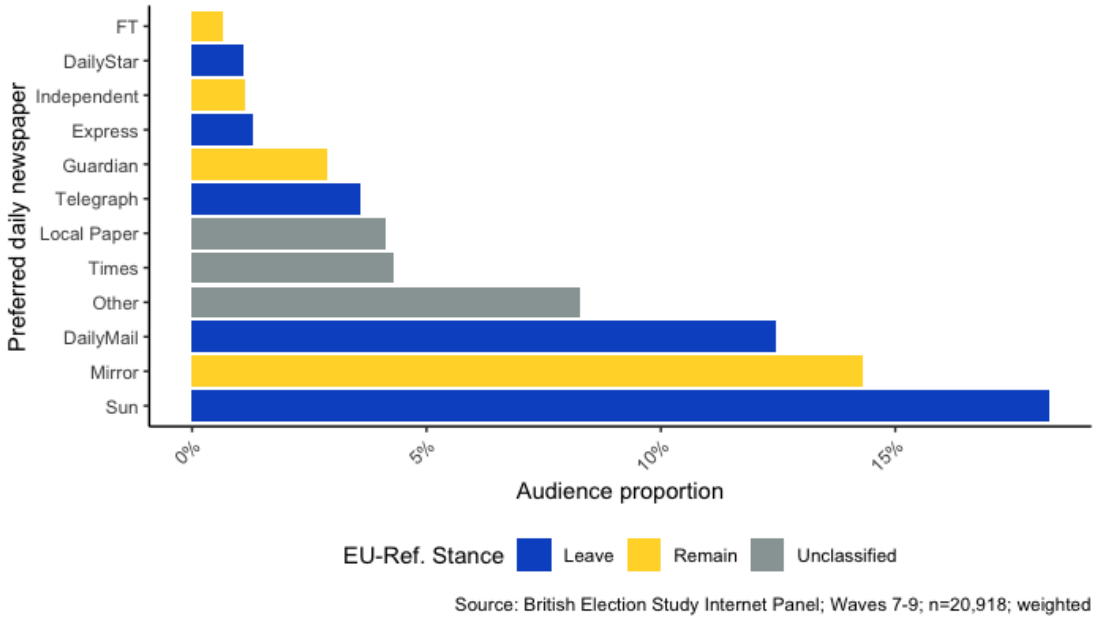


Figure 3.1: Popularity and EU Referendum Stance of Newspapers in the UK

often?', 38% of all participants preferred a newspaper coded as pro-Leave; 19% preferred a newspaper coded as pro-Remain; and 16% preferred a newspaper that was not distinctively categorised as either pro-Leave or Remain and thus remained unclassified. When newspaper preferences are broken down by vote intentions, among those who said they would vote Remain in the upcoming referendum, there is a relatively even split between Leave, Remain, and unclassifiable newspapers, with shares of 25%, 25% and 21%, respectively (see Appendix A.3, Table A.14). The remaining 30% of Remain supporters either did not have a preferred newspaper or did not read newspapers at all. For Leave supporters, this share lies at 23%. Moreover, among those who said they would vote Leave, a significant majority of 52% preferred newspapers that were classified as pro-Leave. Only 13% read Remain-classified newspapers, and 11% read newspapers that are not classified as supporting one side or the other. Among individuals who were undecided about how they would vote when asked before the campaign, 30% most frequently read a newspaper with a pro-Leave stance, while only 9% primarily read Remain-leaning newspapers (see Appendix A.3, Table A.14).

3.4.3 Logistic Regression Model

To analyse the effects of media consumption during the EU Referendum campaign period on political opinion formation, I modelled two logistic regressions of participants' recall referendum vote to Leave the EU instead of to Remain as a function of time spent following political news on various news sources. All models include a pre-treatment lagged dependent variable capturing EU Referendum voting intentions. This allows for effectively measuring media effects of political news consumption during the campaign period on voting behaviour. In addition, the models include an interaction effect between newspaper consumption and the Brexit stance of the newspaper consumed, as the media effect of reading a newspaper on vote choice may strongly depend on the newspaper's portrayal of the news. For added robustness, the second model includes a comprehensive list of socio-demographic and identity controls. Table 3.3 shows the results of both logistic regression models.

Comparing the Model 2 with added control variables to the first model without them demonstrates that adding control variables to the model does not result in substantial changes to the general pattern of the coefficients, their size, or direction. This suggests that the results are fairly robust and not overly sensitive to the inclusion of additional controls, with a slight increase in the already relatively high McFadden's pseudo R^2. This indicates that the second model with added controls fits the data well and has robust effects. Thus, from this point on, all references to the model refer to the regression results of Model 2, unless otherwise specified. For added clarity, Figure 3.2 shows the coefficients of Models 1 and 2 plotted side by side.

The coefficients plotted in Figure 3.2 visualise clearly the magnitude and direction of the relationship between the explanatory variables on the EU Referendum Leave Vote and provides a clear representation of the minimal fluctuations in coefficients between the two models. The relative stability of the coefficients of the media consumption measures after the inclusion of control variables provides

Table 3.3: Logistic regression models of Leave vote

	Dependent variable: EU-Ref.Vote - Leave	
	(1) Media + Vote intention	(2) Media + Vote intention + Controls
Internet (ref. = None)		
0<0.5h	−0.235*** (0.068)	−0.134 (0.071)
0.5h-1h	−0.425*** (0.078)	−0.281*** (0.083)
1h-2h	−0.373*** (0.096)	−0.299** (0.101)
>2h	−0.406*** (0.103)	−0.419*** (0.110)
DK	0.148 (0.199)	0.211 (0.207)
TV (ref. = None)		
0<1h	0.362*** (0.085)	0.261** (0.090)
>1h	0.354*** (0.093)	0.302** (0.102)
DK	0.479* (0.204)	0.687** (0.215)
Newspaper (ref. = None)		
0<1h	−0.892*** (0.166)	−0.854*** (0.169)
>1h	−0.866*** (0.191)	−0.778*** (0.195)
DK	−1.814*** (0.418)	−1.871*** (0.429)
Newspaper Stance (ref.= Remain)		
Leave Paper	0.071 (0.182)	−0.095 (0.187)
Unclassifiable Papers	−0.979*** (0.225)	−0.923*** (0.232)
No Preferred Paper	−0.598*** (0.161)	−0.605*** (0.164)
Newspaper * Newspaper Stance (ref.= None*Remain)		
0<1h * Leave Paper	0.912*** (0.202)	0.879*** (0.206)
>1h * Leave Paper	1.066*** (0.233)	0.771** (0.237)
DK * Leave Paper	2.212*** (0.448)	2.558*** (0.464)
0<1h * Unclassifiable Papers	0.863*** (0.247)	0.890*** (0.253)
>1h * Unclassifiable Papers	1.229*** (0.282)	1.213*** (0.289)
DK * Unclassifiable Papers	0.977 (0.622)	1.207 (0.634)
0<1h * No Preferred Paper	0.661*** (0.191)	0.686*** (0.196)
>1h * No Preferred Paper	0.517* (0.254)	0.371 (0.264)
DK * No Preferred Paper	1.591*** (0.424)	1.785*** (0.440)
Radio (ref. = None)		
0<1h	−0.082 (0.057)	−0.074 (0.059)
>1h	−0.026 (0.081)	0.031 (0.084)
DK	−0.247 (0.222)	−0.428 (0.232)
People (ref. = None)		
0<1h	−0.230** (0.072)	−0.217** (0.075)
>1h	−0.089 (0.101)	−0.026 (0.105)
DK	−0.491** (0.178)	−0.573** (0.184)
Pre-Campaign EU-Ref.Vote Intention (ref.= Remain)		
Leave	4.575*** (0.054)	4.392*** (0.057)
I will not vote	2.092*** (0.192)	2.203*** (0.221)
DK	2.237*** (0.067)	2.160*** (0.072)
Constant	−1.644*** (0.164)	−0.732** (0.277)
Pseudo R-sq (McF):	0.544	0.57
Observations	19,584	19,464

Notes: *p<0.05; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel Waves 7 to 9. Dependent variable: Leave=1, Remain=0, undecided and refusals excluded. DK = Don't Know. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention, and EU Referendum recall vote (Leave vote, I did not vote, and ref. being remain vote). See Appendix A.3 for a complete table of all control variables.

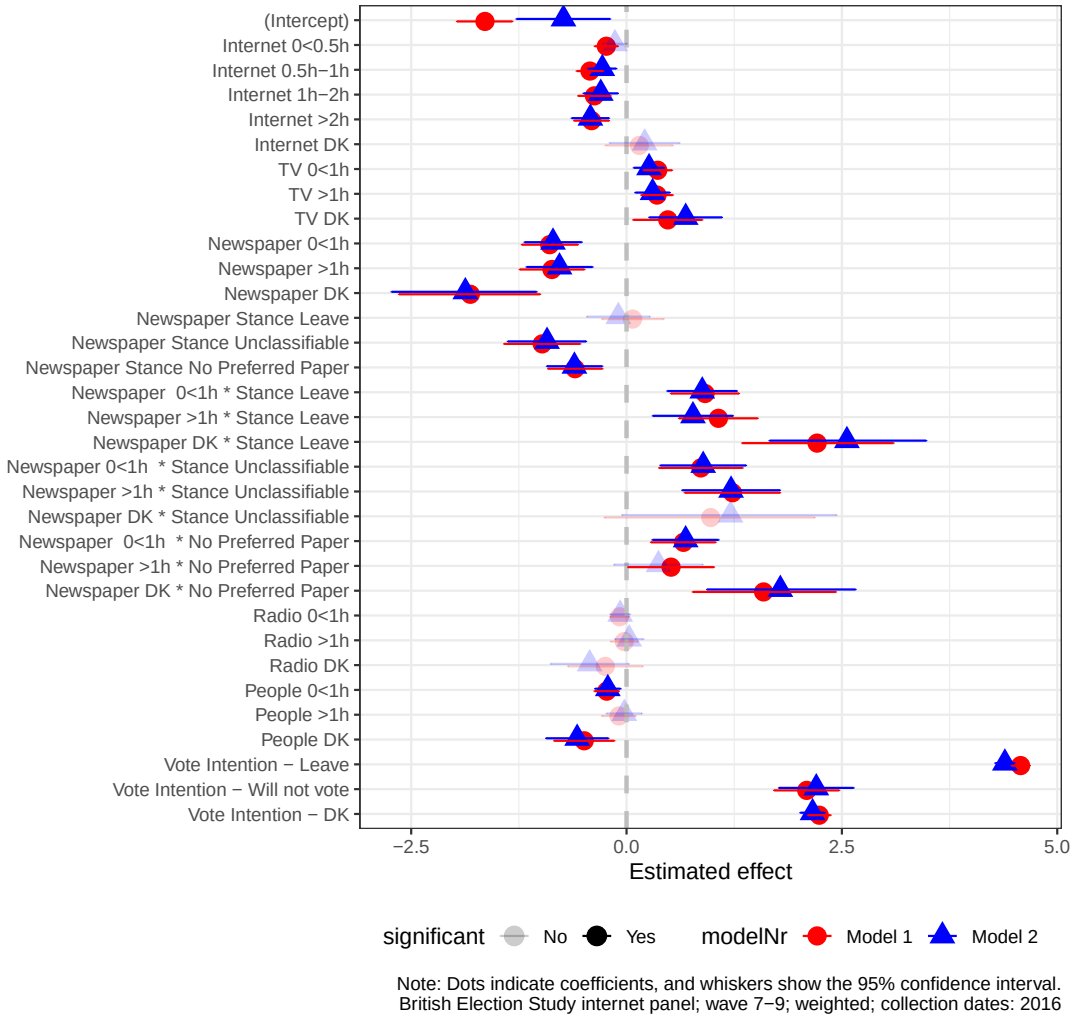


Figure 3.2: Coefficients of logistic regression Models 1 & 2 predicting a Leave vote

support to assume a causal relationship between media consumption and vote choice.

In summary, controlling for a wide range of additional explanatory factors improves the model and does not change the significant relationship between media consumption and EU Referendum votes.

Radio

Of the five measures of news sources analysed, only radio news consumption showed no statistically significant effect on voting one way or another in the EU Referendum. Overall, the results of the regression model do not support Hypothesis 3, that radio news would influence voters towards the Leave side. This

suggests that radio news consumption did not play a significant role in swaying voters in either direction during the campaign. In contrast to radio listening, all other types of media show some form of significant effect on voting behaviour.

Internet

The association between consuming political news on the Internet (which here excludes online newspapers and is therefore likely to be dominated by the *BBC News* website, news aggregators, and social media) and opting to vote Remain is strong and statistically significant. This means that, compared to individuals who do not engage in such online news consumption, Internet usage reduces the likelihood of someone voting Leave. This effect gets stronger the more time someone spends on the Internet. More specifically, individuals who spend less than half an hour on average consuming political news online daily exhibit the smallest effect size, not reaching statistical significance. However, for all other time categories, starting from Internet consumption of more than 30 minutes per day, the effect size is stronger and significant at least at the 1% level. The group of individuals who did not provide a self-reported estimate of their average time spent daily consuming news online lacks a statistically significant value. Figure 3.3 displays predicted probabilities for a Leave vote in the EU Referendum by the level of consumption for each news media source, including Internet, TV, Radio, and People, while averaging across the observed values of all other covariates in the dataset.[4] The plot illustrates the findings for Internet consumption, with a slight downward slope indicating a decreasing likelihood of a Leave vote with more time spent daily

[4]Figure 3.3 presents marginal predicted probabilities for categories of a media use variable, estimated using the logistic regression Model 2. The predicted probabilities represent the estimated isolated effect of a given media use category, holding everything else constant. Thus, these predictions are based on standardised or average values for non-focal covariates, and therefore, the output reflects the expected probability of voting Leave for a hypothetical individual with average characteristics, rather than the actual distribution of individuals in the sample. Consequently, the predicted values do not necessarily reflect the overall distribution of the outcome variable in the sample, which in this case is skewed towards Remain. The primary interest is in the pattern of differences across levels of the media use variable (e.g. the change in predicted probability from no Internet use to heavy Internet use) rather than the absolute predicted probabilities per se. These relative trends are stable and substantively meaningful across methods of estimation.

on the Internet consuming news (excluding online newspapers). This means that compared to individuals who do not use the Internet to obtain political news, Internet usage decreases the likelihood of someone voting Leave. The results support my initial hypothesis that online news consumption increases the probability of opting for a Remain vote. This finding aligns with the analysis in Chapter 2, which identified the *BBC News* website as the most frequently accessed source for political news. Given its slightly more Remain-leaning audience, this pattern further reinforces the conclusion that online news consumption contributed to a greater likelihood of supporting Remain.

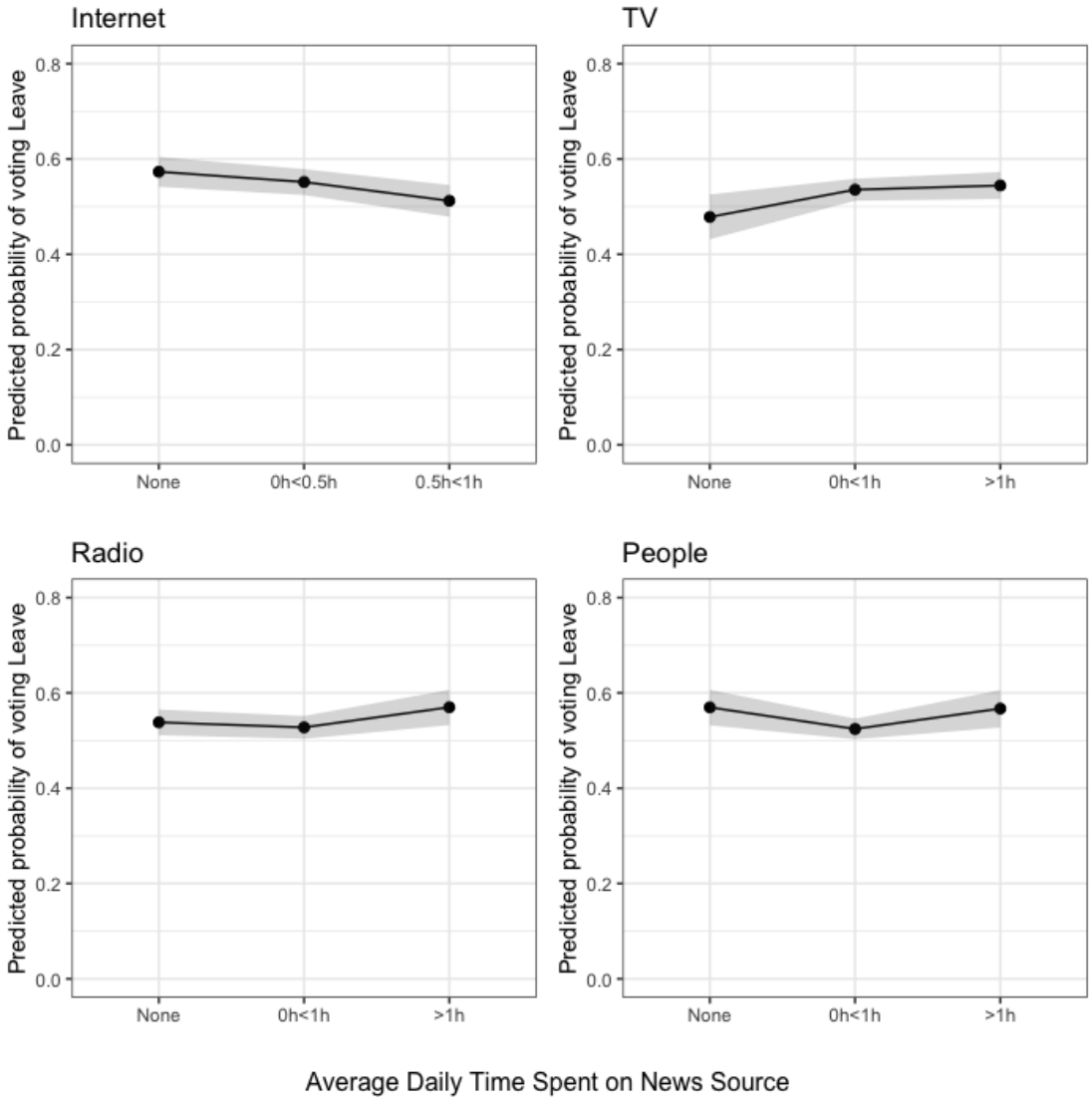


Figure 3.3: Predicted Probabilities for a Leave Vote in the EU Referendum by Level of News Consumption and Media Type

TV

In contrast, the consumption of political news through television had the opposite effect on voting behaviour during the EU Referendum campaign. The results, which are all significant at the 1% level, indicate that using TV as a political news source shows a significant effect towards voting Leave. The coefficients and predicted probabilities for those who watched more than one hour of TV news per day compared to those who watched less than one hour per day have nearly identical effect sizes, suggesting that time spent watching TV may be less important than whether someone watched TV news at all (see Figure 3.3). However, participants who did not report their TV consumption exhibit an even higher probability of voting Leave. The results for television news consumption provide clear support for Hypothesis 1 suggesting that using TV as a political news source during the campaign period increased the probability of voting Leave in the referendum compared to those who never watched TV news. It is noteworthy that 88% of respondents indicated that they watch TV for political news. As previously discussed, TV news is largely dominated by *BBC* channels, which account for approximately three-quarters of all television news, followed by much smaller shares for ITV, Channel 4, Channel 5, and Sky News (Office of Communications, Great Britain 2017). While the publicly-funded *BBC* is strictly monitored by internal and external bodies such as the Office of Communications (Ofcom), to meet editorial guidelines and standards (*BBC*, 2019), other TV news channels are not unregulated and also have to follow guidelines set by Ofcom with the aim to provide impartial news coverage (Office Of Communications, Great Britain, 2017). Thus, the finding that television news consumption significantly swayed voters towards the Leave side provides evidence for the argument that treating news coverage of the Remain and Leave campaigns in a balanced way ultimately favoured the Leave campaign. Thus, TV news does not appear to have had the impartial influence that we might expect. Given that TV news was the most popular choice for news in the UK in 2016 (Newman, 2017; Office of Communications,

Great Britain 2017), these results have important implications for understanding the referendum results, especially since the Leave campaign won by just a narrow margin.

People

The story behind obtaining political news and information through one's social network—i.e. by talking to other people—is not quite as clear. While all coefficients suggest that obtaining political information through interpersonal conversations is linked to a reduced likelihood of voting to Leave compared to those who never obtain political information this way, this relationship is statistically significant only for individuals who engage in interpersonal conversations for less than one hour and for those individuals (5% of all respondents) who did not provide a specific answer to the question of how much time they spend daily talking to others. It is worth noting that the group of individuals who do engage in interpersonal conversations about politics and current affairs but spend on average less than one hour daily represents 63% of the population. For individuals who engage in conversations for more than one hour per day, the relationship is not statistically significant. Overall, the effects of receiving political information through interpersonal conversations on voting attitudes are not as strong or clear, as the significant relationship seems to hold only for individuals who talk to others for less than an hour or those who did not give a specific answer. The results for the effects of interpersonal communication on voting behaviour show that for those people who do not spend more than one hour a day discussing politics with others, the likelihood of voting Remain increased. For people who said they spent more than one hour a day discussing politics with others, the results are not statistically significant. People in this group are likely more politically interested and tend to have such conversations with like-minded people, making it unlikely for them to change their political opinions. However, this conclusion is speculative and would need further empirical evidence. On the other hand, the regression model provides

evidence that for most people, conversations with others made them more likely to vote to Remain in the EU.

Newspaper

Most prominent newspapers did not remain entirely neutral in their reporting during the EU Referendum campaign and took a clear stance for either the Leave or Remain side (see Levy et al., 2016; Jackson et al., 2016; and Deacon et al., 2016). The regression model incorporates an interaction term to capture the combined influence of time spent reading newspapers for political news and the newspapers' stance on the EU Referendum. This inclusion is based on the hypothesis that the effect of newspaper consumption on voting inclinations significantly depends on the political stance of the newspaper. The reference categories for these interaction terms are individuals who never read newspapers for political news and newspapers with a Remain stance.

The main effects of newspaper consumption represent the impact of time spent reading newspapers when the newspaper stance is at its reference category, which in this case corresponds to Remain-leaning newspapers. The coefficient for up to one hour of daily newspaper consumption is negative and statistically significant at the 0.1% level, and represents the expected change in the log odds of voting Leave relative to the reference group, i.e. those who do not consume newspapers. The results for individuals who spend more than one hour per day reading newspapers are nearly identical. The group of individuals that did not provide an exact estimate of their reading time displays a stark negative effect, but also a larger standard error, indicating greater variability. Reading Remain-leaning newspapers, whether for less than one hour or more than one hour daily on average, significantly reduces the likelihood of voting Leave compared to not reading newspapers at all. In other words, the findings show that consuming Remain-leaning newspapers is associated with an increased likelihood of voting Remain.

The interaction term quantifies how the effect of newspaper consumption time

on voting behaviour changes based on the stance of a participant's preferred newspaper. Without the interaction term, the model would assume that the effects of time spent reading newspapers are uniform across all newspaper stances, which is unrealistic in most cases. The interaction term allows the effect of newspaper consumption to vary for: 1) Remain-leaning papers (which is also the reference category for Newspaper Stance), 2) Leave-leaning papers, 3) Unclassifiable papers, and 4) No preferred paper stance. The category of 'Unclassifiable papers' predominantly comprises the *Times* and local or smaller newspapers that could not be precisely categorised as Leave- or Remain-supporting. Therefore, this group represents a particularly heterogeneous collection of newspapers. Participants who indicated that they did not have a preferred daily newspaper could fall into one of several sub-groups: those who do not read daily newspapers, those who do not have a preferred newspaper, those who are unsure of their preferred newspaper, or those who did not indicate their preference. Although this group contains some unknowns, it represents a part of the sample that is distinct from those who prefer a daily newspaper and is coded as 'no preferred newspaper'. In interpreting the influence of Leave-leaning newspaper consumption on voting behaviour, it is essential to consider both the main effect and the interaction effect associated with the newspaper's political stance. Together, these effects determine the overall impact on the log-odds of voting Leave. For instance, in the case of the '0 < 1h' category of newspaper consumption for Leave-leaning newspapers, the combined effect is calculated as $-0.854 + 0.879 = +0.025$. Compared to Remain-leaning newspaper consumption, these result suggests that an average daily consumption of less than one hour of a Leave-leaning newspaper during the campaign period effectively neutralises the general negative effects of newspaper consumption on the likelihood of voting Leave. The same is true for Leave-leaning newspaper reading of more than one hour daily on average.[5]

[5]Note that the Unclassified and No Preference Paper categories are significant because they are measured relative to the reference category, Remain Paper. Since the consumption of Remain-leaning newspapers has a significant negative effect on voting Leave, other categories also appear significant in comparison. However, this significance arises due to the baseline effect

To better determine the magnitude of the interaction effects, Figure 3.4 shows the predicted probabilities for a Leave vote in the EU Referendum by the level of newspaper consumption and newspaper Brexit stance [6]. Additionally, the plot is divided into pre-treatment voting intention, allowing for a comparison between those with an initial Remain voting intention and those with an initial Leave voting intention. Naturally, both groups have substantially different base probabilities of voting Leave due to their pre-treatment voting intentions.

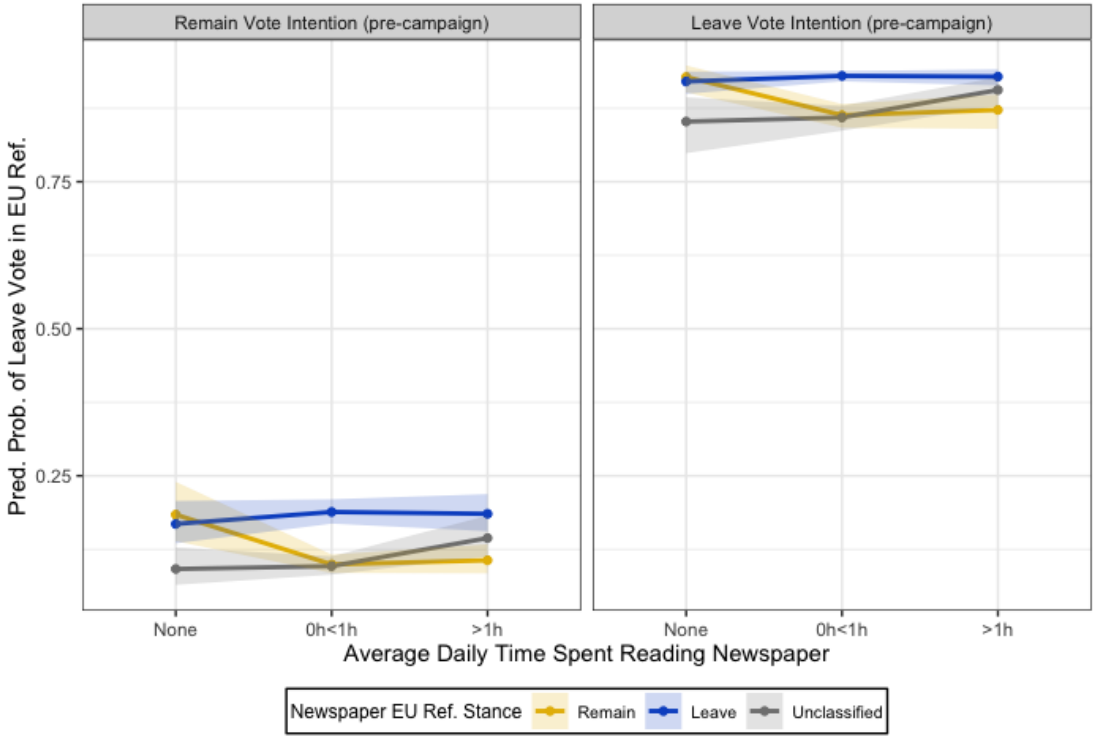


Figure 3.4: Predicted Probabilities of Voting Leave in the EU Referendum based on Newspaper Consumption and Newspaper Brexit Stance, split by Pre-Treatment Voting Intention

The plot shows that individuals with a pre-treatment intention to vote Remain, but who preferred a Leave-leaning newspaper, had a 19% predicted probability of voting Leave in the referendum, for both consumption groups i.e. spending up to one hour or more than one hour reading a Leave-leaning newspaper. As expected, the blue line for Leave-leaning newspapers is almost level, as there is

of Remain papers rather than any independent influence of these categories. See Table A.19 in the Appendix, which shows the same model but with Leave paper as a reference.

[6] Please refer to Appendix A.3 for the predicted probabilities listed in Table A.17

only a modest increase from the predicted 17% probability for those who did not read Leave-leaning newspapers.

In contrast, individuals who read a pro-Remain newspaper during the campaign period exhibited significantly lower predicted probabilities of voting Leave, with only 10% for those reading up to one hour daily and 11% for those reading more than one hour. This is a statistically significant decrease compared to those who did not read pro-Remain newspapers, as shown by the step decrease in the yellow line in Figure 3.4.

The right-hand box in Figure 3.4 shows the predicted probabilities for individuals with a pre-treatment Leave voting intention. For those who preferred reading pro-Leave newspapers, the predicted probability of voting Leave was 93% for both consumption time periods, showing no meaningful change compared to the 92% probability for those who did not consume such newspapers. However, for individuals who preferred reading Remain-leaning newspapers, the predicted probabilities of voting Leave decreased by 7 percentage points for up to one hour of newspaper consumption and by 6 percentage points for more than one hour, reflecting the substantial effect of Remain-leaning newspapers.

In summary, Leave-leaning newspapers were predominantly consumed by individuals who already supported the Leave side, and showed limited evidence of their persuasive impact in converting voters to the Leave position during the campaign. In contrast, Remain-leaning newspapers demonstrated a significant capacity to influence their audience, effectively mobilizing support for the Remain vote. Hence, the results provide strong support for Hypothesis 4b regarding newspapers with a Remain stance, but not for Hypothesis 4a regarding Leave-leaning newspapers. Those preferring Leave-leaning newspapers were more likely to vote Leave, while those preferring Remain-leaning newspapers were more likely to vote Remain. However, only Remain newspapers demonstrated substantial effects in influencing voters during the short-term period of the campaign towards their side.

However, long-term effects remain highly relevant, as the sustained mobilization of loyal readers can significantly influence political behaviour, even if immediate campaign effects are less apparent (Norris et al., 1999). For instance, partisan newspaper readers are often primed over several years—not necessarily on the specific topic of Brexit, but on related issues aligned with the newspaper's editorial stance. In the case of Leave-leaning newspapers, particularly tabloids such as the *Sun*, *Daily Mail*, and the *Express*, long-term users were likely influenced by years of consistent messaging supporting their editorial positions. This sustained exposure may have minimised the observable effects during the campaign itself, as the messaging during the Brexit Referendum period closely aligned with the narratives these readers had already been exposed to over time.

Limitations

This study analysed and compared different types of media, including TV, radio, newspaper, the Internet (excluding online newspapers), and interactions with people, to examine their impact on voting behaviour in the EU Referendum. However, due to data limitations, a more detailed analysis of specific TV channels, radio stations and other news providers, and broadcasters was not possible in this study, but would be a natural next step to further investigate the effects of different media sources on voting behaviour, specifically in the context of the EU Referendum. Moreover, though this study was able to split newspaper consumption into Leave- and Remain-supporting newspapers, it was not able to do the same for other information sources, such as information accessed online or through people. This should be an objective for further research. Lastly, self-report survey data can be affected by social desirability bias, which occurs when respondents give answers that reflect social norms or values rather than their actual behaviour or attitudes (Marlow and Crowne, 1961). As a result, it is plausible that people may overestimate the time they spend consuming political news in self-report surveys. Despite this potential bias, the general directions of the effects should still hold. While

caution is warranted when interpreting self-reported survey data on political news consumption, the findings provide valuable insights into the relationship between news consumption and political opinion formation. Future research could explore alternative methods of measuring news consumption, such as digital tracking data or experimental manipulations, to complement self-report survey data and provide more robust evidence. The analysis presented includes controls that approximate variations in social class, but a more detailed investigation may reveal further associations and interaction effects between social class, news media choice, and Brexit attitudes.

To assess the robustness of the logistic regression model, I employed a variety of techniques to ensure the validity and reliability of the results. In addition to standard robustness tests, I estimated a series of logistic regression models with isolated media variables, and I also used a random forest model for benchmarking purposes. Details for all robustness and benchmarking tests can be found in Appendix A.3. The comparative analysis reinforces confidence in the robustness and reliability of the presented results.

Finally, true causality cannot be fully established with observational data due to inherent limitations, but it can be reasonably inferred. Recognising these limitations, I have taken rigorous steps to increase the robustness and reliability of effect estimates, for example by including temporal factors and using robust controls to reduce potential bias and confounding.

3.5 Conclusion

The results of this study clearly demonstrate that news consumption during the period leading up to the EU Referendum had a significant influence on people's vote choice. There is a direct relationship between an individual's level of media consumption, the type of media they choose to consume, and the way they voted in the referendum. I modelled a logistic regression to test the impact of news consumption from different media types on changes from pre-campaigning

voting intentions to post-treatment voting behaviour in the Brexit Referendum. The findings were robust even after controlling for socio-demographic and identity variables, confirming the reliability of the results. The overall pattern of coefficients indicates that consumption of political news media has a significant impact on opinion formation in regards to the EU Referendum vote. Yet, the direction of this impact is highly contingent on the specific medium used for obtaining political news.

The key findings are that consuming political content online (excluding newspapers) led to a reduced likelihood of opting for a Leave vote, with the predicted probability declining as Internet usage rose. In contrast, watching television news made individuals more inclined to vote for Leave. Radio news consumption showed no significant impact on people's voting intentions, and discussions with others only seemed to discourage voting for Leave if they lasted no more than an hour daily. Newspaper readership, encompassing online newspapers, displayed signs of selective exposure, as most readers preferred publications that matched their political beliefs. The results lend support to the claim that individuals tend to select (newspaper) sources that correspond to their political preferences or those that are most likely to reinforce their existing beliefs. Compared to non-readers, reading a pro-Remain newspaper made one more likely to vote Remain, while Leave newspapers had no such persuasive effect during the campaign. The amount of time spent reading was less influential.

Except for Internet consumption (excluding online newspapers), time of consumption does not consistently affect the effect size of the Leave vote. More relevant is whether an individual uses a particular media source over another for political information.

One of the more striking findings of this study is that even-handed news coverage did not necessarily mean even influence on voters. I find support that television news, which is dominated by supposedly neutral news providers such as the *BBC*, might have inadvertently favoured the Leave campaign by provid-

ing an even-handed coverage. The exact mechanism behind this effect should be the subject of future studies. The results suggest that the only sources associated with actively influencing opinion away from a Leave vote were online news sources (excluding online newspapers), interpersonal conversations, and pro-Remain news coverage, as in the case of pro-Remain newspapers. As the Internet measure excludes online newspapers, this is another news source likely to be dominated by the *BBC* website, besides other dominant online news websites, news aggregators, and social media.

This suggests an interesting conjecture. The public broadcaster was not systematically associated with increasing the likelihood of a Leave vote. Instead, its impact seems to depend on the medium. Specifically, TV consumption was significantly linked to a Leave vote, while Internet consumption showed a significant effect in favour of Remain. Future research should investigate the role of public service broadcasters and test whether their influence on public opinion is contingent on the medium through which the content is consumed.

Taking into consideration Soroka et al.'s (2012) findings that public broadcasters play a significant role in informing the public on 'hard news' (news about politics and world affairs), my findings raise an important question about how these 'even-handed' public broadcasters are influencing public opinion in a real-world context, such as the EU Referendum and future democratic events.

The findings of this study call for further research into and attention to public broadcasting and issues like 'impartiality fraud', where news is presented under the assumption of being neutral and impartial, yet systematically favours one political side over the other. As with all research, my study has its limitations and is not able to provide conclusive evidence of partiality of (public) broadcasters in the Brexit campaign, yet the evidence presented nonetheless suffices to raise awareness for such issues and call for further investigations. In conclusion, this study demonstrates the importance of understanding the media's influence on political decision-making and points to potential areas for future research in this

domain. The contribution of this study lies in its rigorous comparison of the impact of different media sources on the EU Referendum vote, which provides valuable insights into the role of political information in shaping citizens' voting behaviour more generally, and has implications for improving the quality and diversity of political information sources, as well as for informing the regulation of news broadcasting within and outside the UK.

Chapter 4

Changing Brexit Identities: The Impact of News Media on Political Identity

Brexit introduced a new form of political identity in Britain, with more individuals identifying as either 'Leaver' or 'Remainer' than with political parties. However, little is known about the mechanisms by which Brexit identities are formed. This study contributes to the literature on Brexit and political identity by examining the influence of political news sources on the development and changes in Brexit identities across three major electoral events: the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election. The analysis reveals that the media's influence on Brexit identity switching was relatively limited. Evidence suggests that news consumed via the Internet increased the likelihood of adopting or shifting to a Remain identity during both the 2016 EU Referendum and the 2017 General Election campaigns. Additionally, extensive reading of Leave-leaning newspapers was associated with a shift toward a Leave identity in the 2017 General Election, while radio consumption during the same period was linked to Remain identifiers. Interestingly, media effects were largely absent during the referendum period, with the most significant impacts emerging during the 2017 snap General Election. No notable media effects were identified for the 2019 General Election. These findings make several important contributions. They empirically demonstrate that the media's influence during campaign periods on Brexit identity switching was modest, if not entirely absent, and show the importance of analysing media effects within the specific contextual framework of political events. This approach allows for the identification of nuanced effects that might otherwise be overlooked.

4.1 Introduction

Brexit has had a profound impact on UK individuals' political lives, as the impact of its divisions and uncertainty on shaping political identities continues to influence political attitudes and voting behaviour (Cutts et al., 2020; Fieldhouse et al., 2020;

Hobolt, 2016, 2018; Hobolt et al. 2021). Brexit identities, on both the Remain and Leave sides, have an impact on people's voting behaviour and their views on other political issues, touching on topics even beyond the direct scope of Brexit. Yet, mechanisms of how these identities are created through mass media and partisan news remains an understudied area.

Research on Brexit has yet to fully explore the role of mass media in shaping, maintaining, and reinforcing Brexit identities over time and after the referendum. This study addresses this gap by taking a longitudinal approach to the question of what role different media sources have played in the formation and development of Brexit identities. By analysing the impact of news consumption on political identity in the UK, this research provides valuable insights into the role of mass media in the political transformation triggered by the Brexit Referendum.

Specifically, this study explores whether media sources, including television, newspapers, radio, Internet use, and conversations with others, were influential in forming Brexit identities at the time of the referendum and in switching Brexit identities during the subsequent general elections in 2017 and 2019. This study is the first to comparatively analyse how different types of information sources and the time spent consuming political news influenced the development and evolution of Brexit identities across the three electoral events. I use panel data from the British Election Study (BES) Internet panel dataset and a representative sample of the British population to test the effect of individuals' news engagement and political news preferences on the formation and change of Brexit identities from the pre- and post-referendum period in 2016 to the two general elections that followed.

The findings indicate that Internet use (excluding online newspapers) shows a strong association with the Remain side. Moderate daily Internet news consumption during the 2016 EU Referendum and 2017 General Election campaigns increased the likelihood of switching to a Remain identity. TV effects are minimal, not statistically significant, and at best, suggestive of an association towards

Leave identity. The impact of newspapers depends heavily on their Brexit stance. Preference for pro-Leave newspapers is positively associated with a shift towards a Leave identity, whereas no similar effect is observed for pro-Remain newspapers. Time spent reading newspapers has a smaller-than-expected influence on changes in Brexit identity.

In the absence of bold media effects across all elections for most news sources, the findings demonstrate the intricate influence media sources have on the shaping of political identities and the importance of analysing media effects on political identity within individual electoral events and campaigns. Factors identified as relevant for media effects include the type of media and the political stance of both the information source and the recipient.

4.2 Literature

The EU Referendum and Brexit debate resulted in a new type of political identity, in which voters identified with others who shared their stance on Brexit, not just their political party. Theory on social identity by Tajfel and colleagues (Tajfel, 1970; Tajfel, 1982; Tajfel and Turner, 1979) argues that group membership and its associated value is not only established by sharing similarities with those within one's in-group, but also through clearly distinguishing from and comparing to those in the out-group. Such differentiating between 'us' and 'them' can lead to favouritism towards one's own group and bias against others (Tajfel, 1978; Tajfel, 1981; Tajfel and Turner, 1979). A survey and experimental study by Hobolt, Leeper, and Tilley (2021) finds evidence that Brexit identities generate affective polarization as intense as those associated with political parties, resulting in stereotyping, prejudice, and various evaluative biases against the opposite Brexit group. Literature on Brexit identities has predominantly investigated their emergence and significance, yet few studies so far focus on explanations of potential causes and influences on these new political identities.

This study evaluates the impact and significance of various media sources in

shaping EU Referendum voters' identification as either a 'Leaver' or a 'Remainer', and in influencing the realignment of these identifications in the subsequent general elections in 2017 and 2019.

Lichtwarck-Aschoff et al., (2008) emphasise the temporal dimension of identity development, suggesting that social identity is a dynamic system formed over time, and highlight the importance of distinguishing between short-term (days and weeks) and long-term (years) processes (often referred to in the psychological literature as micro- and macro-level processes). Political news and campaign messages disseminated through conversations or media exposure may affect short-term identity dynamics in several ways. For example, exposure can increase the salience, or importance, of a particular identity (e.g., Chong & Druckman, 2007; Huddy et al., 2001); exposure to identity-congruent messages can intensify group affect, i.e. in the form of in-group favouritism and out-group hostility (Iyengar et al., 2019; Hobolt et al., 2021).[1] Thus, the analysis focuses particularly on the effects of information flows during campaign periods, when individuals are especially likely to encounter identity-relevant messaging. My study thus tests the effects of media consumption and interpersonal political communication during campaign periods on identity dynamics during the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election.

Drawing on social identity theory in conjunction with cognitive dissonance theory, balance theory, and motivated reasoning, I test the short-term effect of political news consumption during campaign periods on the formation and changes of Brexit identities. In doing so, the study seeks to contribute to a better understanding of the role of mass media in shaping Brexit identities of the electorate over the period of 2016-2019, as well as comment on media effects on political identity more generally. Influenced by its politics and cultural diversity, and no-

[1]This study does not focus on classical Eriksonian or Marcian psychological theories of long-term identity formation during adolescence (see Erikson, 1950, 1968; Marcia et al., 1993). Rather, it focuses on the short- and medium-term dynamics of political identity development. Specifically, it examines how individuals' political identities respond to information exposure over relatively short periods of time, such as the duration of an election campaign, as opposed to the longer-term developmental processes associated with adolescent socialisation.

tably described by Cohen (1995) as having 'fuzzy' boundaries, identities in Britain have always been complex and constantly evolving. The Brexit Referendum and its consequences have introduced a new and unique source of political identity in that it divided the British population into those to identify politically as 'Leavers' and those who identify as 'Remainers' (Evans and Schaffner, 2019; Hobolt and Tilley, 2019). Following the UK's vote to exit the EU, both Leave voters and Remain voters adopted these votes as new political identities that remain strongly held and stable over time (Curtice, 2018; Hobolt et al. 2021; Tilley and Hobolt 2023b).

The EU Referendum is an interesting case, as it allowed for clear labelling of sub-groups and political attitudes that had been slowly growing within the electorate, providing the basis for new political identities. These identities were reinforced not only by a sense of 'belonging' but also by a clear separation from the opposing group (Sobolewska and Ford, 2020). According to Sobolewska and Ford (2020), rising numbers of university graduates and an increase in ethnic diversity, as well as generational differences, began to reshape political identities in Britain. These shifts in and unease around identity found an exit valve in the Brexit and Leave-Remain identities. As we would expect, voter identification as either Leave or Remain was not widespread at the start of the EU Referendum campaign. However, there were already clear differences between Leavers and Remainers, as those who wanted to leave the EU adopted a Brexit identity earlier and more frequently than Remainers. Brexit identities have become more prevalent in the UK since the referendum, leading to increased political polarization of the electorate through Brexit, and these identities are more prevalent than party affiliation (Evans and Schaffner, 2019). Even years after the EU Referendum, most of the people who voted in the referendum and identified with one of the two sides remain loyal to their chosen group (Tilley et al. 2023b). An analysis by Hobolt et al. (2021) demonstrates that polarization across the Brexit divide is at least as strong, if not more so, than partisan affective polarization. Recent find-

ings by Tilley et al. (2023b) indicate that these newly adopted EU Referendum identities are linked to policy norms that extend beyond positions on European integration, and such policy preferences are somewhat distinct from partisan identities. Thus, these group identities formed in the referendum persist and influence people's political perspectives long after the vote.

According to Social Identity Theory, people identify with particular social groups and derive their sense of self-worth from group membership (Tajfel and Turner, 1979). Moreover, the perception of oneself and the perception of others in their group and outside of their group are strongly linked. Identity formation and perceptions of in-group and out-group individuals are also influenced by self-categorisation. The theory suggests that individuals categorise themselves into social groups based on shared characteristics, attitudes, and behaviours that maximise differentiation between groups and minimise differences within a group (Turner, 1987). According to Balance Theory (Heider, 1958) and cognitive dissonance theory (1962) individuals have a tendency to seek balance and consistency in their attitudes, beliefs, and behaviours. Thus, we can hypothesise that individuals will choose the Brexit identity and corresponding group that fits best with their existing political attitudes. However, if inconsistencies arise between political identities, such as Brexit, and partisan identities, the individual is likely to adjust one of the identities in order to achieve balance overall. Thus, identity concepts strongly influence people's perceptions of other people, attitudes, norms, and behaviour. It is likely that the political attitudes of those who adopted new Brexit identities will be influenced by in-group dynamics and attitudes common within their new identity group, possibly even beyond Brexit-related issues. Taken together, these mechanisms suggest a circular relationship between political and social attitudes, behaviour, and identity; for example, political attitudes towards the UK leaving the EU may lead an individual to vote Leave in the referendum, which in turn, makes that individual more likely to identify as a Leaver. However, because of the mechanisms described above, group membership can also influence

individuals' perceptions of new information and people. The causal direction between identity and behaviour/attitudes is therefore difficult to predict. To address this issue, I will incorporate the element of time by following individuals through several panel waves with repeated measurements of identity.

Hobolt and Tilley (2019) point out that these new identities likely shape how people perceive the consequences of Brexit, with both groups interpreting new information in ways that reinforce their pre-existing views. Such individual-level mechanisms of biased selection of information and motivated interpretation of such information can be explained by theories of cognitive dissonance (Festinger, 1962), selective exposure theory (Klapper, 1960), and motivated reasoning (Kunda, 1990). Hobolt and Tilley's (2019) analysis shows that Leavers consistently believe that Brexit has a predominately positive effect on Britain and on themselves personally, while Remainers remain pessimistic about the effects of leaving the EU on them and the country. This shows the impact that Brexit identities can have on people's perceptions of political issues.

Research by Chan et al., (2020) suggests that cultural values and national identity played a role in Brexit. For instance, people who identify as British rather than English and those who have a diverse range of cultural interests were less likely to support Brexit.

Richards et al. (2021) examined another closely related aspect of social identity in the Brexit puzzle by analysing subjective social status, i.e. individuals' perceptions of their social value. Their results reveal further complexity, showing that, in addition to the commonly labelled 'left behind' Leave voters, individuals with high subjective social status were also likely to have developed preferences towards Leave, contrary to what would be expected in this group.

Kenny, Heath, and Richards' (2021) analysis of the fluidity of Brexiteer vs Remainer identities provides evidence that, firstly, Brexit identities remain important after the referendum and over the course of the Brexit negotiations, and secondly, that there is consistently a greater degree of fluidity between Leave

and Remain identities than there is between Conservative and Labour identities (Kenny et al., 2021). In short, though Brexit identities prove important among voters, they show some degree of variability, even if they were formed mainly after the referendum vote and remained fairly stable throughout the negotiation period.

While studies have repeatedly demonstrated the existence of strong, stable, and persistent Brexit identities that cut across partisan identities (Curtice, 2018; Evans and Schaffner, 2019), somewhat reshaping the landscape of British politics, little is known about behind-the-curtain mechanisms that shape, feed, and maintain these identities even years after the referendum results and the UK's exit from the EU. This case is especially interesting, because as the referendum identities do not necessarily align with partisan identities, individuals cannot rely on clear partisan cues. Personal conversations and mass media are established sources of new information that are critical in influencing people's political attitudes (Butler and Stokes, 1969; Lazarsfeld, et al., 1948), level of knowledge about politics (Berelson et al., 1966), and even driving political affective polarization (Iyengar, 2012, 2019). Thus, it is reasonable to hypothesise that exposure to various sources of news media has a significant impact on shaping Brexit identities.

Tilley and Hobolt's (2023b) study on Brexit identities and policy group norms clarifies some of the mechanisms behind Brexit identities and their strong persistence. The study shows that clear distinctions exist between Leave and Remain policy norms and that people tend to align their own preferences with those of the respective in-groups.

I will contribute to the existing literature a comprehensive investigation of the role of mass media in the formation and development of these new political identities. I use the British Election Study Internet panel data to examine the effects of political news consumption on political identity in more detail, comparing three major electoral events in recent British politics: the EU Referendum campaign period and the immediate post-referendum period, the 2017 General Election, and the 2019 General Election. In addition, I aim to explain the mechanism behind

the different effects observed in different types of media.

Snow (2024) provides the only other study to date focusing on media consumption as a potential influence on Brexit identification, and also uses a longitudinal design with the British Election Study panel data set. I offer a few distinct and, notably, vital improvements over Snow's study. Snow uses an individual-level fixed effects model for the analysis of mass media effects on Remain identity and Leave identity, which are modelled separately, over a period of four years. Using this research design, Snow finds no evidence that Brexit identities were a product of mass media consumption. The study lacks specificity as it relies in parts of the analysis on a combined measure of average media exposure, neglecting the idiosyncratic effects of diverse media sources. In my study, I investigate the effects of each media source separately to allow for media-specific variation in the outcome. Moreover, Snow's use of a fixed effects model has the benefit of controlling for unobserved heterogeneity in individuals; however, it simultaneously neglects event-specific variation. In contrast, in this study, I use a cross-sectional comparative design, modelling separate logistic regressions for each electoral event, in order to capture context-specific short-term variation in identities for the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election, as campaign content and key issues varied. The 2016 EU Referendum offers the opportunity to analyse the initial adoption and early formation of Brexit identities, whereas, subsequently, the 2017 and 2019 General Elections provide means to investigate how these identities evolved and changed over time. In addition, my use of a lagged dependent variable adds temporal dependence, capturing changes in the dependent variable as a function of news exposure. Further research design improvements that contribute to the existing literature are the use of average consumption time for each information source as separate categories and the inclusion of 'Don't Know' responses for average daily consumption time when possible. This approach allows for the inclusion of data from participants who consume a particular news source and recall average consumption times but does not exclude

those who may consume a medium but do not recall the exact time spent with it. Lastly, one key methodological decision was to separate newspaper consumption by Brexit stance using participants' answers about their primary newspaper. This research design allows for a more nuanced analysis of newspaper exposure, as the consumption of a Brexit-supporting newspaper is likely to have a different directional effect compared to a Remain-supporting newspaper. The decision to consider newspaper slant and conduct separate investigations for each electoral event was vital for discovering the nuanced effects of media exposure on Brexit identification.

4.2.1 Media effects

Media consumption is crucial in the dissemination of political information to the electorate and plays a crucial part in democratic systems (Berelson et al., 1966; P. Lazarsfeld and Merton, 1948).

Barnes and Hicks (2018) demonstrate that media framing and media consumption significantly influence the formation of public attitudes. Their study, which uses survey data from the British Election Study (BES) and experimental data, illustrates this by examining how media effects contribute to variations in individual attitudes toward government deficits and austerity. Their survey results suggest a causal link between variation in individual attitudes towards government deficits and the presentation of government deficit information.

By exploiting the rare event of several British newspapers switching their political endorsements to the Labour Party before the 1997 General Election, Ladd and Lenz (2009) provide strong evidence, using a quasi-experimental research design, that the ideological stance of a newspaper can directly influence the political attitudes of its readers, and is able to persuade a significant proportion of readers to even change their party support.

The Brexit Referendum was a pivotal political event, marking a turning point for Britain and its political landscape. It brought to light significant social and

political divisions within the electorate that continue to persist seven years later. Brexit revealed a complex and multi-faceted issue, as the divide did not neatly align with party lines and instead cut across various factors such as social class, education, age, geography, and other complex factors, resulting in a restructuring of UK's party system (M. J. Goodwin and Heath, 2016; S. B. Hobolt, 2016; S. B. Hobolt, 2018). The political period between 2015 and 2019 was clearly dominated by this historic political event. While the 'hardBrexit' UKIP and Pro-Remain Liberal Democrats and Greens lost votes after the referendum, voters transitioned to the Conservatives in the 2017 UK General Election (Hobolt, 2018). According to studies by Hobolt (2018) and Mellon et al. (2018), voters who were concerned about immigration and supported Brexit in the referendum became more inclined to support the Conservative Party after 2016, as the party adopted a more Eurosceptic and stricter stance on both Brexit and immigration. Several studies have since emphasised and investigated these divisions and their lasting impact on British society and politics (e.g. Carl et al., 2019b; S. B. Hobolt, 2016; M. Goodwin et al., 2020; Chan et al., 2020; Tilley and Hobolt, 2023b; Richards et al., 2020; Sorace and Hobolt, 2021), yet the media's direct role in influencing individuals' referendum voting intention and Brexit identity as well as a systematic comparison of the influence of different types of news media in this context have not been sufficiently studied, a gap in the existing literature this study aims to fill.

In addition to the aforementioned theories, it is important, when analysing media effects on identity formation, to consider Goffman and Berger's (Goffman and Berger, 1986) concept of framing. The framework suggests that the contextual position of information matters to the audience's perception of a given piece of information. Media outlets can select, curate, and phrase issues, therefore providing a certain frame within which information is presented and perceived. Such frames may be curated deliberately according to a newspaper's political stance. Framing might, however, also occur due to a specific medium's characteristics.

When one searches for news online, the framing and succession of news articles may be particularly dictated by search algorithms, social media architecture, etc., creating quite a separate experience to newspapers. Thus, I hypothesise to see different types of media effects on identity formation and adaptation for various media types and outlets.

In the framework of social interactionism, language is considered a crucial and fundamental medium on which self-identification and social interaction depend (Mead et al., 1934). Additionally, social and group identification rely on language and social markers in language, which are linguistic cues that can help individuals to identify social categories or particular groups (Scherer and Giles, 1979; Hogg and Abrams, 1999). In the context of Brexit, it can be posited that the language and labels employed by news outlets have the potential to significantly influence the formation and strength of group identities. The choice of wording in media content plays an important role in shaping the framing of Brexit-related discussions, thereby influencing how individuals perceive the issue and their sense of affiliation with a particular group.

Using 2017 web tracking data from YouGov's Pulse panel, Fletcher et al. (2023) examine how different forms of online news access—e.g. search engines, social media, aggregators, or direct access—affect the diversity of a user's news portfolio. Their findings show that direct access to news leads to less diverse news repertoires, while distributed access leads to more diverse and politically diverse news consumption, although it also increases exposure to partisan outlets. The study finds that the news portfolios of people who use search engines, social media, and news aggregators are more diverse than those of people who access news directly. Specifically, direct access is associated with a higher concentration of visits to the *BBC*, whereas distributed access spreads visits more evenly across different news sources, including partisan outlets. This finding is likely specific to the UK, given the dominant presence of the public broadcaster.

In my study, Internet news use excludes online newspapers, which are cate-

gorised under the Newspaper measure. Instead, it focuses on information accessed via social media platforms, news aggregators, and search engines. Consequently, the *BBC News* website likely accounts for a significant portion of Internet-based political news consumption. Furthermore, as shown in previous chapters, Internet use was more strongly associated with the Remain side, which informs the hypothesis for this study.

4.2.2 Hypotheses

The directions of the following hypotheses are motivated by the literature and the results of my previous Chapter 3. For example, reviewing the literature and acknowledging criticisms of the *BBC*'s presentation during the Brexit campaign as failing their impartiality guidelines, presenting evidence-based arguments and less factual ones as equally valid (Bennet, 2016; Harding, 2016; Newman, 2017) led to overly balanced coverage of the EU Referendum campaign and, ultimately, slightly favoured the Leave side. In conjunction with the findings presented in Chapter 3, which indicate that television influenced individuals to vote for Leave, it can be assumed that similar directional effects would be observed when investigating the impact of media on Brexit identities.

Similarly to TV, radio news consumption is dominated by *BBC* stations, with consistently over 70% of radio news listeners tuning in to a *BBC* station (Ofcom, 2018; Ofcom, 2019; Ofcom, 2023). Therefore, based on a similar theoretical framework, I hypothesise that radio news is more likely to be positively associated with a Leave identity.

Chapter 3 provided evidence that Internet consumption showed negative effects on Leave voting. Due to theories of selective exposure and the evidence supporting the presence of this phenomenon in newspaper consumption, I also expect in this study that newspaper consumption shows attitudinally congruent and supporting effects. Similarly, due to Social Identity, Balance, and Homophily theories, I expect that talking to other people, who are likely to be of the same political

attitudes, has a reinforcing effect on identities.

Although I analyse across all elections the effects of news media consumption during each campaign period on changes in identity, it is important to acknowledge a key distinction between the 2016 EU Referendum and the subsequent General Elections when considering short-term media effects on Brexit identity. Specifically, the 2016 Referendum period is likely to capture the initial formation of Brexit identities, whereas the 2017 and 2019 General Elections are more likely to capture processes such as identity revision, realignment, or reinforcement of pre-existing identifications. Despite this interpretive distinction, I expect the effects of media exposure and interpersonal political communication to be broadly similar across these contexts, particularly in terms of direction. Accordingly, I formulate a unified set of hypotheses that applies to all three campaign periods. While I do not anticipate directional shifts in media effects across the different electoral events, I hypothesise that the magnitude of these effects will diminish over time, as the distance from the referendum increases and identities become more deeply entrenched. This expectation aligns with Chong and Druckman's (2007) argument that the influence of political communication tends to weaken as individuals acquire greater familiarity with a topic.

H1 *Television news consumption is positively associated with UK citizens' likelihood of forming or switching to a Leave identity.*

H2 *Internet news consumption (excluding online newspapers) is negatively associated with UK citizens' likelihood of forming or maintaining a Leave identity.*

H3 *Radio news consumption is positively associated with UK citizens' forming or switching to a Leave identity.*

H4a *Newspaper consumption (including online newspapers) is positively associated with UK citizens' likelihood of developing a Brexit identity. Specifically, consumption of Leave-leaning newspapers (including online newspapers) is associated with a positive effect on the likelihood of adopting a Leave identity.*

H4b *Consumption of Remain-leaning newspapers (including online newspapers) is associated with a positive effect on the likelihood of adopting a Remain identity.*

H5 *Across all forms of media exposure, effects on Brexit identity are expected to be strongest during the 2016 EU Referendum campaign (when identities were still forming), moderately strong during the 2017 General Election, and weakest during the 2019 General Election, by which point identities had become more stable and more resistant to change.*

I do not formulate a formal hypothesis for the influence of conversations with people in one's social network on Brexit identity switching, as I expect that discussing politics or current affairs with others will reinforce individuals' existing EU Referendum identities over time, rather than cause a shift between Leave and Remain identities. However, I will include 'People' as an information source in the empirical analysis.

4.3 Data and Method

I use a one-group pretest–posttest design (Shadish et al., 2002) to examine how exposure to various media sources during electoral campaigns influences changes in Brexit identity. Data for this analysis comes from the British Election Study (BES) Internet Panel (Fieldhouse et al., 2023), and the dependent variable is derived from a question where respondents are asked whether they identify as a Leaver, Remainer, or neither. I use three BES wave triplets that were fielded around key electoral events (i.e. the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election). For each event, a wave triplet captures a pre-campaign wave for baseline measures of identity and controls, a campaign-period wave for media exposure, and a post-election wave for outcome measurements. This design aims for temporal separation of the independent and dependent variables. BES Waves 7–9 correspond to the referendum, 11–13 to the 2017 General Election, and 17–19 to the 2019 General Election. The objective is to estimate

the association between patterns of political information exposure and change in Brexit identity. Change in identity is operationalised by comparing responses at separate time points: i.e. one wave prior to the campaign (e.g., Wave 7 for the 2016 EU Referendum) and one wave following the election (e.g., Wave 9). Thus, the models test for changes in Brexit identity between the pre-campaign and post-election waves. Specifically, they estimate the likelihood of individuals shifting from pre-campaign categories—Leave, Remain, No identity, or Neither—to either a Leave or Remain identity post-election.

4.3.1 Panel Data

The BES data was collected online by YouGov and fielded for Wave 7 from 14 April 2016 to 4 May 2016, for Wave 8 from 6 May 2016 to 22 June 2016, and for Wave 9 from 24 June 2016 to 4 July 2016, just after the EU Referendum vote held on 23 June 2016.

The 2017 General Election triplet was fielded for Wave 11 from 24 April 2017 to 3 May 2017, for Wave 12 from 5 May 2017 to 7 June 2017, and for Wave 13 from 9 June 2017 to 23 June 2017, just after the general election held on 8 June 2017.

The 2019 General Election triplet was fielded for Wave 17 from 1 November 2019 to 12 November 2019, for Wave 18 from 13 November 2019 to 11 December 2019, and for Wave 19 from 13 December 2019 to 23 December 2019, just after the general election held on 12 December 2019.

Participants in the sample had to meet the following criteria: individuals had to be present in all three waves for one election triplet. For instance, individuals had to have answered the Brexit Identity (i.e. 'euID') question in all waves.

Each election wave triplet includes individual cumulative panel weights to attain results that are representative of the general British population.

The EU Referendum wave triplet includes 5209 individuals, and the two subsequent wave triplet samples contain a combination of individuals who had been

in the previous waves as well as new respondents to deal with panel attrition. The sample sizes for the 2017 General Election wave triplet and the 2019 General Election wave triplet are 5,351 participants and 4,673 participants, respectively.[2]

4.3.2 Variables

In this analysis, my focus lies on self-categorisations of Brexit identity. To measure 'Leaver' and 'Remainer' identities, the questionnaire asked 'In the EU referendum debate, do you think of yourself as closer to either the "Leave" or "Remain" side? If yes, which one?' Possible answers were '1) The Remain side', '2) the Leave side', '3) Neither', and '4) Don't know'. This measure of Brexit identity will serve as the dependent variable, denoted as y_1^i for all models testing the choice of Brexit identity side. The analysis estimates changes in identity between pre-campaign and post-election waves, modelling the likelihood of individuals transitioning from initial categories (i.e. Leave, Remain, Neither, or Don't know) to either a Leave or Remain identity. Remain identity is treated as the reference category in all models. For analytical clarity, respondents who were undecided post-election were excluded.[3]

The explanatory variables of interest are media consumption variables capturing consumption habits of participants. The BES asks survey participants how much time per day, on average, they have spent during the last seven days following news about political or current affairs. The question addresses five different news sources, i.e. Internet (not including online newspapers), Television, Newspaper (including online), Radio, and talking to other people. The level of intensity

[2]Table A.26 in Appendix A.4 shows sample sizes and retention rates.

[3]I focused the analysis on 'Leave' and 'Remain' outcomes, excluding respondents who reported a 'Don't Know' or 'Neither' identity in the post-election wave, as the central focus of the analysis is to assess how media exposure influences the formation of or changes in Brexit identity. The proportion of participants who changed their answer to 'Don't Know' or 'Neither' in the post-election wave was small (less than 5% of the sample in each election period), and excluding them had no meaningful impact on the results. The pre-campaign identity variable retains all categories, including 'Neither' and 'Don't Know', to fully capture movement into a defined identity position. Nevertheless, further investigation of individuals who reported losing their Brexit identity, i.e. switching to 'Don't Know' and 'Neither', is an interesting derivative of this study and is noted for further research.

of news consumption per source was measured on an interval variable with six options: 'none, no time at all', 'less than $\frac{1}{2}$ hour', '$\frac{1}{2}$ hour to 1 hour', '1 to 2 hours', and 'more than 2 hours', and with a 'Don't Know' option.

Including a lagged dependent variable, as baseline identity measure, allows the models to estimate within-individual change and control for time-invariant, unobserved heterogeneity correlated with prior identity (Morgan and Winship, 2007; Wooldridge, 2014). Additional control variables include potential confounders that affect both media exposure and identity change (e.g., political interest, national identity, party identification), as well as demographic factors that have been shown to influence Brexit attitudes (e.g., age, education, employment type, and income). I use cumulative panel weights in all analyses to achieve results that are representative of the general British voting population.

4.3.3 Limitations

This study faces similar data limitations to Fisher and Renwick (2018) in their study of Brexit expectations using the BES dataset, as self-selected Internet panel data, such as the BES, often have a bias towards highly politically engaged respondents. This is particularly likely to be the case for the sample used in this study, as study participants had to answer all questions on Brexit identity in three consecutive waves in order to be selected for one of the wave triplets. As Fisher and Renwick (2018) have previously pointed out, that the willingness of respondents to complete several extensive BES questionnaires on political issues over a relatively short period of time suggests a strong commitment to their political views and political interests. As a consequence, it is reasonable to assume that these individuals may have developed their opinions early on and may be less inclined to alter them. Consequently, the BES panel data are likely to underestimate the extent of change over time.

Zaller and Feldman (Zaller and Feldman, 1992) addressed the issue that individuals often lack fully formed opinions on political issues when responding to

surveys. Instead, they suggest that respondents possess a collection of considerations and that survey answers are influenced by the considerations most salient at the time. Consequently, the timing of the survey and the prevailing salient topics are crucial factors to consider when analysing such data. To account for campaign and election-specific variability, and to acknowledge idiosyncratic election factors, I decided to run separate regression models and analyses for each election period. I then compared and discussed the results relative to each other.

Self-reported survey data can be influenced by several biases, such as social desirability bias, where respondents provide answers that align with social norms or values rather than their true behaviours or attitudes (Marlow and Crowne, 1961). In this particular case, this may lead to overestimating the time spent consuming political news. Moreover, participants may struggle with accurately recalling their average consumption times. Therefore, I cautiously Interpret consumption times and focus on category differences, translating average consumption times into groups such as no time, some time, or a lot of time spent reading newspapers. Additionally, I include 'Don't Know' responses, as they are likely referencing some consumption time as opposed to no consumption time.

Several studies examined newspaper coverage of Brexit related news and identified that several newspapers consistently adopted a clear stance on Brexit, either endorsing Leave or Remain (Brandenburg, 2019; Deacon et al., 2016; Jackson et al., 2016; Levy et al., 2016 ; Simpson and Startin, 2023). To assess the influence of newspaper reading on voting intentions during the campaign, it is essential to differentiate between newspapers with clear pro-Leave or pro-Remain stances. Referring to studies by Levy et al. (2016), Jackson et al. (2016), and Deacon et al. (2016) to classify the major UK newspapers according to the EU Referendum stance demonstrated consistent positions of certain newspapers along the Leave-Remain spectrum. Each study was in agreement over the EU Referendum stance of the *Daily Mail*, the *Sun*, the *Daily Star*, the *Telegraph*, and the *Express* (Leave) and the *Mirror*, *Guardian*, *FT*, and *Independent* (Remain). The *Times*' EU Refer-

endum stance, however, was not consistent across the studies and therefore coded as 'unclassified.' (see Appendix A.4 for Table A.24).

Lastly, although I was able to classify the Brexit stance of a reader's preferred newspaper, the same classification is not possible for other information sources, such as the Brexit stance of Internet sources or of people engaged with in conversations. Therefore, I expect these estimates to slightly underestimate the effects, as possible influences from slanted information might level out.

4.3.4 Method

The primary focus of my analysis lies on assessing the variability, i.e formation and change of identity measurements in successive waves within each election wave group, rather than analysing the entire time series as a whole. I then compare the results of each election period in order to draw conclusions about the general effects and mechanisms of different media sources on identity formation. First, due to panel attrition, a consistent sample over several years would significantly limit the number of individuals in the sample, posing challenges in terms of statistical power and sample representativeness. Secondly, the design of this study allows for variation between elections and, finally, allows for a selective analysis of each election period.

To ensure robust and reliable causal estimates within the constraints of observational data, I follow established methodological frameworks for causal inference, drawing on the work of Angrist and Pischke (2008), Shadish et al. (2002), and Singer and Willett (2003). While these frameworks enhance the rigor of the analysis, I also acknowledge the inherent limitations of observational studies. The research design is based on a simple quasi-experimental One-Group Pretest-Posttest Design as described by Shadish et al. (2002), using three survey waves for each electoral event, one pre-campaign wave, one campaign wave, and one post-election wave. Following this design, to maintain a causal timeline, I use in each election period, pre-election waves for all explanatory variables, and the post-election wave

for the dependent variable. This allows for a separation of the time of cause and effect. The basis of my inferential statistical analysis is built on logistic regression models with the specified dependent and independent variables. I include separate dummy variables for 'Don't Know' responses in the models to capture the effects of voters' uncertainty about their news consumption.

In selecting control variables to incorporate in my model, I drew upon prior investigations into overall voting behaviour by Campbell et al. (1976) and contemporary studies related to the EU Referendum context, such as Curtice (2017), Hobolt (2016), Fisher and Renwick (2018), and Carl et al. (2019b), and on political identity, Kenny et al. (2021) and Tilley and Hobolt (2023a).

To assess the influence of political news consumption during the various election campaigns and to examine the shifts in time from initial pre-election identity to subsequent post-election identity, I include a lagged dependent variable. This approach aims to increase the precision of estimating the causal relationship between media consumption and identity changes around key elections. The overall null hypothesis (H_0) is that there is no statistically significant relationship between news consumption and changes in Brexit identity.

I aimed to keep all regression models as consistent as possible across all three electoral events to facilitate comparability. However, slight adjustments were necessary in a few cases due to missing variables in certain survey waves or issues with small sample sizes.

4.4 Results

I will begin with an overview of the distribution of Leave and Remain identities over time, followed by detailed analyses of each election campaign period using logistic regression models.

4.4.1 Examining Brexit Identities Over Time

The primary objective of this study is to investigate the influence of news consumption from different sources in shaping Brexit identities.

The data in Table 4.1 shows the distribution of Brexit Identities—'Remainer', 'Leaver', 'Neither', and individuals who answered with 'Don't Know'—as observed across the three election wave groups. The first group consists of Waves 7 and 8, which capture the pre-election/campaign, period for the 2016 EU Referendum, and Wave 9, which captures the recall votes. Similarly, the 2017 General Election triplet consists of Waves 11 and 12, which capture the pre-election and campaign period, and Wave 13, which provides the post-election data. Finally, the 2019 General Election group consists of only pre-election Wave 17 and post-election Wave 19, due to data limitations in the Brexit identity question.

Table 4.1: Brexit Identities Over Time (%)

Election	BES wave	Remain	Leave	Neither	DK
2016 EU Ref.	W7	40.6	42.0	7.7	9.7
	W8	40.4	44.2	6.6	8.8
	W9	47.1	44.1	5.8	3.0
2017 GE	W11	43.3	43.6	6.6	6.5
	W12	43.0	44.4	6.6	6.1
	W13	43.3	43.7	8.1	5.0
2019 GE	W17	41.9	41.6	6.2	10.3
	W19	42.8	42.1	9.0	6.0

Source: British Election Study Internet panel; Waves 7-9, Apr to Jul 2016, weighted, n=5209; Waves 11-13, Apr 2017 to Jun 2017, weighted, n=5351; Waves 17 & 19, Nov 2019 to Dec 2019, weighted, n=4673.

Figure 4.1 complements Table 4.1 as it provides a visual representation of the proportions of Brexit Identities for each election period.[4] Changes in Brexit political identities show limited movement overall, but especially after the referendum. Examining Wave 7 to Wave 9 shows that during the run-up to the EU Referendum, the proportion of Leavers grew slightly, while Remainers stayed relatively

[4]Table A.23 in the Appendix shows proportions of Brexit identities as a stacked area plot.

constant. Yet, during the campaign period, a sizable proportion of 7.7% reported neither a Leave nor a Remain identity, and 9.7% did not have a clear answer to the question. The biggest movement occurs from Waves 8 to 9, when the proportion of 'Don't Knows' decreased and the proportion of Remainers overtook Leave in the recall vote Wave 9. Looking at the post-referendum waves, the results show that there is not too much change at a population level. If anything, there has been a slight overall decrease in the proportion of people with a clear Brexit identity, with more people choosing neither side. However, Brexit identities remain strong even three years after the referendum, consistent with findings by Curtice (2018), Hobolt et al. (2021), and Tilley and Hobolt (2023b).

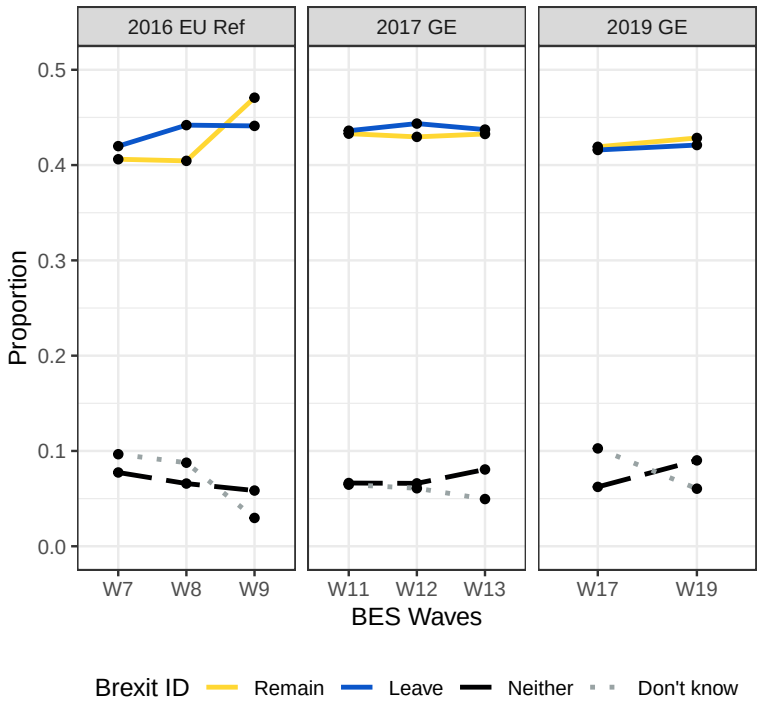


Figure 4.1: Brexit Identities Over Time. Data from the British Election Study (BES), Waves 7–9, 11–13, and 17–19, with corresponding sample sizes of 5209, 5351, and 4673, respectively.

The proportions presented in Table 4.1 and Figure 4.1 differ slightly from the shares of Brexit vote intention outlined in Chapter 3. This variation highlights that while Brexit identities and vote choices are strongly related, their rate of change are not entirely parallel. Not everyone who voted in the referendum

also identified with their vote choice. Notably, pre-campaign Brexit identification among Remain supporters was lower compared to Leave supporters, leading to a significant increase in Remain identifiers following the referendum. In contrast, Leave supporters identified with their side more quickly and demonstrated greater overall stability in their Brexit identity over time. These differences suggest that the development of Brexit identities involves distinct dynamics beyond immediate vote preferences.

Table 4.2 shows notable changes in Brexit identity, although the overall proportion of Brexit identities appears to be relatively stable. Yet, 25% of respondents changed their answer to the Brexit identity question from the pre-referendum campaign period to after the vote in the 2016 EU Referendum. Although there was less switching in subsequent general elections, a significant proportion of voters still changed their Brexit identity, with 14% and 15% changing their answer from pre-campaign to post-campaign measures in the 2017 and 2019 General Elections, respectively. This suggests a significant level of identity switching over these periods.

These overall changes include those who shifted from 'Neither Identity' or 'Don't Know' categories.

When focusing only on individuals who made a switch from Remain to Leave or vice versa, nearly 7% switched during the 2016 EU Referendum campaign period, while 2.5% and 2.3% switched in the 2017 and 2019 General Elections, respectively.

While direct switching from one identity to the other was relatively rare, a larger proportion of individuals formed a new identity (i.e. shifting from 'Don't Know' or 'Neither' to either Leave or Remain. Following the 2016 EU Referendum campaign, 12.4% of respondents adopted a Brexit identity, compared to 5% during the 2017 General Election and 5.9% in the 2019 General Election.

A few individuals also lost their Brexit identity by switching from identifying with either Leave or Remain to answering the question with 'Neither' or 'Don't

Know'. This was the case for 3.8%, 5%, and 4.4% of the sample in the 2016 EU Referendum, 2017 General Election, and 2019 General Election, respectively. Similarly, a very small proportion of respondents switched between 'Neither' and 'Don't Know' across waves. These types of changes are not treated as identity shifts for the purposes of this study and are, together with those who lost a Brexit identity, excluded from the main models, which focus specifically on media effects on the formation or change of Leave or Remain identities.

Table 4.2: Churn Rates: Proportion of Sample Changing Brexit Identity from Pre-Campaign to Post-Campaign Period (%)

Election	Overall Churn	Leave-Remain Churn	Formed ID	Lost ID	DK-None Churn
2016 EU Ref.	25.0	6.9	12.4	3.8	1.9
2017 GE	14.3	2.5	5.0	5.0	1.9
2019 GE	15.3	2.3	5.9	4.4	2.7

Source: British Election Study Internet panel; Waves 7-9, Apr to Jul 2016, weighted, n=5209; Waves 11-13, Apr 2017 to Jun 2017, weighted, n=5351; Waves 17 & 19, Nov 2019 to Dec 2019, weighted, n=4673.

The extent of change in Brexit identities after the referendum is limited, with identities remaining strong and persistent several years after the referendum, but there is some fluidity in Brexit identities, with a small proportion of the population reassessing their identity over the years.

Fluidity of Brexit Identities

To measure the fluidity of Brexit identities from pre- to post-campaign waves for all three electoral events, I use symmetric log odds ratios (SLORs), similar to Kenny et al. (2021), and as described by Heath et al. (1991) and Fisher and Swyngedouw (2002).

Given two options X and Y at two time points t_1 and t_2, the symmetrical log odds ratios (SLORs) for the choice of Brexit identity are defined as follows:

$$\text{SLOR}(X, Y) = \log\left(\frac{\text{P}(X_{t2}|X_{t1})/\text{P}(Y_{t2}|X_{t1})}{\text{P}(X_{t2}|Y_{t1})/\text{P}(Y_{t2}|Y_{t1})}\right)$$

In this expression, X_{t1} represents the selection of Brexit identity X over Y at time $t1$ (i.e., the pre-campaign survey wave), and X_{t2} denotes the selection of Brexit identity at time $t2$ (i.e., the post-election survey wave). The SLOR quantifies the change in the odds of choosing Brexit identity between these two time points, adjusting for the initial choices of Brexit identity. For two Brexit identities X and Y, the odds of adopting identity X rather than Y, given a previous identity of X in the pre-campaign wave, is divided by the odds of identifying with X rather than Y, given a previous identity of Y, at the previous measurement. The odds of identifying as X rather than Y given a previous identity of X at the previous measurement is the conditional probability of identifying as X divided by the conditional probability of identifying as Y given a previous identity of X at the previous measurement. I will examine three scenarios: In this case, Brexit Identity measures X or Y can stand for 1.) Remain ID versus Leave ID, 2.) Remain ID versus No ID, and 3.) Leave ID versus No ID.

The value of SLOR increases when there is less switching between the given options relative to the number of individuals remaining constant. This means that lower values closer to zero indicate more fluidity, while higher values indicate more attachment to the given options. Kenny at al. (2021), who analyse the fluidity of Brexit preferences and associated identities from 2017 to 2019, show that Brexit identity shows greater fluidity than shifts between English and European identities or between British and Scottish identities, although it remains more stable than shifts between other national identities, such as British and English. Furthermore, there is consistently more fluidity between Brexit and Remain identities than between major party identities such as Conservative and Labour.

The results of the SLORs for Brexit identity are presented in Table 4.3 and Figure 4.2.

Table 4.3: Brexit Identity SLORs

	Wave 7-9 SLOR [CI]	Wave 11-13 SLOR [CI]	Wave 17-19 SLOR [CI]
Leave:Remain	4.7 [4.5, 4.9]	6.9 [6.7, 7.0]	7.0 [6.6, 7.4]
Leave:None	2.5 [2.3, 2.8]	3.9 [3.8, 4.1]	4.1 [3.8, 4.3]
Remain:None	3.1 [2.8, 3.4]	4.2 [4.0, 4.3]	4.2 [3.9, 4.5]

Source: British Election Study Internet panel; Waves 7-9, Apr to Jul 2016, weighted, n=4,241; Waves 11-13, Apr 2017 to Jun 2017, weighted, n=18,837; Waves 17 & 19, Nov 2019 to Dec 2019, weighted, n=3,963. SLOR: symmetrical log odds ratios; CI: 95% confidence interval.

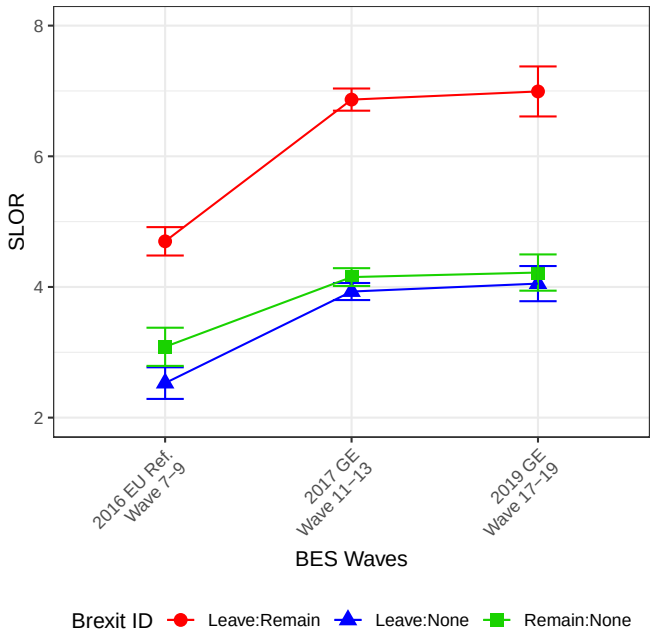


Figure 4.2: SLORs for Brexit Identity. Dots indicate SLORs, and whiskers show 95% confidence interval. Data: British Election Study (BES), with sample weights.

The first notable observation is the significant increase in 'stickiness' to a given identity after the referendum, highlighting how this newly formed political identity has evolved from the pre-EU Referendum period to the more entrenched post-referendum period. Around the time of the 2016 EU Referendum, SLORs show relatively high levels of fluidity, particularly for those with no identity shifting to either Leave or Remain, and even between Leave and Remain themselves. After the sharp increase following the referendum, SLOR scores remained relatively stable from the 2017 General Election to the 2019 General Election. Un-

surprisingly, the shift from Leave to Remain or vice versa is the least fluid, with switching between one of the Brexit identities (Leave or Remain) and no Brexit identity showing considerably more fluidity. My analysis of fluidity between Leave and Remain is consistent with the findings of Kenny et al. (2021), although my SLORs suggest a slightly stronger attachment to Leave and Remain identities compared to their findings. Overall, my findings confirm the general conclusions of Kenny et al. on Brexit identification and provide additional evidence by testing the fluidity of Brexit identities with a different dataset (BES) and over a slightly broader time frame.

4.4.2 Logistic Regression Models - Brexit Identity

To test the effect of political news consumption from different media sources on Brexit identity formation and change, I modelled logistic regressions of participants' political identity as 'Leavers' versus as 'Remainers'.

For each major election—the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election—I modelled separate logistic regressions of participants' Brexit identity (measured in the corresponding post-election wave) as a function of time spent consuming political news from different news sources.

All election models are fitted with the same variables to facilitate model comparisons. Each regression includes an extensive list of socio-demographic and identity control variables. The influence of newspaper consumption on political identity formation may depend significantly on how the news is presented in the newspaper. To account for newspaper slant, each model includes an interaction effect between newspaper consumption and the Brexit stance of the newspaper consumed. For a summary of the newspaper classifications, refer to Table A.24 in Appendix A.4.

Table 4.4 shows the results of three logistic regression models for each electoral event, i.e. the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election. Each model is predicting a Leave ID as opposed to a Re-

main ID and includes the media explanatory variables of interest as well as a set of controls. The primary focus of this study is to assess the estimated treatment effect of news consumption during the corresponding election campaign period on changes in self-categorisation with a distinct Brexit identity. Hence, each model includes a pre-treatment lagged dependent variable capturing Brexit identity from the wave preceding the campaign and election waves to test for media effects of political news consumption during the campaign period on switching of political identity measured in the post-election wave. Figure 4.3 shows the corresponding coefficient plots for the EU Referendum, 2017 General Election, and 2019 General Election models. Slightly translucent dots indicate coefficients that are not statistically significant at the 95% confidence level, while solid-coloured dots represent coefficients that are statistically significant at the 5% level or higher. The plots show both the magnitude and the direction of the association between the explanatory and control variables in relation to Brexit identity. The visualisations help to effectively convey the slight variations in the coefficients between the three models.

Table 4.4: Change in Brexit ID - Logistic regression models of Leave-ID

	Dependent variable: Leave ID		
	(1)	(2)	(3)
	2016 EU Ref.	2017 GE	2019 GE
Internet (ref. = None)			
0<1h	−0.330* (0.157)	−0.361** (0.111)	−0.322 (0.226)
>1h	−0.397 (0.211)	0.267 (0.163)	−0.441 (0.327)
TV (ref. = None)			
0<1h	−0.097 (0.212)	0.230 (0.119)	−0.003 (0.248)
>1h	−0.029 (0.243)	0.257 (0.155)	0.404 (0.322)
Newspaper (ref. = None)			
0<1h	−0.088 (0.357)	−0.051 (0.352)	−0.439 (0.730)
>1h	0.134 (0.442)	−0.570 (0.412)	0.514 (0.847)
Newspaper Stance (ref.= Remain)			
Leave	0.948* (0.394)	0.436 (0.325)	1.427* (0.678)
Unclassified	0.120 (0.507)	0.122 (0.359)	0.209 (0.763)
N.A.	0.296 (0.347)	0.507 (0.300)	0.532 (0.624)
Newspaper * Newspaper Stance (ref.= None*Remain)			
0<1h * Leave	−0.034 (0.443)	0.654 (0.393)	−0.642 (0.831)
>1h * Leave	−0.202 (0.539)	1.253** (0.484)	−1.261 (1.009)
0<1h * Unclassified	−0.155 (0.562)	0.633 (0.437)	0.351 (0.922)
>1h * Unclassified	−0.491 (0.669)	0.617 (0.543)	−0.657 (1.168)
0<1h * N.A.	−0.058 (0.420)	0.183 (0.380)	0.513 (0.789)
>1h * N.A.	−0.536 (0.557)	0.270 (0.490)	−1.718 (1.049)
Radio (ref. = None)			
0<1h	0.185 (0.140)	−0.008 (0.107)	0.040 (0.215)
>1h	−0.315 (0.197)	−0.537** (0.176)	−0.585 (0.333)
People (ref. = None)			
0<1h	0.109 (0.184)	−0.089 (0.114)	
>1h	−0.440 (0.251)	−0.171 (0.170)	
Pre Treatment Brexit ID (ref.= Remain ID)			
Leave ID	4.952*** (0.149)	6.716*** (0.110)	7.016*** (0.242)
Neither	2.321*** (0.203)	3.188*** (0.130)	3.742*** (0.283)
DK	2.304*** (0.219)	3.372*** (0.163)	3.872*** (0.313)
Constant	−2.277*** (0.627)	−3.438*** (0.411)	−3.220*** (0.875)
Pseudo R-sq (McF):	0.621	0.785	0.808
Observations	4,502	15,012	4,013

Notes: *p<0.05; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel Waves 7-9, 11-13, 17-19. Dependent variable: Leave-ID=1, Remain-ID=0, undecided and refusals excluded. DK = don't know. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention, and Pre-treatment Brexit identity (Leave ID, Neither, DK, and ref. being Remain ID).

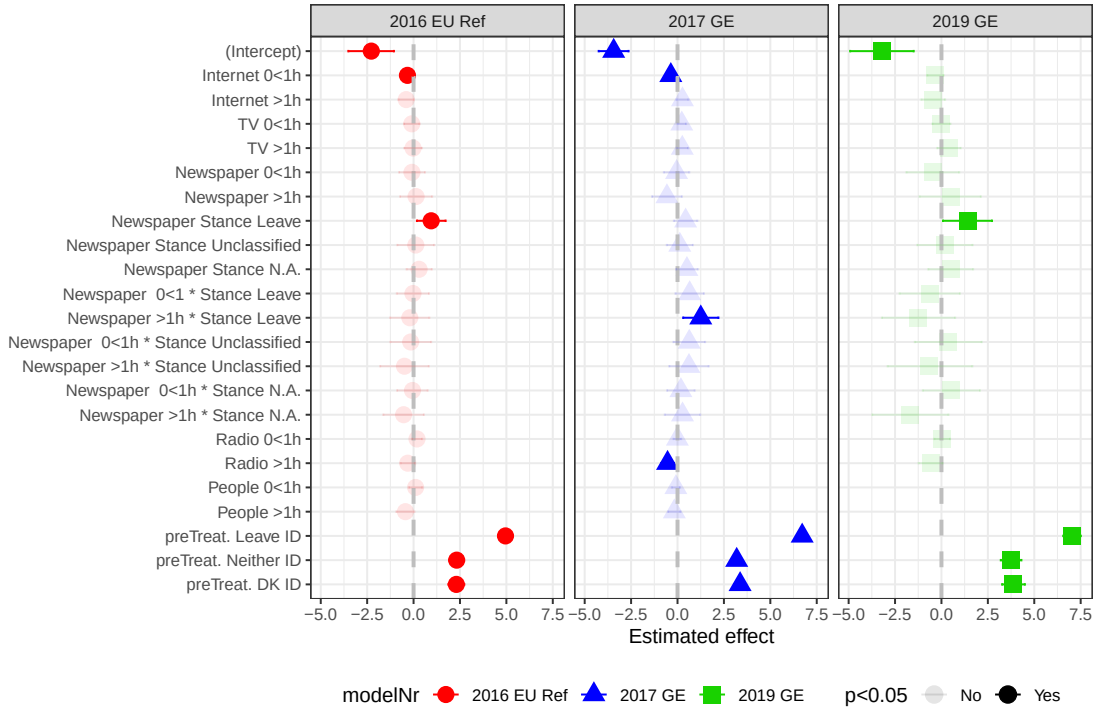


Figure 4.3: Change in Brexit ID; Coefficients of Logistic Regressions of Leave-ID. Note: Dots indicate coefficients, solid coloured coefficients indicate significance at 5% level, and whiskers show the 95% confidence interval. Data: British Election Study (BES), with sample weights.

For robustness, I compared the models presented in Table 4.4 with models that exclude the lagged dependent variable, which also helps in identifying the relationships between the specified media sources and the overall process of Brexit identity formation. An extended version of each table and figure, encompassing all variables including control variables, is provided in the Appendix A.4 (See Table A.27 and Figures A.24).

The control variables show no surprising results and are relatively consistent with previous literature (Chapter 3; Curtice, 2017; Hobolt, 2016; Fisher & Renwick, 2018). For instance, households with lower income levels tend to align with the Leave side, while higher-earning individuals exhibit a propensity toward Remain. Although not statistically significant in all models, my findings confirm the general observation from previous literature that higher levels of education are negatively associated with support for the Leave side. Looking at the age variable in the models, the results are generally as expected. Older participants are more

likely to identify as Leavers, while younger participants are more likely to identify as Remainers.

Comparing the control variables in each election model, it is clear that while there is some variation in the results of individual models, the overarching trends are consistent and do not deviate significantly from established patterns documented in previous literature. This consistency with the existing literature not only underscores the robustness of the analytical approach, but also reinforces the reliability of the findings. The observed variation in the regression models may be due to contextual factors or temporal shifts, but the results demonstrate sufficient coherence of the models to allow for a meaningful comparison of the results.

Model 1 in Table 4.4 displays the regression model for the period of the EU Referendum in 2016. This means that the control and lagged dependent variable are measured in BES Wave 7, the treatment is measured in Wave 8, and the Brexit identity dependent variable is measured in Wave 9. The McFadden's pseudo R^2 for Model 1 is 0.62, indicating that the model explains a substantial proportion of the variance in the dependent variable.

Model 2 and Model 3 in Table 4.4 show the effects for the 2017 General Election and 2019 General Election, respectively. Pseudo R-squared values for both models indicate good fit, with values of 0.79 and 0.81 for Models 2 and 3. The models use a sample of participants who answered the Brexit identity question in both the pre-treatment and post-treatment waves, i.e. Waves 11 and 13, and Waves 17 and 19 for the 2017 General Election and 2019 General Election, respectively. It is important to note that the inclusion of survey weights should help achieve reliable and representative results. Lastly, I would like to note that the data in Model 2 for the information source 'People' variable is sourced from Wave 13, as the British Election Study did not include this question in Wave 12. All other media variables used in the analysis pertain to Wave 12 to keep the causal timeline of effects. As with preceding waves of the BES, not all participants were presented with the Brexit Identity question (referred to as 'euID'), resulting in a smaller

sample size. Unfortunately, the 2019 General Election wave did not include a question regarding news acquired through personal networks, hence the 'People' variable is not used in Model 3. To refine model complexity and address the issue of complete separation, 'Don't Know' responses for the information source variables have been excluded due to their limited occurrence. Additionally, the time categories for media consumption variables have been consolidated into three average daily time brackets: up to one hour, over one hour, and 'none' as the reference category, to streamline the analysis.

People

Based on previous research, we would expect that one's social network plays a crucial role in political communication and that such information received through social networks is likely to correlate with the political views of the recipient (Huckfeldt and Sprague, 1995; Klapper, 1960; Kunda, 1990; McPherson et al., 2001). Moreover, referring to the social network theory of homophily (McPherson et al., 2001) which in the context of politics states that people have a tendency to prefer other people in their network who share their values and opinions and therefore are more likely to have more partisan network ties. Therefore, on average, we would assume that engaging in discussions with others in one's social network about current affairs and politics is likely to involve information that aligns with the receiver's political stance. Consequently, this information is unlikely to induce a change in the individual's mindset or opinions; instead, it is more likely to affirm existing beliefs. Without further distinction of the participants' types of political stances, the regression results suggest, as expected, no clear direct association between engaging in political discussions with people towards one particular Brexit identity. The results of Model 1 clearly demonstrate that none of the coefficients for interpersonal political communication reaches the 5% significance level. Thus, neither during the 2016 EU Referendum nor the 2017 General Election campaign did conversations with others show a significant influence on changes in Brexit

identity from pre- to post-treatment. These null effects may indicate that the influence of interpersonal communication depends heavily on the political perspectives of the individuals involved, and engaging in conversations with others is not inherently biased toward either side. Alternatively, these findings suggest that interpersonal communication lacks persuasive power in this context.

Radio

Radio has varying effects according to election and consumption time. Radio listening does not have a significant effect on Brexit identity change during the EU Referendum campaign. Furthermore, average daily listening behaviour of less than one hour per day is not associated with a significant change in Brexit identity across all three electoral events. However, for all three election events, the coefficients for more than one hour of daily radio listening are negative and even statistically significant at the 1% level for the 2017 General Election. The results suggest that individuals who spend a considerable amount listening to radio news are more likely to shift towards a Remain identity. However, the models only confidently show this relationship for the 2017 General Election campaign. Overall, my findings do not support the initial hypothesis that *BBC*-dominated radio consumption would be positively associated with the formation of a Leave identity among UK citizens. If anything, the results weakly suggest the opposite direction for heavy radio listeners.

TV

Effects for television news consumption are predominantly small and statistically non-significant for all three studied election periods. For the 2017 General Election, the coefficients weakly suggest an association with a change to a Leave identity, but also do not reach the 5% significance level. The results do not present a convincing picture; therefore, the findings for TV news consumption do not indicate any media influence on switching to Leave or Remain identity. Thus,

the results do not confirm the hypothesis that TV news consumption is positively associated with a switch to a Leave identity.

Newspaper

The newspaper consumption measure includes online and offline newspaper reading, and all models include an interaction term to account for the joint effect of time spent reading newspapers for political news and the newspapers' stance on the Brexit debate. This is because we can assume that the influence of newspaper consumption on political opinion formation depends on the main political stance of the newspaper. The reference categories for these interaction terms are individuals who never read newspapers for political news and newspapers with a Remain stance.

The findings presented in Table 4.4 for the 2016 EU Referendum model indicate that the main effect of newspaper consumption time is non-significant. This main effect represents the influence of time spent reading newspapers when the newspaper stance is at its reference category, i.e., pro-Remain newspapers. When considering the combined effect of newspaper time and newspaper stance, the results remain non-significant, including for Leave-leaning newspapers, regardless of the duration of reading. The only statistically significant effect observed is the main effect of newspaper stance for Leave-leaning newspapers, which is significant at the 95% confidence level.

Interpreting the main effect of Newspaper Stance as reflecting someone who consumes a Leave-leaning newspaper for 'no time' is not intuitive. The main effect of Newspaper Stance reflects the expected difference in the dependent variable (e.g., Leave Identity) at the baseline level of newspaper consumption time, which is 'None'.

The BES survey question used to measure newspaper consumption asks: 'During the last seven days, on average how much time (if any) have you spent per day following news about politics or current affairs from each of these sources?' This

aims to specifically assess time spent reading newspapers for political or current affairs news. However, the question used to identify respondents' preferred daily newspaper, and which is the basis for the newspaper stance variable, does not make this distinction. It is therefore possible that respondents might indicate no time spent on newspapers for political news, despite being exposed to newspapers for other purposes, such as entertainment or non-political content.

This discrepancy is likely for two reasons: 1.) In the example of online newspapers studied in Chapter 2, I showed that most online newspaper consumption was not concerned with current political news, and 2.) The newspapers identified in this study as having a clear Leave-leaning stance—the *Sun*, the *Daily Mail*, the *Telegraph*, the *Express*, and the *Daily Star*—are predominantly tabloids, except for the *Telegraph*. The 2016 EU Referendum model appears to capture either a latent effect, whereby individuals who prefer a daily Leave-leaning newspaper are reinforced in forming a Leave identity even if they do not actively consume newspapers as a source of political news, or—more likely—this measure serves as an additional control. Importantly, it cannot be stated with certainty that the coefficient for Leave-leaning newspapers, in isolation and without any interaction with consumption time, reflects an effect driven by actual consumption. Instead, it likely indicates a strong association between Leave identifiers and their preference for Leave-leaning newspapers. For the 2017 General Election, the results clearly show that individuals who read newspapers for more than one hour daily during the election campaign experienced a sizable positive effect on switching to a Leave identity, with statistical significance at the 1% level. Although the results for those with lower average daily consumption time were also positive, they were not statistically significant. The findings for the 2019 General Election are largely non-significant, similar to those for the referendum. Thus, among the three models, only the 2017 General Election campaign shows a clear effect of Leave-leaning newspaper reading on forming a Leave identity over a Remain identity.

The results might also point to long-term effects not explicitly captured in

this study of campaign-period influences. Long-term exposure to consistent political framing, as noted by Norris et al. (1999), can prime readers over time, aligning them more closely with the political stance of their preferred publication. This kind of reinforcement through sustained exposure may explain the alignment between Leave-leaning newspapers and their audience's identity formation.

Internet

The measure of online news consumption excludes online newspapers and is, therefore, likely to be dominated by the *BBC News* website, news aggregators, and social media. Looking at the effect of Internet use on the change from pre-campaign Brexit identity to the post-referendum Brexit identity, the results in Model 1 show significant and negative values for both consumption habits of up to one hour per day (significant at the 5% level) and consumption habits of more than one hour per day (not quite reaching significance at that level). The findings suggest a weak association between Internet use and Remain identity formation. This finding corresponds to the results of Chapter 3, which demonstrated a strong and statistically significant link between consuming political news online and voting to Remain in the Brexit Referendum. The story behind online news consumption during the 2017 General Election is consistent with the findings from the EU Referendum period, with the model predicting with 99% confidence that those who spent up to one hour a day following news online being more likely to have a post-treatment Remain identity. However, for those who spent more time than that, the findings remain statistically non-significant. The 2019 General Election model also shows negative effects, but both time brackets are statistically non-significant. Overall, the findings support my initial hypothesis that Internet news consumption is associated with an increased likelihood of developing a Remain identity, particularly during the formative years of Brexit identity formation. Notably, moderate daily use—up to one hour—appears to have the most significant influence, while spending more time on the Internet for political news shows diminishing returns

in its effect.

4.4.3 Stratified Analysis by Pre-treatment Brexit Identity

To test the robustness of my findings on Brexit identity switching, I conducted additional models treating pre-campaign Leave identifiers and pre-campaign Remain identifiers independently. To account for systematic heterogeneity with respect to pre-treatment Brexit identification in the sample, I employ a stratification analysis approach in addition to the main regression models. This method enables a detailed investigation of how media consumption influences Leave and Remain identifiers before the campaign differently. This method involves dividing the dataset into two strata based on how participants identified as either Leaver or Remainer just before the given election campaign. Separate regression models are then run for each stratum, allowing for the analysis of the effects of different media on Leave identifiers and Remain identifiers independently. This approach acknowledges that media effects may differ based on voters' choices and prior political beliefs.

In the stratified analysis imbalances within the dependent variable of each stratum have further attenuated the statistical robustness of the estimates. Consequently, traditional maximum likelihood estimates derived from this data exhibit considerable variability, biased parameter estimates, or convergence issues, precluding confident interpretation of the outcomes. Firth's penalization method effectively addresses the small-sample bias inherent in maximum likelihood (ML) coefficient estimates. Penalized Maximum Likelihood Estimation (PMLE), as proposed by Firth, enables the computation of finite coefficient estimates even in cases of 'complete data separation'. In situations where a limited number of observed events cause a linear combination of explanatory variables to perfectly distinguish between the two outcome states, maximum likelihood estimation may fail (Puhr et al., 2017). This failure can result in predicted probabilities close to 0 or 1, along with disproportionately large inconclusive intervals due to large

standard errors or even convergence issues. Penalized Maximum Likelihood Estimation can mitigate this problem of complete separation (Puhr et al., 2017; Firth, 1993). To address the challenge of modelling rare event logistic regression, I will adopt a Penalized Maximum Likelihood Estimation, as proposed by Firth (1993) for the stratified analyses. This approach will yield more satisfactory estimates for dealing with rare event data and issues such as complete separation, compared to using traditional maximum likelihood estimates or dropping variables for a more parsimonious equation.

The results of the stratified analysis can be summarised as follows.

For the 2016 EU Referendum, heavy Internet use (more than one hour per day on average) is associated with higher likelihood of forming a Remain ID among those who initially claimed to have a Leave ID before the campaign. Conversely, television consumption showed a positive effect on the likelihood of adopting a Leave identity for those who previously identified as Remain. Additionally, engaging in frequent conversations with others significantly reduced the likelihood of pre-treatment Remainers switching to a Leave identity post-treatment. The results are presented in Table A.29 in the Appendix A.4.

In the 2017 General Election, Internet consumption continued to be associated with a decreased likelihood of developing a Leave identity post-treatment for pre-treatment Leave identifiers. Television again showed a significant association with an increased likelihood of switching to a Leave identity among those who initially identified as Remain before the campaign. However, for pre-treatment Leave identifiers, engaging in more than one hour per day with radio or conversations appeared to reduce the likelihood of maintaining a Leave identity. The results are presented in Table A.30 in the Appendix A.4.

For the 2019 General Election, heavier Internet consumption was once more linked to a Remain identity post-treatment for those who had a Leave identity before the campaign. In contrast to previous findings, television effects were non-significant. However, reading newspapers for more than one hour daily was

associated with maintaining a Leave identity among pre-treatment Leavers. Effects for TV and Radio news are absent for both Leave and Remain identifiers. The results are presented in Table A.31 in the Appendix A.4.

4.5 Discussion

The EU Referendum in 2016 and a lengthy Brexit process introduced a new type of political identity in Britain where more voters identified with a Brexit identity—as either a 'Leaver' or 'Remainer'—rather than with one of the political parties (Evans and Schaffner, 2019; Hobolt and Tilley, 2019).

In this study, I show that while the majority of voters, unsurprisingly, align their Brexit identity with their Brexit vote, there is still considerable fluidity in Brexit identities. A significant portion of voters altered their Brexit identity, with 25% changing their stance from before the 2016 EU Referendum to after the vote. While the rate of change decreased in subsequent general elections, 14% and 15% of voters still altered their Brexit identity between pre-campaign and post-campaign measures in the 2017 and 2019 elections, respectively.

My analysis adds to the findings of other scholars on Brexit identities, demonstrating that Brexit identities mainly formed around, and especially immediately after, the EU Referendum vote in 2016 and persist as a strong identity among voters (Curtice, 2018; Evans and Schaffner, 2019; Kenny et al., 2021). Yet, in accordance with findings by Kenny et al. (2021), there is some degree of fluidity between Leave and Remain identities that should not be overlooked. Even small proportional changes are critical when it comes to social identities, as they tend to be inherently stable, and especially for a polarizing issue that split the UK almost perfectly down the middle at the time of the referendum.

Moreover, this study provides a detailed analysis of the effects of political news use on the formation of and changes to Brexit identities, starting with the 2016 EU Referendum and including the subsequent 2017 and 2019 General Elections. My research findings show the complex role media plays in shaping political identities,

with implications for elections and political polarization in the UK.

My research design acknowledges election and campaign variability by running separate regression models, thus capturing media effects that may be idiosyncratic to each electoral event. This approach proved important and yielded significant contributions to the debate on media effects on Brexit identity formation, as I identified media effects on Brexit identity formation that research by Snow (2024) missed.

In general, the media exerts minimal influence during campaign periods in persuading voters to alter their Brexit identities. Nevertheless, as can be expected, my findings show that some news sources are more influential than others in forming Brexit identities. Conversations with people and television show the least effects on Identity change, followed by Radio use and Newspapers. The use of the Internet (excluding online newspapers) shows clear effects favouring the Remain side.

Table 4.5 provides a summary of the study results, organised by news source and election period.

Table 4.5: Summary Table

News Source	2016 EU Ref	2017 GE	2019 GE	Hypothesis Outcome
Internet	Effect toward Remain ID	Effect toward Remain ID	Null	Accept: associated with Remain ID
TV	Null	Null	Null	Fail to accept/reject
Newspaper	Null	Leave-Papers associated with Leave ID	Null	Inconclusive/Fail to accept/reject
Radio	Null	Some effect toward Remain ID	Null	Reject: Radio does not influence towards Leave ID
People	Null	Null	No data available	Fail to accept/reject

Contrary to my initial hypothesis, the analysis of radio consumption weakly suggests that listening to news had a significant effect towards a Remain identity, but only for those who engaged extensively with radio news. This finding hints, perhaps, that listening to substantial amounts of political news may lead to a readjustment of identities. However, these effects were significant only during the 2017 General Election and not the referendum. Interpreting the effects of radio news consumption poses unique challenges due to the unstructured nature of listening behaviour. Average daily consumption times are likely more prone to recall bias, as radio news is often consumed intermittently and passively, with listeners tuning in and out throughout the day. Unlike TV news, which is typically consumed in fixed segments, radio news is repeated frequently and often serves as background noise during activities such as driving or cooking. As a result, I approached the interpretation of reported consumption times with caution, recognizing the potential for overestimation or inaccuracy. Nevertheless, given that radio news in the UK is dominated by the *BBC*, with over 70% of radio news listeners tuning in to *BBC* stations (Ofcom, 2017, 2018, 2019), identifiable effects could indicate a potential pro-Remain association with *BBC* news.

Similarly, talking to others did not show any significant persuasive influence on changing one's Brexit identity. Both the EU Referendum and the 2017 General Election periods yielded inconclusive findings. This lack of effect may be attributed to several factors. Talking to others might not be a persuasive enough source of information. According to the social network theory of homophily, information shared within closely-knit social groups is often redundant. Thus, conversations about politics within one's social network may not offer new perspectives or information that could influence a shift in political identity. Due to data limitations, this analysis cannot account for the political stance of individuals involved in discussions. As a result, while conversations about politics may influence identity, any potential effects could be neutralised across participants due to random variation. That the findings do not provide evidence that talking to other peo-

ple leads to identity switching aligns with the initial expectations. However, the absence of statistically significant findings means we cannot reject the null hypothesis. Overall, it can be concluded that such discussions had no significant impact on Brexit identity switching.

The main models provided no indication of TV news affecting identity changes. Stratifying the sample into pre-treatment identities shows that for the 2016 EU Referendum and the 2017 General Election, TV was somewhat influential for individuals classified as pre-treatment Remainers in increasing the likelihood of switching to a Leave identity. Thus, the results point towards accepting the initial hypothesis that TV news is positively associated with UK citizens' switching to a Leave identity, yet the evidence is not sufficiently compelling to conclusively support the initial hypothesis.

The relationship between newspaper consumption (including online newspapers) and changes in Brexit identity are not straightforward. In general, the results do not provide sufficient evidence to support the assertion that newspaper reading influenced identity switching. The study found a positive relationship between preferences for pro-Leave newspapers and a Leave identity only during the 2017 General Election campaign, with no similar effect observed for pro-Remain newspapers or during the referendum or 2019 General Election campaigns. Thus, the findings are suggestive of Hypothesis H4a, indicating that consumption of Leave-leaning newspapers is positively associated with a Leave identity. However, no corresponding evidence is found for Hypothesis H4b regarding the influence of Remain-leaning newspapers.

Overall, Internet use shows a tendency towards forming a Remain identity. For the 2016 EU Referendum and the 2017 General Election, moderate daily Internet news consumption (excluding online newspapers) is associated with a decreased probability of identifying as a Leaver after the given campaign period, compared to those who never used the Internet for news. Especially, for those who initially supported the Leave side, online news consumption (excluding newspapers) in-

creased the likelihood of them switching to a Remain identity. The results are consistent with my initial hypothesis that Internet use is associated with a Remain identity and increased the likelihood of switching to a Remain identity.

A comparison of the regression results across the three electoral periods offers no clear indication in support of Hypothesis H5. Contrary to expectations, the 2016 EU Referendum, in which I expected Brexit identities to be the most malleable, shows the smallest media effects. Significant media effects are rare across all three elections, making meaningful comparisons of effect sizes difficult. Overall, there is no conclusive evidence of a consistent pattern of diminishing effects over time.

By comparing three major electoral events (i.e. the 2016 EU Referendum, 2017 General Election, and the 2019 General Election), my study contributes to our understanding of which sources significantly influenced the formation and shifts of Brexit identities and when. The results point to several broader implications. Methodologically, this paper demonstrates the importance of categorising newspaper consumption by the newspaper's political stance in order to obtain robust results. It provides evidence that the political leanings of newspapers significantly matter for political identity formation and development. This research design strategy is likely relevant to other news sources and should be kept in mind in survey collection and when designing future studies.

Secondly, the study shows the complex relationship between media consumption and political identities. Certain types of media, like Internet use (excluding online newspapers), are predominantly associated with a shift towards one side of the debate—in this case, a Remain identity. In contrast, newspaper consumption clearly demonstrates that the political stance of the source is a crucial factor in influencing identity change. Meanwhile, other news sources show little to no evidence of significantly affecting shifts in political identification.

Lastly, the results demonstrate the necessity of examining media effects within the context of specific political events and campaigns. This study suggests that

future research on the relationship between political identification and media effects should adopt a context-sensitive approach. Following this line of argument, further specific data collection and research are required to examine the effects of individual TV channels on political identities, such as Brexit identities.

Gavin (2018) contends that an often overlooked, yet important mechanism of media exposure is the reinforcement of attitudes. Gavin argues that the media's significance may not always lie in changing attitudes, but in consolidating confidence in existing ones. Thus, a more speculative interpretation of the non-significant coefficients in this paper could suggest that media influence the maintenance of existing identities rather than a switch to Leave or Remain identities. For example, in cases of non-statistically significant evidence that Radio news consumption or conversation with others affects the likelihood of switching Brexit identities, those media could still have an influence on listeners or respondent maintaining their Brexit identity. The maintenance of identities as a media effect, while often challenging to test, remains crucial and should not be overlooked.

The broader picture that emerges from this study is that media has shown only minimal influence on Brexit identity switching, with most media sources exhibiting no significant effects. However, the British population has rapidly aligned itself with the new Brexit divide, with many individuals firmly entrenched in their stance. Instances of switching from one identity to the other are rare; consequently, it is important to understand how people become deeply rooted within their respective positions. This entrenchment contributes to the polarization of British politics during the Brexit process. Therefore, the logical next step is to examine how media influences the strengthening of existing identities within one side of the debate, as this could provide crucial insights into the mechanisms driving political polarization and its broader societal consequences. This will be the focus of the next Chapter 5.

Chapter 5

Political Chatter: Investigating Effects of Interpersonal Influence and Mass Media on Brexit Identity Strength

The 2016 EU Referendum has shaped British politics for years, creating a new political divide and even influencing individuals' identities, with 89% of voters identifying as Leavers or Remainers after the vote. Social and political identities are a crucial aspect of political research, as they are often linked to in-group favouritism, out-group prejudice, and affective polarization. As instances of switching from one Brexit identity to the other were rare, it is important to understand how people became deeply rooted in their respective positions—an entrenchment that contributed to political polarization during the Brexit process. To address a gap in the literature on how these identities led some people to become more attached to one side of the Brexit debate than others, this study examines whether different sources of political information, including mass media and interpersonal communication, influence changes in the strength of Brexit identities. Using representative data from the British Election Study and longitudinal mixed-effects models, I analysed how political news exposure during the campaign periods of the 2016 EU Referendum and the 2017 and 2019 General Elections shaped the strength of Brexit identities. The findings reveal that the reinforcement of Brexit identities was primarily driven by interpersonal communication, which played a significant role for both Leavers and Remainers. This is of particular pertinence, as it was the second most commonly reported source of political information, with three-quarters of participants relying on it. Mass media, by contrast, played only a minimal and supportive role in strengthening Brexit identities.

5.1 Introduction

Brexit caused a multi-dimensional political and social rift, creating new political sides, divisions, and identities. This study addresses the research question of

whether different sources of political information, including mass media sources but also conversations with people, influence changes in the strength of Brexit-related social identification. The outcome of the 2016 EU Referendum not only redefined the political relationship between the United Kingdom (UK) and the European Union (EU) but also the political landscape within the UK itself. Brexit revealed a new political division in Britain which resulted in two new political identities splitting the British population into 'Leavers' and 'Remainers' (Tilley and Hobolt, 2023a). These EU Referendum identities, as a direct consequence of the unexpected referendum, were not only new (Tilley and Hobolt, 2023a), they also intersected with traditional British partisan affiliations and solidified into enduring political identities to which voters developed strong emotional attachments (Curtice 2018; Evans and Schaffner 2019). Previous research shows that Brexit identities are relatively stable, with the majority of voters who aligned with either side continuing to demonstrate a strong commitment to their chosen identities even years after the EU Referendum (Evans & Schaffner, 2019; Hobolt & Tilley, 2019; Tilley & Hobolt, 2023a). This trend is particularly notable given the decline in party affiliation over recent decades. For instance, in 1964, 45% of the electorate reported a very strong identification with a political party, yet by 2005, this figure had declined sharply to just 10% (Fieldhouse, Green, Evans, Mellon, et al., 2020). Yet, there is limited research exploring why some people identify so strongly with their side of the Brexit identity and what influences shape them over time.

In my preceding Chapter 4, I examined the formation and fluidity of Brexit identities among British voters, as well as the influence exerted by mass media on these identity changes. This analysis spans from the inception of the new Brexit identities around the time of the EU Referendum to the subsequent 2017 and 2019 General Elections. In this study, I will focus on the changes of strength in Brexit identities for the same time period. Previous research has highlighted the relationship between national identities and the outcome of the referendum, par-

ticularly the heightened likelihood of a Leave vote among individuals identifying primarily as English rather than British or European (Hobolt, 2016). Further investigation has delved into the emergence of Brexit identities and their connection to affective polarization (Hobolt, 2021), as well as the intensity of these identities compared to British party affiliations as of 2018 (Curtice, 2018). Yet, the existing literature falls short in elucidating the underlying mechanisms driving changes in the intensity of Brexit identities over time. In this study, I seek to contribute to this discourse by specifically examining the impact of information sources, such as mass media and social networks, on fluctuations in the strength of Brexit identities from their origin to the 2019 General Election.

The primary aim of this study is to enhance our understanding of political identities by examining how different political news sources influence the intensity and persistence of Brexit identities in the short and medium term. In addition, this study aims to investigate the relationship between mass media and interpersonal political communication in reinforcing existing social identities. Brexit serves as a case study, allowing us to explore these dynamics from the referendum through the subsequent years of negotiations and elections. The 2016 EU Referendum represents a critical case for understanding the initial strength and early development of Brexit identities. In contrast, the 2017 and 2019 General Elections allow us to examine the evolution or change in the strength of these identities over time.

To accomplish this, I will evaluate how various news sources influence the strength of both Leave and Remain identities, utilising a representative sample of British voters from 2016 to 2019 by using panel data from the British Election Study (BES) Internet Panel dataset. I will analyse the outcomes for each electoral event—the EU Referendum, the 2017 General Election, and the 2019 General Election—recognizing that each event is distinct yet intricately connected to Brexit and related political identities.

The results of this study show that mass media demonstrates negligible significance in influencing the strength of Brexit identity for both Remain and Leave

identifiers, while political interpersonal communication significantly reinforces and strengthens existing Brexit identities. This study contributes to the literature by showing that while media alone may not alter Brexit-related social identification, its strength is reinforced through interpersonal political communication among those exposed to political news. The findings have important implications not only for understanding the reinforcement of Brexit identities, but also for the broader role that exposure to political news—across various sources—can play in strengthening social identities. The findings of this study show the potential for interpersonal influence to solidify political identities and potentially further divide individuals along ideological lines.

5.2 Literature

Politics is inextricably linked to communication, particularly in the context of elections and their associated campaigns. This communication is an essential part of the democratic process and involves citizens, political actors, and the media. In examining the impact of political information on political identity, it is important to consider some of the main pathways through which this influence occurs. In this study, I will focus on the following: (1) direct effects of interpersonal political communication, (2) political information transmitted from mass media sources to voters, and (3) interpersonal political communication as a mediator of mass media effects (see Huckfeldt and Sprague, 1995; Katz et al., 2006; Reinemann, 2014).

Media consumption is crucial for disseminating political information to the public and plays an important role in democratic systems (Berelson et al., 1966; P. Lazarsfeld and Merton, 1948). Research on media effects in Britain covers a wide range of evidence on the impact of the media on public opinion formation—for example, through media framing or media consumption habits on public opinion (Barnes and Hicks, 2018), the influence of newspapers on changes in party support (Ladd and Lenz, 2009), or the role of public broadcasters in influencing the public's political knowledge (Soroka et al., 2013).

But mass media are not the only source of political information for the electorate. Social networks and interpersonal communication can be more than just sources of political information; they can also shape the effect of previously obtained political information (Huckfeldt & Sprague, 1987, 1995; Mutz, 2002, Druckman et al., 2018). The mechanism by which individuals—often those with high political interest—act as mediators between media and others is known as the two-step flow of communication (Katz and Lazarsfeld, 2006; Lazarsfeld, Berelson, and Gaudet, 1948). Following an experimental design, Druckman et al. (2018) test the concept of two-step communication. They investigated whether partisan media can indirectly influence opinions through interpersonal conversations, even among people who do not directly consume these media. Their findings strongly support the concept of two-step communication flows, showing that individuals who engaged in conversations with partisan media viewers developed opinions similar to those of the viewers themselves. In particular, the study suggests that the indirect effects of media exposure through discussion can outweigh the direct effects. Furthermore, Druckman et al. (2018) argue that partisan media exposure has a direct effect on political polarization, which is even further exacerbated by the addition of homogeneous discussions.

Drawing on this rich literature, in this study, I will examine the impact of mass media and interpersonal communication on the strength of identification as either 'Leaver' or 'Remainer' from the referendum campaign through to the post-referendum years.

Group salience, group distinctiveness, and clarity of group boundaries positively influence the adoption and shape of social identity (Hogg and Abrams, 1999; Hogg and Turner, 1985; McGuire, et al., 1978; Tajfel, 1982), and political identity (Abrams, 1994). Thus, it is likely that the continued salience of the Brexit debate portrayed in the media has a direct effect on the adoption and strength of Brexit identification. Moreover, the clear distinctiveness of the two Brexit sides—Leavers and Remainers—easily defined by their referendum vote

and their support for or opposition to Brexit likely contributes to the widespread adoption of Brexit identities.

The concept of 'party identification' (Dalton, 2016) suggests that voting behaviour is not solely a rational process, where individuals select a party based on policy alignment or perceived competence in governance. Instead, voters may be driven by affective or emotional factors. They may develop a sense of belonging or association with parties like 'Labour' or 'Conservative'. Due to this emotional connection, they might continue to support their identified party despite reservations about specific policies or doubts regarding leadership competency. Iyengar et al. (2019) describe how affective polarization—animosity between political parties—develops from strong partisanship identification, which in turn becomes one's social identity. As such, affective polarization is associated not only with political consequences but also societal ones. According to Social Identity Theory, individuals derive self-worth from group membership and identify with particular social groups (Tajfel, 1981; Tajfel and Turner, 1979). This identification shapes perceptions of both in-group and out-group members. Identity formation and perceptions are influenced by self-categorisation, where individuals align with groups based on shared characteristics, attitudes, and behaviours, enhancing inter-group differentiation and intra-group similarity (Turner, 1987). Experimental studies reported that categorising individuals into groups can be enough to induce in-group favouritism and out-group discrimination (Billig and Tajfel, 1973; Tajfel, 1970; Turner, 1987). Even groupings that are allocated entirely randomly can lead to in-group and out-group bias (Billig and Tajfel, 1973). Thus, even categories acquired in the very short term can have a substantial impact on social attitudes and behaviour. Hobolt et al. (2021) provide experimental evidence supporting this phenomenon, showing that Brexit identities—through stereotypes, prejudice, and other evaluative biases—generate affective polarization as intense as that stemming from partisanship. Moreover, Social Identity Theory (in the tradition of Tajfel, Turner, as well as Stryker and colleagues) distinguishes between 'identity

prominence' and 'identity salience'—the former reflects the subjective value of a given identity to the identity holder, whereas the latter focuses on the likelihood of an identity to be performed in social interaction (Brenner et al. 2014; Stryker 1968). In other words, both the subjective value of an identity and its likelihood of being relevant in social behaviour are defining characteristics of social identity. Lichtwarck-Aschoff et al. (2008) emphasise that identity is not fixed but a dynamic system shaped by interactions over time. Lichtwarck-Aschoff's et al. (2008) framework highlights the relevance of distinguishing between short-term and long-term processes, typically unfolding over days or weeks versus years, respectively. Short-term processes often involve unreflective or reactive responses to external stimuli (e.g. political campaigns or media framing) that can activate identities or heighten their salience. In contrast, long-term processes typically involve sustained reflection on one's identity, fostering greater stability and resistance to change (Klimstra et al., 2010; Lichtwarck-Aschoff et al., 2008). Thus, it is important to analyse and consider changes in identity strength in the short-term, as not only the meaning of one's identity may evolve, but also its importance, prominence, and the degree to which it is activated or made salient in different contexts, which may increase or decrease over time (Brenner, Serpe, and Stryker, 2014; Lichtwarck-Aschoff et al., 2008; Serpe, 1987).

According to Balance Theory (Heider, 1958) and Cognitive Dissonance Theory (Festinger, 1962), individuals seek balance and consistency in their attitudes, beliefs, and behaviours. Thus, individuals are likely to adopt a Brexit identity that aligns with their existing political attitudes. If inconsistencies arise between political identities, such as Brexit and partisan identities, individuals will adjust one identity to maintain overall consistency. Related to this concept is the assumption that the language and labels used in interpersonal conversations or by different types of news media, outlets, and channels also have a significant impact on the development and strengthening or weakening of group identities. In the

framework of social interactionism, language is considered a crucial and fundamental medium on which self-identification and social interaction depend (Mead et al., 1934). Additionally, social and group identification rely on language and social markers in language, which are linguistic cues (i.e., word choice, labels, language style, etc.) that can help individuals to identify social categories (e.g. age, gender, social class, ethnicity, etc.) or particular groups (Scherer and Giles, 1979, Hogg and Abrams, 1999), or in this case, distinguish Brexit supporters from EU membership supporters. In the context of Brexit, the specific use of certain words and labels, such as 'Remainer', 'Leaver', 'Brexiteer', 'Europhile', 'Eurosceptic', 'Remoaner', and others, may significantly influence the evolution of group identity and the associated strength of that identity. The language employed by both media outlets and individuals within social networks plays a crucial role in framing discussions and shaping narratives about Brexit, influencing how people perceive the issue and their sense of belonging to a particular group. Consequently, I hypothesise that the strength of one's Brexit identity may increase with greater interpersonal conversation, as people tend to engage with others who share similar views, reinforcing their existing identities as suggested by homophily (McPherson et al., 2001) and cognitive dissonance theories (Festinger, 1962).

> H1 *Talking to other people about politics or current affairs is expected to increase the strength of individuals' existing Brexit identities.*

A similar principle applies to media sources that are highly personalised, such as news from social media and non-newspaper online platforms. Therefore, I also hypothesise that Internet use (excluding online newspapers) is associated with an increase in ones existing Brexit identity strength.

> H2 *Internet news consumption (not including online newspapers) significantly increases the strength of individuals' existing Brexit identities.*

Newspaper consumption, particularly when readers prefer newspapers with a distinct political stance on the Brexit debate, is expected to strengthen the existing Brexit identity held by the consumer. This is because individuals tend to seek news

that aligns with their pre-existing beliefs and selectively retain information that is consistent with their political attitudes (i.e. based on selective exposure theory, (Klapper, 1960) and motivated reasoning (1990)). Thus, consuming newspapers with a specific Brexit stance can create a feedback loop that reinforces existing attitudes and strengthens political identities, rather than challenging them.

> H3 *Newspaper consumption (including online newspapers) is positively associated with strengthening Brexit identity. Furthermore, the consumption of pro-Leave newspapers is positively associated with increasing the strength of a Leave identity, whereas the consumption pro-Remain newspapers is positively associated with increasing the strength of a Remain identity.*

Conversely, media sources with fewer options and generally less political bias—such as television and radio, which are dominated by public broadcasters in the UK[1]—are not expected to necessarily reinforce existing identities and may even challenge existing opinions or weaken identity strength. Given this expectation, no formal hypotheses are made for the effects of TV and radio consumption.

While the 2016 EU Referendum primarily concerns the initial formation of Brexit identities, and the 2017 and 2019 General Elections are more relevant to processes of identity revision and reinforcement, the expected effects of media exposure and interpersonal political communication are broadly similar across these contexts and are expected to have the same effect direction. Therefore, for the sake of parsimony and clarity, I formulate a single set of hypotheses that applies to all three campaign periods, while acknowledging that the mechanisms at play may differ subtly depending on the stage of identity development. Furthermore, it is hypothesised that the expected magnitude of the effects will diminish over time as one moves further away from the referendum. This line of reasoning is similar to that of Chong and Druckman (2007), who argue that the effects of political communication tend to diminish over time as individuals become more deeply involved in an issue and exposed to a wider range of arguments. Better

[1]TV and radio news consumption is dominated by the *BBC*, with consistently over 75% of adults using *BBC One* as a television news source and 70% of radio news listeners tuning in to a *BBC* station (Ofcom, 2018; Ofcom, 2019; Ofcom, 2023).

informed individuals are more likely to have established opinions and are therefore less susceptible to persuasion or opinion change.

Research in the field of political identities tends to show that the number of individuals strongly identifying with a political party is decreasing (Crewe, Särlvik, and Alt, 1977; Dalton, 1984; Fieldhouse et al., 2020; Lee and Young, 2013; Sanders, 2017). The EU Referendum however, has introduced a new political identity, which British voters strongly and frequently adopted (Hobolt, 2018; Tilley and Hobolt, 2023a; Curtice 2018; Evans and Schaffner 2019.) In 2018, Curtice interviewed a large subsample (n=2,090) of the British Social Attitudes survey, revealing that a significantly larger number of individuals express a strong attachment to either Remain or Leave than identify themselves as supporters of a specific political party.

This persistence in EU Referendum identity can influence the way voters engage with information related to Brexit or associated political matters, as cognitive biases like selective exposure and motivated reasoning may prompt individuals to filter and interpret information in alignment with their 'Leaver' or 'Remainer' identity (see Curtice, 2018; Webster and Albertson, 2022). Tilley and Hobolt's (2023b) research on Brexit identities and policy group norms sheds light on the mechanisms behind the enduring nature of Brexit identities. Their study reveals distinct differences between the policy norms of Leave and Remain supporters, demonstrating that individuals often align their personal preferences with the norms of their respective in-groups. Tilley and Hobolt (2023b) find that Brexit identities, which are partly based on existing divisions within the electorate, are distinct from traditional partisan identities, but are linked to broader cultural policy preferences rather than being confined to views on European integration. Their research shows that Brexit identities are associated with affective polarization (Hobolt et al., 2021) and perceptual biases (Sorace and Hobolt, 2021; Pickup et al. 2021). Thus, it seems that Brexit identities continue to shape voters' public

opinion and in-group identities with distinct views.

Snow (2024) examines the relationship between media consumption behaviour and Brexit identities, utilizing longitudinal data from the British Election Study panel. The study focuses on general effects rather than delving into the nuanced relationships of specific time periods, media sources, and exposures. The findings provide no evidence that mass media consumption is directly associated with Remainer or Leaver identification. However, the study does find that some media sources (i.e. television, newspapers, and the Internet) are associated with stronger Brexit identification. My study extends and improves on Snow's research by using mixed-effects models that incorporate individual random effects and lagged dependent variables, rather than relying solely on fixed-effects models. Additionally, by concentrating on specific election periods and leveraging the BES campaign-to-election waves, I implement a one-group pre-test post-test research design, which allows for a more differentiated analysis of changing strengths of identity over time.

5.3 Data and Method

In this study, I use the YouGov administered British Election Study Internet Panel (BES) dataset (Fieldhouse et al., 2023). To test hypotheses and closely examine the strength of Brexit identities, I focus on key election waves within the BES. These waves capture both the pre-campaign, campaign, and post-election periods of the EU Referendum, the 2017 General Election, and the 2019 General Election. This analysis specifically incorporates BES Waves 7, 8, and 9; 11, 12, and 13; and 17, 18, and 19. The data for the EU Referendum Vote was collected online by YouGov and fielded for Wave 7 from 14 April 2016 to 4 May 2016; for Wave 8 from 6 May 2016 to 22 June 2016; and for Wave 9 from 24 June 2016 to 4 July 2016. The 2017 General Election triplet was fielded for Wave 11 from 24 April 2017 to 3 May 2017; for Wave 12 from 5 May 2017 to 7 June 2017; and for Wave 13 from 9 June 2017 to 23 June 2017. The General Election was held

on 8 June 2017. The 2019 General Election triplet was fielded for Wave 17 from 9 November 2019 to 12 November 2019; for Wave 18 from 13 November 2019 to 11 December 2019; and for Wave 19 from 13 December 2019 to 23 December 2019—immediately following the vote on 12 December 2019. See Appendix A.5 for a summary in Table A.32. The analysis includes individual cumulative panel weights for each election period, to attain results that are representative of the general British population.

The methodological approach of this study is focused on testing the effect of exposure to various political information sources during election campaign periods on change in strength of Brexit identification.

I follow methodological frameworks for causal inference with observational data, guided by Angrist and Pischke (2008), Shadish et al. (2002), and Singer and Willett (2003) to produce robust and reliable causal estimates within the constraints of the data and methods, while acknowledging the inherent limitations of observational studies.

I make use of three survey waves for each electoral event—one pre-campaign wave, one campaign wave, and one post-election wave—to follow a basic quasi-experimental One-Group Pretest-Posttest Design (see Shadish et al., 2002). The model choice is a linear mixed effects model to run a 'between-person' change model, as laid out by Singer and Willet (2003). In contrast to Snow (2022), who uses an individual-level fixed effects model to test whether an increase (or decrease) in media consumption is a predictor of a stronger (or weaker) Brexit identification than usual, my study adopts a slightly different approach. Here, I am testing whether exposure to political information from different sources during an election campaign period is a predictor of changes in people's Brexit identity. Thus, I specifically take the news consumption measures from the campaign wave and add an individual random effect allowing for each individual to have their own baseline ID-Index level, which accounts for unobserved factors specific to

each person.[2] By also adding a time fixed effect for each survey wave, I control for variables that are constant between individuals but change overtime.

5.3.1 Dependent Variable

To measure Leaver and Remainer identities, the questionnaire asked, 'In the EU referendum debate, do you think of yourself as closer to either the "Leave" or "Remain" side? If yes, which one?' Possible answers were 1) The Remain side, 2) the Leave side, 3) Neither, and 4) Don't know. This question is used to classify individuals into the respective Brexit identities. The following analysis will separately investigate individuals who identify as Leavers and those who identify as Remainers. To minimise noise, the sample is restricted to individuals who maintained consistent identity responses throughout a single election period. Specifically, I excluded individuals who participated in more than one of the three waves within the election period and reported a change in their Brexit identity during that time.

To capture the associated strength of one's Brexit identity, I constructed an index-scale from answers to four questions in the BES dataset aimed to capture the strength of Brexit identification.

In my research design, I adopted a similar strategy to measure the strength of Brexit identity by using a set of scale questions. This approach is analogue to the measures used by Huddy and Khatib (2007) or Theiss-Morse (2009) to measure national identity, and by Greene (1999) for partisan identity. The BES questions used in this study to assess the strength of identity are grounded in political psychology theory and adhere to common practices by using a series of subscales

[2]The random effects model addresses unobserved individual-specific heterogeneity by including an individual-specific random intercept (Wooldridge, 2014). This intercept captures unobserved characteristics that are assumed to be randomly distributed across individuals and uncorrelated with the observed covariates. This assumption allows the random effects model to use variation both within and between individuals over time. Hence, random effects models use both within and between variation, and thus also account for unobserved individual-specific factors, similar to fixed effects, but they do so under different assumptions. The research design and model selection used in this study was informed by Bell et al. (2019), Gelman and Hill (2007), and Wooldridge (2014).

to measure identity strength, but are adjusted to particularly measure strength of Brexit identities. These subscales aim to capture the subjective importance of an identity, a subjective sense of belonging, the feeling that one's status is interconnected with other group members, and positive emotions towards in-group members (Huddy, 2013).

In the BES survey, respondents were able to agree or disagree to each question on a four-item scale, spanning 'Strongly disagree', 'Disagree', 'Agree', and 'Strongly agree'. Moreover, individuals could answer with 'Don't know'. Study participants were only asked the index questions when they identified with either a Leave or a Remain identity. Consequently, those without a Brexit identity are excluded. Henceforth, Brexit identity strength was coded as a scale ranging from 1 (very weak) to 4 (very strong). A score of 1 reflects consistently low levels of agreement, as respondents who produced this score answered 'strongly disagree' to all identity-related questions, resulting in the lowest possible identity score. While the survey responses are technically ordinal, there is a strong rationale for treating the aggregated scale as continuous. As a composite measure derived from multiple questions, the Brexit identity strength scale produces a cumulative score that represents a continuum of identity strength. Notably, this four-point scale lacks a natural midpoint, as the underlying survey questions did not offer a 'neither disagree nor agree' type answer. In addition, 'Don't know' responses were excluded from the coding of identity strength. The survey questions used for the scale are:

> *'When I speak about the Leave/Remain side, I usually say "we" instead of "they".'*
> *'When people criticize the Leave/Remain side, it feels like a personal insult.'*
> *'When I meet someone who supports the Leave/Remain side, I feel connected with this person.'*
> *'When people praise the Leave/Remain side, it makes me feel good.'*

I selected a set of four out of a total of seven questions asked in the BES survey. This choice was made to enhance the accuracy and robustness of measuring Brexit

identity strength, while also optimising for the largest possible sample size without compromising measurement precision. For instance, Question 5 in the BES survey was only fielded in the EU Referendum waves. To increase comparability of identity strength measures over time, I excluded this question due to missing values in the subsequent waves. I decided against using Questions 2 and 4 because, although related to Brexit identity strength, the causal direction of the responses is less clear. For instance, Question 2 asks, 'I am interested in what other people think about the Leave/Remain side.' Agreement with this question could be associated with a stronger sense of in-group identification; however, it may also simply measure political interest and not the strength of identity. Similarly, Question 4 asks, 'I have a lot in common with other supporters of the Leave/Remain side.' An individual with a strong Brexit identity is likely to strongly agree with this question, but it is possible that an individual happens to have a lot in common with members of their Brexit side without feeling a strong identity or connection to the group.

This approach provides an additional, more detailed level of analysis in measuring the impact of media on the development and evolution of political identity and associated strength, and allows estimation of the degree of in-group identification and the extent of perceived group membership.

Table 5.1: Brexit Identity Strength Scale Internal Consistency

Election	Wave Triplet	Cronbach's Alpha	Guttman's Lambda
2016 EU Ref.	W7W8W9	0.82	0.81
2017 GE	W11W12W13	0.86	0.85
2019 GE	W17W18W19	0.88	0.86
Total Avg.		0.85	0.84

The overall Cronbach's Alpha score of 0.85 across all waves shows very good internal consistency for the survey items measuring Brexit identity. Guttman's Lambda of 0.84 confirms the reliability suggested by Cronbach's Alpha. This indicates that the survey items are reliably measuring identity across the different waves, thus bolstering the reliability of the Brexit Identity Index used as the

dependent variable in this study. These results echo Snow's (2024) test of validity and consistency for the Identity measures. This index measure of Brexit Identity Strength will serve as the dependent variable.

To accurately measure the effect of exposure on changes in Brexit identity strength, it was necessary to exclude participants who changed their identity during one election wave triplet period. Therefore, only individuals who showed no indication of identity change within a given election period were included in the sample.

Finally, all models incorporate a lagged dependent variable, specifically the pre-treatment Brexit identity strength measured in the wave prior to the campaign wave. This inclusion accounts for temporal dependence, enabling the analysis to capture changes in Brexit identity strength as a function of news exposure during the campaign period.

5.3.2 Explanatory Variables

The key explanatory variables are participants' media consumption habits. The political news sources examined include television, radio, newspapers, the Internet (excluding online newspapers), and interpersonal political conversations, referred to as 'People' as the news source in the following models. The BES survey asked respondents: 'During the last seven days, on average how much time (if any) have you spent per day following news about politics or current affairs from each of these sources?' The response options were grouped, to increase statistical power and improve model parsimony, into three categories: 'none, no time at all' (the reference category in all models), 'up to 1 hour,' and 'more than 1 hour' of average consumption.

Note that due to data limitations, interpersonal political conversations ('People') are included only in the 2016 EU Referendum and the 2017 General Election periods, and are therefore absent from the 2019 General Election analysis. For the models of the 2017 General Election, this variable (i.e 'People') was derived

from Wave 13 of the BES, as this question was omitted from Wave 12.

Figure 5.1 shows the share of the UK population using each news source examined in this study, based on the BES data. The results align with general trends and proportions documented by the Office of Communications (2018, 2022). Over the period studied in this paper, average media consumption remained relatively stable. Notably, TV is the most widely used news source, closely followed by interpersonal communication. Both are consistently reported by around 75% of participants as important sources of political news and current affairs information. The plots also show a slight upward trend in Internet consumption (excluding online newspapers), which is the third most used source. Newspaper (including online newspapers) and radio news consumption have remained relatively stable, at around 60% and 50%, respectively.

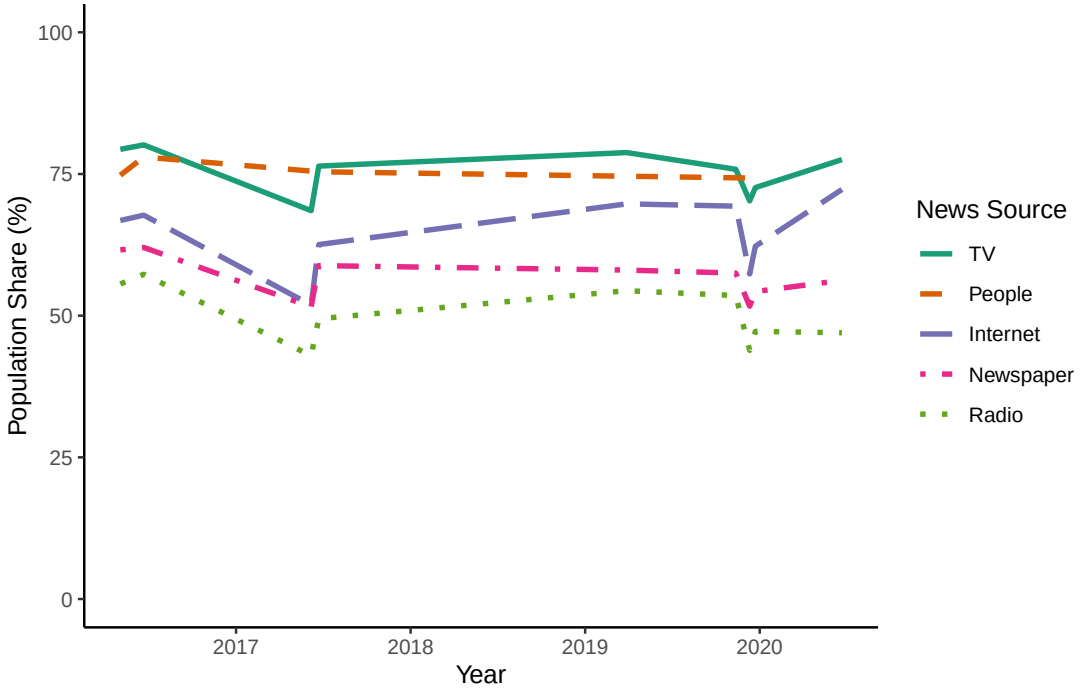


Figure 5.1: Political news sources and the proportion of the UK population using them. Data are sourced from the British Election Study (BES), with samples weighted to reflect the British population.

To capture news exposure through reading newspapers during campaign periods, I use a second question, part of the BES profile variables, that asks all participants: 'Which daily newspaper do you read most often?' Participants were

presented with the following options: the *Express*, the *Daily Mail/Scottish Daily Mail*, the *Mirror/Daily Record*, the *Daily Star/Daily Star of Scotland*, the *Sun*, the *Daily Telegraph*, the *Financial Times*, the *Guardian*, the *Independent*, the *Times*, the *Scotsman*, the *Herald (Glasgow)*, the *Western Mail*, *Other local daily morning newspaper*, *Other Newspaper*, and *None*. For this analysis, I categorised the *Scotsman*, the *Herald*, *Western Mail*, and responses such as *Other local daily morning newspaper* and *Other Newspaper* together as *Other*. As my Chapter 3 and Chapter 4 clearly demonstrate, it is crucial to distinguish between newspapers that have a pronounced Leave or Remain stance in order to evaluate the impact of newspaper reading on voting intentions during the campaign. To address this, each model includes an interaction effect between newspaper consumption and the Brexit stance of the newspaper. I refer to studies by Levy et al. (2016), Jackson et al. (2016), and Deacon et al. (2016) to classify newspapers according to their stance on Brexit. The *Daily Mail*, the *Sun*, the *Daily Star*, the *Telegraph*, and the *Express* are coded as Leave leaning, whereas the *Mirror*, *Guardian*, *Financial Times*, and *Independent* are classified as Remain supporting. However, the *Times*, local newspapers, and other newspapers not specified by participants could not be categorised into a clear Brexit stance and therefore remain coded as 'Unclassifiable Papers' (see Table A.34 in Appendix A.5 for more details.)

By using the preferred daily newspaper question, I can create a variable that measures whether a daily newspaper reader prefers a Leave-leaning, Remain-leaning, or unclassifiable newspaper. Participants who indicated that they do not have a daily newspaper they read most often may either not read daily newspapers, may not have a preferred newspaper, may be unsure of their favourite, or may have chosen not to disclose their preference. Although this group is less clearly defined, it represents a significant portion of the sample and is coded as 'No Preferred Paper'. This group is also carried over to the Newspaper Brexit Stance variable as 'No Preferred Paper'.

Figure 5.2 presents cell percentages for two variables, one classifying whether

one reads newspapers for political news and the other the Brexit stance of an individual's preferred daily newspaper, shown separately for each election.[3] Notably, 5%, 2%, and 2% of the 2016 EU Referendum sample fall into the category of respondents who indicated that they do not read newspapers for political news, yet have a preferred daily newspaper with a Leave, Remain, or unclassified stance, respectively. The share of this group of individuals is even larger for the 2017 and 2019 General Elections.

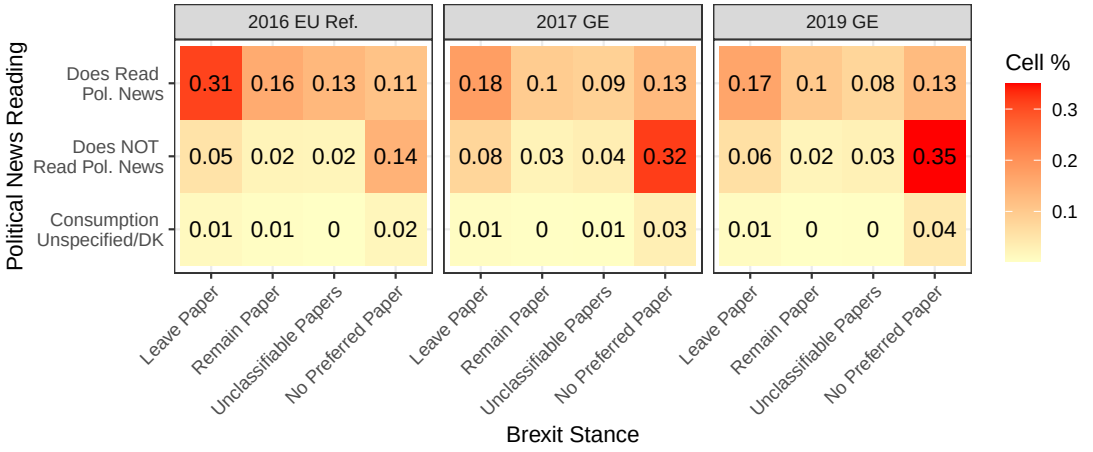


Figure 5.2: Newspaper reading for political news by Brexit stance of favourite daily newspaper. Data from the British Election Study (BES), Waves 7–9, 11–13, and 17–19, with corresponding sample sizes of 20,918, 21,520, and 19,000, respectively; samples are weighted to represent the British electorate at each election.

This demonstrates that roughly 11% of respondents listed a favourite daily newspaper but did not report recently reading a newspaper for political news. This group is likely dominated by those who read newspapers for entertainment or other non-political information. Even a newspaper that is consumed for entertainment purposes rather than for political news may still exert an influence, as the general format and titles employed in its presentation may still affect its audience. Moreover, for the 2016 EU Referendum sample, 11% reported reading political news but did not indicate having a preferred daily newspaper. This share remains consistent at 13% for both the 2017 General Election and the 2019 General Election.

[3] A heatmap illustrating daily newspaper preferences and their Brexit stances among Leave and Remain identifiers is presented in Figure A.29 in Appendix A.5.

When comparing newspaper readership for political news between the 2016 EU Referendum and the 2017 General Election in Figure 5.2, we observe a noticeable decline in political news reading. This drop is particularly pronounced among readers of Leave-leaning newspapers, but it is also evident among readers of Remain-leaning newspapers. This substantial decline in political news readership during such a politically turbulent period is striking. Future research should investigate the mechanisms behind this trend, exploring whether individuals reduced their political news consumption to avoid the stress of turbulent politics or whether other factors, such as media fatigue or shifts in news consumption habits, played a role.

It is important to note that for the profile variables in the BES dataset, such as the preferred daily newspaper question, YouGov determines the intervals at which the profile variables are collected. Henceforth, it is not possible to assume that they are measured exactly during a BES wave, and the dates of collection may vary. However, I use the most up-to-date measure of daily newspaper preference available for the given election period.

All models control for age, gender, education, employment status, household income, British and European identification, party identification, and political attention. Moreover, as noted above, the individual random effects accounts for unobserved heterogeneity between individuals. To guide my selection of control variables, I consulted previous research on voting behaviour by Campbell et al. (1976) as well as studies on the EU Referendum, including Curtice (2017), Hobolt (2016), Fisher and Renwick (2018), Carl et al. (2019b), and Kenny et al.(2021) on political identity.

5.4 Results

The results section begins with an overview of Brexit identity strength over time, followed by a detailed analysis of the model results estimating the causal effects of political news exposure on Brexit identity strength during each election campaign period: the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election.[4]

Figure 5.3A shows the proportion of the British population that identified as 'Leavers' or 'Remainers' for the period spanning the 2016 EU Referendum campaign period, the 2017 General Election, and the 2019 General Election. Most notably, there is a sharp increase in the proportion of individuals who identify with their respective Brexit identities immediately after the day of the referendum. This increase is slightly more pronounced among Remainers. Figure 5.3B illustrates average Brexit identity strength levels for both Leave and Remain identifiers over the same period. Changes in identity strength at the population level look similar for Leavers and Remainers. After a notable spike and sustained higher levels of average identity strength following the referendum, levels remain fairly stable until finally falling to a new plateau following the 2017 General Election. Levels of strength again remain fairly stable until a smaller decline following the 2019 General Election.[5]

[4]Note: The official campaign period for the 2016 EU Referendum ran from early April 2016 until polling day on 23 June 2016 (Walker, 2017). The official campaign for the 2017 General Election ran from early May 2017 until polling day on 8 June 2017 (Cowley and Kavanagh, 2018). The official campaign for the 2019 General Election ran from early November 2019 until polling day on 12 December 2019 (Ford et al., 2021).

[5]For further descriptive insights into population level changes in average Brexit identity strength, additional figures are provided in the appendix. Figure A.32 compares the average identity strength of both Leavers and Remainers from pre- to post-election across each electoral period. Figure A.29 presents the distribution of Leave and Remain identifiers by preferred daily newspaper, and figures A.34 to A.37 further display average Brexit identity strength by participants' media consumption patterns across different news sources.

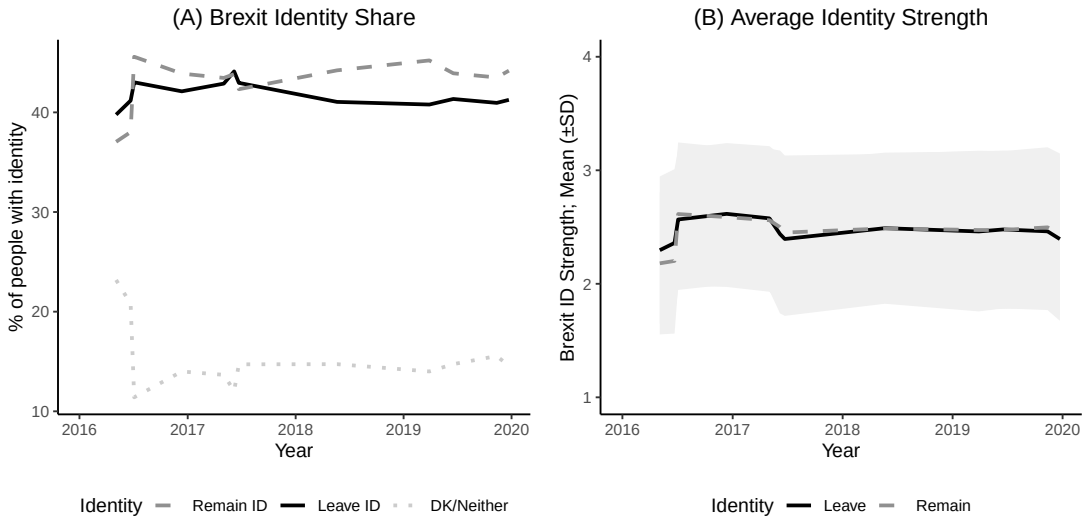


Figure 5.3: Brexit identity share and average strength. Figure A illustrates the percentage of the British electorate identifying as closer to either the 'Leave' or 'Remain' side. Figure B depicts the average strength of Brexit identity among 'Leave' and 'Remain' identifiers, with the grey shaded area representing ±1 standard deviation from the mean. Data are sourced from the British Election Study (BES), with samples weighted to reflect the British population.

The summary Table 5.2 offers a detailed comparison of within-person variation in Brexit Identity Strength (measured on a 1–4 scale) across the three election periods: 2016 EU Referendum, 2017 General Election, and 2019 General Election. The measures focus on how stable or volatile individuals' identity strength was over time. The first metric in Table 5.2 is the average of each person's standard deviation in identity strength across the three waves within each period. In the 2016 EU Referendum period, individuals showed the highest average volatility (0.302), decreasing in the 2017 General Election period (0.280) and further in 2019 General Election period (0.250). This suggests that for individuals, identity strength became progressively more stable over time.

Table 5.2: Within-Person Variation in Brexit Identity Strength by Election Period

Election Period	2016 EU Ref.	2017 GE	2019 GE
Survey Waves	7, 8, 9	11, 12, 13	17, 19
Within-Person St.Dev.	0.302 (0.222)	0.280 (0.268)	0.250 (0.274)
Coefficient of Variation	0.130 (0.107)	0.118 (0.124)	0.111 (0.132)

Notes: Cell entries show sample mean with associated standard deviations in parentheses.

A substantial proportion, 38% of the population, changed their identity strength by more than one standard deviation between the pre-election and post-referendum waves in 2016. This figure declines to 26% in the 2017 General Election period, and further to just 17% in the 2019 General Election period.[6] The variation of within-person standard deviation is used here as a measure of heterogeneity in stability. This measure increases slightly from 0.22 in 2016 to 0.27 in 2019, indicating that while most individuals became more stable, a subset remained volatile, and this gap widened. The coefficient of variation (CV) provides a standardised measure of the variability of data points relative to its mean. Here, it is used as a normalised measure of instability in a person's identity strength variations to account for scaling differences due to between-person variation. The CV dropped from 0.13 to 0.12, and then to 0.11, over the course of the three electoral events, further confirming a reduction in relative variation in identity strength over time. This pattern also reinforces the finding that the 2016 EU Referendum period exhibited the greatest degree of within-person change.

Although, on the population-level, variability in identity strength increased slightly, suggesting growing divergence in how strongly individuals identified with either side, within-person variation in Brexit identity strength became increasingly more stable over time. This seems plausible, as the repeated salience of Brexit over multiple election cycles likely led individuals to consolidate their positions. Early on, identities may have been more malleable, shaped by new information, however, over time individuals increasingly aligned themselves with a more stable sense of being a 'Leaver' or 'Remainer'.

This growing consolidation of Brexit identity over time raises important questions about the role of political information in shaping and reinforcing these attachments. In the following section, I present model results that assess the impact of political news consumption across different media sources on changes in the strength of Brexit identity.

[6]For additional metrics on population-level and within-person variation in Brexit identity strength, see Figures A.30 and A.31 and Table 5.2 in the appendix.

5.4.1 Effects of Political News Exposure on Brexit Identity Strength

For the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election, I modelled separate linear mixed effects models of participants' Leave and Remain identity strengths, to test my hypotheses. The models estimate treatment effects of political news exposure during the corresponding election campaign period on changes in the level of Brexit identity. To do so, each model includes a pre-treatment lagged dependent variable capturing Brexit identity strength levels from the wave preceding each campaign wave. As anticipated, this is the strongest predictor across all models, as previous political identity strength is strongly connected to subsequent levels.

For each electoral event, I created two separate models, one for Leave identifiers and one for Remain identifiers. Table 5.3 shows the results for change in Leave identity, and Table 5.4 shows the results for change in Remain identity. All models are fitted with the same set of variables to facilitate model comparisons.

Figure 5.4 presents the model coefficients for the key media variables of interest—Internet, Television, Radio, Newspaper, and Interpersonal Communication—with the Leave and Remain identity models plotted side by side. Coefficients in blue correspond to the Leave identity strength models, while those in yellow represent the Remain identity strength models. Translucent dots indicate that the coefficients are not statistically significant at the 95% confidence level.

The following sections detail the effects of each political news source variable included in the models, exploring their specific effects on changes in Brexit identity strength.

Table 5.3: Effects of Political News Exposure on Leave ID Strength - Results from Linear Mixed Effects Models

	Dependent variable: Leave ID Strength		
	(1)	(2)	(3)
	2016 EU Ref.	2017 GE	2019 GE
FIXED EFFECTS			
Internet (ref. = None)			
0<1h	−0.008 (0.017)	0.017* (0.008)	0.010 (0.015)
>1h	−0.009 (0.024)	0.045*** (0.013)	−0.013 (0.022)
TV (ref. = None)			
0<1h	0.010 (0.029)	0.017 (0.010)	−0.001 (0.017)
>1h	0.021 (0.031)	0.023 (0.012)	−0.003 (0.021)
Newspaper (ref. = None)			
0<1h	−0.128 (0.075)	−0.037 (0.035)	0.016 (0.069)
>1h	−0.104 (0.084)	0.048 (0.046)	0.076 (0.090)
Newspaper Stance			
(ref.= Remain Paper)			
Leave Paper	−0.126 (0.076)	−0.024 (0.030)	−0.021 (0.056)
Unclassifiable Papers	−0.175 (0.092)	−0.025 (0.034)	0.024 (0.064)
No Preferred Paper	−0.145* (0.072)	−0.029 (0.029)	−0.002 (0.053)
Newspaper * Newspaper Stance			
(ref.= None*Remain Paper)			
0<1h * Leave Paper	0.162* (0.081)	0.065 (0.037)	0.034 (0.073)
>1h * Leave Paper	0.132 (0.090)	−0.036 (0.048)	0.009 (0.094)
0<1h * Unclassifiable Papers	0.151 (0.100)	0.034 (0.042)	−0.052 (0.082)
>1h * Unclassifiable Papers	0.167 (0.110)	−0.024 (0.056)	−0.008 (0.106)
0<1h * No Preferred Paper	0.137 (0.081)	0.062 (0.037)	−0.009 (0.072)
>1h * No Preferred Paper	0.171 (0.095)	−0.060 (0.052)	0.001 (0.104)
Radio (ref. = None)			
0<1h	−0.020 (0.016)	−0.013 (0.008)	0.026 (0.015)
>1h	−0.006 (0.022)	−0.007 (0.014)	0.012 (0.024)
People (ref. = None)			
0<1h	0.069** (0.023)	0.038*** (0.009)	
>1h	0.128*** (0.030)	0.052*** (0.014)	
Pre Treatment Leave ID Strength	0.743*** (0.012)	0.823*** (0.006)	0.861*** (0.010)
Intercept	0.756*** (0.143)	0.465*** (0.040)	0.376*** (0.068)
RANDOM EFFECTS Variance (Std.Dev.)			
Individual Intercept	0.029 (0.169)	0.020 (0.142)	0.008 (0.089)
Residual	0.115 (0.339)	0.107 (0.327)	0.102 (0.320)
Observations	5,312	14,845	3,708
R^2	0.71	0.74	0.79
Log Likelihood	−3,390.181	−7,898.518	−1,708.274

Notes: *p<0.05; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel Waves 7-9, 11-13, 17-19. Dependent variable: Leave Identity Strength Index; Cell entries for fixed effects are coefficients, with associated standard errors in parentheses; entries for random effects represent variance and associated standard deviation in parentheses. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention. Pre-treatment Brexit identity and survey waves are included as time fixed effects.

Table 5.4: Effects of Political News Exposure on Remain ID Strength - Results from Linear Mixed Effects Models

	Dependent variable: Remain ID Strength		
	(1)	(2)	(3)
	2016 EU Ref.	2017 GE	2019 GE
FIXED EFFECTS			
Internet (ref. = None)			
0<1h	0.021 (0.022)	0.010 (0.009)	0.002 (0.016)
>1h	0.024 (0.028)	0.007 (0.011)	0.019 (0.022)
TV (ref. = None)			
0<1h	−0.003 (0.024)	−0.006 (0.009)	−0.017 (0.017)
>1h	0.010 (0.027)	−0.005 (0.012)	−0.017 (0.021)
Newspaper (ref. = None)			
0<1h	0.056 (0.050)	0.018 (0.020)	0.009 (0.038)
>1h	0.009 (0.055)	0.017 (0.022)	0.028 (0.042)
Newspaper Stance			
(ref.= Remain Paper)			
Leave Paper	0.028 (0.064)	−0.055* (0.025)	−0.030 (0.050)
Unclassifiable Papers	0.063 (0.065)	0.002 (0.025)	−0.005 (0.048)
No Preferred Paper	0.006 (0.049)	−0.023 (0.019)	−0.024 (0.036)
Newspaper * Newspaper Stance			
(ref.= None*Remain Paper)			
0<1h * Leave Paper	−0.075 (0.070)	0.042 (0.029)	0.027 (0.057)
>1h * Leave Paper	−0.001 (0.085)	0.028 (0.038)	0.038 (0.073)
0<1h * Unclassifiable Papers	−0.084 (0.070)	−0.018 (0.028)	−0.017 (0.055)
>1h * Unclassifiable Papers	0.058 (0.077)	−0.006 (0.033)	−0.021 (0.065)
0<1h * No Preferred Paper	0.005 (0.056)	0.017 (0.023)	−0.001 (0.043)
>1h * No Preferred Paper	0.051 (0.074)	0.012 (0.031)	−0.062 (0.055)
Radio (ref. = None)			
0<1h	0.015 (0.018)	0.022** (0.008)	0.022 (0.014)
>1h	−0.019 (0.026)	0.024* (0.012)	0.0001 (0.021)
People (ref. = None)			
0<1h	0.037 (0.024)	0.056*** (0.011)	
>1h	0.066* (0.033)	0.070*** (0.014)	
Pre Treatment Leave ID Strength	0.756*** (0.013)	0.834*** (0.006)	0.870*** (0.009)
Intercept	0.412*** (0.113)	0.325*** (0.037)	0.339*** (0.066)
RANDOM EFFECTS Variance (Std.Dev.)			
Individual Intercept	0.028 (0.169)	0.020 (0.142)	0.010 (0.098)
Residual	0.128 (0.357)	0.095 (0.309)	0.095 (0.308)
Observations	4,977	15,292	3,451
R^2	0.69	0.77	0.81
Log Likelihood	−3,593.391	−8,041.462	−1,431.237

Notes: *p<0.05; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel Waves 7-9, 11-13, 17-19. Dependent variable: Leave Identity Strength Index; Cell entries for fixed effects are coefficients, with associated standard errors in parentheses; entries for random effects represent variance and associated standard deviation in parentheses. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention. Pre-treatment Brexit identity and survey waves are included as time fixed effects.

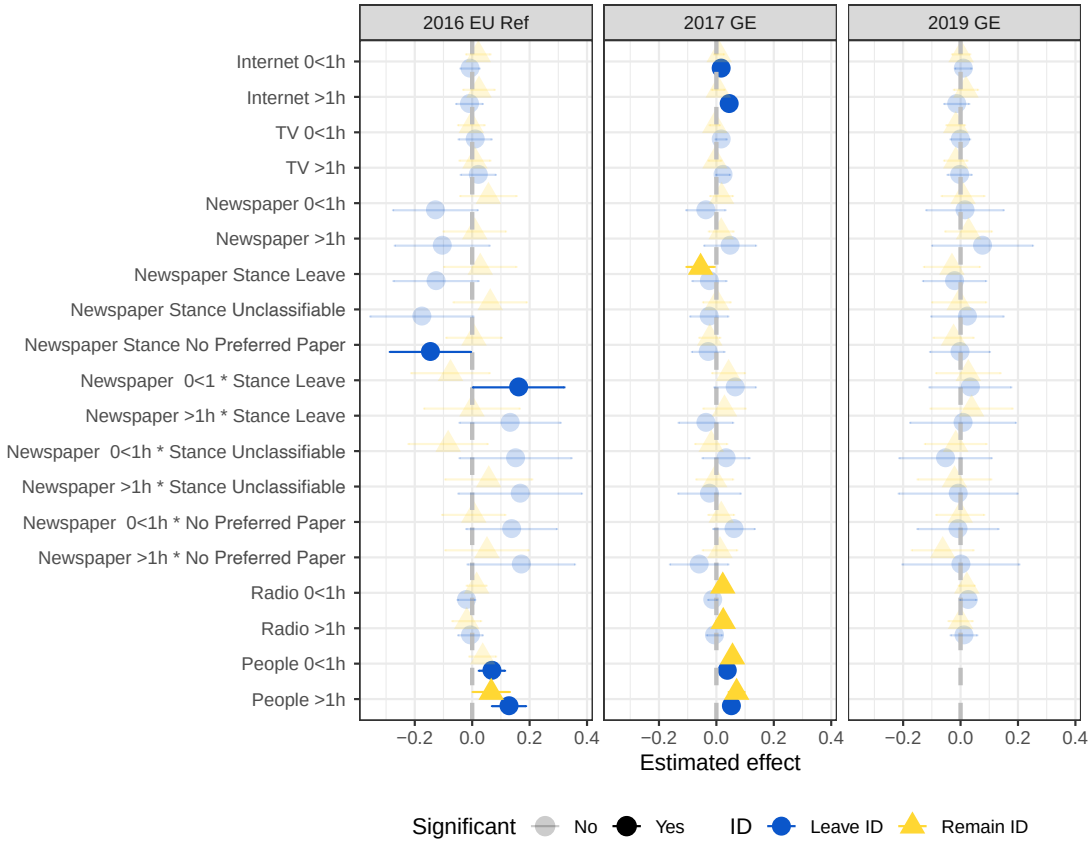


Figure 5.4: Coefficients of linear mixed effects models predicting change in Brexit identity strength. Note: Dots indicate coefficients, solid coloured coefficients indicate significance at 5% level, and whiskers show the 95% confidence interval. Data: British Election Study (BES), with sample weights.

Internet, TV, Radio

I begin by describing the results for Internet, TV, and radio.

The question used to measure Internet use focuses on political news consumed online and excludes the use of online newspapers. As a consequence, this measure is likely dominated by direct visits to the *BBC News* website—which is the most popular online political news source in Britain—and highly user-specific news sources, such as social media, social networks, and blogs.

For Leave identifiers, the results for Internet use, presented in Table 5.3, are non-significant for the 2016 EU Referendum and the 2019 General Election. However, the 2017 General Election is the exception, with a significant positive effect for more than one hour of daily online news consumption increasing the likelihood

of strengthening one's Leave identity from the period before the 2017 General Election campaign to post-vote.

The results for Remain identity strength, presented in Table 5.4, do not show statistically significant effects for political news exposure via the Internet. Thus, the results lend only limited support to the initial hypothesis that Internet news consumption strengthens individuals' existing Brexit identities, and it does so only for Leavers in the 2017 General Election campaign.

Based on the fitted model, I estimated average marginal effects for different levels of consumption levels for each media type. The marginal effects interpret the expected change in the dependent variable according to changes in news consumption, averaged across the observed values of the other covariates in the dataset. Figure 5.5 displays the predicted average marginal effects of Internet, TV, Radio, and Interpersonal Communication (i.e. People) on Brexit identity strength for each election period, segmented by average daily exposure levels: None, up to one hour, or more than one hour. The middle column shows the effects for the 2017 General Election, where the figure clearly demonstrates that, for Leave identifiers, higher levels of Internet news exposure are associated with an increase in identity strength. In contrast, Remain identifiers do not exhibit a similar effect, as their identity strength levels appear unaffected by Internet exposure.

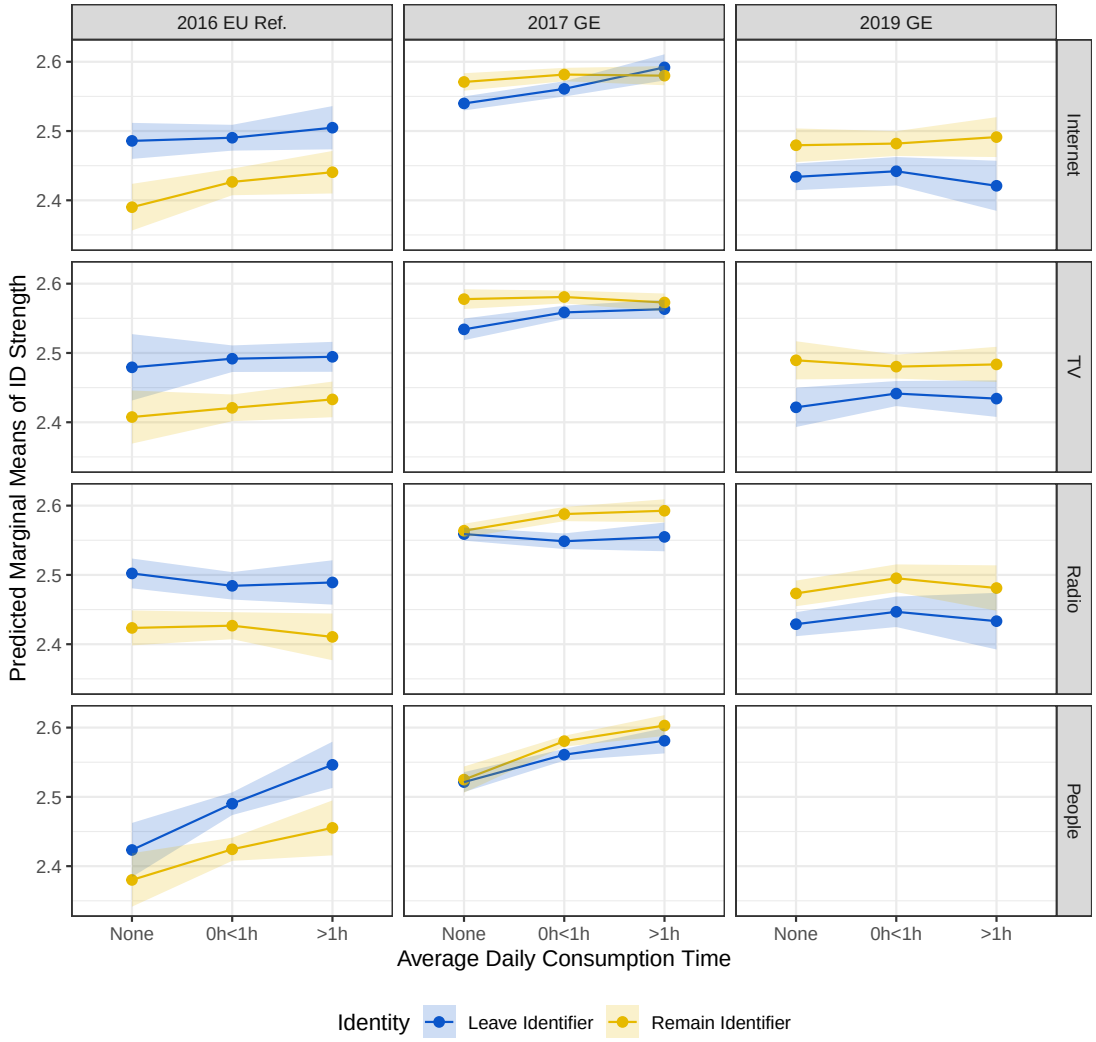


Figure 5.5: Predicted Identity Strength by News Source

It is worth noting that the 2017 General Election period provided the largest sample size. To determine whether the observed significance—such as the Internet effects, which are absent in other election periods—is primarily due to higher statistical power from the larger sample, I compared the results to results from bootstrapped mixed effects models. The results for the bootstrapped mixed effects models for Leave and Remain identifiers are presented in Appendix A.5, Table A.38 and A.39, respectively. The bootstrapped results show clearly that, even with a reduced sample, all identified effects stay consistent with the original models shown in Tables 5.3 and 5.4, providing further confidence in the robustness of the results.

The impact of TV as a political news source is minimal regarding changes in identity strength; all coefficients for Leave and Remain identity are non-significant. Examining the predicted marginal means reveals a slight increase in strength among Leavers during the 2017 General Election, yet these effects remain statistically non-significant. Overall, television exposure shows no detectable influence on Brexit identity strength for either Leavers or Remainers.

Similar to TV, the results for radio listening do not suggest a meaningful relationship with the strength of Leave identity. Somewhat surprisingly, however, both up to one hour and more than one hour of daily radio news consumption during the 2017 General Election campaign shows a strengthening effect on Remain identity. Therefore, the results for Leave identity strength align with initial expectations, as radio news showed no effect on strengthening Leave identity. However, the same cannot be said for Remain identity—at least not for the period of the 2017 General Election. Testing the influence of radio on changes in Brexit identity revealed that individuals who spent considerable time listening to radio news were more likely to shift toward a Remain identity (Chapter 4). Thus, I conclude that radio news had some effect on Remain identification but not on Leave identity, although the underlying mechanism remains unclear.

Newspaper

The regression results for newspaper consumption are somewhat more complex to interpret. In order to make an overall judgement, it is necessary to consider not only the findings regarding average newspaper reading times, but also the stance of the newspapers and, in particular, the interaction effect of the two. In both Leave and Remain models, none of the coefficients reach statistical significance at the 1% level, and only a limited number are significant at the 5% level. For those coefficients that barely reach significance, effect sizes remain small. During the 2016 EU Referendum period, for Leave identifiers, the combined effect of reading a pro-Leave newspaper and engaging with newspapers for political news

yields slightly larger effect sizes, though only reading for up to one hour reaches significance at the 5% level, and even then, only marginally so. When examining the predicted marginal means for newspaper exposure, shown in Figure 5.6, it becomes clearer for Leave identifiers, reading a pro-Remain newspaper for political news tends to be associated with a decrease effect on identity strength. Statistical strength, however, is limited due to high variability. In contrast, reading a Leave-leaning newspaper has no effect compared to not reading it. For Remain identifies during the 2016 campaign, newspaper reading does not show any obvious signs of making a meaningful difference to identity strength.

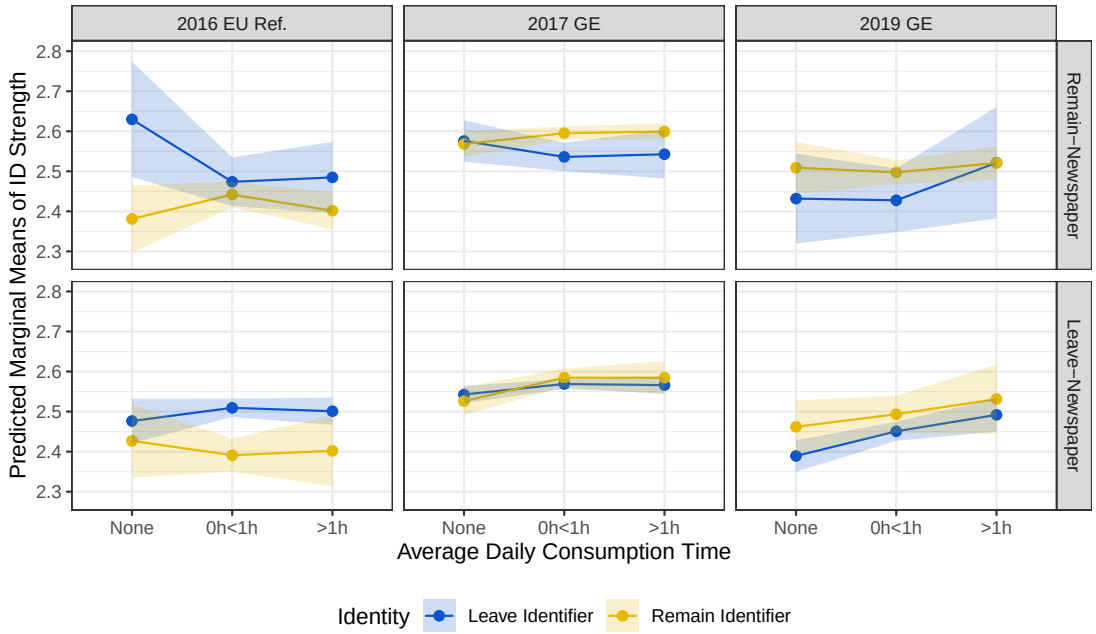


Figure 5.6: Predicted Identity Strength by Newspaper Stance

Identity strength levels for the 2017 General Election remain largely unaffected by newspaper exposure for both Remain and Leave identifiers. Results show mainly non-significant effects with small effect sizes. This general conclusion also holds for the 2019 General Election, where no significant coefficients are observed.

The predicted marginal means for reading either a pro-Remain or pro-Leave newspaper during the 2019 General Election campaign show slightly positive effects for both identities. This may be of particular interest given that overall

identity strength levels were decreasing during this period. However, due to high variability in the results, no definitive conclusion can be drawn. In addition, in Figure 5.6, the right column for the 2019 General Election reveals a somewhat puzzling effect. Although, as previously mentioned, none of the effects of news sources on identity strength during the 2019 General Election are statistically significant, the predicted marginal effects suggest that for Leave identifiers, reading either Remain-leaning or Leave-leaning newspapers for more than one hour daily was associated with an increase in Leave identity strength. Similarly, an analogous effect is observed for Remain identifiers, where increased reading time of Leave-leaning newspapers also appears to strengthen Remain identity. It is important to note that the share of individuals consuming newspapers that oppose their Brexit identity is relatively rare. During the 2019 General Election period, only 11% of Remain identifiers reported a preference for Leave-leaning newspapers, while an even smaller proportion—just 4%—of Leave identifiers preferred Remain-leaning newspapers (see Appendix A.5, Figure A.33). A plausible explanation for these effects might involve motivated reasoning. At this stage in the Brexit debate, most individuals had likely held a consistent Brexit identity for an extended period. Once a decision about political identity is made, exposure to information from the opposing political side may have less impact on reevaluating identity and is more likely to be processed through the lens of motivated reasoning—an interesting observation that warrants further research.

The complex relationship between consumption time and a newspaper's Brexit stance indicates that the effects are not as straightforward as initially expected. Various factors, such as cognitive dissonance, motivated reasoning, and attitude reinforcement, are likely influencing dynamics in various directions. With such mechanisms specific to the individual level, making clear predictions remains challenging.

In summary, the findings generally do not support the hypothesis that newspaper consumption is positively associated with an increase in the respective Brexit

identification. Neither pro-Leave newspapers nor pro-Remain newspapers had clearly identifiable effects on Brexit identity strength.

People

Interpersonal political communication is the only news exposure variable consistently significant across all measured periods (though it is absent for the 2019 General Election due to data limitations).

For Leave identifiers, all effects are significant at least at the 1% level, with a slightly increasing effect size as average daily exposure time increases. The predicted average marginal effects, shown in the bottom row of Figure 5.5, display a clear linear positive effect with Leave identity strength significantly increases for those with average daily exposure times of up to one hour, and an even greater increase for those with over one hour of daily exposure. For Remain identity strength, the trend is similar, though effects are slightly smaller. Due to higher variance, statistical significance for Remain identity strength is only observed for those engaging in over one hour of interpersonal political conversations daily.

The results for the 2017 General Election are even more pronounced, with both Leave and Remain identities increasing in strength as average interpersonal political communication increases. While the difference in identity strength between up to one hour and over one hour of exposure is not as substantial as observed for the referendum, all effects are precise, with statistical significance at the 0.1% level.

At the population level, average identity strength was highest from just after the referendum until mid-2017, followed by a general decline from the pre-campaign to post 2017 General Election. Nevertheless, interpersonal political communication is positively associated with increases in both Leave and Remain identity strength during this period.

In summary, no political news source has as clear or as significant an effect on identity strength levels as interpersonal communication, which clearly shows that

engagement in political discussion with others increases one's respective identity strength.

5.4.2 Effects of Mass Media Exposure and Political Interpersonal Communication

To compare and investigate the relationship between political news exposure through mass media and interpersonal political communication, I classified respondents into four distinct exposure groups: no exposure (neither interpersonal nor mass media sources were used), only mass media (mass media sources alone were used), only interpersonal communication (interpersonal sources alone were used), and both mass media and interpersonal communication used together. A 'Mass Media' measure was created to indicate whether individuals reported using any of the following sources for political information: TV, newspapers (including online editions), radio, or the Internet (excluding online newspapers). This variable was coded as 'Used' if at least one of these sources was reported and 'None' if none were used, resulting in a binary indicator of mass media consumption. An analogous coding scheme was used for interpersonal political communication. I modelled, as before, separate linear mixed effects models for each individual electoral events. All models include time fixed effects, controls, and individual random effects. As the data lacks measurements of interpersonal political communication for the 2019 General Election, I had to exclude this event from the analysis. The results for 2016 EU Referendum and 2017 General Election are shown in Table 5.5.

The results are consistent with those presented earlier in this paper. However, they add an important aspect to the analysis of the effects of interpersonal political communication on identity strength, since the results presented in Table 5.5 show that interpersonal communication as a political news source in isolation is, in most cases, not sufficient to change someone's identity strength in a meaningful way. Similarly, and as shown above, the political news sources grouped here under

Table 5.5: Effects of Mass Media Exposure and Political Interpersonal Communication - Results from Linear Mixed Effects Models

	Dependent variable:			
	Leave ID Strength	Leave ID Strength	Remain ID Strength	Remain ID Strength
	2016 EU Ref.	2017 GE	2016 EU Ref.	2017 GE
FIXED EFFECTS				
Political News Exposure through (ref. = None)				
Mass Media & Interpersonal Communication	0.130* (0.061)	0.060*** (0.014)	0.0004 (0.056)	0.068*** (0.017)
Only Mass Media	0.058 (0.063)	0.019 (0.015)	−0.057 (0.058)	−0.004 (0.019)
Only Interpersonal Communication	0.015 (0.113)	0.038* (0.017)	0.060 (0.098)	0.017 (0.020)
Pre Treatment Leave ID Strength	0.751*** (0.012)	0.823*** (0.006)	0.754*** (0.013)	0.834*** (0.006)
Intercept	0.563*** (0.126)	0.438*** (0.029)	0.440*** (0.108)	0.310*** (0.034)
RANDOM EFFECTS				
Variance (Std.Dev.)				
Individual Intercept	0.029 (0.170)	0.021 (0.142)	0.029 (0.170)	0.021 (0.144)
Residual	0.115 (0.340)	0.108 (0.328)	0.127 (0.357)	0.098 (0.314)
Observations	5,416	15,330	5,055	15,799
R^2	0.70	0.74	0.69	0.76
Log Likelihood	−3,432.074	−8,195.536	−3,617.386	−8,460.442

Notes: *p<0.05; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel Waves 7-9, 11-13. Cell entries for fixed effects are coefficients, with associated standard errors in parentheses; entries for random effects represent variance and associated standard deviation in parentheses. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention. Pre-treatment Brexit identity and survey waves are included as time fixed effects.

mass media (i.e. television, newspapers (including online editions), radio, or the Internet (excluding online newspapers)), as a collective, do not show significant associations with a change in the strength of Brexit identities. However, individuals exposed to political information through both mass media and interpersonal communication during each election campaign period demonstrate a statistically significant increase in identity strength. For Leave identifiers, significant effects are shown for both the 2016 EU Referendum and the 2017 General Election, significant at the 5% and 0.1% levels, respectively. The same is not observed for Remain identifiers during the referendum period. However, the combined effect of mass media and interpersonal communication is associated with an increase in the strength of Remain identity in the 2017 General Election, statistically significant at the 0.1% level.

These results reveal the limited individual impact of mass media or interpersonal communication in complete isolation. Both mass media (TV, newspapers, radio, and the Internet) and interpersonal communication appear to be ineffective in changing the strength of political identities when used in isolation.

However, the results show that the combination of mass media and interpersonal communication leads to meaningful changes in the strength of political identities, albeit through interpersonal political communication, as conversations with others seem to be the mechanism by which previously received information is possibly supported or credited though the means of social interactions.

Prior to discussing and concluding these results, it is necessary to acknowledge a few limitations of the analysis. Self-reported survey data carries certain limitations, such as the risk of the introduction of social desirability bias. Social desirability bias manifests as a tendency for respondents to provide answers that align with social norms or values, rather than reflecting their actual behaviours or attitudes (Marlow and Crowne, 1961). Participants may feel, for example, that watching the news is a socially desirable behaviour; thus, they may over-report their TV news consumption in order to align with what they believe is expected or

approved by society. Furthermore, participants may encounter difficulties in accurately recalling their average consumption times. Accordingly, I exercised caution when interpreting consumption times by focusing on the direction of effects and category-based differences. Average consumption times were classified from smaller increments into broader categories of 'none', 'up to one hour', and 'more than one hour'. As also noted by Fisher and Renwick (2018), the British Election Study (BES) panel consists of participants who evince a high level of political engagement, as demonstrated by their willingness to complete comprehensive online questionnaires on multiple occasions throughout the year. It is probable that this group is more politically informed and less susceptible to alterations in voting behaviour or political identity than a fully randomised sample. Consequently, the results of this study may under-represent the extent of change in voting behaviour or identity. In light of this potential bias, it is reasonable to estimate that the observed effects are likely to be smaller than they would be in a more diverse, random sample survey, suggesting that the findings might slightly underestimate the true effects. As previously stated, a quasi-experimental research design was employed, using separate panels from the British Election Study (BES) to temporally separate measures of news consumption from the outcome variable. However, it is important to acknowledge the inherent limitations of causal inference with observational data. Notwithstanding the constraints of the study, the applied research design, the use of a longitudinal mixed effects model, and the application of post-stratification weights to enhance representativeness of the sample enabled the acquisition of valuable insights into the impact of diverse news sources on the formation and evolution of political identification among the British population.

5.5 Discussion

The aim of this study was to assess how various news sources—including television, newspapers, radio, Internet, and interpersonal communication—influence shifts in the strength of Brexit identities. Building on the findings presented in

Chapter 4, which analysed how news consumption shaped Brexit identity formation and switching, this study explores the degree of identity strength to which these identities have fluctuated over time. The results of Chapter 4 show that while Brexit identities were found to be relatively stable, there was notable fluidity, with 25% of voters changing their stance before the 2016 EU Referendum to after the vote. In subsequent general elections, this fluidity decreased, with 14% and 15% of voters shifting their identities, respectively. This paper extends these findings by examining the impact of news sources on changes in the strength of Brexit identities, focusing on shifts in identification as a Leaver or Remainer from before the campaign period to after the elections for the 2016 EU Referendum and the 2017 and 2019 General Elections.

The results show that following the EU Referendum, there was a noticeable rise in the strength of the Brexit identity for both Leave and Remain identifiers. Right after the referendum, 53% of Leavers and 58% of Remainers identified strongly with their respective Brexit identities. After the 2017 General Election, however, the strength of Brexit identity declined for both identities. By contrast, the 2019 General Election saw little change, with identity levels remaining stable.

For the referendum and the first two general elections which were most affected by the recent vote to leave the EU, the results of the mixed effects models presented show that, in particular, talking about politics and current affairs with other people plays a significant role in strengthening existing political identities. When comparing Brexit identities, there are systematically different effects, albeit small, for Leave and Remain identifiers.

My findings correspond to some degree with results by Snow (2024) in that they suggest that while news exposure has limited effects on the initial formation of political identity, it plays a significant role in reinforcing existing political identities. However, whereas Snow argues that media consumption in general reinforces Brexit identification, my findings reveal a more nuanced picture, with notable variations across different news sources and time periods. In particular,

interpersonal communication, which Snow did not include in his analysis, shows the most consistent association with increases in social identity strength.

My previous investigations into the effects of Internet news use (excluding online newspapers) on voting Leave in the EU Referendum (Chapter 3) and on identifying as a Leaver after the referendum and subsequent general elections (Chapter 4), suggested that Internet news consumption was more associated with a Remain position. However, the results presented in this study show that Internet use had a slight reinforcing effect on identifying as a Leave voter during the 2017 General Election campaign, with effect size increasing the more time spent using online news. Yet, except for the effect observed for Leave identifiers during the 2017 General Election, other coefficients do not reach statistical significance. In the regression models, there are no significant effects of Internet use for Remain identifiers. Overall, I find no clear support for my initial hypothesis that the highly individualised experience of seeking news online significantly strengthens identity for both Leavers and Remainers.

The most widely used source of political news among the British electorate is television, with over 75% of respondents reporting regular use. Nevertheless, no notable association was identified between television news consumption and changes in identity strength. This was observed for both the Leave and Remain identities, with the results failing to reach statistical significance for all three election periods.

The results indicate that radio news consumption strengthened Remain identification among listeners during the 2017 General Election campaign. However, no effect was found during other election campaigns or among those identifying with the Leave position. The findings are consistent with the results presented in Chapter 4, which show that radio news listening was associated with adopting a Remain identity during both the 2017 and 2019 General Elections.

Although there are indications that politically slanted newspapers may influence Leave and Remain identifiers differently, neither pro-Leave nor pro-Remain

newspapers show a clear impact on Brexit identity strength. Overall, the findings do not support the hypothesis that newspaper readership is positively associated with an increase in Brexit identification.

Of all the sources of political news examined, none appears to affect the strength of political identity as clearly or significantly as interpersonal communication. Engaging in political discussions with others is strongly associated with an increase in political identity strength for both Leavers and Remainers. Interpersonal political communication is not only notable because of the effect size shown by the models—it had the most consistent and largest effect on the strength of someone's identity for both Leave and Remain—but also due to its frequency of exposure. Conversations with people is the second most commonly reported source of political news, just after television, with three-quarters of all participants reporting that they rely on people for political information. This renders it a critical factor, as even modest effects are pertinent when a considerable proportion of the population is affected.

As Reinemann (2014) describes, an individual's network of interpersonal political communication encompasses all those with whom they engage directly on political matters. However, this engagement can involve anything from talking about political topics, perhaps even indirectly related, to listening to others discuss politics. These networks commonly consist of family members, friends, colleagues, neighbours, and fellow members of various social groups, such as sports clubs. As such, a person's communication network can be segmented into various sub-networks, some of which are more closely tied to their daily life than others (Reinemann, 2014). Classic social network theories posit that information within close connections, or 'strong ties', is often redundant (Granovetter, 1973). Individuals within these networks are likely to share similar opinions and knowledge, as people tend to like and engage with others that are similar to them (McPherson, 2001), and information tends to circulate within these networks rather than introduce new perspectives (Granovetter, 1973; Burt, 1992) Following this no-

tion, in more cases than not, talking with people in one's social network about politics and current events will generally involve content that supports the recipient's political viewpoint and reinforces their existing identities as suggested by theories of homophily (McPherson et al., 2001), Balance Theory (Heider, 1958), and cognitive dissonance theories (Festinger, 1962). Importantly, social interactions in the form of conversations are crucial for self-identification (Mead et al., 1934) and identifying one's group membership (Tajfel, 1981; Tajfel and Turner, 1979). Therefore, as hypothesised, the strength of one's Brexit identity is likely to increase with interpersonal conversations, as people tend to engage with others who share similar views, reinforcing their existing identities. Chapter 4 found no effect of political discussions on influencing individuals to change their Brexit identity. However, the results presented in this study show clearly that interpersonal political communication produced distinct, statistically significant results in strengthening an existing Leave or Remain identity. This outcome holds true for both the 2016 EU Referendum and the 2017 General Election and thus confirms the initial hypothesis.[7]

Nevertheless, the mechanism is slightly more complex than that, as further analysis showed that for individuals who are never engaged in receiving political news from the analysed media sources, interpersonal communication as a political news source in isolation is in most cases not sufficient to change someone's identity strength in a meaningful way. The results demonstrate that the interplay between mass media and interpersonal communication contributes to notable shifts in the strength of political identities. This effect appears to occur primarily through interpersonal communication, as discussions with others reinforce or validate information previously received through other channels, thereby solidifying identity through social interaction.

Further research is warranted to investigate the exact chain of effects, as this finding represents an intriguing contribution to the literature and may not be

[7]Note that data for the 2019 General Election is missing due to data limitations.

unique to Brexit identities.

Building on the work of Hobolt et al. (2021), the findings of this study clearly demonstrate the key role of social interactions as amplifiers of identity-driven divisions. While mass media alone may not directly reshape Brexit identities, media provides the informational basis that, when processed in interpersonal discussions, is likely to deepen the emotional and evaluative bonds individuals feel towards their in-group. Finally, the findings of this study show that media effects and political communication are more dynamic, shaped by interactive effects, and context-dependent than is often assumed, with potential implications for understanding how political identities evolve over time, especially in relation to high-stakes political events like the Brexit Referendum and subsequent elections.

Chapter 6

Conclusion

Political information, whether disseminated through mass media or exchanged via personal communication, plays a central role in politics and democracy. Ideally, political information sources fulfil fundamental functions in a democratic society, including guaranteeing widespread access to knowledge, encouraging accountability by evaluating and critiquing the activities of the government, and offering forums and resources for discussion and debate (Bogart, 1997). This thesis examines the impact of various political information sources—including mass media, social media, and interpersonal communication—on the formation of political attitudes and electoral behaviour during the pivotal event of the 2016 EU Referendum and subsequent years in the UK.

The 2016 EU Referendum was a major political event that resulted in a country divided not along party lines but by the new categories of Leave and Remain. The electorate was less able to rely on party cues when it came to choosing sides, placing particular importance on political communication in guiding voters in their choices. Furthermore, Brexit continued to be a leading topic in UK politics in the subsequent years, which included two general elections, in 2017 and 2019. For these reasons—the potential media influence on shaping Brexit identities and the continued relevance of the event even eight years after the vote—Brexit is an interesting and theoretically important case for my research on the impact of political information on voter behaviour and identity formation. The overarching motivation for this thesis is the examination of the transforming media landscape

in the UK and people's political news use behaviour on political systems, the spread of information, the electorate, and public opinion.

Following a multidisciplinary and quantitative methods approach that combines computational social science, political science, and sociology, this research investigates the ways in which exposure to political information, both in terms of source and volume, can shape public opinion, voting patterns, political identities, and polarization. The research in this thesis focuses particularly on the polarized camps of Leave and Remain supporters and addresses the question of whether these sides engaged in different news-seeking behaviours and whether certain media types—both traditional and digital—and interpersonal communication were more influential in shaping electoral behaviour and identity. In doing so, it provides a comprehensive analysis of how evolving media landscapes and the plethora of media choice influence political identities and voter behaviour over time and addresses several key questions, including: How does media consumption contribute to political polarization and influence the political reasoning of citizens? To what extent do information sources and volume of information affect changes from voting intentions to actual voting behaviour? How does political information from various sources influence the formation, persistence, and changes in political identities?

The research topics in this thesis cover a wide range of theories from the disciplines of Sociology and Political Science, ranging from Festinger's (1962) cognitive dissonance theory, Kunda's (1990) motivated reasoning theory, and Klapper's (1960) selective exposure theory to Weberian rationality theory. The thesis employs a range of quantitative methods, including statistical inference, regression analysis, machine learning techniques, and network analysis. The data sources used in the study include browsing history data and panel survey data sets, especially the British Election Study data set.

By testing and comparing the effects of various information sources on political behaviour at different electoral events—the EU Referendum, the 2017 General

Election, and the 2019 General Election—this research engages in modal and temporal comparisons, while ensuring that the analysis is firmly anchored in each election's unique circumstances. This approach renders the work pertinent not only in the context of Brexit, but also in the broader study of media's political impact in modern democracies.

To summarise the findings of this thesis, Table 6.1 presents an overview of the key results from each chapter, broken down by news source.

Chapter 2 examines the role of media consumption in shaping public opinion during the Brexit Referendum campaign period by examining whether there was polarization of online media consumption between Leave supporters and Remain supporters during the campaign. With the initial hypothesis that individuals are more likely to seek out political information and media outlets that confirm, rather than challenge, their existing political beliefs, I anticipated distinct differences between Leave and Remain supporters and their online news consumption portfolios. To empirically test this hypothesis, I used a combination of clickstream data and survey data (Banducci et al., 2018). The clickstream data captures participants' browsing history from 1 May to 23 June 2016, while the survey data from the same participants provides socio-demographic and attitudinal information. To analyse and integrate these datasets, I employed standard statistical methods, including several regression models tailored to each application, as well as network analysis techniques. The findings indicate a significant overlap in online media consumption during the campaign period, suggesting that individuals who accessed political news online were exposed to multiple sources, potentially reducing the risk of single-sided news exposure. However, the data also reveal that individuals' preferred online news outlets generally aligned with their political attitudes. The study shows that, while there were minor differences in the preferred news outlets of Leave and Remain voters, the overall patterns of online news consumption did not differ substantially between the two groups, due to the shared news sources in their media portfolios. There was notable variation

Table 6.1: Summary Table: Key Findings Across Chapters

Source/Chapter	**Chapter 2** *Online Brexit News Network*	**Chapter 3** *ΔBrexit Vote*	**Chapter 4** *ΔBrexit Identity*	**Chapter 5** *ΔBrexit ID Strength*
Online News (including newspapers)	Leave/Remain supporters showed selective exposure for primary news sources. News portfolios with > 1 domain were heterogeneous, not polarized. The *BBC* accounted for 37% of all clicks, attracting 57% of participants (slightly more Remain supporters).	-	-	-
Online News (excluding newspapers)	-	**Pro-Remain:** Online political news increased likelihood of switching to Remain.	**Pro-Remain:** Online news consumption was linked to forming/switching to Remain identity.	**Pro-Leave:** The Internet only shows a significant strengthening effect for Leave identifiers in the 2017 GE.
Television	-	**Pro-Leave:** TV consumption increased likelihood of shifts to Leave vote.	**Null:** No significant effects	**Null:** No significant effects
Radio	-	**Null:** No significant effects	**Pro-Remain:** Radio news was linked to Remain identity (in 2017 & 2019 elections for > 1h/day listeners)	**Pro-Remain:** No significant effects except for Remain identifiers in the 2017 GE.
Leave-leaning Newspaper	-	**Minimal/Null** Leave-leaning newspapers were associated with Leave voting but had limited persuasive effect.	**Pro-Leave for Leave Papers:** Significant effect on identity switching to Leave-ID was present only for > 1h/day reading in 2017 GE. Preference for Leave-leaning newspaper was associated with Leave identity formation.	**Null:** No significant effects
Remain-leaning Newspaper	-	**Pro-Remain:** Remain-leaning newspapers had a strong persuasive effect towards Remain.	**Null:** No significant effects	**Null:** No significant effects
People		**Pro-Remain:** Talking to others (for up to 1h/day) made them more likely to vote Remain.	**Null:** No significant effects	**Pro-Remain & Pro-Leave:** Interpersonal political communication was the primary reinforcer of Brexit identity strength.

in news consumption behaviour in terms of time spent seeking news online, with a substantial portion of the population accessing little to no referendum-related news online, while a small group of 'super-readers' exhibited frequent and intensive engagement with online news. Among those actively seeking political news, there was no significant evidence of ideological segregation resulting from biased news exposure during the lead-up to the referendum.

Using representative data from the British Election Study Internet Panel, Chapter 3 investigates whether the type of news source and volume of political news individuals consumed during the 2016 EU Referendum campaign contributed to changes from UK citizens' vote intentions to their actual vote cast in the EU Referendum. Employing a pretest-posttest design, explanatory variables were measured in separate panel waves from the response variables, with an added lagged dependent variable to capture changes from pre-treatment voting intentions to post-treatment vote recall. The results suggest that online political news consumption (excluding newspapers) increased the likelihood of a shift in voting intentions towards Remain during the campaign, while television news consumption was associated with a shift towards Leave. The effect of newspaper reading varied according to the Brexit stance of an individual's preferred newspaper. Leave-leaning newspapers were predominantly associated with an audience that voted Leave, but had a limited persuasive effect in driving a shift towards Leave during the campaign. In contrast, Remain-leaning newspapers had a significant impact in persuading their readers to vote Remain. These findings demonstrate the significant impact of media-specific consumption patterns on voting behaviour.

In an effort to better understand the mechanisms behind the formation of Brexit-related political identities within a political landscape that has been largely restructured by these very identities, Chapter 4 uses a longitudinal study to investigate the influence of media consumption on the formation of, and specifically, changes in UK citizens' Brexit identities over time. Brexit introduced a new form

of political identity in Britain, in which more people in Britain identified as either 'Leaver' or 'Remainer' than with political parties. The mechanisms by which Brexit identities were formed has not received much scholarly attention. This study investigates Brexit identities across three major electoral events: the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election. The sources of political news examined are television, radio, newspapers, Internet (excluding online newspapers), and conversations with people. The analysis shows that the influence of the media on Brexit identity switching was modest, if not entirely absent. There is some evidence that news accessed via the Internet increased the likelihood of developing or switching to a Remain identity during the 2016 EU Referendum and 2017 General Election campaigns. In addition, extensive reading of Leave-leaning newspapers was associated with switching to a Leave identity in the 2017 General Election, while radio consumption during the same period showed an association with Remain identifiers. Surprisingly, media effects were largely absent during the referendum period, with the most significant effects appearing in the 2017 snap General Election. Unsurprisingly, no significant media effects were found for the 2019 General Election, as identities were largely formed prior to that.

Chapter 5 builds on the study presented in Chapter 4 by examining the influence of different media—television, newspapers, radio, Internet, and interpersonal conversations—to affect changes in the strength of Brexit identities. Using the same data from the British Election Study Internet Panel, I tracked the strength of both Leave and Remain identities separately over time. While Chapter 4 shows that these identities were stable for most people, there was some fluidity, with 25% of voters changing their stance between the 2016 EU Referendum and the post-vote period. In the subsequent general elections, this fluidity decreased to 14% and 15%. The findings presented in Chapter 5 reveal that the reinforcement of Brexit identities—for both Leavers and Remainers—was primarily driven by interpersonal communication. This is particularly notable as interpersonal com-

munication was the second most commonly cited source of political information after television, with three-quarters of participants relying on it. The findings show the significant influence of conversations in reinforcing existing Brexit identities, not only because of their significant effect size, but also because of their pervasiveness. In contrast, mass media played only a minimal and supportive role in this process. The findings suggest that the combination of mass media and interpersonal communication can lead to meaningful changes in the strength of political identities. However, it is through interpersonal communication that previously received information can be reinforced or validated through social interactions. These findings contribute to the literature by providing evidence of the dominant impact of interpersonal communication over media exposure in shaping political identity and strengthening existing identities, thereby adding to the entrenchment of the two sides.

Next, I will briefly address the limitations of this study and propose directions for future research. As with any study, the research presented in this thesis has its limitations that future studies could address to build upon its findings. While the analyses presented focus primarily on the case of British politics during the Brexit period, the contextual specificity of this research introduces certain boundaries. Although the findings offer insights that may resonate beyond the UK, several contextual phenomena unique to British politics—such as the dominance of a public service broadcaster and the intensely polarized nature of the Brexit debate—may have shaped the observed effects. In countries with less polarized political environments or media systems characterised by stronger partisanship and weaker public service broadcasters, the effects identified here may differ. Comparative research across varying political and media landscapes would be encouraged to test these findings and further our understanding of how contemporary media consumption influences political identity and behaviour in diverse contexts. This thesis, following the sociological tradition of explaining social phenomena, em-

ployed quantitative methods grounded in the principles of causal inference with observational data. While these methods provide robust and reliable causal estimates, they inevitably abstract some of the nuanced individual-level mechanisms that underlie media effects. For instance, the cognitive processes individuals employ when interpreting information remain somewhat concealed. People process information in diverse ways: some may be persuaded by a rational argument, while others, influenced by cognitive biases or motivated reasoning, may use the same information to reinforce opposing views. Future research employing experimental approaches could illuminate these micro-level psychological mechanisms in the outlined context. Despite these limitations, this thesis makes a significant contribution to understanding the forces that influenced the outcome of the 2016 EU Referendum and subsequent British politics. It also advances our broader comprehension of the dynamic interplay between news media and democratic processes, offering a foundation for further inquiry into the complexities of political communication in the modern era.

Having summarised the objectives and findings of this research, along with a brief commentary on its limitations and directions for future research, I now turn to the broader lessons that can be drawn from the study. In doing so, I highlight the theoretical contributions and the central argument advanced by this thesis.

The rise of digital platforms, particularly those used for political news, has frequently been criticized for their potential negative effects on democracy and society. Scholars have argued that these technologies foster echo chambers, deepen political polarization, and create significant obstacles to deliberative democracy and unbiased access to information (e.g., Sunstein, 2009; Mutz, 2002; Dahlberg, 2007; Van Alstyne and Brynjolfsson, 2005). Based on the findings presented in this thesis, I argue against this overcritical view of the media, especially digital media, as cause for recent political trends such as political polarization and the rise of populism, fear of echo chambers and filter bubbles, and fake news. I align

with Dubois and Blank's (2018) argument that individual media consumption habits and selection play a crucial role in determining the risk of being caught in echo chambers. One effective way to mitigate this risk is by consuming a diverse range of media types and sources. For instance, even individuals with politically homogeneous social media networks may avoid significant informational bias if they also engage with television and newspaper news. The findings presented in Chapter 2, for example, demonstrate that the *BBC* played a central role in providing Brexit news for both Leave and Remain supporters. As a consequence of the *BBC*'s popularity and the accessible, low-cost nature of online news, there were no discernible Leave or Remain clusters in the browsing history data.

However, because the risk of echo chambers is overstated does not mean that media's influence on the electorate ought not be scrutinised. The influence of partisan media on politics has been widely studied, and that literature often demonstrates the influence of media on their audiences. Yet, media tends to reach a relatively small segment of the population—primarily those who are more politically active and engaged. However, in the context of Brexit and the UK, where mainstream and traditional media dominate, the subtle and perhaps unintentional biases of media outlets warrant greater scrutiny. For example, even small biases in the reporting of a broadcaster such as the *BBC* can have a significant impact, given its unparalleled reach and influence. My research shows clearly the centrality of the *BBC* as the most popular source of political news across different political orientations. This unique position enables the *BBC* to act as a cornerstone of the democratic public service by providing a common information base. But it also gives it a powerful and consequential role in shaping public opinion. A subtle bias—whether in news selection, issue framing, or decisions about equal airtime—can have significant consequences. Such dynamics point to the broader implications of media effects beyond the partisan extremes. While research often emphasises the ability of partisan outlets to mobilise already-engaged individuals, the more understated biases of mainstream media can exert comparable, if not

greater, influence due to their extensive reach. Even small shifts in framing or emphasis on key issues can have meaningful effects at the population level. This effect may be amplified by the *BBC*'s ability to attract less politically-engaged and potentially undecided voters, who are less likely to consume overtly partisan content but remain susceptible to subtle information cues.

My findings show the critical role of public broadcasters, which are tasked with serving as neutral arbiters of information in democratic societies. This responsibility, coupled with their influence, makes their role powerful and crucial. These findings are particularly relevant for:

1) Motivating further research on the effects of public service broadcasters on voters; 2) Informing policymaking regarding public service broadcasting and standards of due impartiality; and 3) Promoting public education on media literacy and the responsible use of diverse forms of news media.

When examining the media's role in shaping social and political phenomena, it is essential to analytically assess the influence of each media source with appropriate granularity while interpreting the overall impact of news on individuals and society from a holistic, multi-platform perspective. The modern media market is diverse, offering a heterogeneous landscape of news types, content, and opinions across various sources and media platforms. This diversity has made the media market more varied than ever before, especially compared to earlier eras which were dominated by the paper press or limited television options with just one or two channels.

This does not mean that media is not relevant or partially responsible for movements such as political polarization, but blaming political polarization only on the supply side oversimplifies a complex issue. Since the beginning of research in political behaviour, studies have found evidence illustrating the important role of the media in politics. Lazarsfeld and Merton (1948) and Cohen (1965) argued that mass media plays a key role in shaping citizens' opinions and beliefs, influencing societal dynamics through mechanisms like agenda setting. Nevertheless, it is

up to the consumer of news to choose the source of their information, the media type, the style of article, and the frequency of consumption. News consumption, especially online, is practically without cost, making it easy to branch out beyond favoured news sources and become exposed to articles from other perspectives.

The onus was on the people to pick sides in the Brexit debate—to choose their media diet and to process the information they received. The same is true of the present and future political moments. The theories discussed in this thesis—selective exposure, cognitive dissonance, agenda setting, two-step flow of communication, social identity theory—interact to shape the complex social world we live in. The research presented in this thesis adds several insights to the current conversation.

1. **Only a few read news** – This thesis acknowledges that people do not consume media primarily for political news but for entertainment. Political news consumption online is a very small percentage of all online news consumption. As demonstrated in the case of the 2016 EU Referendum in Chapter 2, most people do not actively seek online news for political information, and when they do, it is only around key political events.

2. **Free variety** – For those engaged in political news consumption, especially through online platforms, the diversity and predominantly cost-free nature of media markets have made news more accessible than ever. The Internet functions as an open media marketplace where news outlets compete not only with each other but also with a wide range of online services for attention, traffic, and clicks. This intense competition fosters an environment of abundant choice, resulting in a more heterogeneous and varied corpus of information than has been available through any previous media type. Consequently, individuals are more likely to be exposed to a broader spectrum of opinions, enhancing the potential for diverse perspectives in political discourse. Hence, one could argue that the Internet has the potential to pull people away from polarization rather than the opposite, popular alterna-

tive. This theoretical framework of a digital free press market may hold the possibility of offering diverse information, but it is ultimately up to users to define what they will click on and what they will avoid. Nevertheless, I argue that the Internet offers essentially free variety.

3. **People choose and have preferences** – Much like some people prefer coffee to tea or sweet to savoury, people have media preferences. Some people prefer the *Guardian* to the *Daily Mail* or Leave to Remain. According to social psychology theories, such as cognitive dissonance theory, individuals gravitate toward sources that align with their attitudes and are least likely to challenge their views. My research in Chapter 2, as well as subsequent chapters examining newspaper preferences, supports this theory, consistently showing that people are significantly more likely to engage with online news websites or favour daily newspapers that reflect their political leanings. However, this finding is not novel—it has long been recognised (see Druckman et al., 2012; Kunda, 1990; Lazarsfeld et al., 1948; Sears and Freedman, 1967). What my findings in Chapter 2 add, however, is that even when consuming news online from preferred websites, individuals are not completely isolated from exposure to other perspectives, as most online news readers click on other sources on the side. The nature of Internet consumption, with its accessibility and low cost, makes it easier to encounter news sources outside one's usual preferences, allowing for at least some level of diverse media exposure. If a person really only wants news from one partisan website or partisan newspaper, this behaviour is due to individual-level explanations. This information selectivity and brand loyalty is an overarching concern for public opinion research and the role of media. Such behaviour makes echo chambers possible. It is important to recognize that the mechanisms underlying echo chambers are neither new nor exclusive to politics; they extend across various media sources. In press media, for instance, phenomena analogous to online echo chambers are often explained

by selective exposure theory, where individuals gravitate toward content that aligns with their existing beliefs (Klapper, 1960). Similarly, in interpersonal communication, an equivalent phenomenon is described as a homophilous network—a tightly-knit cluster characterised by strong ties between individuals and the circulation of redundant information (Granovetter, 1973; McPherson et al., 2001). In summary, the echo chamber phenomenon is a materially monotone, homogeneous, and attitude congruent dialogue between a person and an information source (whether that is one person, a group, or an online thread). The dialogue may occur cognitively, as the receiver processes information and seeks further information from the same source which is likely to be in agreement with the receiver's views.

4. **Different media type means different media effect** – Not all media types seem equally involved in shaping or influencing us. Consumption of certain media types heavily depends on people's characteristics. For example, older generations more commonly consume TV news as opposed to newer members of the electorate who may prefer online news. Despite a person's general news consumption and media habits, politically-slanted or biased newspapers (whether press or online) consistently show associations with change towards that political side. This is demonstrated in the case of EU Referendum vote choice (Chapter 3) and, to some degree, even for changes in Brexit identity (Chapter 4), but not in strengthening Brexit identity (Chapter 5). Television, on the other hand, was a strong predictor for switching to the Leave vote during the referendum campaign. However, its influence was less pronounced later, when it came to changes in Brexit identity or the strength of those identities. This suggests that television news may have been a particularly important source during the early stages of the debate, playing a key role in shaping opinions before identities were firmly established, but it became less persuasive once individuals had predominantly settled into their positions.

5. **Short-term persuasion versus long-term reinforcement** – Chapter 4 shows that, in the short campaign period, Remain-leaning newspapers were more effective than Leave-leaning newspapers in persuading readers. The results demonstrate that Remain-leaning newspapers had a significant impact on shaping their readers' voting intentions, whereas Leave-leaning newspapers were associated with reinforcing pre-existing Leave identities rather than persuading people to change their views. This phenomenon is likely to be attributed to a long-term effect for Leave-leaning newspapers, given their long-standing publication of Eurosceptic news. Thus, while Leave-leaning newspapers did not demonstrate positive effects in the short term, the possibility of long-term effects cannot be discounted.

6. **Different times, different story** – This study provides evidence that strengthens the understanding that media effects vary across time periods and electoral contexts. For example, television and Internet consumption (excluding newspapers) showed significant effects during the referendum and the 2017 General Election but not for the 2019 General Election. In fact, the results for most media sources in 2019 were largely non-significant. Testing media effects without accounting for specific political events and contexts may lead to null results (see Snow, 2024). A closer examination, however, reveals that certain sources played important roles at specific times.

7. **Public service broadcasting matters** – Chapter 2 revealed the dominant role of the *BBC* website in providing news during the 2016 EU Referendum campaign period. Over one-third of all clicks on Brexit-relevant news were linked to the *BBC*, with 57% of participants reporting that they visited the *BBC* for such news. These findings align with statistics released by Ofcom (2018), which reported that approximately 60% of Internet news users claimed to use the *BBC* website or app. My analysis also revealed a slight surplus of Remain supporters among *BBC* website users. Chapter 3 provided evidence that online news consumption (excluding newspapers)

increased the likelihood of switching to a Remain identity. Given the dominance of the *BBC* website for political news, this association could be connected to its influence. Interestingly, Chapter 3 also found that heavy *BBC* TV consumption was associated with a shift toward Leave. This may be attributable to the *BBC*'s efforts to provide 'equal' or even-handed reporting on the Leave and Remain campaigns during the referendum period. Critics, including Bennett (2016), Harding (2016), and Newman et al. (2017), argued that the *BBC*'s attempt at impartiality during the referendum ultimately advantaged the Leave campaign. This criticism was primarily focused on the *BBC*'s TV news coverage. Based on the findings in this thesis, I hypothesise that TV news indeed had a stronger effect in favour of Leave, whereas other platforms, such as its website and radio, were less affected and showed a stronger association with the Remain side. Chapter 4 further supports the association between online news consumption (excluding newspapers) and a push toward the Remain side, with similar effects observed for radio news during the 2017 General Election campaign. This suggests that BBC dominant media platforms—such as radio and online news (excluding newspapers)—are associated with persuasion toward the Remain side. It is important to consider that changes in the direction of the *BBC*'s effects may reflect broader shifts in the political and media landscape after the referendum. The style and topics of news coverage evolved post-referendum, emphasizing issues more aligned with Remain sentiment, such as economic uncertainties, international relations, or the challenges of Brexit implementation. However, exceptions exist, as online news consumption (excluding newspapers) during the 2017 General Election was associated with strengthening Leave identities for individuals already firmly aligned with that side, while online news generally showed a tendency to push identities toward the Remain side in the same campaign period. This raises the question of whether these contrasting effects within the same campaign period are

attributable to the same underlying web sources or different ones, a topic worthy of further investigation. With its unparalleled reach across the vast majority of the British population through its various channels—TV, radio, and online platforms—the *BBC* holds a central role in political communication. This position comes with significant responsibility. While this thesis has shown the varying effects media consumption can have on voter behaviour, it has also revealed instances where media influence appears to be minimal or absent. The *BBC*, in particular, emerges as a potentially crucial actor in mitigating bias in political news, exposing audiences to non-partisan information, and serving as a shared point of reference for many British voters. Such a role is essential in fostering informed political discourse and maintaining a common ground in an increasingly polarized media landscape.

8. **People matter** – Political interpersonal communication plays a significant role in shaping political outcomes. The findings indicate negative associations between interpersonal communication and switching to a Leave vote during the referendum, suggesting that such interactions were significant for switching to Remain. However, Chapter 4 finds no clear evidence of interpersonal communication influencing identity switching during any election period. In contrast, Chapter 5 demonstrates a significant effect of interpersonal communication in strengthening existing identities. This effect is most pronounced when interpersonal communication complements media consumption, suggesting an intriguing dynamic: information encountered through media may gain credibility or salience when reinforced through discussions with others. The findings, thus, suggest a broader point by challenging the notion of the absolute, independent power of either mass media or interpersonal communication to meaningfully change identity strength. Instead, the results emphasise a reinforcing dynamic: while mass media alone may have a limited effect on altering the strength of political social identities for most people, it plays a crucial role in reinforcing those identities when

combined with interpersonal political interactions. The process of talking to others about politics appears to be a crucial mechanism for forming stronger political identities. This aligns with established theories on social identity and in-group versus out-group dynamics (Tajfel, 1970; Tajfel, 1982; Tajfel and Turner, 1979). Identities are inherently social phenomena, making it logical that they are forged and solidified through social interactions. Perhaps information absorbed through a newspaper article remains dormant in its effect until it is processed, repeated, or exercised through social interaction; results presented in Chapter 5 point to such a connection, but further research is necessary to rigorously test this relationship.

In closing, I will comment on a few broader social and political implications of the research undertaken in this thesis. The findings presented here reveal the media's critical role in influencing voters and, by extension, shaping elections. The empirical evidence demonstrates that media profoundly affects public opinion, electoral behaviour, and identity formation. However, it is worth re-examining the pervasive cynicism often directed at the media—particularly digital media—and its rapidly evolving market. While the media is frequently accused of systematically shaping the political landscape, today's unprecedented diversity and accessibility of media sources mean much of the responsibility rests with individuals. It falls upon the voter to engage with politics and current affairs thoughtfully, critically evaluating the advantages and limitations of each medium.

So, does the modern media environment influence voters? Undeniably, it does. Media remains a cornerstone of democratic systems, offering citizens information on political and societal issues through a heterogeneous landscape of sources and perspectives. But does this mean that the media dictate voter behaviour or single-handedly drive political shifts like political polarization? Not entirely; or better, certainly not without help. As demonstrated in this thesis, media effects are highly context-dependent, medium-specific, and, perhaps most importantly, dependent on the characteristics and behaviour of the consumer. Consequently, the role of

individual responsibility in this area of democratic process remains essential. In a media-saturated world, it is not just the content we consume, but the discernment with which we consume it that plays a significant role in shaping political and social change.

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Appendices

A.1 Appendix to Introduction

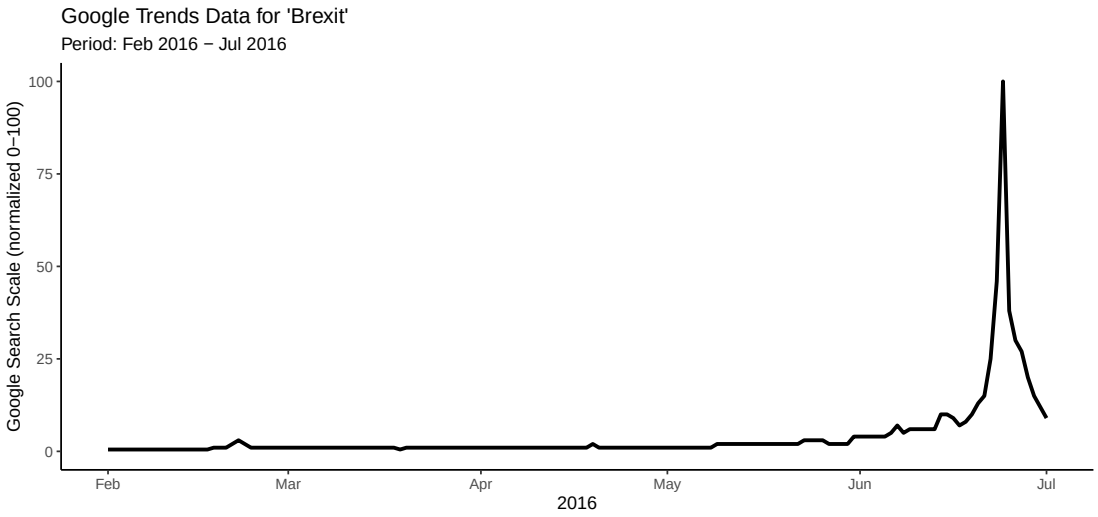


Figure A.1: Google Trends search scale for interest over time for the search term 'Brexit' from 1 February 2016 to 1 July 2016. Data are sourced from Google Trends.

Figure A.2 shows a choropleth map of the UK using Google Trends geo-data, with deeper colours representing a higher relative search interest for the term "Brexit" across regions in the UK. Google Trends normalizes the data to a scale of 0 to 100, where 100 represents the region with the highest proportion of searches for the term compared to all searches in that region. England and Northern Ireland have the highest levels of search interest proportional to the overall searches in their country, followed by Wales with a slightly lower relative interest, and then Scotland with a relative search interest equal to 76% of the relative search interest in England. Please note that the scale values represent proportions relative to total search activity in each region, not absolute numbers. Scotland's lower value

could be attributed to a lower overall interest in Brexit compared to other search topics in Scotland relative to England, or a greater diversity of search topics in Scotland, which reduces the relative proportion of searches for Brexit.

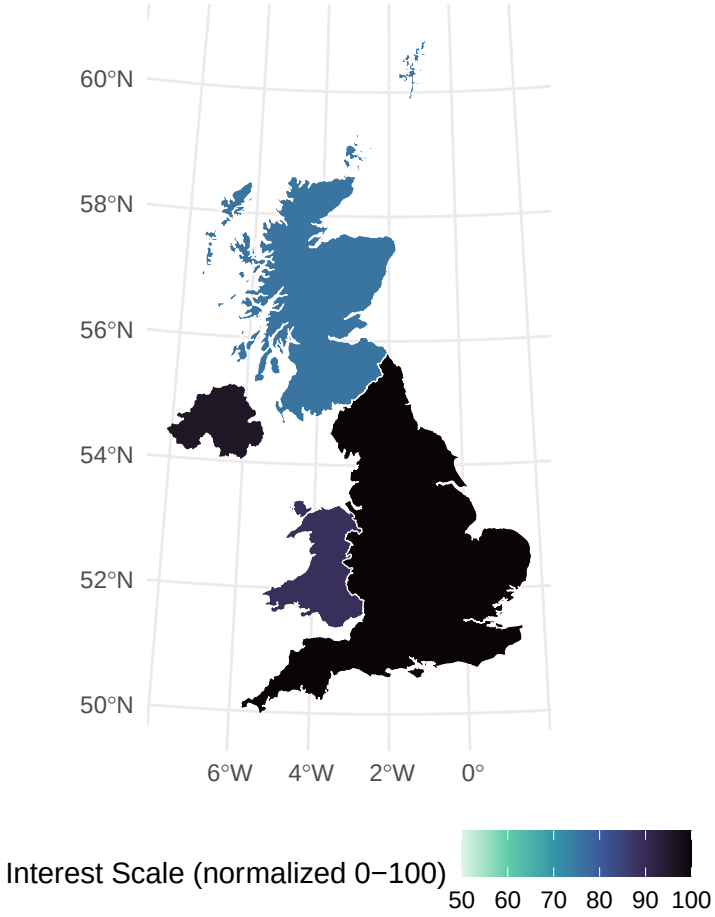


Figure A.2: Google Trends search scale for interest by region for the search term 'Brexit' from 1 January 2014 to 1 January 2024. Data are sourced from Google Trends.

A.2 Appendix to Chapter 2

A.2.1 Two-Mode Network Projections

Figure A.3 provides a clear visualisation illustrating how a two-mode network can be projected into one-mode network projections. The two-mode network consists of 10 nodes, with two distinct modes: Mode 1 (Individual nodes) and Mode 2 (Domain nodes). The network includes 4 Individual nodes, labelled 1, 2, 3, and 4, and 6 Domain nodes, labelled A, B, C, D, E, and F. The following edges are defined between the nodes: Node 1 is connected to A, B, and C. Node 2 is connected to B and C. Node 3 is connected to B, C, D, E, and F. Node 4 is connected to D, E, and F

Subfigure (a) shows the original two-mode network. Subfigure (b) presents the projection of the Individual nodes, referred to as the Co-Individual Network. Subfigure (c) displays the projection of the Domain nodes, labelled as the Co-Domain Network.

It is important to note that the projected networks are now one-mode networks, representing either the connections between individuals or domains, respectively.

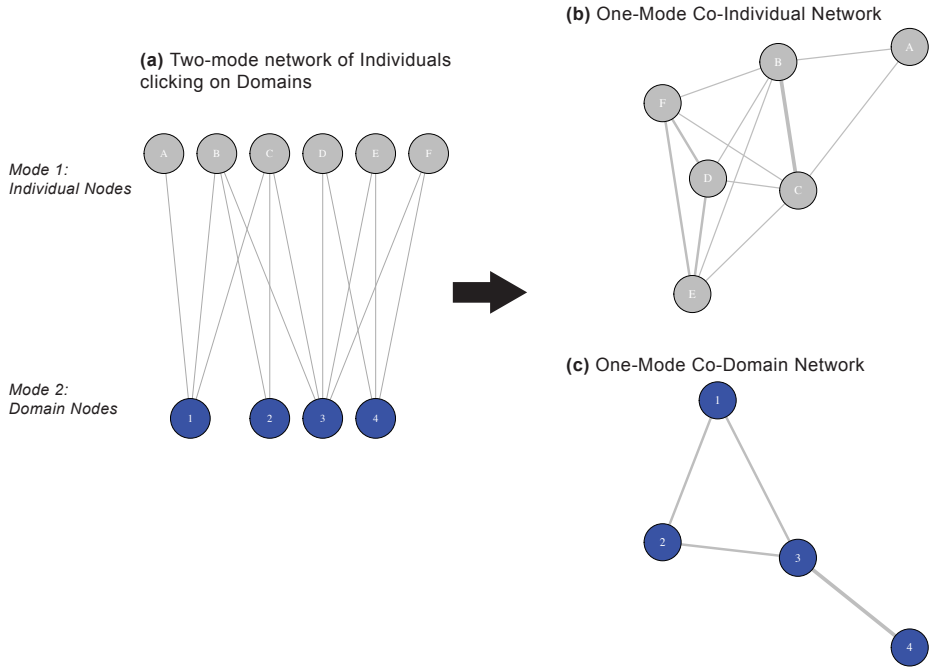


Figure A.3: Two-Mode Network and its Projection Networks

A.2.2 URL Classification Keywords

EU Referendum Keywords: news, newstab, brexit, referendum, politics, leave, remain, european union, EU, article 50, withdrawal agreement. Soft-news keywords: celebrity, sport, entertainment, lifestyle, fashion, food, weather.

A.2.3 Sample Descriptive Statistics

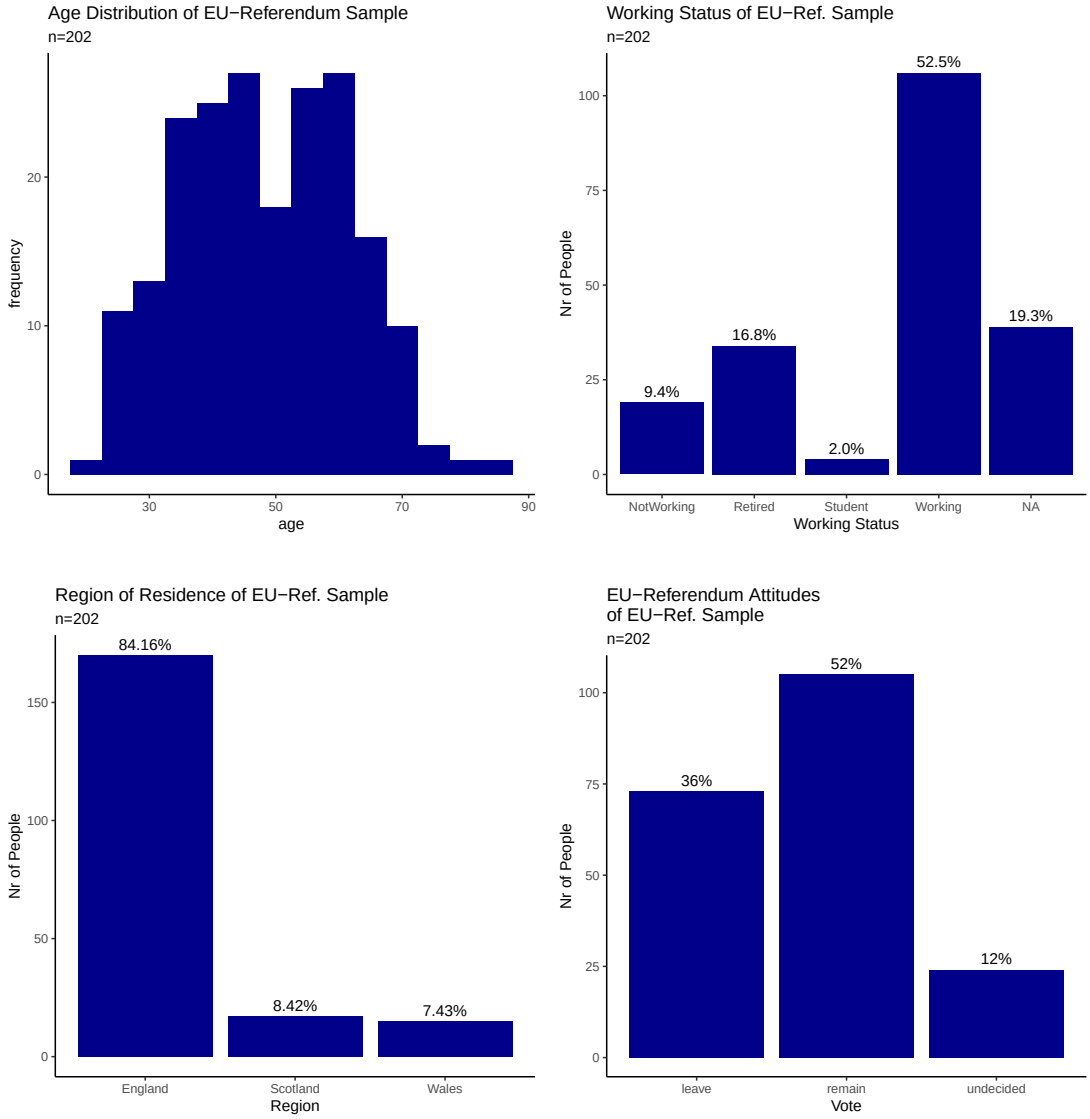


Figure A.4: Descriptive information about the sample of people who were active online readers of Brexit news; n=202

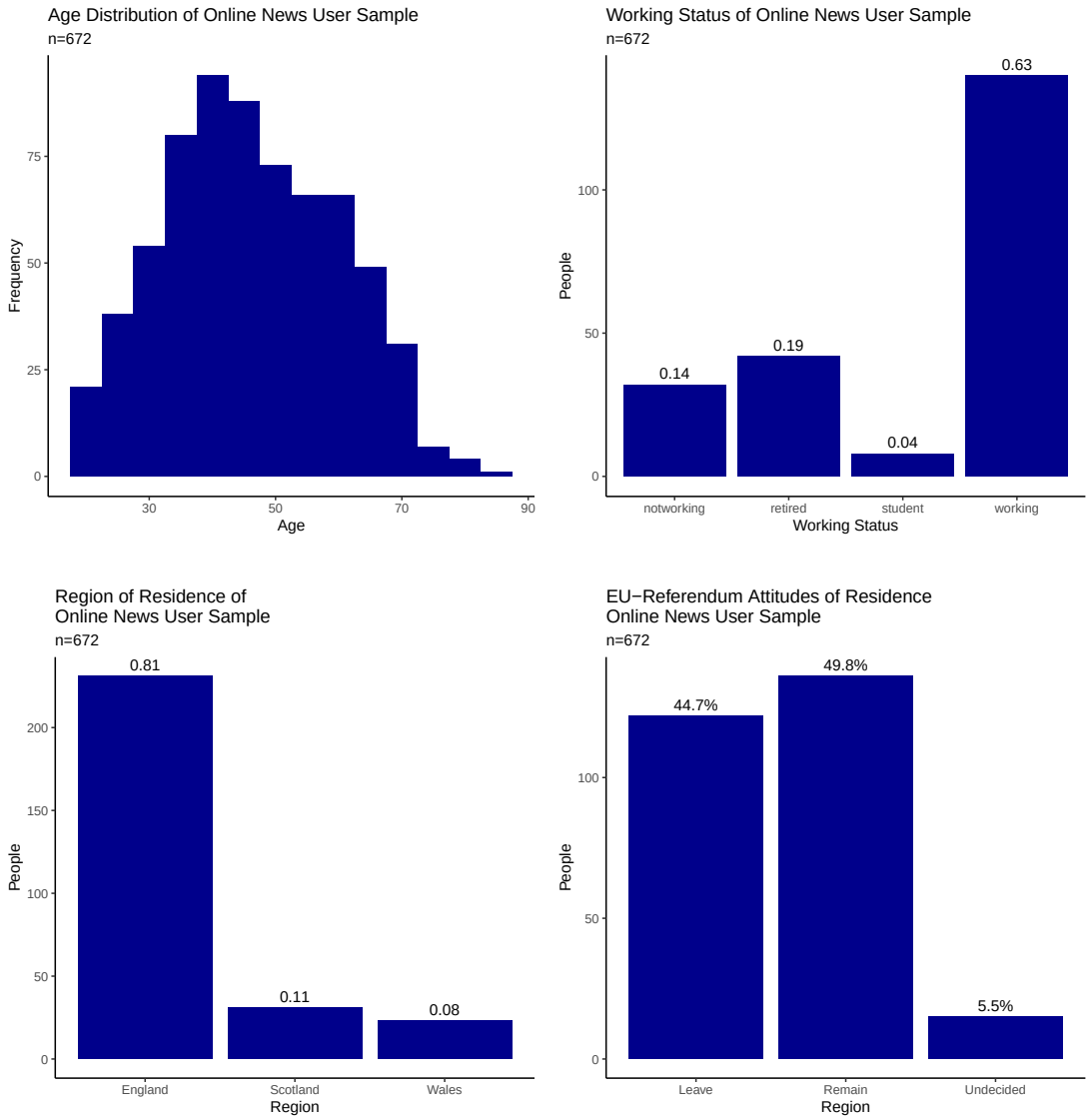


Figure A.5: Descriptive Information of the Sample with All Online News Readers; n=672

Note: I ran a two-proportion z-test to compare the proportion of 'Leave' voters in two samples: the full sample of all online news users and a sub-sample consisting of individuals who had clicked at least once on a Brexit-relevant online news article. The results indicate a statistically significant difference (with 95% confidence) in the proportion of 'Leave' voters between the two samples, with a z-value of 2.19 and a p-value of 0.0284, suggesting that the proportion of 'Leave' voters differs significantly between these groups. However, when comparing the proportion of 'Remain' voters in the same samples, the test revealed no significant difference, with a z-value of -0.55 and a p-value of 0.5834, indicating that the proportion

of 'Remain' voters is not significantly different between the full sample and the sub-sample.

A.2.4 Online News Clicking Activity

Overall, online news clicking activity looks highly event driven. The number of active users per day corresponds to the number of clicks per day with an unsurprisingly strong positive association (Pearson's r = 0.96). Figure A.6 shows the relationship between the number of active users per day and the number of total clicks on EU Referendum online news per day, disputing the idea that a few outliers drove up the demand. Thus, the demand for and interest in EU Referendum online news increased over time with its maximum on the day of the vote.

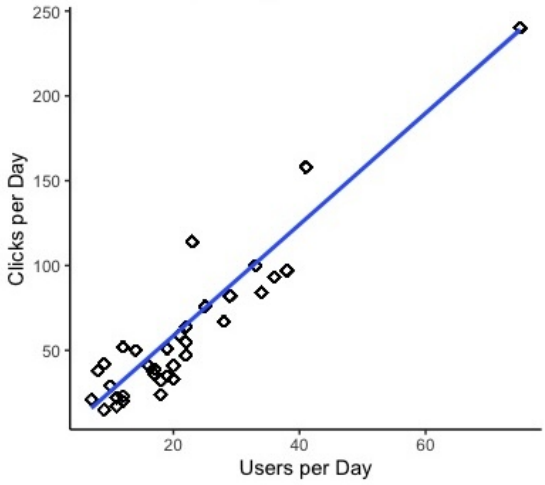
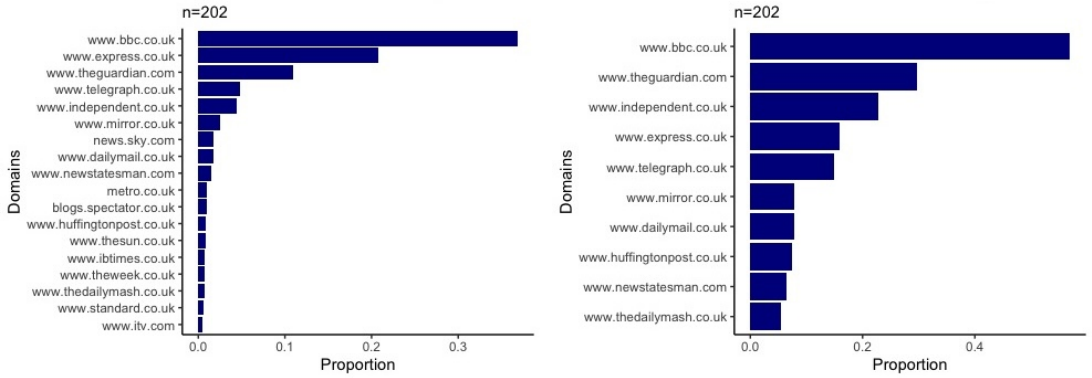


Figure A.6: Relationship between Number of Users active per Day and Total Clicks on EU Referendum News per Day

A comparison of the EU Referendum-relevant online news consumption (Figures A.7a & A.7b) to the full sample of all News information (Figures A.8a & A.8b) shows that tabloids, such as the Mirror, the Daily Mail, and the Sun, are dominant in the second, third, and fourth positions ranked by total clicks in the unfiltered, full sample, whereas, once classified and EU Referendum-unrelated URLs have been excluded, those domains fall to lower positions. Thus, tabloids have a significant presence in overall online content consumption, though less for

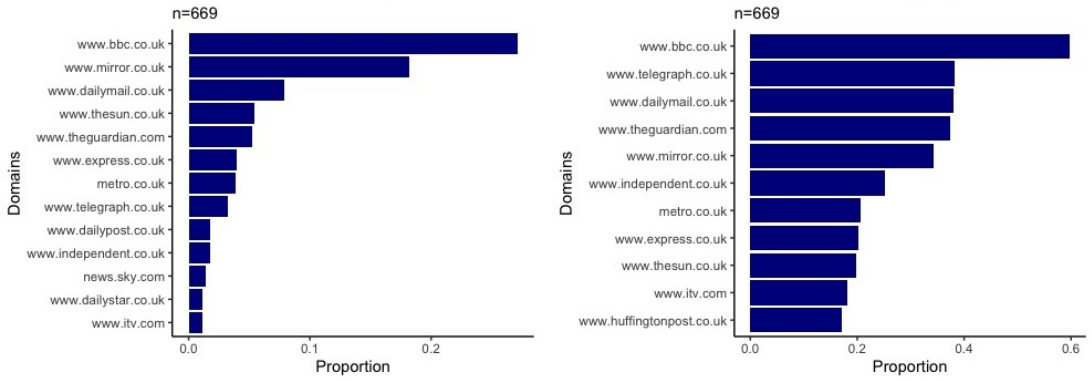
their political news.



(a) Proportional Distribution of Clicks on EU Referendum News Across Top Domains

(b) Proportional Distribution of Participants for Top Domains for EU Referendum News

Figure A.7: Proportion of Clicks and Participants for EU Referendum News Domains. Note: Only participants who accessed EU Referendum online news at least once during the data collection period are considered in these figures. Thereby, sample size equals 202 participants.



(a) Proportional Distribution of Clicks on Any News Across Top Domains

(b) Proportional Distribution of Participants for Top Domains for Any News

Figure A.8: Proportion of Clicks and Participants for EU Referendum News Domains. Note: Figures show news activity of any news content. Thus, both soft and hard news are considered. The sample size equals 669 individuals, which are all study participants who accessed at least once an online news source.

As mentioned above, most online news readers did not visit many EU Referendum online articles or consult a large portfolio of domains for their EU Referendum news. Nevertheless, there is a positive, yet weak, linear relationship between portfolio size and the number of clicks on EU Referendum online news articles. However, the relationship is not perfectly linear and has outliers. Figure A.9 shows the association between clicks on EU Referendum online news and portfolio size

with a logarithmic transformation of both Clicks Count and Domain Count more clearly (Pearson correlation r = 0.7). Generally speaking, individuals with larger portfolios of domains for EU Referendum online news clicked on more URLs. It is especially true that individuals with unusually large domain portfolios had more clicks. However, there are also outlier cases where individuals with a very high frequency of clicks visited one main domain and only a few others.

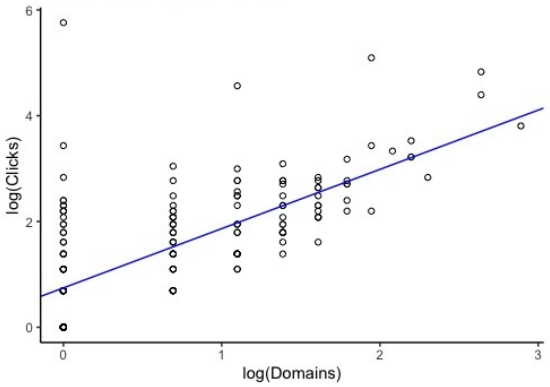


Figure A.9: Relationship Between Click Count and Domain Count for Individual Users Accessing EU Referendum News; n=202

Figure A.10 shows the relationship between an individual's number of clicks on EU Referendum online news and interest level in the EU Referendum campaign. The box plots suggest that there is no substantial difference in the average number of clicks when grouping participants by their interest level in the EU Referendum campaign. Those individuals in the sample who are very active newsreaders and who clicked frequently on EU Referendum online articles are in the 'very interested' category. These findings suggest a logical positive association between interest in the EU Referendum campaign and the frequency of clicks on EU Referendum online news. Nevertheless, this is only true for very active individuals that take outlier values in the sample. For the majority of participants, news consumption behaviour in terms of frequency did not significantly differ for different EU Referendum interest levels. This might suggest that individuals who show active EU Referendum online news consumption are likely to be very interested in the EU Referendum campaign; however, being interested in the EU Referendum campaign does not predict high levels of online news consumption.

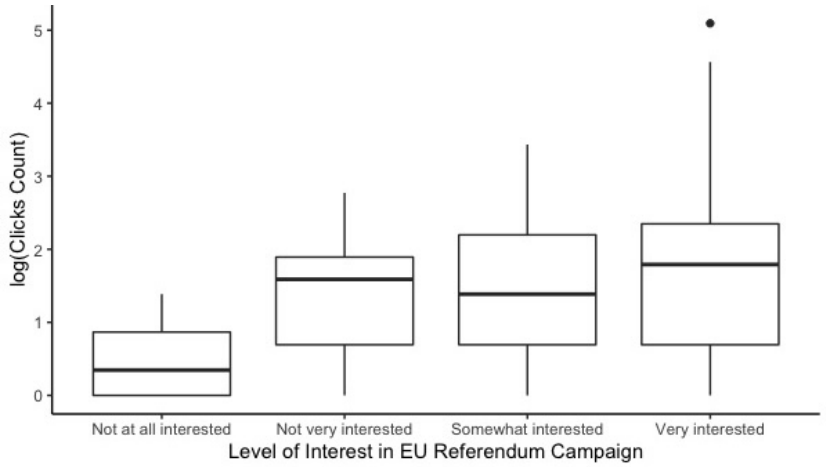


Figure A.10: Number of Clicks by Individuals according to their Level of Interest in the EU Referendum Campaign; Note: only study participants in the June survey were asked about their interest level in the EU Referendum Campaign. This limits the sample to participants of the June survey; n=123.

Using logistic regression models to compare interest levels in the EU Referendum campaign by Brexit stance suggests that there is no relationship between interest level in the EU Referendum campaign and supporting Leave or supporting Remain (Table A.1)[1]. However, individuals who stated to be 'not very interested' are more likely to be undecided than to have a defined Brexit stance. Comparing interest levels in the EU Referendum campaign by Brexit stance by using logistic regression models suggests that there is no relationship between interest level in the EU Referendum campaign and supporting Leave or supporting Remain (Table A.1). However, individuals who stated to be 'not very interested' are more likely to be undecided compared to having a Brexit stance.

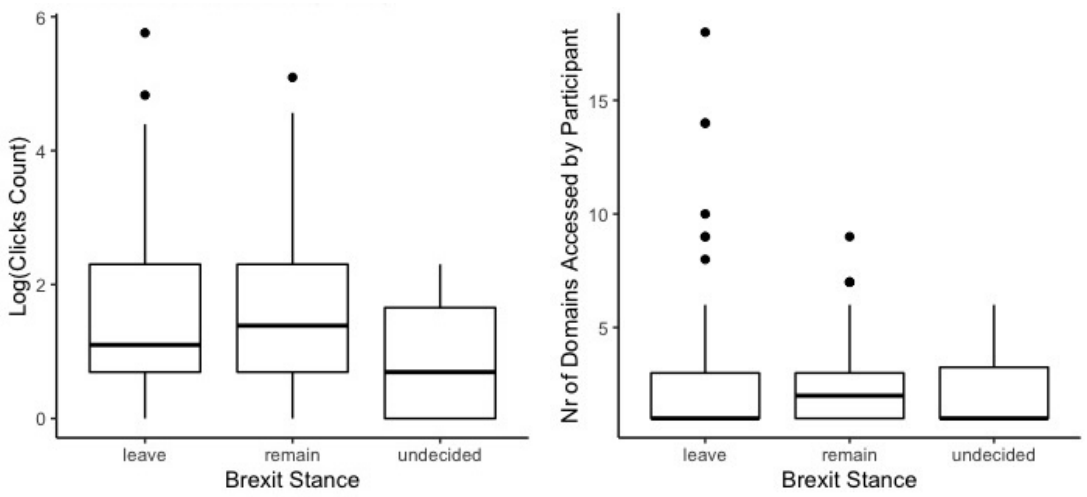
[1]Interpretation of Table 1 should be done with caution due to a sample size of only 123 participants.

Table A.1: Logistic Regression Models Comparing EU Referendum Campaign Interest Levels by Brexit Stance

	Dependent variable:		
	Leave	Remain	Undecided
Level of Interest (ref. = very)			
Not at all	-0.693 (1.184)	0.762 (1.184)	-13.48 (1978.09)
Not very	-0.693 (0.635)	0.174 (0.579)	2.132* (1.260)
Somewhat	0.266 (0.404)	-0.383 (0.402)	1.057 (1.242)
Intercept	-0.405 (0.264)	0.336 (0.262)	-4.078***(1.008)
Observations	123	123	123
Log Likelihood	−81.828	−83.380	−19.203

Notes: *p<0.1; **p<0.05; ***p<0.01.

Figure A.11a, a box plot of the number of clicks on EU Referendum news by Brexit stance, shows again that the majority of individuals accessed relatively few online news articles and that this tendency does not seem to differ between Leave and Remain supporters. There are active news readers with an extremely high number of clicks on both sides. Due to the highly right-skewed distribution, a log transformation of the number of clicks variable can decrease variability and help to provide clearer comparison between the groups. Figure A.11b shows a comparison portfolio sizes (i.e. the number of online news sources accessed for EU Referendum online news) by Brexit stance. Again, there is no noticeable substantial difference between Leave and Remain for the general user. However, individuals who claimed to be undecided were, on average, less active than Leave and Remain voters.



(a) Nr of Clicks by Brexit Stance **(b)** News Portfolio Size by Brexit Stance

Figure A.11: Comparison of Number of Clicks on EU Referendum News and Portfolio Size by Individuals according to their EU Referendum Attitudes.

To test for significance, I modelled a negative binomial regression with the number of clicks on EU Referendum online news as dependent count variable and the reported Brexit attitudes as explanatory categorical variable. Note that the choice of a negative binomial regression model over a Poisson model stems from the distributional properties of the data. The clicks data are highly overdispersed, with the variance substantially exceeding the mean. the negative binomial regression allows for a more flexible model of count data with greater variance. Table A.2 shows the results for two negative binomial regression models. Model (1) uses the full sample of active EU Referendum online newsreaders, and Model (2) is identical with the exception that Super-Readers are excluded, i.e. individuals who clicked on more than 50 EU Referendum online news articles and therefore show an extremely high level of online news activity unrepresentative of the general user. Model (1) suggests that Remainers show slightly lower online news clicking activity compared to Leavers, measured by clicks on EU Referendum online news articles. However, once Super-Readers are excluded from the model, Model (2) finds no statistically significant difference between a Remain and Leave supporter with regards to news activity, suggesting that an individual's Leave or Remain Brexit stance does not explain his or her number of clicks on EU Referendum

online news. However, both models show a negative relationship between being undecided and the frequency of clicks. Individuals that claimed in the survey to be undecided accessed, on average, fewer EU Referendum online news articles than Leave or Remain supporters did.

Table A.2: Negative Binomial Models

	Dependent variable: Clicks Count	
	(1) Full Sample	(2) Super-Readers Excluded
Remain (ref. = Leave)	-0.382*** (0.179)	0.035 (0.142)
Undecided	-1.394*** (0.292)	-0.688*** (0.231)
Intercept	2.610*** (0.137)	1.904*** (0.110)
Observations	202	197
Log Likelihood	−664.194	−570.801
Θ	0.772*** (0.073)	1.434*** (0.168)

Notes: *p<0.1; **p<0.05; ***p<0.01.

In summary, once Super-Readers are excluded from the analysis, news consumption activity of the general user with regards to EU Referendum online information during the campaign period did not differ considerably between Leave and Remain supporters, whereas undecided individuals show lower levels of activity. The results suggest that there is a relationship between low news activity and being undecided, whereas the relationship between news activity and a Leave or Remain vote is not as clear. The frequency of article visits is not the only important measure that provides insight into someone's news consumption. It is also important to consider the news portfolio size, i.e. the number of domains an individual accessed for EU Referendum online information.

For example, Person A might very frequently access news from one specific domain, whereas Person B might access fewer articles overall but visit a broad number of domains. If Person A's most visited domain leans strongly towards one political ideology or is even partisan media, this could arguably have a strong impact on confirming Person A's political stance and lead to even more extreme beliefs. Whereas, if Person B's portfolio consists of a balanced set of domains with regards to political position, this might have a more moderate effect. In any case, the size of the portfolio also tells us something about the individual demand

and consumption preferences that could be significant, as in the case described. Figure A.11b shows a comparison of portfolio sizes (i.e. the number of online news sources accessed for EU Referendum online news) by Brexit stance. Again, there is no noticeable substantial difference between Leave and Remain for the general user. However, individuals who claimed to be undecided were, on average, less active than Leave and Remain voters. Table A.3 shows the results of a Poisson regression model with Portfolio Size as dependent variable and Brexit stance as the independent variable. I opted for a Poisson model because, unlike click counts, the portfolio size data are characterised by smaller counts and less dispersion. Here, the variance is more closely aligned with the mean, making the Poisson regression model appropriate. Both the box plot in Figure A.11b and the Poisson regression model show that there is no apparent relationship between domain portfolio sizes and Brexit stance. In this case, excluding Super-Readers from the data shows no significant effect. The following section contains a detailed network analysis of the Audience Network that examines online news consumption patterns, the components of news portfolios, and potential differences between Leavers and Remainers in more detail.

Table A.3: Poisson Regression Models

	Dependent variable: No. of Domains in Portfolio	
	Full Sample	Super-Readers Excluded
Remain (ref. = Leave)	-0-128 (0.094)	-0.036 (0.099)
Undecided	-0.250 (0.155)	-0.137 (0.158)
Intercept	1.023*** (0.070)	0.911*** (0.076)
Observations	202	197
Log Likelihood	−425.113	−388.598

Notes: *p<0.1; **p<0.05; ***p<0.01.

Table A.4: Degree Centrality: Undecided Voters Only; n=24

Rank by Audience Size	Domain	Audience Size out of Undecided	Audience Proportion of Undecided Sample	Clicks	Clicks/Sum
1	BBC	11	46%	21	26%
2	Express	5	21%	9	11%
3	Guardian	5	21%	6	7%
4	Telegraph	4	17%	4	5%
5	Independent	3	13%	3	4%

Table A.4 presents Top Domans for all Undecided participants in the sample.

Table A.5: Average News Exposure by Brexit Stance

Brexit Stance		n	mean	sd	median	min	max	skew	kurtosis
Leave	Average News-Portfolio Size	73	2.78	3.35	1	1	18	2.63	7.09
	Average Nr of Clicks	73	13.6	40.34	3	1	317	6.18	41.76
Remain	Average News-Portfolio Size	105	2.45	1.76	2	1	9	1.33	1.28
	Average Nr of Clicks	105	9.29	18.59	4	1	163	6.37	46.04
Undecided	Average News-Portfolio Size	24	2.17	1.61	1	1	6	1.01	-0.48
	Average Nr of Clicks	24	3.38	2.9	2	1	10	0.88	-0.65

A.2.5 Additional Network Analyses

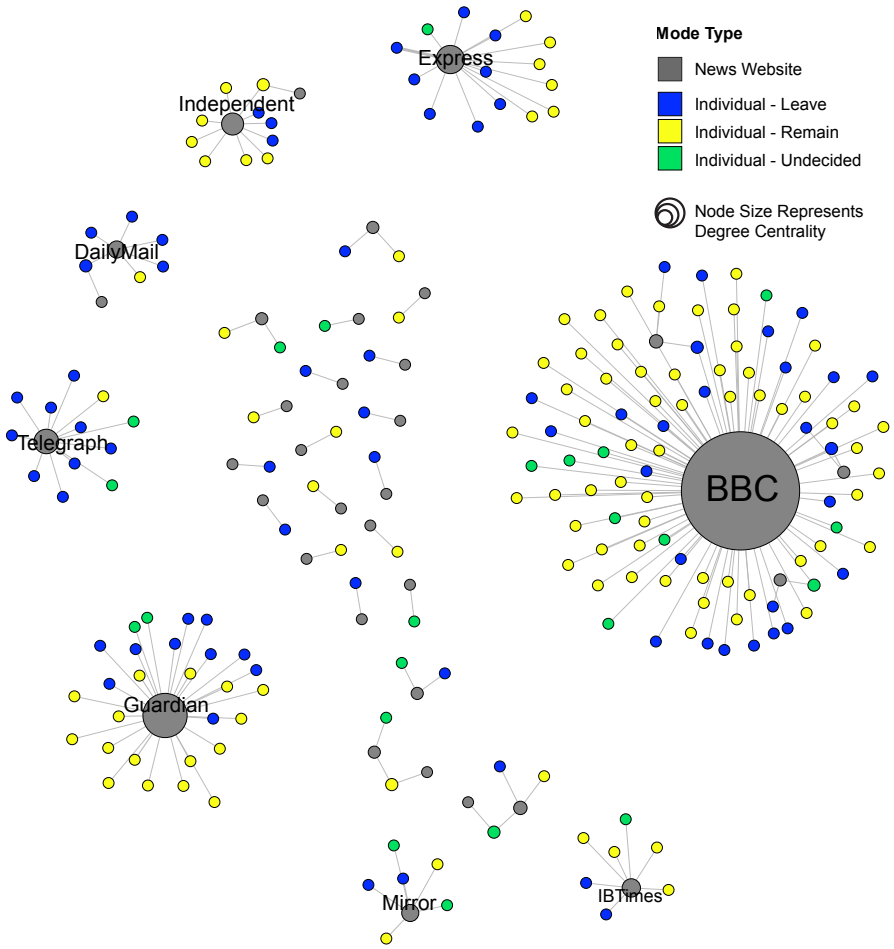


Figure A.12: Modified Two-Mode Audience Network: Individuals and Their Favourite News Domains Only (Nodes = 237, with Individual-Nodes = 202 and Domain-Nodes = 35; Layout: Forced Atlas

Table A.6: Domain Classification by EU-Referendum Stance

Domain	EU-Referendum Stance
www.attitude.co.uk	Unclassified
www.bbc.co.uk	Unclassified
www.blogs.lse.ac.uk	Unclassified
www.blogs.spectator.co.uk	Leave
www.bloomberg.com	Unclassified
www.bristol247.com	Unclassified
www.businessinsider.com	Unclassified
www.cityam.com	Unclassified
www.cnbc.com	Unclassified
www.cnn.com	Unclassified
www.dailymail.co.uk	Leave
www.dailypost.co.uk	Leave
www.dw.com	Unclassified
www.edition.cnn.com	Unclassified
www.euronews.com	Unclassified
www.express.co.uk	Leave
www.expressandstar.com	Unclassified
www.heraldscotland.com	Unclassified
www.huffingtonpost.co.uk	Remain
www.ibtimes.co.uk	Unclassified
www.independent.co.uk	Remain
www.irishtimes.com	Unclassified
www.itv.com	Unclassified
www.leicestermercury.co.uk	Unclassified
www.manchestereveningnews.co.uk	Unclassified
www.marketwatch.com	Unclassified
www.mcclatchydc.com	Unclassified
www.metro.co.uk	Unclassified
www.mirror.co.uk	Remain
www.money.cnn.com	Unclassified
www.nbcnews.com	Unclassified
www.news.sky.com	Unclassified

www.newstatesman.com	Unclassified
www.newsthump.com	Unclassified
www.nytimes.com	Unclassified
www.pcadvisor.co.uk	Unclassified
www.personneltoday.com	Unclassified
www.premier.org.uk	Unclassified
www.rappler.com	Unclassified
www.reuters.com	Unclassified
www.scotsman.com	Unclassified
www.shropshirestar.com	Unclassified
www.slate.com	Unclassified
www.spectator.co.uk	Leave
www.standard.co.uk	Unclassified
www.sunderlandecho.com	Unclassified
www.telegraph.co.uk	Leave
www.tes.com	Unclassified
www.theatlantic.com	Unclassified
www.thecourier.co.uk	Unclassified
www.thedailymash.co.uk	Unclassified
www.theguardian.com	Remain
www.thesun.co.uk	Leave
www.thetimes.co.uk	Unclassified
www.theweek.co.uk	Unclassified
www.thisismoney.co.uk	Unclassified
www.timeout.com	Unclassified
www.torquayheraldexpress.co.uk	Unclassified
www.townhall.com	Unclassified
www.uk.news.yahoo.com	Unclassified
www.uk.reuters.com	Unclassified
www.usatoday.com	Unclassified
www.voanews.com	Unclassified
www.yougov.co.uk	Unclassified
www.zerohedge.com	Unclassified

Table A.6 shows a list of the domains in the data classified according to their

positions on the EU referendum.The classification has been done on the basis of the following sources:: Brandenburg, 2019; Deacon et al., 2016; Jackson et al., 2016; Levy et al., 2016; Simpson and Startin, 2023; University of Oxford, 2016. For the purposes of this analysis, it was assumed that the political stance of a newspaper also applied to its corresponding website, given the lack of information and evidence suggesting a divergence between the print and online editions.

Projection Networks Analysis

I will next analyse in more detail one-mode projections from the two-mode Audience Network. An analysis of the projection networks, i.e. Co-Domain Network and the Co-Individual Network, allows a broader set of analytical tools and better illustrates shared audiences of Domains and common news consumption behaviour of individuals, respectively.

In order to prevent misinterpretation or loss of data arising from the conversion, I analyse both projections. I will present and compare five different models of each projection network in order to retain meaningful information. This allows for an informed and careful analysis. First, I present Model (a) which is the Simple Projection (SP), i.e. the direct projection from the original two-mode network. I will apply the edge-weight thresholding method to it by removing edges which have a weight equal to 1. The resulting connected component of the network will be Model (b). Second, as previous analysis has demonstrated, most individuals accessed little online news relevant to the EU Referendum with a median of 4 clicks on news articles over the collection period. The distribution of article clicks per person is a strongly right skewed long tail distribution. 75% of the sample participants clicked on 9 or fewer EU Referendum relevant online news articles. However, the data also shows individuals who clicked on 50, 100, or more times on EU Referendum relevant online news. I will call those very active individuals who have more than 50 clicks 'Super-Readers'. As Super- Readers take outlier values and show extremely active online behaviour compared to the rest of the

sample, they do not represent the majority of the participants. For that reason, I created Model (c) which excludes those Super-Readers from the Network. Five study participants, who had more than 50 clicks were excluded from the network, as they demonstrated outlier values. Next, I converted from this two-mode subgraph with 197 individuals the Co-Domain and Co-Individual projections. Thus, Model (c) projections exclude Super-Readers. Model (d) is derived from Model (c), represents the network projection with excluded Super-Readers, and has an edge-weight threshold of 1. Lastly, since simple graph pruning methods such as edge-weight thresholding discounts low-degree nodes, I apply the above described MLF method. The resulting networks with the most significant edges are presented in Model (e). Summary information for each Model is presented in Table A.7 and Table A.8 for the Co-Domain Network and Co-Individual Network, respectively. Visualisations are given in Figure A.13 and Figure A.14 for the Co-Domain Network Models and Co-Individual Network Models, respectively. In the next section, I describe and compare the network models of the Co-Domain and the Co-Individual projection networks.

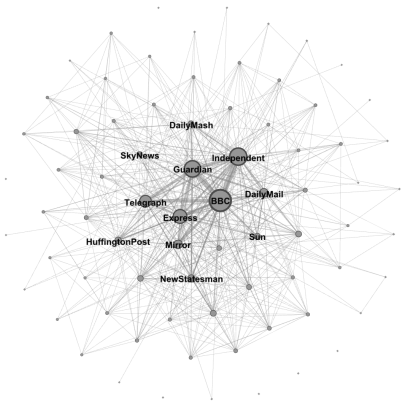
Table A.7: Co-Domain Network Models

	(a) Simple Projection (SP)	(b) Giant Component with edge-weight Threshold = 1	(c) SP Super-Readers Excluded	(d) Giant Component; edge-weight threshold = 1; Super-Reader Excluded	(e) Pruned Network (25%)
Nodes	75	33	75	30	67
Edges	528	137	418	113	132
Isolates	6	0	12	0	8
avg. Degree	14	8	11	8	4
avg. Weighted Degree	26	36	21	32	9
Communities Detected	11	3	4	3	6
Modularity	0.14	0.07	0.13	0.05	0.57

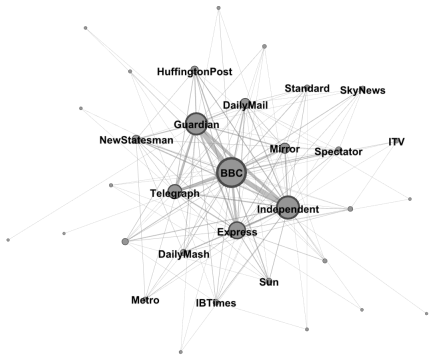
Table A.8: Co-Individual Network Models

	Original Projection	Component with edge-weight limit = 1	Hyperbolic Weighting Scheme	Pruned Network
Nodes	202	100		146
Edges	9180	1420		1377
avg. Degree	91	28		19
avg. Weighted Degree	110	66		26
Communities Detected	9	3		7
Modularity	0.17	0.18		0.45
Coefficient:				
Degree	-0.04	-0.26		0.22
EU-Ref Attitudes	0.00	0.07		0.04
Leavers Dummy		0.07		0.03
Remainers Dummy		0.10		0.07
Undecided Dummy		-0.02		-0.04

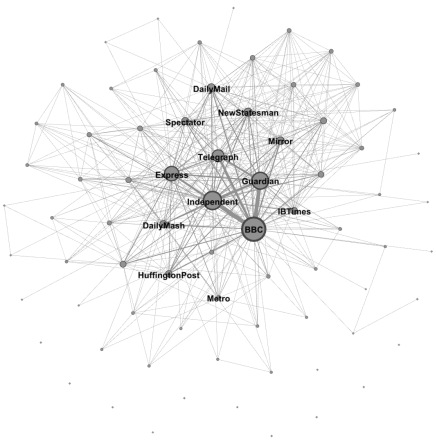
Figure A.13: Co-Domain Projection Model Visualised Using Five Different Graph Pruning Methods. (Node Size Indicates Degree Centrality; All Nodes Represent News Domains)



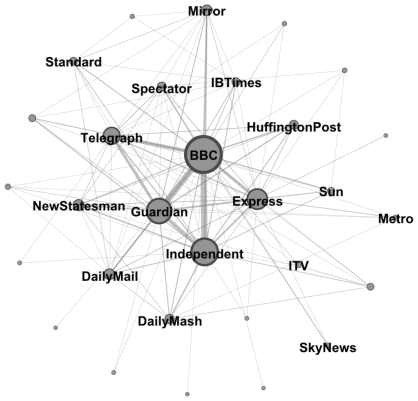
(a) Co-Domain Simple Projection (SP)



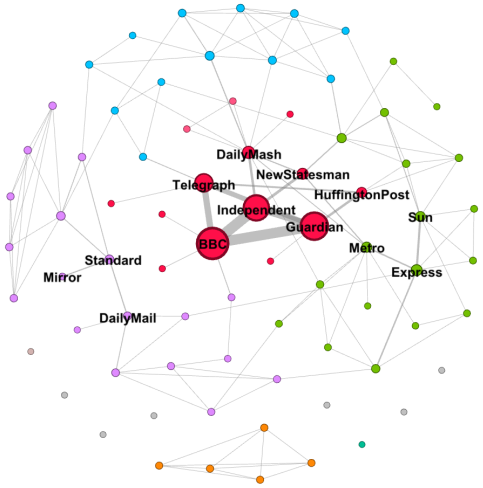
(b) Co-Domain, Giant Component, and edge-weight Threshold



(c) Co-Domain, SP, Super-Readers Excluded

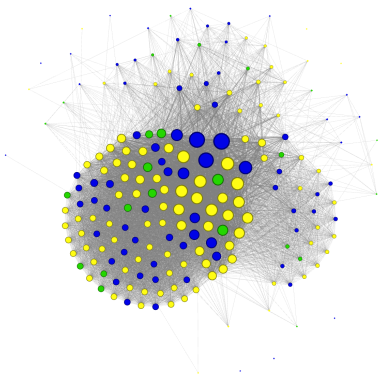


(d) Co-Domain, SP, Giant Component, Super-Readers Excluded, and edge-weight Threshold

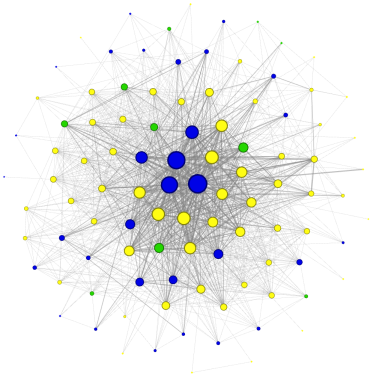


(e) Pruned Projection using Marginal Likelihood Filter (MLF); the top 25% of the edges are retained. Colours represent community membership.

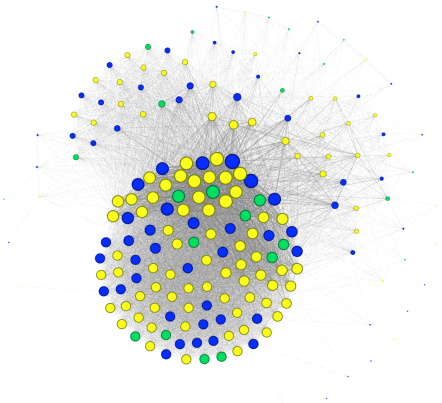
Figure A.14: Co-Individual Projection Model Visualised Using Five Different Graph Pruning Methods. (Node Size Indicates Degree Centrality; Blue = Leave Supporters, Yellow = Remain Supporters, Green = Undecided)



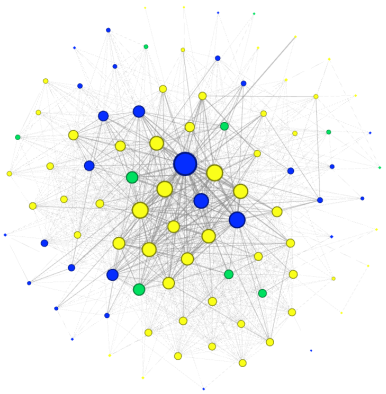
(a) Co-Individual Simple Projection (SP)



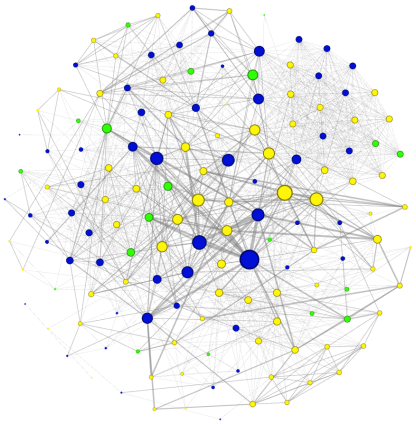
(b) Co-Individual, Giant Component, and edge-weight Threshold



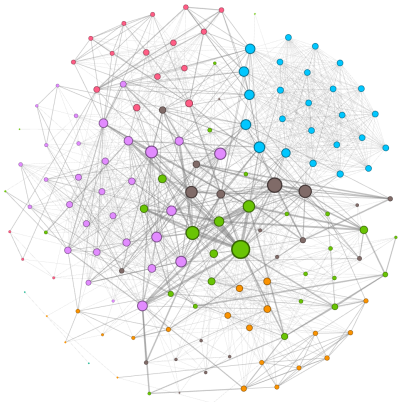
(c) Co-Individual, SP, Super-Readers Excluded



(d) Co-Individual, SP, Giant Component, Super-Readers Excluded, and edge-weight Threshold



(e) Pruned Projection using Marginal Likelihood Filter (MLF), the top 15% of the edges are retained; Giant Component; 56 isolates are not presented



(f) MLF Pruned Projection with Node Colours representing Communities; 7 communities detected using Louvain Method; Modularity = 0.45

Co-Domain Network Analysis

The directly derived simple Co-Domain projection has 75 nodes, which correspond to the Domains the study participants accessed for EU Referendum-relevant news. Within those nodes exist 528 ties. This simple projection (SP), which is directly derived from the two-mode Audience Network is the first Model (a) presented in Table A.7 and is visualised in Figure A.13. A tie between two domains exists when those outlets share at least one individual in their audiences. The strength of the audience overlap is presented as an edge weight. The graph has six isolates, which are domains that have not been clicked on alongside other news sources and are therefore not connected to any other domain in the network. In the simple Co-Domain network (a), 391 edges out of the total 528, have an edge weight of 1. The edge-weight distribution of the Co-Domain Network is highly right-skewed, which demonstrates that the bulk of ties between domains in the network arise from an audience overlap of one individual (See Figure A.3 in the Appendix). Only a few domains share ties with a higher edge weight. The edge-weight distribution provides insight into the most popular combinations of dyads. Thereby, it shows which two domains have been visited the most often alongside each other. Table 13 shows the ten most popular dyadic Domain combinations. The BBC-Independent combination was the most popular, followed by the BBC-Guardian combination. Investigating the edges with the highest edge weights shows that the BBC was visited the most often alongside other websites for EU Referendum online news. Moreover, popular combinations occur among the most popular online news sources for EU Referendum news. Next to the BBC, the Independent, the Guardian, the Telegraph, and the Express were often accessed together or with a second source.

Table A.9: Top Edges in Co-Domain Network Model (a)

Edges ID (Rank)	Source	Target	Edge Weight
1	BBC	Independent	33
2	BBC	Guardian	32
3	Independent	Guardian	20
4	BBC	Telegraph	19
5	BBC	Express	16
6	Telegraph	Guardian	15
7	BBC	Mirror	11
8	Express	Independent	11
9	Express	Guardian	11
10	BBC	Daily Mail	9

In order to emphasise stronger overlap patterns, I set an edge weight threshold, retaining only ties between domains when their edge weight is greater than 1. As a consequence, 42 Domains, which were connected to the graph by only one participant, lose their connection to the network. As we are interested in analysing overlap patterns, the focus of analysis lies on the largest connected component. The component of a network is a maximal set of nodes, in which each node is connected to the other nodes and can be reached through a path (Borgatti et al., 2018). The remaining connected component of the Co-Domain Network has 33 domains and 137 ties among them. This approach results in the second Model (b) of the Co-Domain Network. Figure A.13 Model (b) shows that the most popular domains are well connected. This indicates strong audience overlap for the most popular online news outlets. The BBC is the most central node in the network and is connected to 27 out of all 33 domains. This verifies the central role of the public broadcaster and shows that the BBC shares a common audience with the most popular online-news outlets. Table 2.9 shows the most connected domains in the Co-Domain Model (b) network ranked by their Weighted Degree. The Degree figure gives the number of connections a domain has to other domains in the network, and the Weighted Degree takes the tie strength, i.e. the number of shared individuals, into account. The BBC, again, has the highest Betweenness and Eigenvector centrality measure, demonstrating its influential and popular role in the network.

Table A.10: Model (b) Co-Domain Network Centrality Measures

Rank	Domain	Degree	Weighted Degree	Betweenness Centrality	Eigenvector Centrality
1	BBC	27	200	96.30	1.00
2	Independent	24	152	72.34	0.83
3	Guardian	24	152	72.62	0.83
4	Express	22	108	45.20	0.55
5	Telegraph	17	87	38.59	0.54
6	Mirror	14	58	18.20	0.36
7	Daily Mail	15	58	34.90	0.34
8	New Statesman	11	44	7.78	0.28
9	Huffington Post	8	38	1.70	0.28
10	Daily Mash	8	31	1.03	0.20
11	The Week	9	30	5.25	0.21
12	The Sun	8	29	9.51	0.20
13	Spectator	10	29	22.11	0.18
14	IBTimes	9	25	19.87	0.16
15	Standard	8	23	19.29	0.15
...					
Average		8	36	17.86	0.22

The public broadcaster is an online-news outlet that is commonly visited alongside other outlets. The Independent and the Guardian are the next most popular domains and have very similar Centrality measures. The BBC, the Independent, and the Guardian create, together with the Express and the Telegraph, the densest and most central cluster in the network. They are identified as the most popular and important online news outlets for EU Referendum online news. Those central domains are surrounded by a group of the second most accessed domains, including the Mirror, Daily Mail, New Statesman, Huffington Post, Daily Mash, the Week, the Sun, the Spectator, IBTimes, and the Standard. At the periphery are the less popular online news outlets that have been accessed alongside some of the more popular domains located at the centre of the graph. In summary, the Co-Domain network has a strong core-periphery network structure as described by Borgatti and Everet (2018). The network has a dense, cohesive core of popular news outlets that show strong audience overlap with each other, and a sparse periphery formed by less popular and sometimes niche domains that are connected to the core but not as connected with each other. Thus, the Co-Domain network shows a hierarchical partition of nodes into well-connected core nodes and peripheral online news sources visited alongside popular domains. This

finding corresponds with and verifies the description of the UK online media audience network by Mukerjee et al. (2018). Their audience network analysis of a similar dataset also identified the BBC as the most popular and well-connected domain and found a very similar network structure and composition of the core online news sources. For identifying communities, I use the Louvain algorithm proposed by Blondel et al. (2008; 2023). This method estimates the optimal community partition in a network based on modularity maximisation. However, the Co-Domain network is very dense and interconnected. The Louvain method detected three communities. However, the modularity score of the Co-Domain network is 0.07, which is a very low score and suggests that the network shows a high level of connectivity and is not very modular. The Co-Domain Network demonstrates that domains do have audience overlap and that especially popular online news outlets are visited alongside each other. Nevertheless, we know from previous analysis that most individuals visited very few online news sources for their EU Referendum online news, and only a few (i.e. 14%) very active news readers had online news portfolios that were larger than 4 domains. 67% of the participants who accessed EU Referendum online news visited a maximum of two domains, and almost half (i.e. 48%) of all participants who accessed online EU Referendum-relevant news visited only one website. As those individuals accessed only one domain, they do not contribute to any tie formation between two domains and are not part of the information presented in the Co-Domain network. The Co-Domain network, therefore, presents information that comes from more widely engaged online newsreaders only (i.e. only 52% of sample). This must be considered when interpreting the Co-Domain network results.

Models (a) and (b) primarily demonstrate the hierarchical structure regarding popularity of domains in the Co-Domain network as well as the strong audience overlap between popular domains. Since very active individuals as well as very popular domains might contribute to a lot of 'noise' in the network, I will next describe Models (c), (d), and (e), which try to uncover further potentially hidden

structures. As previously described in the 'Projection Networks Analysis' section, Model (c) excludes identified 'Super-Readers' to better represent the majority of the population and test the impact of those very active online news readers on the network structure. The model shows, therefore, domains that have been visited for EU Referendum-relevant news, and the ties between them map the audience overlap. The edges were created by study participants who accessed two or more domains and were not classified as 'Super-Readers. Model (d) shows the resulting connected component after setting an edge-weight threshold of 1. Excluding 'Super-Readers' from the network caused no major disruption or change from the original network structure. The removal of the most active individuals in the sample removed a few edges from the original network, but did not, however, result in a more modular network or create more communities (see Figure A.13). The network still shows a strong core-periphery structure. Thus, although 'Super-Readers" online news clicking activity was substantially higher than that of the average, their activity was mostly redundant. Overall, this shows that individuals who accessed a portfolio of online news sources for information about the EU Referendum during the campaign period got their information mostly from legacy news providers and visited a few niche outlets alongside these popular sources. Legacy news providers are the most popular domains in the network and share a strong common audience. Though my analyses suggest some differences in online news source preferences between Leavers and Remainers, I did not find groups separated along political ideological lines.

The last Co-Domain Model (e) is the result of applying the Marginal Likelihood Filter (MLF) to the original Co-Domain network. The model shows the top 25% of the edges. That means that the most significant ties, compared to the null model, are retained to reveal those network structures that are the least likely to have occurred due to pure chance. After applying the MLF, the network has 8 isolate domains and 67 connected nodes with 132 ties among them. The visualisation of Model (e) in Figure A.13 shows that the network looks slightly

sparser compared to the previous models. Model (e) has a similar number of edges as Model (b); however, the Marginal Likelihood Filter is less biased towards keeping edges of large domains than the edge-weight thresholding method. Thus, the model reveals more connections between niche and smaller outlets that were visited alongside the most popular domains. Overall, Model (e) tells the same story as the previous models. It shows a very dense and strong overlap of the core domains. The most central outlets are again the BBC, the Independent, the Guardian, and the Telegraph. Only the Express, which was part of the core in the Models (a)-(d), drifted slightly away from the most central domains. It is now more strongly connected to other tabloids such as the Sun and the Metro. The Huffington Post, the Daily Mash, and the New Statesman similarly surround the dense core. The Community Detection algorithm now identifies six communities with a significantly higher modularity score of 0.57, suggesting that Model (e) does show tendencies of grouping. Community membership is indicated by different coloured nodes in the visualisation of Model (e). However, the community compositions are not very clear. From a political orientation perspective, the groupings create some puzzles. For example, the Metro, Express, and Sun community and a Mirror, Standard, and Daily Mail community are not politically homogenous. Since Models (a)-(d) do not show high modularity scores, and the communities detected in Model (e) are somewhat puzzling, I conclude that the Co-Domain network does not show signs of substantial or meaningful clustering with regard to political orientation. The strongest result is a core-periphery structure of the Co-Domain network, which suggests that more popular and especially mainstream online news outlets remain the primary source for political news and were the most relevant sources for EU Referendum online news during the campaign period. To conclude, mainstream news providers, such as the BBC, the Independent, the Guardian, the Express, and the Telegraph were the most important news sources for EU Referendum news during the campaign period and show substantial audience overlap. These findings correspond to results from

previous studies (e.g. Fletcher and Nielsen, 2017; Fletcher and Selva, 2019; Mukerjee et al., 2018). The Co-Domain network shows no meaningful partition by political orientation of news sources, and the most prominent structural pattern is a core-periphery structure revealing a strong and overlapping core opposed to niche and less popular domains visited alongside mainstream sources. More widely engaged online news readers might show signs of diverse online news exposure; however, this is a small group of individuals compared to the wider population. Therefore, considering the online news exposure of both less active and widely engaged online news readers is important. For that reason and to analyse further whether a potential divide exists between Leavers and Remainers in their online news consumption, I will next analyse the corresponding Co-Individual network.

Co-Individual Network Analysis

Following the selective exposure hypothesis, I expected to see audience fragmentation along ideological lines. Thus, I hypothesised that Leavers and Remainers show substantially different news consumption behaviours, fragmenting the audience of online news outlets accordingly. The second one-mode projection derived from the two- mode Audience Network is the Co-Individual Network which shows ties between individuals when those users visited the same domains for EU Referendum-relevant online news. The analysis of the Co-Individual Network aims to answer the question of whether individuals who share the same attitudes toward the EU Referendum are also more likely to share common news exposure due to similar online news consumption behaviour. The simple projection, Model (a), has 202 individual nodes and 9180 edges (see Table A.8 and Figure A.14 above). Many of those edges between individuals exist because they had only the BBC in their online news portfolio in common. Again, in order to deal with this issue and identify stronger similarities between individuals in their news portfolios, I used the edge-weight thresholding method and set an edge weight threshold of 1. This means that ties between individuals which exist due to only one com-

mon domain are filtered out. The resulting network for further analysis has 100 individuals which are still connected and 1420 edges between them. Figure A.14 shows a visualisation of the resulting Co-Individual network Model (b).

Model (a) shows one big and very dense cluster of connected individuals. This circle is the k-core of the Co-Domain Model (a) network; in other words, it represents the maximal connected subgraph of the network wherein all nodes are connected with each other with at least a degree of k (Seidman, 1983). The k-core of Model (a) consists of 115 individuals (i.e. 57%) which are the study participants that visited the BBC for EU Referendum news. In this case, k equals a degree of 114, as the subgraph comprises 115 nodes that are all connected to each other due to the BBC. Nodes surrounding the k-core are individuals that did not visit the BBC. Thus, there is a clear distinction between individuals who accessed the BBC and individuals who did not. At the bottom left part in the k-core are individuals that visited only the BBC, whereas at the top right in the k-core are individuals that have wider news portfolios. Outside of the k-core, a group of individuals that predominantly visited the Guardian but not the BBC is located as a distinct cluster at the bottom right of the Model (a) visualisation. Slightly less organised and sparser are the nodes positioned at the most outer circle and top of the network. Those nodes are a mix of individuals who accessed only one or very few domains for EU Referendum news and did not visit the BBC or the Guardian. Only very few individuals had a wider domain portfolio but did not access the BBC. The 48% of individuals in the network that visited only one domain for their EU Referendum online news are equally divided into Leavers and Remainers, with 42% Leavers, 45% Remainers, and the remaining individuals being Undecided. Of those individuals who only visited one domain, 44% visited only the BBC, and 17% visited only the Guardian. The remaining individuals visited other domains, among which are the Mirror, the Express, the Telegraph, the IBTimes, and other less popular domains. There are no clear differences between Leavers and Remainers who visited only one online news source for their

EU Referendum online news. Model (a) has a relatively low modularity score of 0.17, indicating that the network is very dense and does not reveal multiple distinct communities. The community detection identified three communities which can be summarised as mainly one community of individuals who only or predominantly visited the BBC, individuals who visited predominantly the BBC and the Guardian or only the Guardian, and a third community of others. However, those communities are not strictly defined, and those descriptions of the communities are not applicable to every individual therein. Overall, Model (a) mainly shows the divide of individuals who accessed the BBC for EU Referendum relevant online news and those that did not. My findings reveal the dominance of the BBC and other legacy media outlets and therefore correspond with results by Newman et al. (2017). The public broadcaster was often visited alongside other domains, making it a sort of reference-point.

The BBC definitely acts as an important bridge and connection point for individuals. The public broadcaster connects the majority of individuals, demonstrating its popularity as well as dominant role as an online news provider for EU Referendum-relevant news during the campaign period. Individuals often visited the BBC alongside one or more additional outlets. Excluding the BBC from the original data results in slightly more distinguishable groups, revealing communities that can be allocated to specific domains. Model (a) shows that the BBC connects a lot of individuals that would be less strongly, if at all, connected if the BBC were excluded. The BBC represents an impartial information source many individuals use in addition to other news outlets. Hence, the BBC plays a vital role in providing unbiased information and facilitating an overall balanced exposure to political opinions and news. However, that also means that the BBC is in a sensitive and influential position, holding great power over the supply of political news. In this study, I assume that the BBC does, in fact, provide impartial news information. If, however, the BBC would favour one political position over the other, this could have a strong impact on segregation as well as electoral

behaviour. Due to the BBC creating many connecting ties, other potentially distinct patterns are difficult to observe. I will next describe Model (b) where weak ties are filtered out. Model (b) is the resulting subgraph of Model (a) after setting an edge-weight threshold of 1. This method filters out all connections between two individuals that share only one common domain in their news portfolio, but it also removes all the ties of individuals that accessed only one domain over the collection period (i.e. have a news- domain portfolio size of 1). Hence, Model (b) shows a subgraph of more widely engaged individuals but also retains only ties that represent a stronger overlap between two individuals' news portfolios. A community detection on Model (b) finds, again, only three communities with a similarly low modularity score of 0.18. Overall, Model (b) demonstrates similar results as Model (a). Communities cannot be strongly associated with political attitudes towards the EU Referendum. I hypothesised that I would see homophily in the network because of an observable segregation between individuals with Leave and Remain attitudes due to different online news outlet preferences. In order to test for homophily, I calculate assortativity coefficients as defined by Newman (2003). Results are presented in Table 12 above. Assortativity coefficient r lies between -1 and $+1$. An r equal to zero indicates that there is no assortative mixing present in the network, whereas an $r = 1$ reveals perfect assortative mixing, and negative values suggest disassortative mixing.

Model (a) shows no assortative mixing with regards to EU Referendum attitudes, suggesting that individuals with Leave or Remain attitudes and individuals who are undecided are evenly spread in the network. Once we exclude weak ties from the network, Model (b) has an assortativity coefficient of 0.07 for EU Referendum attitudes. This suggests that when analysing slightly more widely engaged individuals and stronger overlap patterns, we detect weak assortative mixing in the network with regards to EU Referendum attitudes. Thus, some individuals are more connected to other individuals sharing the same attitude towards the EU Referendum than in a completely random distribution. Nevertheless, an as-

sortativity coefficient of 0.07 only suggests slight homophily in the network. To summarise, in accordance with previous findings presented above (e.g. Table 9 and 10), my analysis suggests that some individuals who share the same opinion on Brexit do have a preference for similar news outlets. Overall, however, no very distinct groups have been identified, and strong segregation along ideological lines has not been detected, because the strong presence of the BBC among individuals presents a very homogenous audience. Next, I will describe Model (c), which excludes Super-Readers from the Network. After excluding five individuals that demonstrated extreme online news activity and were therefore identified as outliers, the network in Model (c) has 197 individuals and corresponding nodes. Between those nodes exist 8493 edges. Moreover, the network has 6 isolates that are no longer connected to the giant component. Like Model (a), the network is still very dense and well connected. Excluding Super-Readers had no major impact on creating communities, and Model (c) lacks modularity just as the original model and demonstrates no clear divide between Leavers and Remainers. Overall, excluding Super-Readers from the network revealed no drastically different picture from Model (a). Likewise, setting an edge-weight threshold of 1 resulted in Model (d), which also has no mentionable differences to the corresponding Model (b). This leads to the conclusion that excluding the identified Super-Readers had no substantial effect on the network. The Network Models (c) and (d), which filtered out the outlier individuals, present very similar results to the original network Models (a) and (b) (see Table 12). Overall, individuals accessing more than one domain for EU Referendum news show more diverse online news consumption than previously expected. Most political online news activity centres on legacy news providers with large shares of audience overlap and relatively politically diverse users.

Lastly, I describe the Co-Individual network Model (e). It is the result of applying the Marginal Likelihood edge filter (MLF) to the original Co-Individual network, which retained, in this case, the top 15% of edges that were the least

likely to have formed purely by chance. Thereby, the model tries to reveal significant substructures in the Co- Individual network. The MLF removed a significant proportion of ties between individuals that resulted from having the BBC in common, since the BBC has the highest audience size and is therefore likely to be visited due to its popularity. Model (e) has 146 connected nodes/individuals, as filtering out less significant edges resulted in 56 isolates. Among the 146 individuals, 1377 edges remained. As a consequence of the filtering, the subgraph Model (e) has a far lower density (Graph Density = 0.13) than the original Model (a) (Graph Density = 0.45). Figure A.14 shows the Giant Connected Component (i.e. no isolates presented) of Model (e), with node size representing the node's weighted degree and colours representing attitudes towards the EU Referendum. Model (f) is a visualisation of the same graph but with node colours changed to indicate community membership. The community detection method has identified 7 distinct communities with a modularity score of 0.45 (see Table A.8). This shows that Model (e) is, out of all other Co-Individual network models, the most modular. Analysing the communities presented in Figure A.14 Model (f) shows that some of the communities have a dominating online news outlet. For example, the blue community at the top right of Model (f) shows individuals with a clear preference for the Guardian. Moving clockwise, the next allocatable group is the orange community at the bottom right. Individuals in this community had, besides the BBC, a clear preference for the Independent. The purple community at the left centre of Model (f) has a majority of individuals with a preference for the Express. The top left community coloured in red is comprised of individuals who accessed the Telegraph. Nodes positioned in the centre of the network are predominantly individuals who had larger news domain portfolios and shared common news sources with more people. Those individuals typically have a more balanced news portfolio and are therefore more difficult to allocate to only one domain. Model (f) shows that after filtering out less significant edges, we do find distinct domain preferences of individuals. This is not particularly surprising, as

it would be unreasonable to assume that people's preferences for news outlets are randomly distributed on the media landscape. Previous models demonstrate that the measured online news exposure is, however, less clustered and shows a high degree of portfolio overlap. This is particularly true due to the popularity of the BBC creating great connectivity of otherwise distinct/separated groups and individuals.

However, although Model (f) shows distinguishable communities formed due to news domain preferences, a comparison of Model (f) with Model (e) in Figure A.14 suggests that those communities do not necessarily represent ideological segregation with regards to EU Referendum attitudes. In other words, these communities are more heterogeneous than previously expected. The only relatively homogenous community with predominantly Remain voters is the orange community formed of individuals with a strong preference for the Independent. This finding corresponds to the Leave-Remain Index above, which suggested a strong Remain voters surplus in the audience of the Independent. All other communities identified in Model (f) are less homogenous with regards to EU Referendum attitudes. Nevertheless, the assortativity coefficient for EU Referendum attitudes of Model (e) equals 0.04. This indicates a faint tendency of assortative mixing with regards to EU Referendum attitudes. In summary, the Co-Individual network shows no obvious signs of political polarization (see Table A.8 and Figure A.14 above), as the high-choice and ease of access of the online media environment makes diverse news consumption possible. Although some Leavers and Remainers do have slightly different preferences for online news sources, at the audience level, there are no clear signs of audience fragmentation, due to audience overlap between mainstream news sources.

A.2.6 Model Fit and Robustness Checks

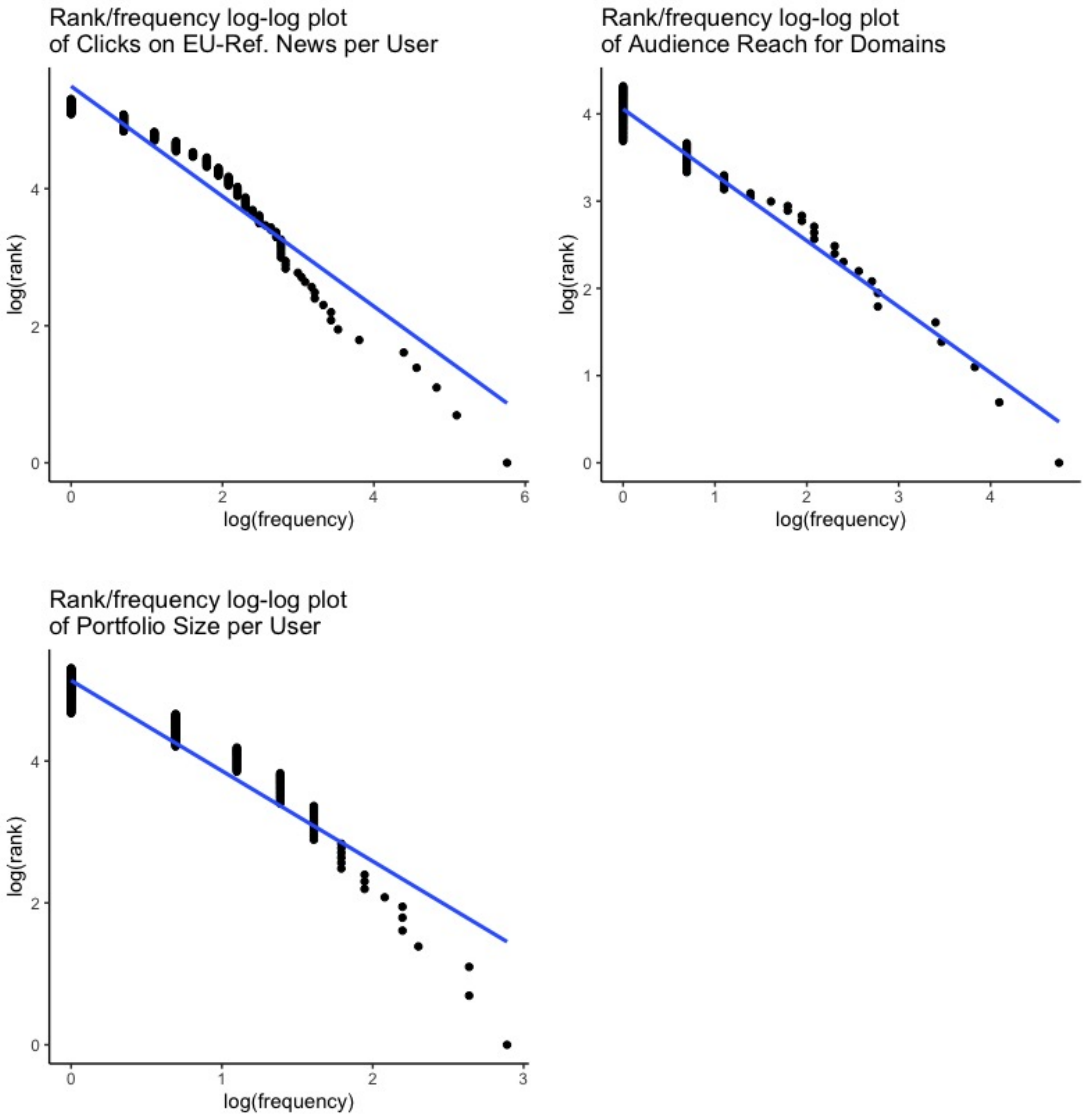


Figure A.15: Rank-Frequency Log-Log Plots

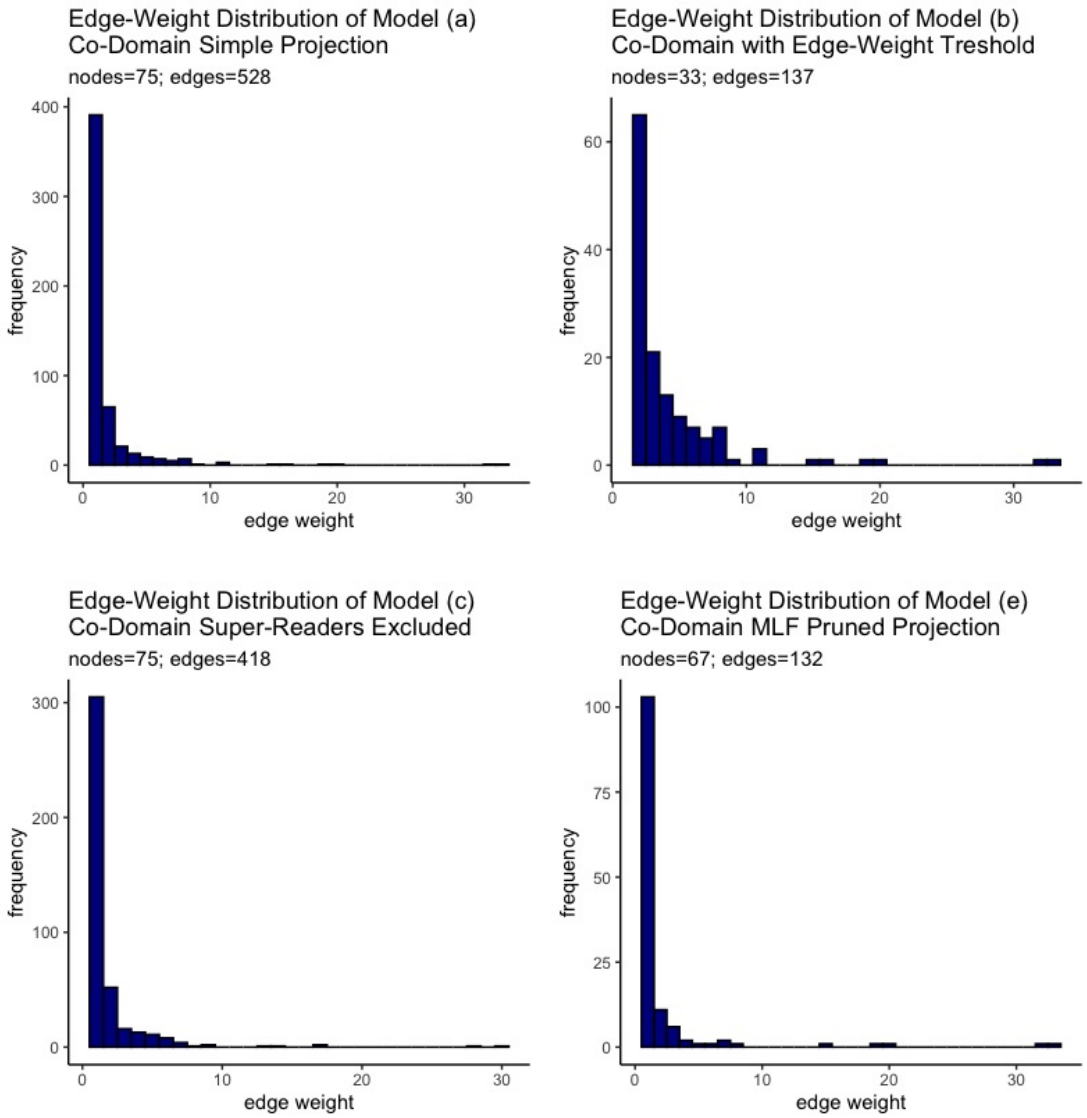


Figure A.16: Edge-Weight Distribution of Co-Domain Network Models

Table A.11: Series of Simple Logistic Regressions – Domain Choice Approximation

	Dependent variable: Domain Choice									
	BBC		Guardian		Independent		Express		Telegraph	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
EU-Ref Attitude (reference = Remain)										
Leave	-1.440 ***	(-0.100)	-1.265 ***	(-0.164)	-0.815 ***	(-0.233)	3.210 ***	(0.213)	1.297 ***	(0.252)
Undecided	-1.192 ***	(0.262)	-0.935 **	(0.433)	-0.534	(0.603)	1.558 ***	(0.407)	0.859	(0.558)
Constant	0.142 **	(0.064)	-1.591 ***	(0.085)	-2.725 ***	(0.133)	-3.638 ***	(0.203)	-3.816 ***	(0.221)
Observations	2,049		2,049		2,049		2,049		2,049	
Log Likelihood	-1236		-674.42		-365.75		-810.66		-380.63	
AIC	2,477.90		1,354.85		737.50		1627.31		767.25	

Note: *p<0.1; **p<0.05; ***p<0.01

Table (Continued)

	Daily Mail		Mirror		Huffington Post		New Statesman	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
EU-Ref Attitude (reference = Remain)								
Leave	0.589	(0.378)	-0.150	(0.296)	-0.630	(0.509)	-1.649 ***	(0.492)
Undecided	1.516 **	(0.596)	0.916 *	(0.504)	0.091	(1.051)	-0.744	(1.026)
Constant	-4.473 ***	(0.303)	-3.638 ***	(0.203)	-4.473 ***	(0.303)	-3.638 ***	(0.203)
Observations	2,049		2,049		2,049		2,049	
Log Likelihood	-174.10		-240.60		-102.29		-153.10	
AIC	354.19		487.20		210.58		312.2	

Note: *p<0.1; **p<0.05; ***p<0.01

A.3 Appendix to Chapter 3

A.3.1 Data and Method

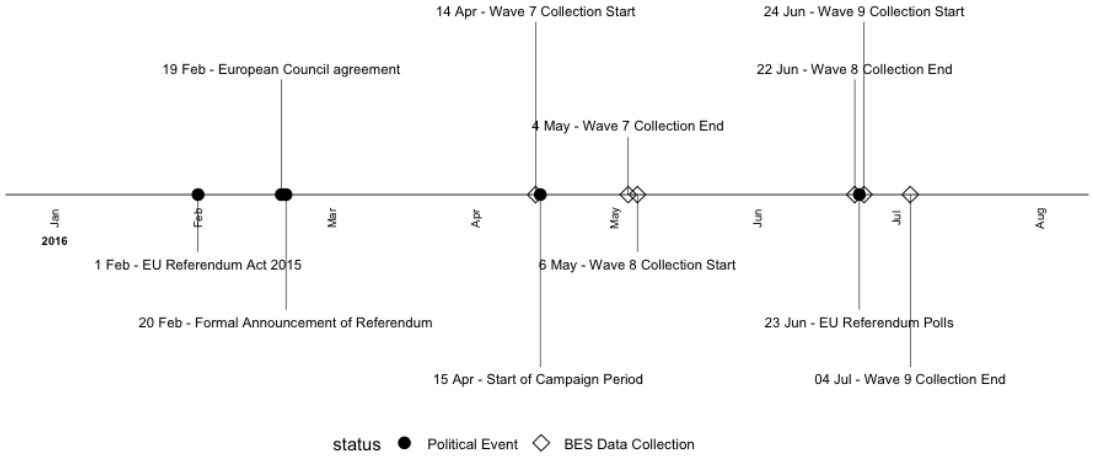


Figure A.17: Timeline of EU Referendum and BES Data Collection

The sample for the main part of this study's analysis has a size of 20,918 participants. This sample comprises BES participants who have data from Wave 7, Wave 8, and Wave 9 and the combined weights, i.e. 2016 EU Referendum pre-campaign-post-waves weight (wt_full_W7W8W9)).

Table A.12: Newspaper EU Referendum Stance

Newspaper	Proportion	Coding of this study	Levy et al. 2016	Jackson et al. 2016	Deacon et al. 2016
None/NoPref.	28%	NA	NA	NA	NA
Sun	18%	Leave	Leave	Leave	Leave
Mirror	14%	Remain	Remain	Remain	Remain
DailyMail	13%	Leave	Leave	Leave	Leave
Other	8%	NA	NA	NA	NA
Times	4%	Unclassified	Remain	balanced/Leave	Remain
Local Paper	4%	NA	NA	NA	NA
Telegraph	4%	Leave	Leave	Leave	Leave
Guardian	3%	Remain	Remain	Remain	Remain
Express	1%	Leave	Leave	Leave	Leave
Independent	1%	Remain	NA	Remain	Remain
DailyStar	1%	Leave	Leave	Leave	Leave
FT	0.6%	Remain	Remain	Remain	Remain

Table A.12 shows newspapers' EU Referendum positions according to three different studies: Levy et al. (2016), Jackson et al. (2016), and Deacon et al.

(2016). The variable 'PaperEuRefStance' in the third column lists the EU Referendum stance classifications for each newspaper as they are used in this study, based on the three detailed studies listed above. The table lists the newspapers in order of popularity among participants in the BES sample, with each study's classification of the newspaper's stance in a separate column. The table shows that, according to all three studies, the *Daily Mail*, the *Sun*, and the *Daily Star* were in favour of leaving the EU. The *Mirror*, *Guardian*, *FT*, and *Independent* were classified as pro-Remain by all three studies. The *Times* was classified as pro-Remain by Levy et al. (2016) and Deacon et al. (2016) but as having a more balanced stance with a slight Leave preference by Jackson et al. (2016). The *Telegraph* and the *Express* were classified as pro-Leave by all three studies. It is important to note that some newspapers, such as local newspapers, were not analysed by any of the studies, and their stance on the EU Referendum is unclassified. In addition, the stance of some newspapers, such as the *Times*, was not consistent across the different studies, so I have coded the *Times* as unclassified.

Control Variables

The dependent variable of the logistic regression model presented in Table 5, EU Referendum vote, is dichotomized as Leave (coded as 1) and Remain (coded as 0). The categories for each independent variable were chosen based on theoretical expectations and previous research, and in the interest of a parsimonious model.

Preferred daily newspaper (i.e. 'p_paper_read'): The BES collected information on respondents' preferred daily newspaper through the question, 'Which daily newspaper do you read most often?' asked in all waves of the survey. Respondents could choose from a list of 16 options, including the *Express*, the *Daily Mail*, the *Mirror*, the *Sun*, *FT*, the *Guardian*, the *Times*, and Other Newspaper, as well as an option for None. Other options include local newspapers such as the *Scotsman* and the *Herald* (Glasgow).

Political attention (i.e. 'polAttention'): The BES asked, 'How much attention do you generally pay to politics?' to estimate individual's level of general political attention. Political attention is measured on a scale of 0-10, and allows 'don't know' answers.

Political Interest (i.e. 'euRefInterest'): To measure interest levels in the EU Referendum, BES Waves 7 and 8 asked participants, 'How interested are you in the EU Referendum that will be held on June 23rd?' Respondents could answer, 'Very interested', 'somewhat interested', 'not very interested', 'not at all interested', and 'don't know'. This variable is the main source for political interest.

EU Referendum Identity (i.e 'euID'): The BES asked participants, 'In the EU Referendum debate, do you think of yourself as closer to either the "Leave" or "Remain" side? If yes, which one?' Possible answers included 'the Remain side'; 'the Leave side'; 'neither'; or 'don't know'.

National Identity (i.e 'nationalIdentities'): To measure people's sense of national identity and belonginess, the BES asked particpants to rank on a scale of 0-10 their feelings of Britishness, Scottishness, Welshness, Englishness, and Europeanness. Independent of partipcants' attitudes towards the EU Referendum, the Europeanness scale is of interest to measure a sense of identity and affiliation to Europe.

Political Identity (i.e. 'partyID'): To measure party identity, the BES asked, 'Generally speaking, do you think of yourself as Labour, Conservative, Liberal Democrat or what?'

Demographics : To include demographic data in my models, I included the following measures:

- Age
- Gender

- Ethnicity (i.e. being non-white)

- Household income: Possible answers include, '<£15,000'; '£15,000–£29,999'; '£30,000–£44,999'; '£45,000–69,999'; '>£70,000'; 'Prefer not to answer; Don't know'). Deciles are treated as factor variables with DK and refusals as separate categories.

- Highest Educational or Work-Related Qualification (i.e. 'p_education'): Possible answers include, 'No formal qualifications'; 'General Certificate of Secondary Education (GCSE) or less'; 'A-level or equivalent'; 'University Degree'; 'don't know/prefer not to say'.

- Employment Status (i.e. 'workingStatusW1W2W3W4W5'): Possible answers include, 'full time', 'part time', 'student', 'unemployed', and 'retired'.

- Seven-point British and European identity scales

- Other

Table A.13: Control Variables

Control Variables	**Reference Literature**	**BES var. code**
Age	(Curtice_2017; Hobolt_2016)	ageW7; ageGroup
- 18-34		
- 35-44		
- 45-54		
- 55-64		
- 65+		
Gender	(Hobolt_2016)	
Working Status		p_work_stat
Work type (approximately social class)	(Fisher_Renwick_2018)	work_type
Household Income	(Hobolt_2016)	p_gross_household; p_gross_personal
- <£15,000		
- £15,000 - £29,999		
- £30,000 - £44,999		
- £50,000 - £69,999		
- >£70,000		
- Prefer not to answer		
- DK		
Education	(Curtice_2017)	p_education
- Degree		
- Higher education below degree/A level		
- GCSE or equivalent		
- None		
Ethnicity (White/Non-white)	(Carl et al 2019)	p_ethnicity
Strength of European identity	(Curtice_2017; Hobolt_2016)	europeanness
Strength of British identity	(Hobolt_2016)	britishness, englishness, scottishness, welshness
Party identity	(Carl et al 2019)	partyId
Trust		
- Trust in MPs/politicians	(Hobolt_2016)	trustMPs
- Trust in Government/Parliament		trustParliamentScale
Government disapproval	(Hobolt_2016)	
General Election Vote		generalElectionVote; p_past_vote_2015
Political Interest	(Carl et al 2019)	
- Interest in EU Referendum		euRefInterest
- General Political Attention		polAttention

A.3.2 Results

Table A.14 shows a contingency table in row percentages of individuals' voting intentions prior to the campaign (W7) and the referendum stance of their preferred daily newspaper (W7). Participants who either did not have a preferred newspaper or did not read newspapers at all are represented in the 'No Preferred Paper' column. Comparing Leave to Remain readers may hint that individuals who supported leaving the EU at an early stage were more likely to seek out news sources that aligned with their stance compared to their opposition. Yet, as previously noted, of those individuals with a preferred daily newspaper, the largest proportion of readers preferred a newspaper classified as pro-Leave. Additionally, it is important to note that the analysis by Levy et al. (2016) revealed a significant overall press bias in favour of the Leave campaign. Further analysis is necessary to confirm such a conjecture.

Table A.14: Contingency table showing pre-campaign referendum voting intentions (W7) and EU Referendum stance of preferred daily newspaper (W7); given in row-%

	Remain_Paper	Leave_Paper	Unclassified_Paper	No Preferred Paper
RemainW7	25	25	21	30
LeaveW7	13	52	11	23
DKW7	9	30	9	52

Source: British Election Study Internet panel; Waves 7-9; weighted; 14 April to 4 July 2016; n = 20,918.

Table A.15: EU Referendum Vote Intention Over Time (%) of referendum voters and non-voters

Period	BES wave	Leave	Remain	DK
Pre-campaign	W7	46	44	10
Campaign period	W8	45	46	8
Post-referendum	W9	46	46	8

Source: British Election Study Internet panel; Waves 7-9; weighted; 14 April to 4 July 2016; n = 20,918.

Table A.16: Logistic regression models of Leave vote

	Dependent variable: EU-Ref.Vote W9 - Leave	
	(1) Media + Vote intention W7	(2) Media + Vote intention W7 + Controls
Internet (ref. = None)		
0<0.5h	−0.235*** (0.068)	−0.134 (0.071)
0.5h-1h	−0.425*** (0.078)	−0.281*** (0.083)
1h-2h	−0.373*** (0.096)	−0.299** (0.101)
>2h	−0.406*** (0.103)	−0.419*** (0.110)
DK	0.148 (0.199)	0.211 (0.207)
TV (ref. = None)		
0<1h	0.362*** (0.085)	0.261** (0.090)
>1h	0.354*** (0.093)	0.302** (0.102)
DK	0.479* (0.204)	0.687** (0.215)
Newspaper (ref. = None)		
0<1h	−0.892*** (0.166)	−0.854*** (0.169)
>1h	−0.866*** (0.191)	−0.778*** (0.195)
DK	−1.814*** (0.418)	−1.871*** (0.429)
Newspaper EU-Ref.Stance (ref.= Remain)		
Leave	0.071 (0.182)	−0.095 (0.187)
Unclassifiable Papers	−0.979*** (0.225)	−0.923*** (0.232)
No Preferred Paper	−0.598*** (0.161)	−0.605*** (0.164)
Newspaper * Newspaper EU-Ref.Stance (ref.= None*Remain)		
0<1h * Leave	0.912*** (0.202)	0.879*** (0.206)
>1h * Leave	1.066*** (0.233)	0.771** (0.237)
DK * Leave	2.212*** (0.448)	2.558*** (0.464)
0<1h * Unclassifiable Papers	0.863*** (0.247)	0.890*** (0.253)
>1h * Unclassifiable Papers	1.229*** (0.282)	1.213*** (0.289)
DK * Unclassifiable Papers	0.977 (0.622)	1.207 (0.634)
0<1h * No Preferred Paper	0.661*** (0.191)	0.686*** (0.196)
>1h * No Preferred Paper	0.517* (0.254)	0.371 (0.264)

DK * No Preferred Paper	1.591*** (0.424)	1.785*** (0.440)
Radio (ref. = None)		
0<1h	−0.082 (0.057)	−0.074 (0.059)
>1h	−0.026 (0.081)	0.031 (0.084)
DK	−0.247 (0.222)	−0.428 (0.232)
People (ref. = None)		
0<1h	−0.230** (0.072)	−0.217** (0.075)
>1h	−0.089 (0.101)	−0.026 (0.105)
DK	−0.491** (0.178)	−0.573** (0.184)
EU-Ref.Vote W7 (ref.= Remain)		
Leave	4.575*** (0.054)	4.392*** (0.057)
I will not vote	2.092*** (0.192)	2.203*** (0.221)
DK	2.237*** (0.067)	2.160*** (0.072)
Age (ref. = [18-34])		
[35,45)		0.242** (0.080)
[45,55)		0.271** (0.084)
[55,65)		−0.039 (0.086)
[65,Inf)		−0.101 (0.119)
Female		−0.034 (0.053)
Education (ref. = None)		
GCSE		−0.275* (0.108)
A-level		−0.654*** (0.109)
Degree		−1.059*** (0.113)
DK		−0.241 (0.168)
Employment Status		
(ref. = Full time)		
PartTime		0.244** (0.076)
Student		0.029 (0.131)
Retired		0.134 (0.101)
Unemployed		0.173* (0.086)
Other		−0.121 (0.154)
Household Income (ref. = <£15k)		
[£15k, £30k)		0.061 (0.089)
[£30k, £50k)		−0.065 (0.086)
[£50k, £79k)		−0.133 (0.093)

[£70k, inf.)		−0.528*** (0.129)
Prefer not to say		−0.143 (0.086)
DK		−0.445*** (0.122)
Europeanness		−0.00004** (0.00002)
Britishness		−0.00002 (0.00002)
Party Identity (ref.= Con.)		
Labour		−0.553*** (0.067)
Lib.Dem.		−0.736*** (0.100)
SNP		−0.727*** (0.153)
UKIP		2.319*** (0.246)
Green		−1.395*** (0.215)
Other		0.105 (0.220)
None		−0.278*** (0.078)
DK		−0.076 (0.116)
Interest in EU-Ref.		
(ref.= not at all)		
Not very		0.243 (0.196)
Somewhat		0.122 (0.184)
Very		0.161 (0.189)
DK		−0.235 (0.244)
Political Attention		−0.011 (0.015)
Constant	−1.644*** (0.164)	−0.732** (0.277)
Pseudo R-sq (McF):	0.544	0.57
Observations	19,584	19,464

Note: *p<0.05; **p<0.01; ***p<0.001

Source: British Election Study Internet Panel Waves 7 to 9. Dependent variable: Leave=1, Remain=0, undecided and refusals excluded. DK = Don't Know.

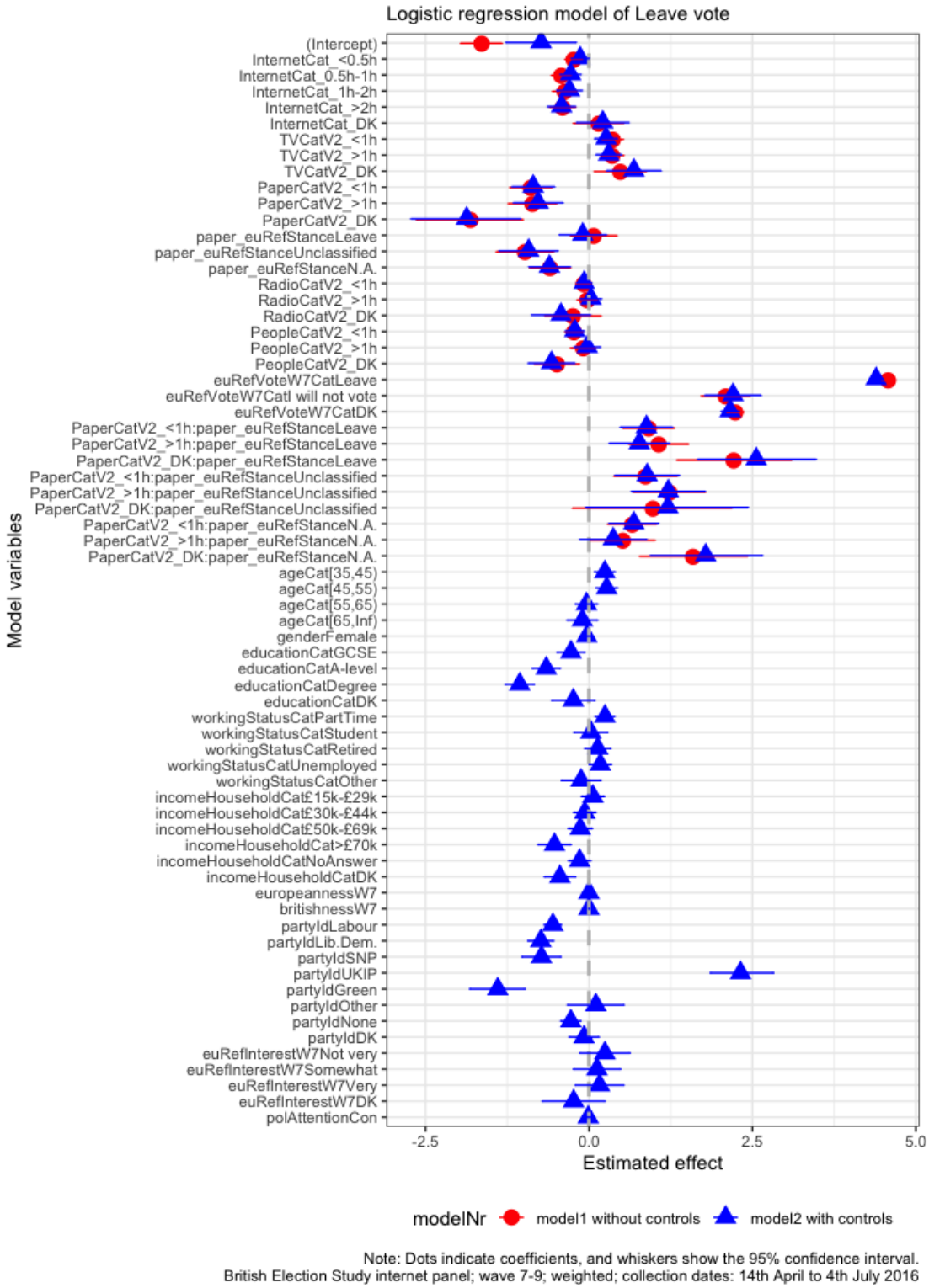


Figure A.18: Full List of Coefficients of Logistic Regression Model 1 & 2

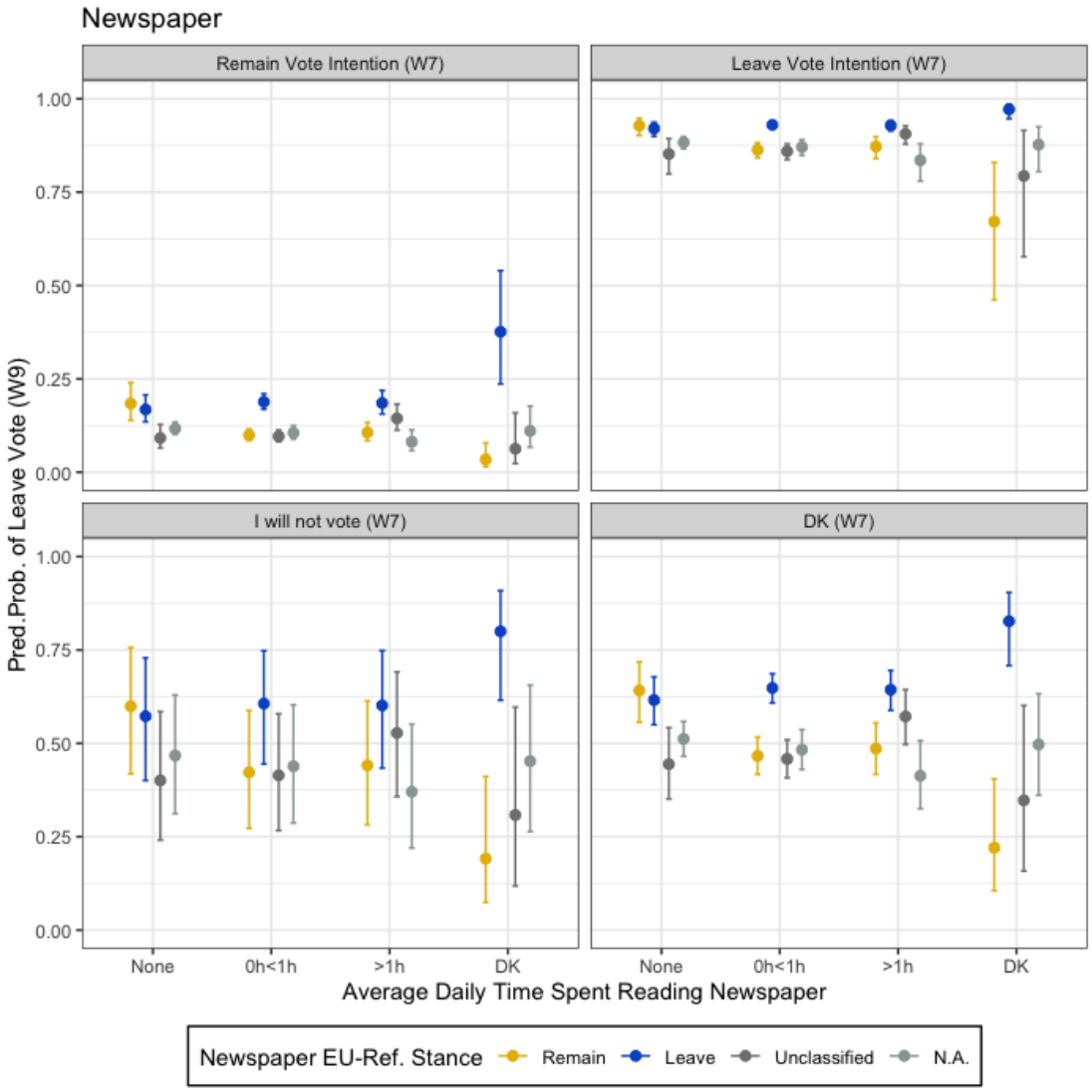


Figure A.19: Predicted Probabilities of Voting Leave in the EU Referendum based on Newspaper Consumption and Newspaper Brexit Stance, split by Pre-Treatment Voting Intention.

Table A.17: Predicted Probabilities of Voting Leave in the EU Referendum based on Newspaper Consumption and Newspaper Brexit Stance, split by Pre-Treatment Voting Intention.

ID	Facet	Group	Time Spent	Predicted	Std. Error
1	Remain Vote Intention (pre-campaign)	Remain	None	0.18	0.17
2	Remain Vote Intention (pre-campaign)	Remain	< 1h	0.10	0.09
3	Remain Vote Intention (pre-campaign)	Remain	> 1h	0.11	0.13
4	Remain Vote Intention (pre-campaign)	Leave	None	0.17	0.13
5	Remain Vote Intention (pre-campaign)	Leave	< 1h	0.19	0.07
6	Remain Vote Intention (pre-campaign)	Leave	> 1h	0.19	0.11
7	Remain Vote Intention (pre-campaign)	Unclassified	None	0.09	0.19
8	Remain Vote Intention (pre-campaign)	Unclassified	< 1h	0.10	0.09
9	Remain Vote Intention (pre-campaign)	Unclassified	> 1h	0.14	0.14
10	Leave Vote Intention (pre-campaign)	Remain	None	0.93	0.17
11	Leave Vote Intention (pre-campaign)	Remain	< 1h	0.86	0.09
12	Leave Vote Intention (pre-campaign)	Remain	> 1h	0.87	0.13
13	Leave Vote Intention (pre-campaign)	Leave	None	0.92	0.13
14	Leave Vote Intention (pre-campaign)	Leave	< 1h	0.93	0.07
15	Leave Vote Intention (pre-campaign)	Leave	> 1h	0.93	0.10
16	Leave Vote Intention (pre-campaign)	Unclassified	None	0.85	0.19
17	Leave Vote Intention (pre-campaign)	Unclassified	< 1h	0.86	0.09
18	Leave Vote Intention (pre-campaign)	Unclassified	> 1h	0.91	0.14

A.3.3 Benchmarking/Model Comparison

Series of Logistic Regressions To test the interdependence of the media effects of individual news sources, I modelled a series of five independent logistic regressions, one for each media variable. Each model includes the lagged dependent variable for EU Referendum voting intentions from Wave 7 and previously introduced controls. Table A.18 shows the coefficients for the logistic regression series. The results clearly show that there are just small changes in the effect sizes when we compare the isolated regression models to the complete Model 2 presented in Table 3.3, with the direction of coefficients and their relationships to each other remaining unchanged. Thus, these findings provide further evidence that the overall results remain consistent and robust. Although controls are included in all models, their coefficients are not shown in the table as they are not substantially different in magnitude and direction from those shown in Table A.16. The only control variable turning from statistically non-significant in Model 2 shown in Table A.16 to statistically significant for some of the media

variables in Table A.18 is political attention. While political attention remains statistically non-significant in the Internet model, the coefficients on political attention become statistically significant at the 1%, 5%, and 10% levels in the TV, Radio, and People models, respectively. Directions of the political attention variable remains the same for all models, suggesting that an increase in self reported political attention is associated with a less likely vote for Leave.

Table A.18: Series of Logistic regression models of Leave vote with isolated Media variables

	Dependent variable:				
	euRefVoteW9				
	(1) Internet	(2) TV	(3) Newspaper	(4) Radio	(5) People
Internet (ref. = None)					
0<0.5h	−0.212** (0.068)				
0.5h-1h	−0.349*** (0.079)				
1h-2h	−0.282** (0.095)				
>2h	−0.358*** (0.098)				
DK	−0.029 (0.133)				
TV (ref. = None)					
<1h		0.151 (0.085)			
>1h		0.216* (0.095)			
DK		0.353* (0.146)			
Newspaper (ref. = None)					
<1h			−0.893*** (0.167)		
>1h			−0.817*** (0.192)		
DK			−1.808*** (0.396)		
Newspaper EU-Ref.Stance (ref.= Remain)					
Leave			−0.100 (0.186)		
Unclassifiable Papers			−0.937*** (0.231)		
No Preferred Paper			−0.627*** (0.163)		
Newspaper * Newspaper EU-Ref.Stance (ref.= None*Remain)					
<1h * Leave			0.884*** (0.205)		
>1h * Leave			0.782*** (0.236)		
DK * Leave			2.531*** (0.460)		
<1h * Unclassifiable Papers			0.895*** (0.253)		
>1h * Unclassifiable Papers			1.207*** (0.288)		
DK * Unclassifiable Papers			1.093 (0.636)		
<1h * No Preferred Paper			0.666*** (0.195)		
>1h * No Preferred Paper			0.405 (0.262)		
DK * No Preferred Paper			1.707*** (0.436)		
Radio (ref. = None)					
<1h				−0.050 (0.056)	
>1h				−0.098 (0.078)	
DK				0.147 (0.132)	
People (ref. = None)					
<1h					−0.265*** (0.071)
>1h					−0.122 (0.092)
DK					−0.273* (0.133)
Constant	−1.012*** (0.233)	−1.160*** (0.235)	−0.766** (0.275)	−1.114*** (0.233)	−1.025*** (0.232)
Pseudo R-sq (McF):	0.56	0.559	0.568	0.559	0.559
Observations	19,464	19,464	19,464	19,464	19,464

Note:*p<0.05; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel Waves 7 to 9. Dependent variable: Leave=1, Remain=0, undecided and refusals excluded. DK = Don't Know. Although the coefficients for some controls are not shown in this table, all Models 1-5 include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), work status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention.

Table A.19: Logistic regression models of Leave vote (Newspaper Stance Releveld)

Dependent variable: EU-Ref.Vote - Leave	
	(2)
	Media + Vote intention + Controls
Internet (ref. = None)	
0<0.5h	−0.134 (0.071)
0.5h-1h	−0.281*** (0.083)
1h-2h	−0.299** (0.101)
>2h	−0.419*** (0.110)
DK	0.211 (0.207)
TV (ref. = None)	
0<1h	0.261** (0.090)
>1h	0.302** (0.102)
DK	0.687** (0.215)
Newspaper (ref. = None)	
0<1h	0.025 (0.126)
>1h	−0.007 (0.151)
DK	0.687 (0.304)
Newspaper Stance	
(ref.= Leave)	
Remain	0.095 (0.187)
Unclassifiable Papers	−0.827*** (0.207)
No Preferred Paper	−0.510*** (0.126)
Newspaper * Newspaper Stance	
(ref.= None*Leave)	
0<1h * Remain Paper	−0.879*** (0.206)
>1h * Remain Paper	−0.771** (0.237)
DK * Remain Paper	−2.558*** (0.464)
0<1h * Unclassifiable Papers	0.011 (0.226)
>1h * Unclassifiable Papers	0.442 (0.260)
DK * Unclassifiable Papers	−1.352* (0.543)
0<1h * No Preferred Paper	−0.193 (0.159)
>1h * No Preferred Paper	−0.400 (0.232)
DK * No Preferred Paper	−0.773** (0.292)
Radio (ref. = None)	
0<1h	−0.074 (0.059)
>1h	0.031 (0.084)
DK	−0.428 (0.232)
People (ref. = None)	
0<1h	−0.217** (0.075)
>1h	−0.026 (0.105)
DK	−0.573** (0.184)
Pre-Campaign EU-Ref.Vote Intention	
(ref.= Remain)	
Leave	4.392*** (0.057)
I will not vote	2.203*** (0.221)
DK	2.160*** (0.072)
Constant	−0.828*** (0.250)
Pseudo R-sq (McF):	0.57
Observations	19,464

*Note:*p<0.5; **p<0.01; ***p<0.001*

Source: British Election Study Internet Panel Waves 7 to 9. Dependent variable: Leave=1, Remain=0, undecided and refusals excluded. DK = Don't Know. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, political attention, and EU Referendum recall vote (Leave vote, I did not vote, and ref. being Remain vote).

Random Forest Regression I use a random forest regression model as cross-validation and to compare the classification performance and model predictions to a logistic regression of the same data and general model design. Relevant statistics are presented in Table A.20. The test classification accuracy of the random forest model, i.e. the proportion of correct predictions made by the model, lies at 90.3%. The sensitivity measure or True Positive Rate (TPR) of the model is 80.5%. Thus, The model correctly identifies 80.5% of the observations that are actually class 1 (i.e., Leave Vote). The specificity measure or True Negative Rate (TNR) of the model is 90.2%. Thus, the model correctly identifies 90.2% of the observations that are actually class 0 (i.e., Remain Vote). The positive (PPV) and negative (NPV) predictive values are 90.1% and 90.4%, respectively. Thus, the model shows good accuracy in classifying Leave votes, and the model is performing well overall in terms of accuracy, sensitivity, specificity, and positive and negative predictive values. We can assume with 95% confidence that the model correctly predicts with an accuracy in the range of 91% and 89%. The most influential predictors of a Leave vote are the lagged dependent variable capturing pre-treatment voting intentions, the level of European identity, party identification, and education. Among the media variables, Internet use is the strongest predictor, while the power among the media variables does not vary significantly, as shown in Figure A.20.

Table A.20: Random Forest Confusion Matrix and Statistics

	Classes	Statistic
1	Accuracy	0.903
2	Kappa	0.805
3	AccuracyLower	0.893
4	AccuracyUpper	0.912
5	AccuracyNull	0.502
6	AccuracyPValue	0.000
7	McnemarPValue	0.878
8	Sensitivity	0.903
9	Specificity	0.902
10	Pos Pred Value	0.901
11	Neg Pred Value	0.904
12	Precision	0.901
13	Recall	0.903
14	F1	0.902
15	Prevalence	0.498
16	Detection Rate	0.449
17	Detection Prevalence	0.499
18	Balanced Accuracy	0.903

Source:
British Election Study Internet panel; Waves 7-9; 14 April to 4 July 2016; n = 19,464

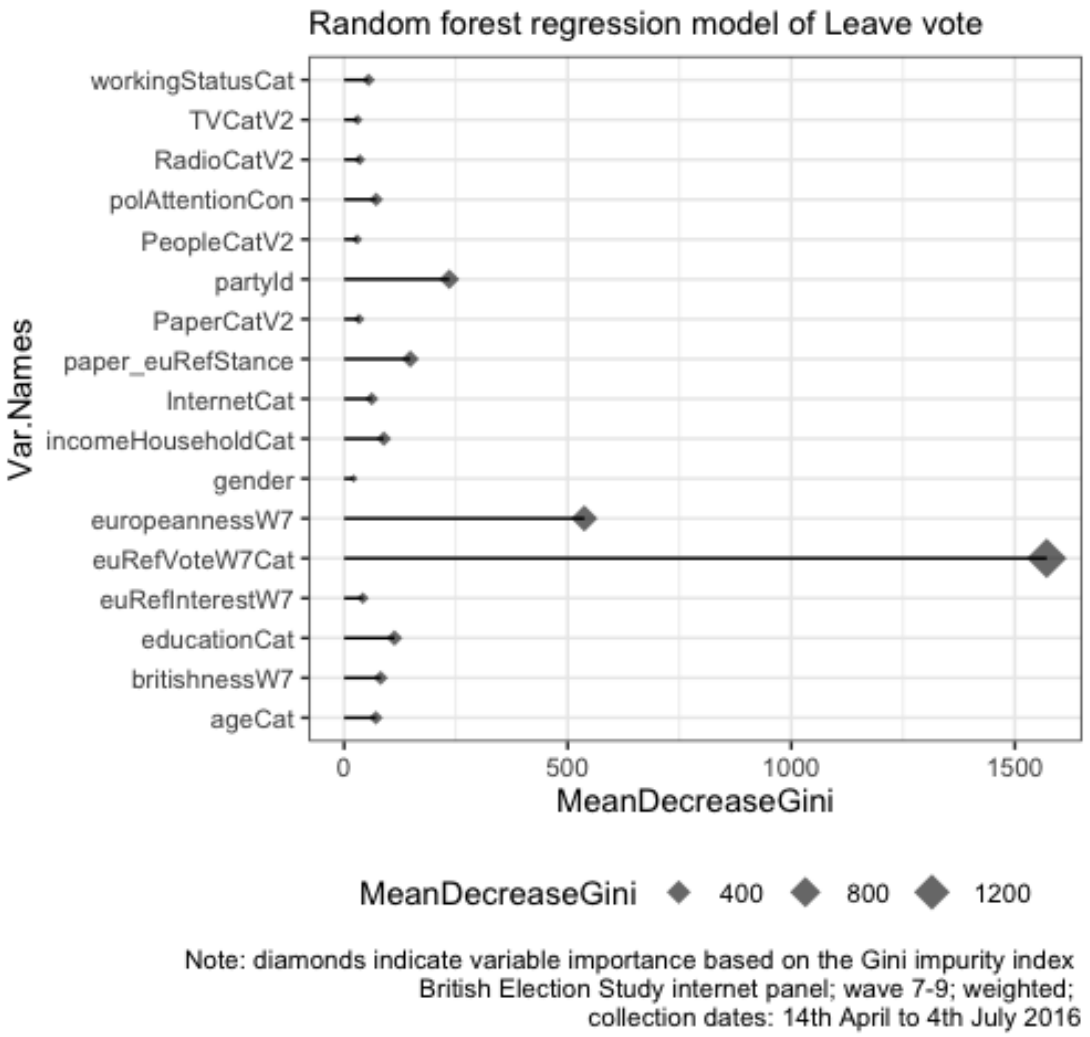


Figure A.20: Random Forest Regression Model 2.RF

A.3.4 Robustness Tests

To assess the robustness of the logistic regression model, I employed a variety of techniques to ensure the validity of the model's performance and reliability. The first step involved a thorough examination of potential multicollinearity issues between independent variables in the model, as highlighted by the correlation matrix (Table 9) in the Appendix. The correlation coefficients suggest that there are no significant multicollinearity issues. Next, I evaluated the model's performance through an analysis of the Receiver Operating Characteristic (ROC) curve plotted in Figure 9 in the supplementary Appendix. The Area Under the Curve (AUC) of 0.97 indicated a high degree of accuracy in our binary classification model.

To further ensure the model's robustness, I conducted a k-fold cross-validation, which yielded a mean accuracy of 0.94 and a mean kappa of 0.88. These values suggest high predictive accuracy and a strong agreement between model predictions and observed response variable values. As an additional validation measure, I modelled a random forest regression to compare its performance to the logistic regression model. The test classification accuracy of the random forest model was 90.3%, with a sensitivity measure (True Positive Rate) of 80.5% and a specificity measure (True Negative Rate) of 90.2%. The positive (PPV) and negative (NPV) predictive values were 90.1% and 90.4%, respectively. Overall, the random forest model demonstrated high accuracy in classifying Leave votes, with an accuracy range of 91% to 89% at a 95% confidence level using the same predictor variables as the regression model. The results of the random forest model underline the findings of the logistic regression model. This comparative analysis reinforces the confidence in the logistic regression model's robustness and reliability.

Multicollinearity diagnostics I checked for multicollinearity between the independent variables in the logistic regression model to gain confidence in the reliability of the estimates, standard errors, and regression coefficients. Table A.21 shows a correlation matrix with the correlation coefficient between each pair of independent variables of the logistic regression model. The correlation coefficients range from -0.155 to 0.526. These values do not indicate a strong problem of multicollinearity. The only slightly moderate correlation exists between political information obtained via the Internet and via one's own social network, with a correlation coefficient of 0.43. In addition, political attention also shows slightly positive associations, with correlation coefficients around 0.3, with the consumption of political news via the sources listed.

Table A.21: Multicollinearity matrix of logistic regression model independent variables (part 1)

	InternetCat	TVCatV2	PaperCatV2	RadioCatV2	PeopleCatV2	euRefVoteW7Cat	ageCat	gender
InternetCat	1.000	0.246	0.242	0.236	0.426	-0.064	-0.152	-0.106
TVCatV2	0.246	1.000	0.290	0.219	0.280	0.060	0.202	-0.055
PaperCatV2	0.242	0.290	1.000	0.229	0.235	0.001	0.107	-0.067
RadioCatV2	0.236	0.219	0.229	1.000	0.246	-0.093	0.023	-0.072
PeopleCatV2	0.426	0.280	0.235	0.246	1.000	-0.009	-0.071	0.008
euRefVoteW7Cat	-0.064	0.060	0.001	-0.093	-0.009	1.000	0.175	-0.010
ageCat	-0.152	0.202	0.107	0.023	-0.071	0.175	1.000	-0.049
gender	-0.106	-0.055	-0.067	-0.072	0.008	-0.010	-0.049	1.000
educationCat	0.103	-0.052	0.069	0.128	0.038	-0.275	-0.257	0.002
workingStatusCat	-0.084	0.124	0.053	-0.073	-0.065	0.152	0.526	0.092
incomeHouseholdCat	0.007	-0.012	0.046	0.050	0.026	-0.042	-0.095	-0.020
europeannessW7	-0.009	-0.006	-0.021	-0.025	-0.009	0.017	-0.029	0.040
britishnessW7	0.013	-0.016	-0.005	-0.011	0.009	-0.024	-0.025	0.022
partyId	0.020	-0.107	-0.107	-0.067	-0.036	0.064	-0.155	0.035
euRefInterestW7	0.140	0.189	0.188	0.127	0.188	0.094	0.150	-0.077
polAttentionCon	0.316	0.345	0.326	0.235	0.293	-0.058	0.102	-0.160

Note: British Election Study Internet panel; Waves 7-9; weighted; 14 April to 4 July 2016; n = 20,918

Table A.22: Multicollinearity matrix of logistic regression model independent variables (part 2)

	educationCat	workingStatusCat	incomeHouseholdCat	europeannessW7	britishnessW7	partyId	euRefInterestW7	polAttentionCon
InternetCat	0.103	-0.084	0.007	-0.009	0.013	0.020	0.140	0.316
TVCatV2	-0.052	0.124	-0.012	-0.006	-0.016	-0.107	0.189	0.345
PaperCatV2	0.069	0.053	0.046	-0.021	-0.005	-0.107	0.188	0.326
RadioCatV2	0.128	-0.073	0.050	-0.025	-0.011	-0.067	0.127	0.235
PeopleCatV2	0.038	-0.065	0.026	-0.009	0.009	-0.036	0.188	0.293
euRefVoteW7Cat	-0.275	0.152	-0.042	0.017	-0.024	0.064	0.094	-0.058
ageCat	-0.257	0.526	-0.095	-0.029	-0.025	-0.155	0.150	0.102
gender	0.002	0.092	-0.020	0.040	0.022	0.035	-0.077	-0.160
educationCat	1.000	-0.206	0.161	-0.028	0.022	0.010	0.051	0.143
workingStatusCat	-0.206	1.000	-0.161	0.020	-0.004	-0.050	0.065	0.029
incomeHouseholdCat	0.161	-0.161	1.000	0.011	0.006	-0.012	0.045	0.029
europeannessW7	-0.028	0.020	0.011	1.000	0.325	0.033	-0.037	-0.045
britishnessW7	0.022	-0.004	0.006	0.325	1.000	0.014	0.020	0.008
partyId	0.010	-0.050	-0.012	0.033	0.014	1.000	-0.094	-0.139
euRefInterestW7	0.051	0.065	0.045	-0.037	0.020	-0.094	1.000	0.465
polAttentionCon	0.143	0.029	0.029	-0.045	0.008	-0.139	0.465	1.000

Note: British Election Study Internet panel; Waves 7-9; weighted; 14 April to 4 July 2016; n = 20,918

ROC curve Figure A.21 shows the Receiver Operating Characteristic (ROC) curve for the Logistic Regression, the main model for analysis. The ROC curve is a graphical representation of the performance of the binary classification model. It plots the true positive rate (TPR or sensitivity) on the y-axis against the false positive rate (FPR or specificity) on the x-axis. The Area Under the Curve (AUC) is 0.97 and indicates that the model performed well, while an AUC of 0.5 indicates that the model has no discrimination power.

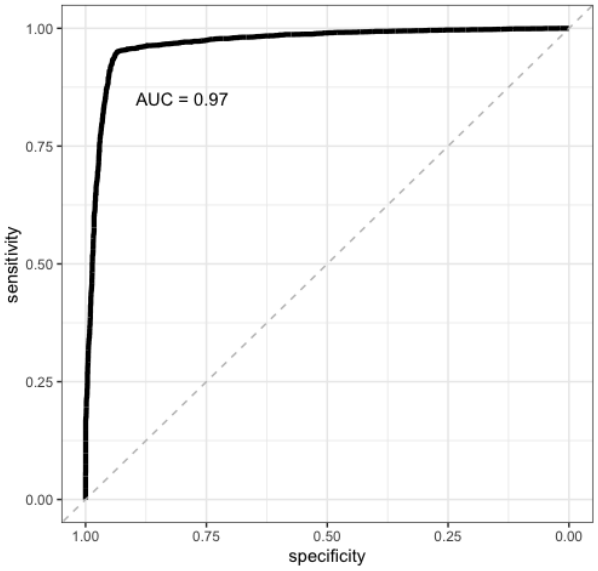


Figure A.21: ROC curve logistic regression Model 2

k-fold cross-validation A mean accuracy of 0.94 and a mean kappa of 0.88 are rather high values, indicating that the logistic regression makes relatively accurate predictions and that there is a high degree of agreement between the model's predictions and the true values of the response variable. See Table A.23 and Figure A.22.

Table A.23: Summary of k-fold cross-validation results

	Resample	Accuracy	Kappa
1	Fold01	0.94	0.89
2	Fold02	0.94	0.88
3	Fold03	0.95	0.90
4	Fold04	0.94	0.88
5	Fold05	0.93	0.87
6	Fold06	0.94	0.88
7	Fold07	0.94	0.89
8	Fold08	0.93	0.87
9	Fold09	0.96	0.92
10	Fold10	0.93	0.86

Source: British Election Study Internet panel; Waves 7-9; weighted; 14 April to 4 July 2016; n = 19,464

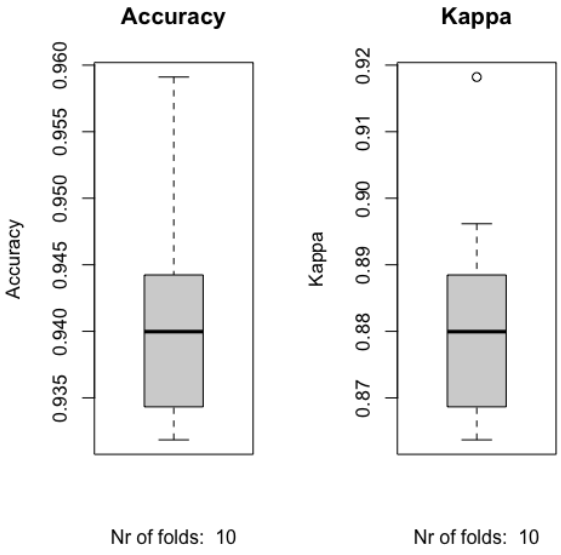


Figure A.22: Cross Validation k-fold

A.4 Appendix to Chapter 4

A.4.1 Newspaper EU-Referendum Stance

Table A.24: Newspaper EU-Referendum Stance

Newspaper	Proportion	Coding of this study	Levy et al. 2016	Jackson et al. 2016	Deacon et al. 2016
None/NoPref.	28%	NA/No Pref.Paper	NA	NA	NA
Sun	18%	Leave Paper	Leave	Leave	Leave
Mirror	14%	Remain Paper	Remain	Remain	Remain
DailyMail	13%	Leave Paper	Leave	Leave	Leave
Other	8%	Unclassified Papers	NA	NA	NA
Times	4%	Unclassified Paper	Remain	balanced/Leave	Remain
Local Paper	4%	Unclassified Papers	NA	NA	NA
Telegraph	4%	Leave Paper	Leave	Leave	Leave
Guardian	3%	Remain Paper	Remain	Remain	Remain
Express	1%	Leave Paper	Leave	Leave	Leave
Independent	1%	Remain Paper	NA	Remain	Remain
DailyStar	1%	Leave Paper	Leave	Leave	Leave
FT	0.6%	Remain Paper	Remain	Remain	Remain

In order to assess the influence of newspaper consumption on voting intentions, it is essential to distinguish between newspapers with a clear pro-Leave stance and those with a clear pro-Remain stance. Lumping all newspapers into a single category could obscure the effects of their biased reporting and lead to null results in the model. In order to detect distinct effects on either the Leave or Remain side, it is necessary to analyse news outlets categorised according to their ideological orientation.

Table A.24 shows the position of popular UK newspapers on the EU Referendum according to three different studies: Levy et al. (2016), Jackson et al. (2016) and Deacon et al. (2016). The variable "PaperEuRefStance", presented in the third column of the table, lists the EU Referendum stance classifications for each newspaper as they are used in this study. The classification is based on the three detailed studies listed above. The table lists the newspapers in order of

popularity among participants in the BES sample, with each study's classification of the newspaper's stance in a separate column. The table shows that, according to all three studies, the Daily Mail, the Sun, and the Daily Star were in favour of leaving the EU. The Mirror, Guardian, FT, and Independent were classified as pro-Remain by all three studies. Based on content analysis of British tabloids, Simpson and Startin (2023) confirm the same Brexit stances as shown in Table A.24. *The Times* was classified as pro-Remain by Levy et al. (2016) and Deacon et al. (2016) but as having a more balanced stance with a slight Leave preference by Jackson et al. (2016). The Telegraph and the Express were classified as pro-Leave by all three studies. It is important to acknowledge that certain newspapers, like local ones, were not included in any of the studies and their position on the EU Referendum remains unclassified. Additionally, The Times exhibited inconsistent stances across various studies. Consequently, I have categorized The Times as unclassified due to the absence of a clear position. Further analysis in the post-referendum period shows that most *Times* readers favour the Remain side, but according to Brandenburg (2019) they also show a clear preference for the government deal over a no-deal. After examining additional sources, The Times remained classified as either Unclassified or leaning towards Remain (see Brandenburg, 2019; Clark, 2024; Greenslade, 2016; Simpson and Startin, 2023).

A.4.2 Relationship Between Voting Intentions and Identity

Next, I test the relationship between voting intentions and the formation of either a Leave ID or a Remain ID post EU Referendum. The contingency table and chi-square test of independence demonstrate presented in Table A.25 shows conclusively that we can reject the null hypothesis of independence, with a p-value significantly lower than any reasonable significance level. Therefore, it is evident that there exists a significant association between voting intentions and the formation of either a Leave ID or a Remain ID. In contrast, participants who

responded to the voting intention question with either "I will not vote" or those who were undecided, show insufficient evidence to assert an association between their answers and later Brexit Identities.

Table A.25: Contingency table showing pre-campaign referendum voting intentions (w7) and Brexit Identity post vote (w9); given in row-%; and Chi-squared test results

	Remain ID	Leave ID	X^2	p-value
I will vote Remain	91	9	67.24	2.404×10^{-16}
I will vote Leave	8	92	70.56	2.2×10^{-16}
I will not vote	59	41	3.24	0.07186
DK	47	53	0.36	0.5485

Table A.26: Panel Sizes and Retention Rate to Previous BES Election Wave Triplet

Election	2016 EU Ref.	2017 GE	2019 GE
BES Waves	7, 8, 9	11, 12, 13	17, 18, 19
Sample Size	5209	5351	4673
Retention Rate	–	55%	31%

A.4.3 Brexit Identities Over Time

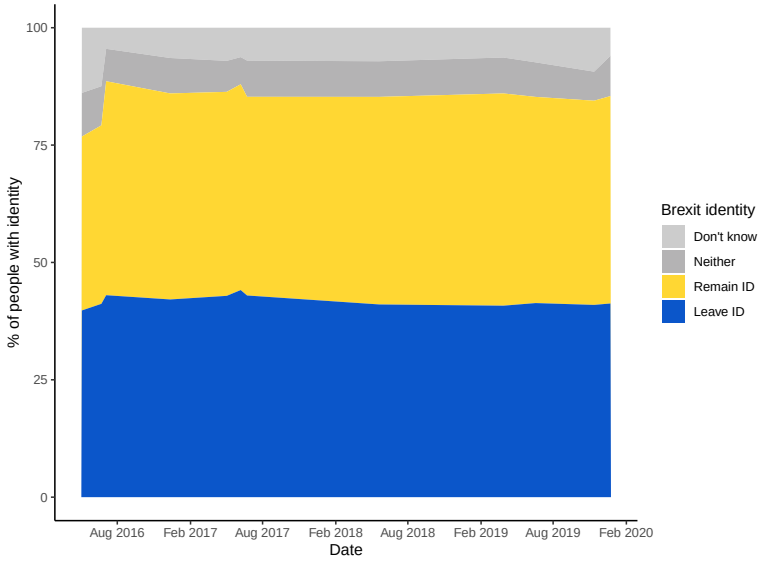


Figure A.23: Brexit Identities Over Time; The figure shows the proportion of respondents who think of themselves as closer to the 'Leave' or 'Remain' side. Data from the British Election Study (BES); weights have been applied to achieve population representativeness.

A.4.4 Models

Table A.27 shows the complete list of results of all three logistic regression models for the 2016 EU Referendum, the 2017 General Election, and the 2019 General Election. Each model is predicting a Leave ID as opposed to a Remain ID and includes the media explanatory variables of interest as well as a set of controls. Lastly, and importantly, each model includes a pre-treatment lagged dependent variable capturing Brexit identity from the wave preceding the campaign and election waves, to test for media effects of political news consumption during the campaign period on switching of political identity measured in the post-election wave. It is important to note that I did not include an individual's referendum recall vote as a control variable for two reasons: (1) the referendum vote variable is strongly associated with the Brexit identity measure, largely explaining the same variation, and (2) this analysis primarily focuses on changes in participants' Brexit identity, thus focusing on the pre-treatment and post-treatment identity measures.

Table A.27: Change in Brexit ID - Logistic regression models of Leave-ID

	Dependent variable: Leave ID		
	(1) 2016 EU Ref.	(2) 2017 GE	(3) 2019 GE
Internet_0<1h	−0.330* (0.157)	−0.361** (0.111)	−0.322 (0.226)
Internet_>1h	−0.397 (0.211)	0.267 (0.163)	−0.441 (0.327)
TV_0<1h	−0.097 (0.212)	0.230 (0.119)	−0.003 (0.248)
TV_>1h	−0.029 (0.243)	0.257 (0.155)	0.404 (0.322)
Paper_0<1h	−0.088 (0.357)	−0.051 (0.352)	−0.439 (0.730)
Paper_>1h	0.134 (0.442)	−0.570 (0.412)	0.514 (0.847)
paper_euRefStanceLeave	0.948* (0.394)	0.436 (0.325)	1.427* (0.678)
paper_euRefStanceUnclassified	0.120 (0.507)	0.122 (0.359)	0.209 (0.763)
paper_euRefStanceN.A.	0.296 (0.347)	0.507 (0.300)	0.532 (0.624)
Radio_0<1h	0.185 (0.140)	−0.008 (0.107)	0.040 (0.215)
Radio_>1h	−0.315 (0.197)	−0.537** (0.176)	−0.585 (0.333)
People_0<1h	0.109 (0.184)	−0.089 (0.114)	
People_>1h	−0.440 (0.251)	−0.171 (0.170)	
preTreat_euIDLeave ID	4.952*** (0.149)	6.716*** (0.110)	7.016*** (0.242)
preTreat_euIDNeither	2.321*** (0.203)	3.188*** (0.130)	3.742*** (0.283)

preTreat_euIDDK	2.304*** (0.219)	3.372*** (0.163)	3.872*** (0.313)
ageCat[35,45)	0.663*** (0.192)	0.190 (0.147)	0.275 (0.300)
ageCat[45,55)	1.262*** (0.201)	0.650*** (0.148)	0.135 (0.290)
ageCat[55,65)	0.994*** (0.204)	0.534*** (0.162)	0.449 (0.317)
ageCat[65,Inf)	1.030*** (0.277)	0.520* (0.213)	0.619 (0.445)
genderFemale	0.264* (0.127)	0.203* (0.096)	−0.278 (0.188)
educationCatGCSE	0.021 (0.263)	−0.609** (0.194)	0.432 (0.389)
educationCatA-level	0.032 (0.266)	−0.787*** (0.195)	0.048 (0.394)
educationCatDegree	−0.136 (0.273)	−0.893*** (0.204)	−0.462 (0.403)
educationCatDK	0.298 (0.435)	−0.405 (0.279)	−0.268 (0.568)
workingStatusCatPartTime	0.199 (0.179)	−0.012 (0.138)	−0.175 (0.280)
workingStatusCatStudent	0.198 (0.319)	−0.579* (0.245)	−1.248* (0.489)
workingStatusCatRetired	0.208 (0.232)	0.109 (0.189)	0.236 (0.386)
workingStatusCatUnemployed	0.359 (0.216)	−0.354* (0.156)	0.168 (0.301)
workingStatusCatOther	−0.685 (0.400)	−0.017 (0.281)	1.326* (0.571)
incomeHouseholdCat£15k-£29k	−0.187 (0.221)	0.617*** (0.158)	0.118 (0.332)
incomeHouseholdCat£30k-£44k	−0.145 (0.209)	0.192 (0.152)	−0.356 (0.323)
incomeHouseholdCat£50k-£69k	−0.547* (0.228)	0.124 (0.163)	0.395 (0.349)
incomeHouseholdCat>£70k	−0.907** (0.323)	−0.018 (0.234)	0.434 (0.438)
incomeHouseholdCatNoAnswer	−0.515* (0.216)	0.190 (0.151)	−0.037 (0.310)
incomeHouseholdCatDK	−0.480 (0.312)	0.263 (0.212)	0.592 (0.486)
europeanness	0.0001* (0.00004)	0.00003 (0.00003)	−0.0002*** (0.0001)
britishness	−0.0001 (0.0001)	0.00002 (0.00005)	0.00002 (0.0001)
partyIdLabour	−0.592*** (0.160)	−0.501*** (0.125)	−1.417*** (0.259)
partyIdLib.Dem.	−0.553* (0.227)	−0.512* (0.200)	−1.862*** (0.390)
partyIdSNP	−1.137*** (0.324)	−0.885** (0.317)	−2.373*** (0.714)
partyIdUKIP	3.013*** (0.799)	2.512*** (0.413)	
partyIdUKIP/ReformUK			3.111** (1.206)
partyIdGreen	−0.216 (0.427)	−1.276*** (0.344)	−3.150*** (0.679)
partyIdOther	−0.486 (0.572)	−0.408 (0.411)	−1.758 (1.027)
partyIdNone	0.162 (0.187)	−0.035 (0.126)	−0.199 (0.252)
partyIdDK	−0.033 (0.286)	0.033 (0.195)	−1.625*** (0.355)
electionInterestNot very	−1.034* (0.420)	−0.173 (0.173)	−0.575 (0.338)
electionInterestSomewhat	−0.714 (0.393)	−0.257 (0.176)	−0.671* (0.336)
electionInterestVery	−0.461 (0.409)	−0.311 (0.204)	−0.598 (0.382)
electionInterestDK	−2.226* (0.897)	−0.573 (0.303)	−0.390 (0.580)
polAttentionCon	−0.060 (0.036)	0.004 (0.024)	0.061 (0.045)
Paper_0<1h:paper_euRefStanceLeave	−0.034 (0.443)	0.654 (0.393)	−0.642 (0.831)
Paper_>1h:paper_euRefStanceLeave	−0.202 (0.539)	1.253** (0.484)	−1.261 (1.009)
Paper_0<1h:paper_euRefStanceUnclassified	−0.155 (0.562)	0.633 (0.437)	0.351 (0.922)
Paper_>1h:paper_euRefStanceUnclassified	−0.491 (0.669)	0.617 (0.543)	−0.657 (1.168)
Paper_0<1h:paper_euRefStanceN.A.	−0.058 (0.420)	0.183 (0.380)	0.513 (0.789)
Paper_>1h:paper_euRefStanceN.A.	−0.536 (0.557)	0.270 (0.490)	−1.718 (1.049)
Constant	−2.277*** (0.627)	−3.438*** (0.411)	−3.220*** (0.875)

Pseudo R-sq (McF):	0.621	0.785	0.808
Observations	4,502	15,012	4,013

Note: *p<0.5; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel waves 7-9, 11-13, 17-19. Dependent variable: Leave-ID=1, Remain-ID=0, undecided and refusals excluded. DK = don't know. All models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention, and Pre Treatment Brexit Identity (Leave ID, Neither, DK, and ref. being Remain ID).

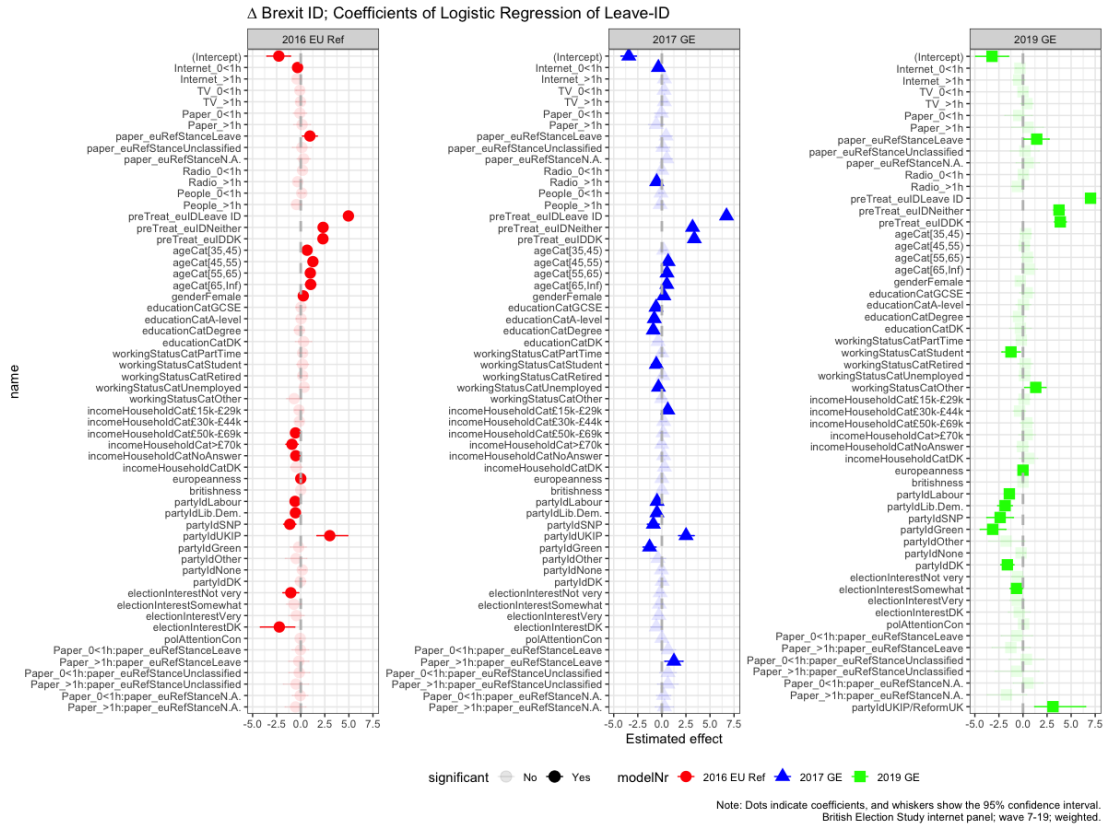


Figure A.24: Δ Brexit ID; Coefficients of Logistic Regressions of Leave-ID

A.4.5 Base Models

Table A.28: Brexit ID - Logistic regression base models of Leave-ID

	Dependent variable: Leave ID		
	(Base 1) 2016 EU Ref.	(Base 2) 2017 GE	(Base 3) 2019 GE
Internet_0<1h	−0.371*** (0.099)	−0.358*** (0.049)	−0.258* (0.102)
Internet_>1h	−0.533*** (0.135)	−0.356*** (0.073)	−0.220 (0.146)

TV_0<1h	0.249 (0.136)	0.046 (0.054)	0.156 (0.111)
TV_>1h	0.254 (0.154)	0.293*** (0.071)	0.203 (0.142)
Paper_0<1h	0.199 (0.244)	−0.053 (0.154)	−0.979** (0.327)
Paper_>1h	0.184 (0.291)	−0.499** (0.189)	−1.067** (0.405)
paper_euRefStanceLeave	1.038*** (0.272)	1.149*** (0.146)	1.038*** (0.307)
paper_euRefStanceUnclassified	0.250 (0.344)	0.451** (0.159)	−0.220 (0.342)
paper_euRefStanceN.A.	0.493* (0.239)	0.665*** (0.131)	0.127 (0.268)
Radio_0<1h	−0.193* (0.087)	−0.148** (0.048)	−0.264** (0.098)
Radio_>1h	−0.203 (0.126)	−0.196* (0.079)	−0.334* (0.156)
People_0<1h	0.126 (0.117)	−0.217*** (0.053)	
People_>1h	0.019 (0.161)	−0.215** (0.078)	
ageCat[35,45)	0.624*** (0.127)	0.434*** (0.070)	0.263 (0.142)
ageCat[45,55)	0.963*** (0.128)	0.740*** (0.069)	0.478*** (0.139)
ageCat[55,65)	0.733*** (0.131)	0.854*** (0.075)	0.606*** (0.150)
ageCat[65,Inf)	0.698*** (0.174)	0.711*** (0.097)	0.735*** (0.197)
genderFemale	−0.054 (0.079)	−0.053 (0.043)	−0.279** (0.086)
educationCatGCSE	−0.313 (0.174)	−0.394*** (0.093)	0.046 (0.190)
educationCatA-level	−0.778*** (0.176)	−0.912*** (0.092)	−0.373 (0.191)
educationCatDegree	−1.048*** (0.180)	−1.258*** (0.095)	−0.950*** (0.194)
educationCatDK	−0.323 (0.293)	−0.242 (0.144)	−0.436 (0.283)
workingStatusCatPartTime	0.265* (0.116)	−0.025 (0.063)	−0.150 (0.127)
workingStatusCatStudent	−0.385 (0.202)	−0.542*** (0.121)	−0.518* (0.241)
workingStatusCatRetired	0.202 (0.144)	0.127 (0.083)	0.136 (0.170)
workingStatusCatUnemployed	0.361** (0.135)	0.122 (0.071)	0.272 (0.143)
workingStatusCatOther	−0.353 (0.254)	0.063 (0.129)	0.282 (0.277)
incomeHouseholdCat£15k-£29k	0.096 (0.136)	0.162* (0.072)	0.297* (0.151)
incomeHouseholdCat£30k-£44k	−0.236 (0.130)	−0.061 (0.070)	−0.071 (0.150)
incomeHouseholdCat£50k-£69k	−0.343* (0.141)	−0.150* (0.075)	−0.288 (0.157)
incomeHouseholdCat>£70k	−0.860*** (0.198)	−0.617*** (0.104)	−0.439* (0.195)
incomeHouseholdCatNoAnswer	−0.233 (0.134)	−0.066 (0.071)	−0.045 (0.144)
incomeHouseholdCatDK	−0.332 (0.204)	−0.174 (0.098)	0.329 (0.227)
europeanness	−0.00001 (0.00003)	−0.00003 (0.00002)	−0.0001*** (0.00003)
britishness	−0.00002 (0.0001)	0.00000 (0.00003)	0.00002 (0.00005)
partyIdLabour	−0.894*** (0.100)	−1.193*** (0.055)	−2.125*** (0.118)
partyIdLib.Dem.	−0.896*** (0.138)	−1.759*** (0.095)	−2.669*** (0.186)
partyIdSNP	−0.669** (0.227)	−1.840*** (0.147)	−3.558*** (0.338)
partyIdUKIP	4.055*** (0.650)	3.243*** (0.286)	
partyIdUKIP/ReformUK			4.133*** (1.092)
partyIdGreen	−1.534*** (0.315)	−1.907*** (0.174)	−3.148*** (0.337)
partyIdOther	−0.439 (0.366)	−0.665*** (0.191)	−1.881*** (0.372)
partyIdNone	0.035 (0.117)	−0.445*** (0.056)	−0.896*** (0.112)
partyIdDK	0.165 (0.193)	−0.545*** (0.095)	−1.500*** (0.176)
electionInterestNot very	0.020 (0.320)	−0.029 (0.088)	−0.290 (0.174)

electionInterestSomewhat	0.057 (0.294)	−0.085 (0.087)	−0.184 (0.166)
electionInterestVery	0.508 (0.301)	−0.087 (0.098)	−0.273 (0.184)
electionInterestDK	−1.787* (0.698)	−0.333 (0.185)	−0.429 (0.371)
polAttentionCon	−0.064** (0.022)	0.018 (0.011)	0.021 (0.022)
Paper_0<1h:paper_euRefStanceLeave	0.156 (0.299)	0.383* (0.177)	0.863* (0.380)
Paper_>1h:paper_euRefStanceLeave	0.619 (0.357)	1.140*** (0.225)	1.104* (0.483)
Paper_0<1h:paper_euRefStanceUnclassified	−0.291 (0.376)	0.076 (0.194)	1.120** (0.419)
Paper_>1h:paper_euRefStanceUnclassified	−0.300 (0.435)	0.376 (0.247)	1.277* (0.530)
Paper_0<1h:paper_euRefStanceN.A.	−0.129 (0.282)	0.014 (0.166)	1.000** (0.349)
Paper_>1h:paper_euRefStanceN.A.	0.174 (0.376)	0.625** (0.227)	0.587 (0.495)
Constant	0.010 (0.433)	0.457* (0.185)	1.372*** (0.382)
Pseudo R-sq (McF):	0.245	0.249	0.333
Observations	4,503	15,012	4,013

Note: *p<0.5; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel waves 7-9, 11-13, 17-19. Dependent variable: Leave-ID=1, Remain-ID=0, undecided and refusals excluded. DK = don't know. All models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention, and Pre Treatment Brexit Identity (Leave ID, Neither, DK, and ref. being Remain ID).

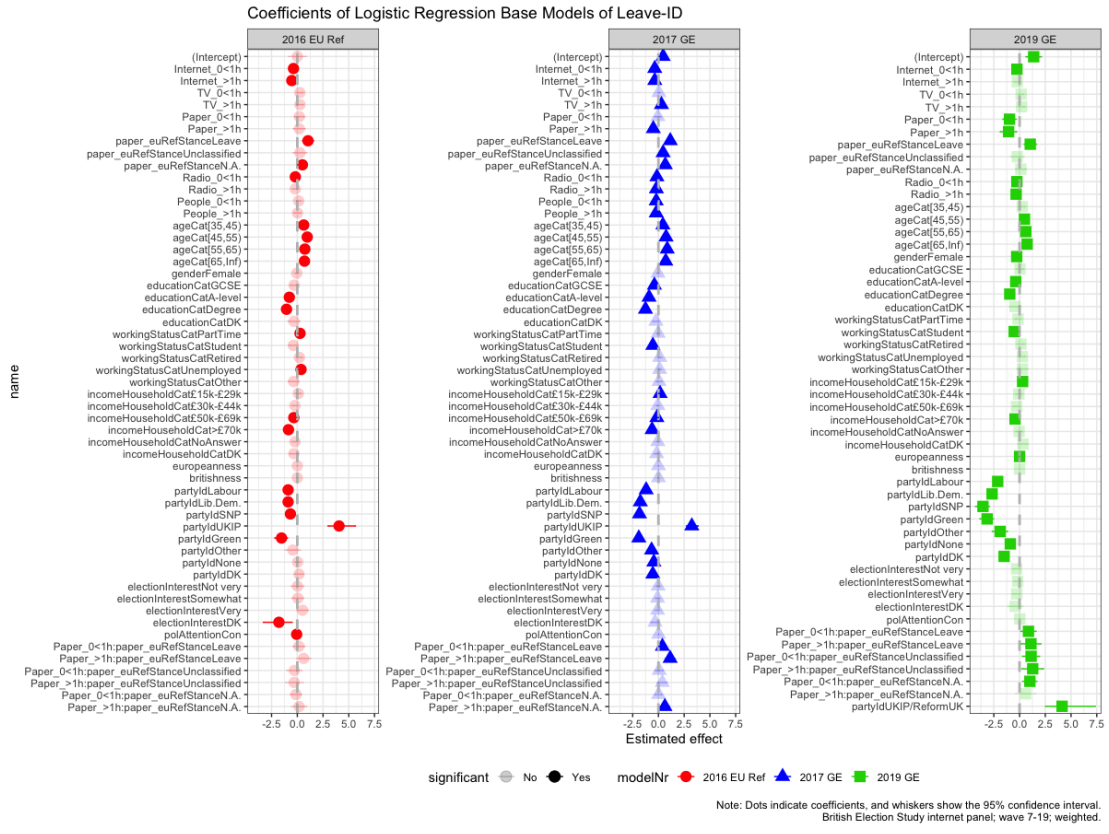


Figure A.25: Coefficients of Logistic Regressions Base Models of Leave-ID

It is essential to highlight that models 1, 2, and 3, presented in Table 4.4 and

Table A.27 control for individuals' Brexit identity measured before the campaign period ("Pre Treatment Brexit ID"). This lagged dependent variable unsurprisingly strongly predicts an individual's Brexit identity post-referendum. In Appendix E, Table A.28 presents the base models for each election of the previously discussed regression models depicted in Table 4.4. Models Base 1, Base 2, and Base 3 in Table A.28 are identical to Models 1, 2, and 3 in Table 4.4, except for the absence of the control variable "Pre Treatment Brexit ID". Comparing the Pseudo R-squared values across all three models, it becomes evident that the inclusion of the lagged dependent variable significantly helps to explain the variation in the data.

A.4.6 Stratified Analysis by Pre-Treatment Brexit ID

2016 EU Referendum

Table A.29: 2016 EU Ref. - Model Leave.1 & Remain.1: Penalized Maximum Likelihood Logistic regression models of Leave-ID

	Dependent variable:	
	Post Treatment Leave ID	
	(Leave.1)	(Remain.1)
	i.e. Pre Treatment Leave ID	i.e. Pre Treatment Remain ID
Internet (ref. = None)		
0<1h	−0.316 (0.228)	−0.377 (0.268)
>1h	−0.601* (0.294)	0.532 (0.353)
TV (ref. = None)		
0<1h	−0.429 (0.348)	1.01** (0.372)
>1h	0.020 (0.388)	0.850 (0.432)
Newspaper (ref. = None)		
0<1h	0.281 (0.546)	−0.695 (0.593)
>1h	0.620 (0.666)	−0.254 (0.769)
Newspaper EU-Ref.Stance		

(ref.= Remain)		
Leave	0.913 (0.648)	0.0445 (0.621)
Unclassified	0.116 (0.771)	−1.47 (0.997)
N.A.	0.959 (0.554)	−0.416 (0.528)
Newspaper * Newspaper EU-Ref.Stance		
(ref.= None * Remain)		
0<1h * Leave	−0.391 (0.704)	1.41 (0.724)
>1h * Leave	−0.567 (0.815)	1.30 (0.941)
0<1h * Unclassified	−0.173 (0.847)	1.70 (1.09)
>1h * Unclassified	−0.882 (0.968)	1.24 (1.31)
0<1h * N.A.	−0.581 (0.646)	0.163 (0.712)
>1h * N.A.	−1.162 (0.789)	−0.643 (1.53)
Radio (ref. = None)		
0<1h	0.171 (0.199)	0.332 (0.232)
>1h	−0.288 (0.267)	−0.418 (0.430)
People (ref. = None)		
0<1h	0.249 (0.274)	0.0420 (0.292)
>1h	−0.061 (0.344)	−1.42** (0.497)
Constant	0.007 (1.169)	−0.516 (1.05)
Pseudo R-sq (McF):	0.25	0.24
Observations	2,088	1,956
Log.Lik.	−436.078	−273.811
Log.Lik.Null	−578.514	−361.530

Note: *p<0.05; **p<0.01; ***p<0.001

Source: British Election Study Internet Panel wave 7 to 9. Dependent variable: Leave=1, Remain=0, undecided and refusals excluded. DK = don't know. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), work status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and refusals as separate categories), seven-point British and European identity scales, party identity, political attention. Note this logistic regression uses Firth's (1993) bias reduction method to reduce bias in maximum likelihood estimates of coefficients due to small sample sizes and rare events.

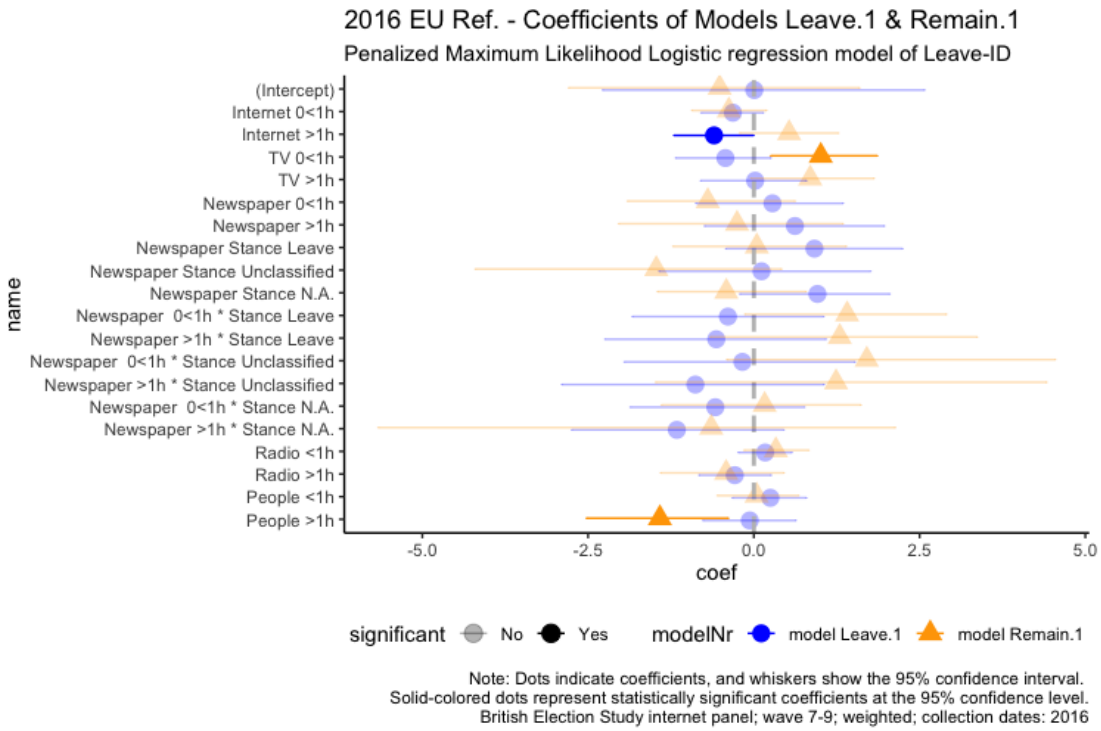


Figure A.26: 2016 EU Ref. - Coefficients of Penalized Maximum Likelihood Logistic Regression Models

2017 General Election

Table A.30: 2017 GE - Model Leave.2 & Remain.2: Penalized Maximum Likelihood Logistic regression models of Leave-ID

	Dependent variable:	
	Post Treatment Leave ID	
	(Leave.2)	(Remain.2)
	i.e. Pre Treatment Leave ID	i.e. Pre Treatment Remain ID
Internet (ref. = None)		
0<1h	-0.388* (0.171)	-0.338 (0.185)
>1h	0.315 (0.271)	0.335 (0.251)
TV (ref. = None)		
0<1h	0.041 (0.193)	0.799*** (0.231)
>1h	0.059 (0.238)	0.398 (0.297)
Newspaper (ref. = None)		
0<1h	0.253 (0.486)	0.031 (0.640)
>1h	-0.604 (0.537)	-0.182 (0.739)
Newspaper EU-Ref.Stance		
(ref.= Remain)		
Leave	0.687 (0.432)	0.861 (0.599)
Unclassified	0.824 (0.525)	-0.620 (0.788)
N.A.	0.843* (0.399)	0.027 (0.563)
Newspaper * Newspaper EU-Ref.Stance		
(ref.= None * Remain)		
0<1h * Leave	0.172 (0.545)	0.592 (0.701)
>1h * Leave	0.976 (0.622)	0.986 (0.829)
0<1h * Unclassified	-0.102 (0.665)	1.391 (0.885)
>1h * Unclassified	0.540 (0.803)	1.541 (1.004)
0<1h * N.A.	-0.301 (0.540)	0.517 (0.687)
>1h * N.A.	0.737 (0.721)	0.824 (0.893)
Radio (ref. = None)		
0<1h	-0.217 (0.173)	-0.113 (0.171)
>1h	-0.945*** (0.236)	-0.024 (0.276)

People (ref. = None)		
0<1h	0.034 (0.183)	-0.003 (0.212)
>1h	-0.544* (0.240)	0.189 (0.283)
Constant	2.108*** (0.624)	-2.422*** (0.716)
Pseudo R-sq (McF):	0.116	0.199
Observations	6,615	6,700
Log.Lik.	−736.434	−615.661
Log.Lik.Null	−833.080	−768.274

Note: *p<0.5; **p<0.01; ***p<0.001

Source: British Election Study Internet Panel wave 11 to 13. Dependent variable: Leave=1, Remain=0, undecided and refusals excluded. DK = don't know. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), work status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and refusals as separate categories), seven-point British and European identity scales, party identity, political attention. Note this logistic regression uses Firth's (1993) bias reduction method to reduce bias in maximum likelihood estimates of coefficients due to small sample sizes and rare events.

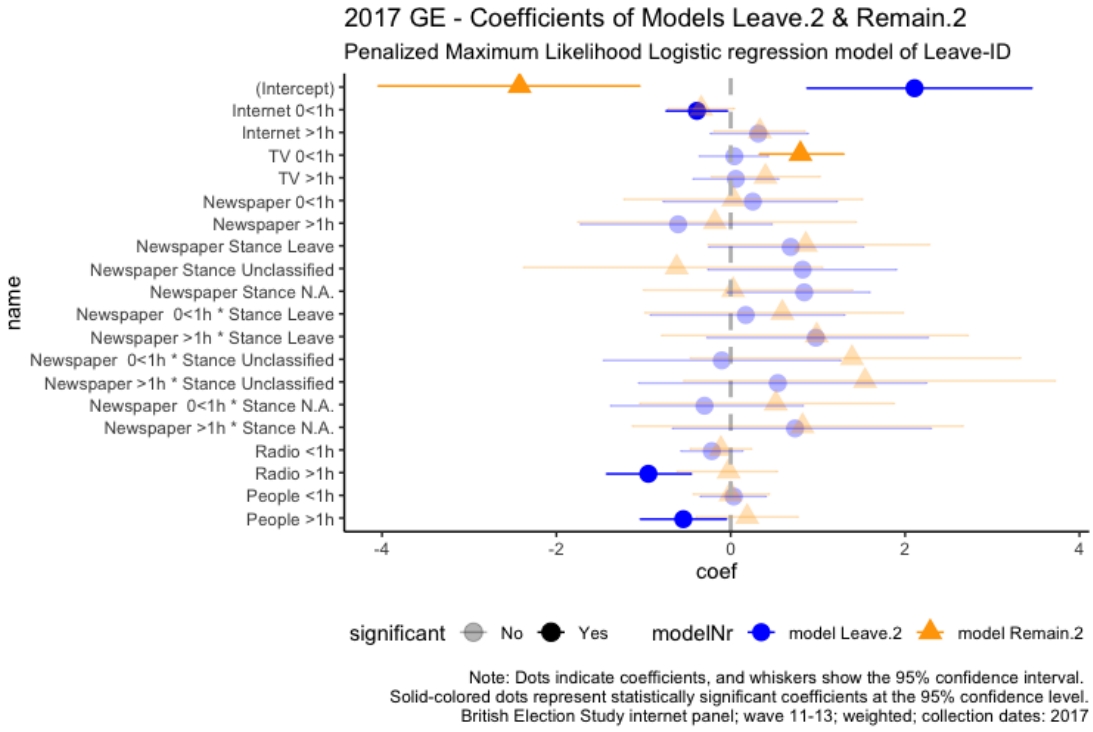


Figure A.27: 2017 GE - Coefficients of Penalized Maximum Likelihood Logistic Regression Models

2019 General Election

Table A.31: 2019 GE - Model Leave.3 & Remain.3: Penalized Maximum Likelihood Logistic regression models of Leave-ID

	Dependent variable:	
	Post Treatment Leave ID	
	(Leave.3)	(Remain.3)
	i.e. Pre Treatment Leave ID	i.e. Pre Treatment Remain ID
Internet (ref. = None)		
0<1h	−0.590 (0.344)	−0.630 (0.348)
>1h	−1.120* (0.432)	-0.302 (0.474)
TV (ref. = None)		
0<1h	0.473 (0.376)	0.069 (0.390)
>1h	0.391 (0.445)	0.776 (0.456)
Newspaper (ref. = None)		
0<1h	0.697 (0.918)	−0.762 (1.409)
>1h	3.806* (1.883)	−0.935 (1.677)
Newspaper EU-Ref.Stance		
(ref.= Remain)		
Leave	1.239 (0.773)	1.953 (1.230)
Unclassified	2.177 (1.445)	0.601 (1.388)
N.A.	1.031 (0.675)	0.499 (1.188)
Newspaper * Newspaper EU-Ref.Stance		
(ref.= None * Remain)		
0<1h * Leave	−1.498 (1.062)	0.123 (1.492)
>1h * Leave	−3.440 (2.074)	0.043 (1.828)
0<1h * Unclassified	−2.021 (1.676)	0.363 (1.700)
>1h * Unclassified	−5.379* (2.468)	−0.098 (2.212)
0<1h * N.A.	−0.713 (1.035)	0.802 (1.470)
>1h * N.A.	−4.953* (2.035)	1.315 (1.862)
Radio (ref. = None)		
0<1h	−0.616 (0.329)	0.511 (0.322)
>1h	−0.792 (0.446)	0.020 (0.546)

Constant	1.051 (0.986)	−1.893 (1.547)
Pseudo R-sq (McF):	0.382	0.291
Weighted Observations	1,770	1,765
Log.Lik.	−120.218	−109.792
Log.Lik.Null	−194.621	−154.881

Note: *p<0.5; **p<0.01; ***p<0.001

Source: British Election Study Internet Panel wave 17 to 19. Dependent variable: Leave=1, Remain=0, undecided and refusals excluded. DK = don't know. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), work status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and refusals as separate categories), seven-point British and European identity scales, party identity, political attention. Note this logistic regression uses Firth's (1993) bias reduction method to reduce bias in maximum likelihood estimates of coefficients due to small sample sizes and rare events.

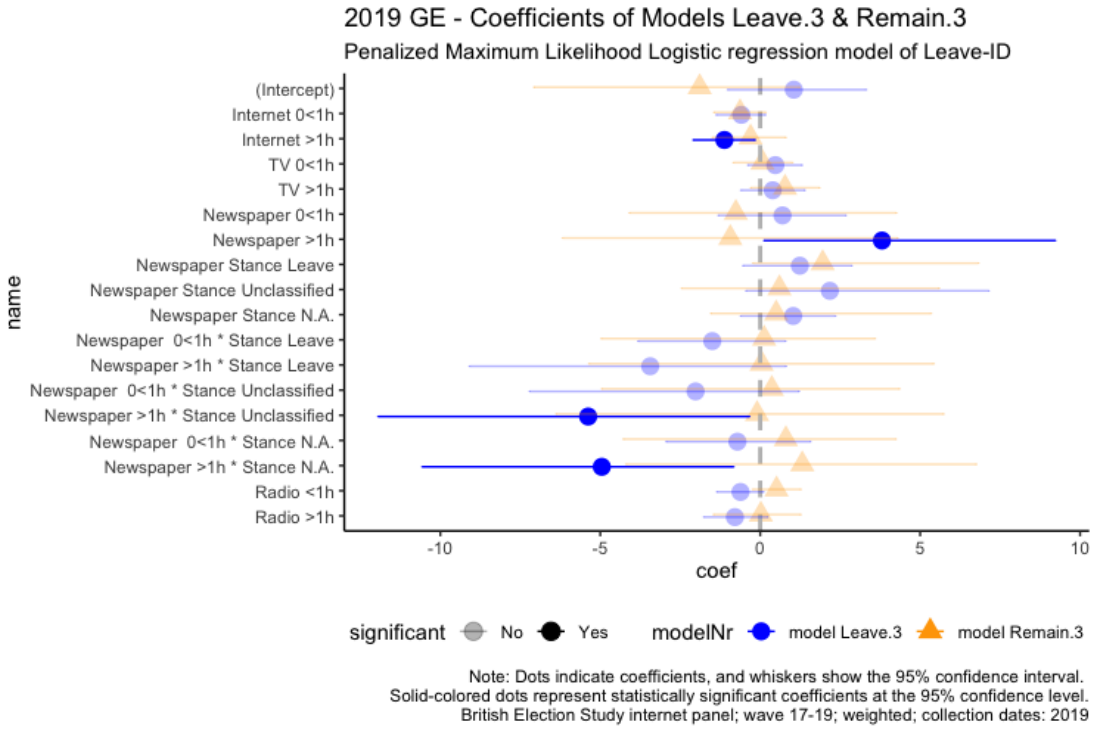


Figure A.28: 2019 GE - Coefficients of Penalized Maximum Likelihood Logistic Regression Models

A.5 Appendix to Chapter 5

Table A.32: BES Survey Wave Collection Dates

Election	Wave	Date Range	Wave Type
2016 EU Referendum	Wave 7	14-04-2016 to 04-05-2016	Pre-treatment
	Wave 8	06-05-2016 to 22-06-2016	Treatment/Campaign
	Wave 9	24-06-2016 to 04-07-2016	Post-treatment/Post-election
2017 General Election	Wave 11	24-04-2017 to 03-05-2017	Pre-treatment
	Wave 12	05-05-2017 to 07-06-2017	Treatment/Campaign
	Wave 13	09-06-2017 to 23-06-2017	Post-treatment/Post-election
2019 General Election	Wave 17	01-11-2019 to 12-11-2019	Pre-treatment
	Wave 18	13-11-2019 to 11-12-2019	Treatment/Campaign
	Wave 19	13-12-2019 to 23-12-2019	Post-treatment/Post-election

Table A.33: Sample Sizes for Brexit ID Figure

Wave	Sample Size
euIDW7	7682
euIDW8	6106
euIDW9	30036
euIDW10	30237
euIDW11	30956
euIDW12	8550
euIDW13	31135
euIDW14	31063
euIDW15	30332
euIDW16	37959
euIDW17	34366
euIDW19	7909

Table A.34: Newspaper EU-Referendum Stance

Newspaper	Proportion	Coding of this study	Levy et al. 2016	Jackson et al. 2016	Deacon et al. 2016
None/NoPref.	28%	NA/No Pref.Paper	NA	NA	NA
Sun	18%	Leave Paper	Leave	Leave	Leave
Mirror	14%	Remain Paper	Remain	Remain	Remain
DailyMail	13%	Leave Paper	Leave	Leave	Leave
Other	8%	Unclassified Papers	NA	NA	NA
Times	4%	Unclassified Paper	Remain	balanced/Leave	Remain
Local Paper	4%	Unclassified Papers	NA	NA	NA
Telegraph	4%	Leave Paper	Leave	Leave	Leave
Guardian	3%	Remain Paper	Remain	Remain	Remain
Express	1%	Leave Paper	Leave	Leave	Leave
Independent	1%	Remain Paper	NA	Remain	Remain
DailyStar	1%	Leave Paper	Leave	Leave	Leave
FT	0.6%	Remain Paper	Remain	Remain	Remain

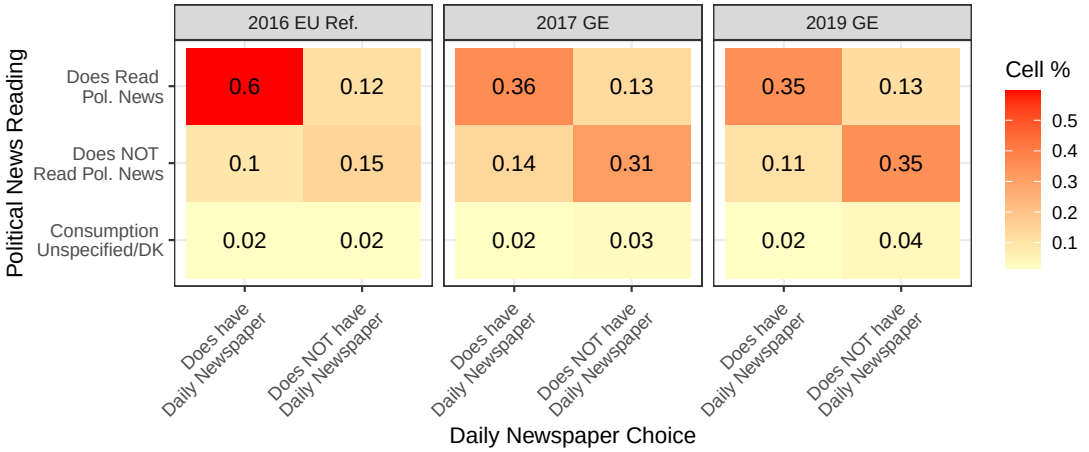


Figure A.29: Newspaper Reading for Political News and Daily Newspaper Choice.

A.5.1 Brexit Identity Strength Descriptive Statistics

Figure A.30 shows the distribution of Brexit identity strength across key survey waves: Waves 7, 8, and 9 correspond to the 2016 EU Referendum; Waves 11, 12, and 13 to the 2017 General Election; and Waves 17 and 19 to the 2019 General Election. Figure A.31 displays the mean Brexit identity strength by wave (left panel) and the corresponding standard deviations (right panel). The plots indicate that the population-level mean of identity strength remains relatively stable over time, with only a slight downward trend. The standard deviation increases slightly over time, indicating increasing variability in Brexit identity strength. Together, Figures A.30 and A.31 clearly illustrate

that the average level of Brexit identity strength remains largely stable; few respondents express extreme levels of identification at either end of the scale.

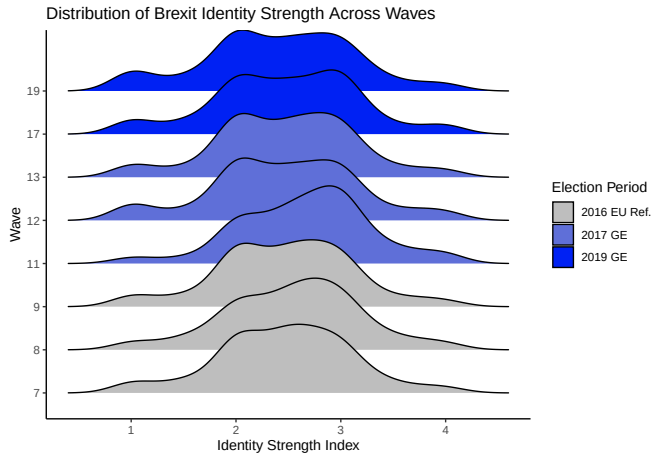


Figure A.30: Distribution of Brexit Identity Strength Across Waves

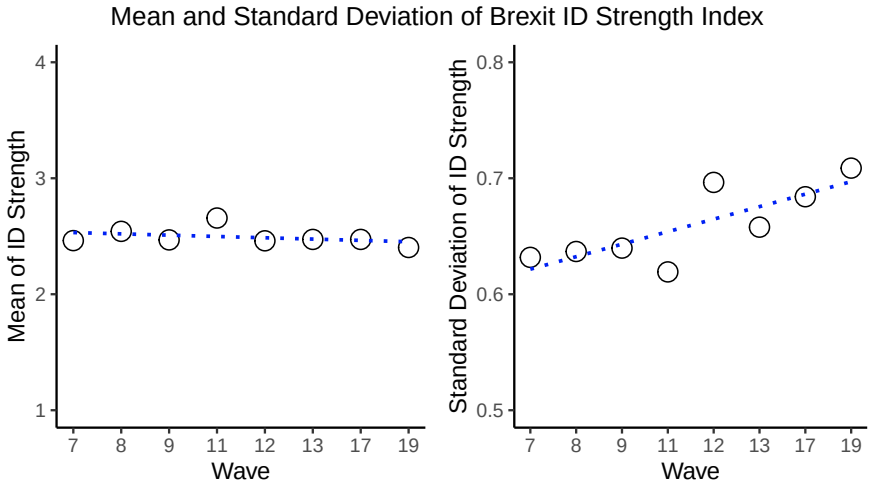


Figure A.31: Distribution of Brexit Identity Strength Across Waves

Table A.35: Within-Person Variation in Brexit Identity Strength by Election Period

Election	2016 EU Ref.	2017 GE	2019 GE
Survey Waves	7, 8, 9	11, 12, 13	17, 19
Mean of Within-Person σ	0.302	0.280	0.250
St. Dev. of Within-Person σ	0.222	0.268	0.274
Proportion with change of ≥ 1 σ	0.377	0.256	0.169
Mean of CV	0.130	0.118	0.111
St. Dev. of CV	0.107	0.124	0.132
Mean of MAC	0.374	0.384	0.353
St. Dev. of MAC	0.313	0.377	0.387

Notes: In this table, σ stands for within-person standard deviation, CV stands for Coefficient of Variation, and MAC stands for Mean Absolute Change.

A.5.2 Brexit Identity Strength by Election Period and Media

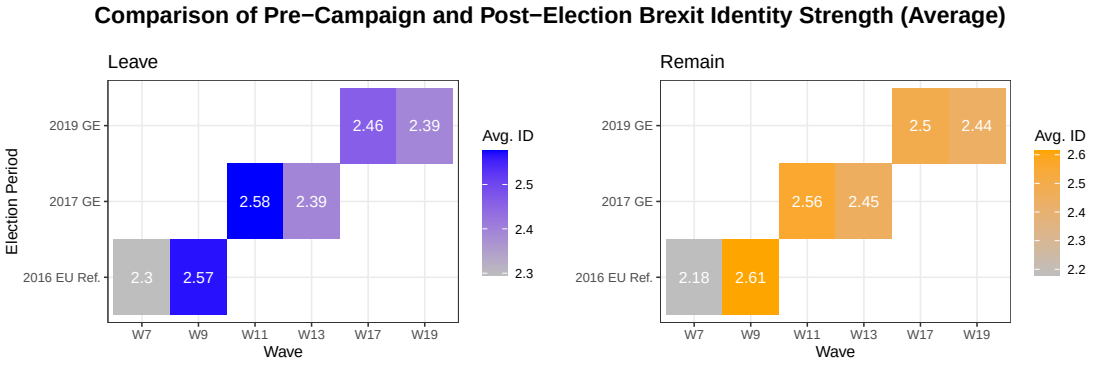


Figure A.32: Brexit Identity Strength Index by Side (Average)

Figure A.33 displays the proportion of Leave and Remain identifiers according to
7195 their preferred daily newspaper, separated by each electoral event.

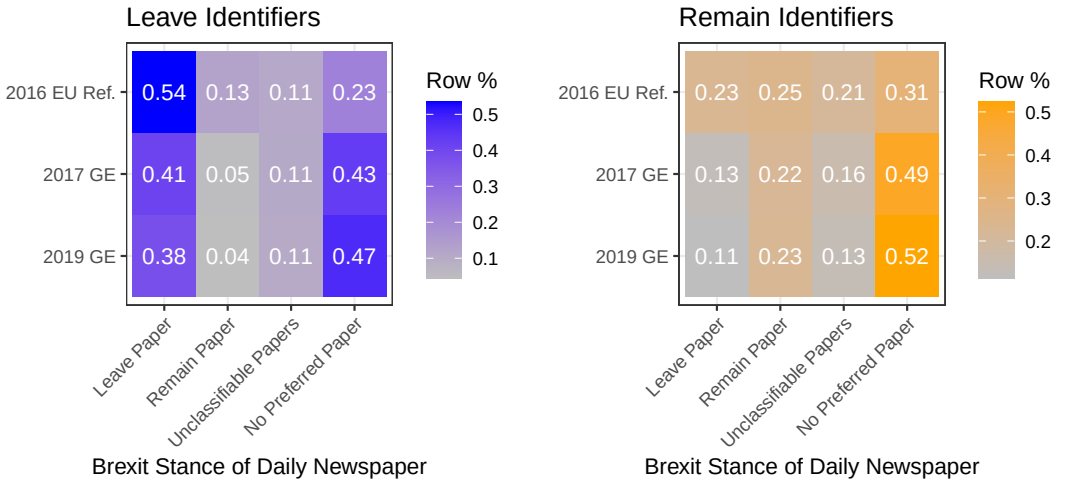


Figure A.33: Share of Leave and Remain Identifiers and their Daily Newspaper Preferences with Corresponding Newspaper Brexit Stance (Row %). Data for 2016 EU Ref., 2017 GE, and 2019 GE samples comes from the British Election Study (BES), waves 7–9, 11–13, and 17–19 respectively. Sample sizes for Leave identifiers are 9,102, 8,903, and 1,989, respectively; for Remain identifiers, sample sizes are 9,215, 9,229, and 1,864, respectively. Samples are weighted to represent the British electorate at each election period.

Figure A.34 shows average identity strength by daily newspaper preference, categorised into Leave-supporting, Remain-supporting, and unclassified newspapers. Leave identifiers who also preferred Leave-supporting newspapers exhibited

higher average identity strength than those who preferred other newspapers; the same pattern is observed among Remain identifiers and Remain-supporting newspapers.

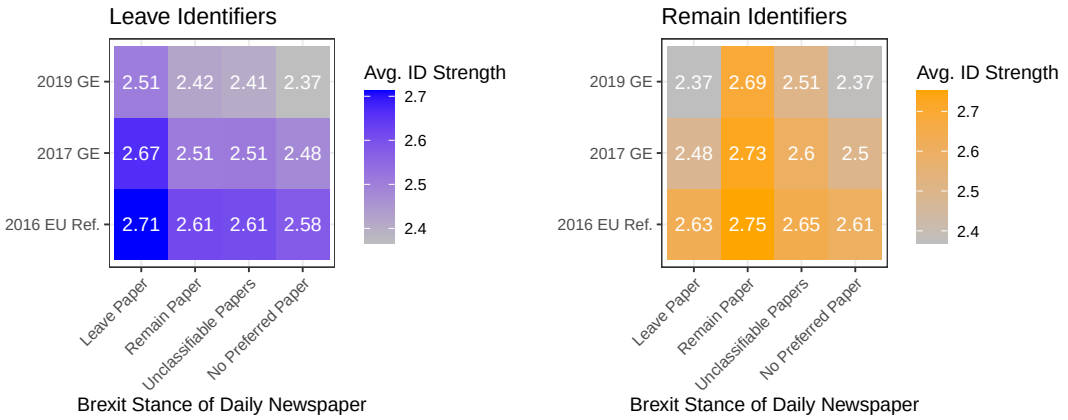


Figure A.34: Brexit Identity Strength Index (Average), by Newspaper Preference and Election Period. Data for 2016 EU Ref., 2017 GE, and 2019 GE samples comes from the British Election Study (BES), Waves 7–9, 11–13, and 17–19, respectively. Sample sizes for Leave identifiers are 9,102; 8,903; and 1,989, respectively; for Remain identifiers, sample sizes are 9,215; 9,229; and 1,864, respectively. Samples are weighted to represent the British electorate at each election period.

Figure A.35 presents average identity strength by levels of Internet news consumption. Among Leave identifiers, those who spent more time consuming news online exhibited stronger identity strength; the same relationship holds for Remain identifiers. Figure A.36 shows average identity strength by time spent consuming political news via television. Figure A.37 shows average identity strength by time spent consuming political news via radio. Across all media types, two general trends emerge. First, respondents who spent more time engaging with a particular type of news media tended to exhibit stronger Brexit identity on average, both for Leave and Remain sides. Second, identity strength declined over time. The highest average levels were observed during the 2016 EU Referendum, with a decrease seen during the 2017 General Election, and a further decline by the 2019 General Election.

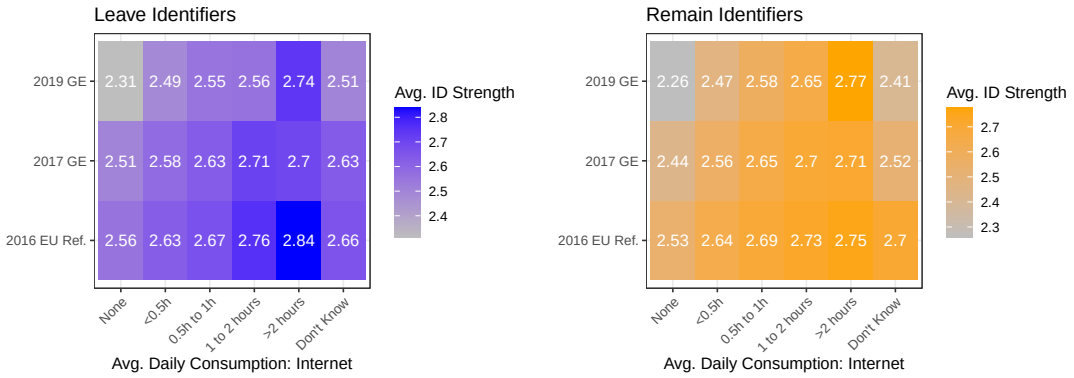


Figure A.35: Brexit Identity Strength Index (Average), and Internet News Consumption

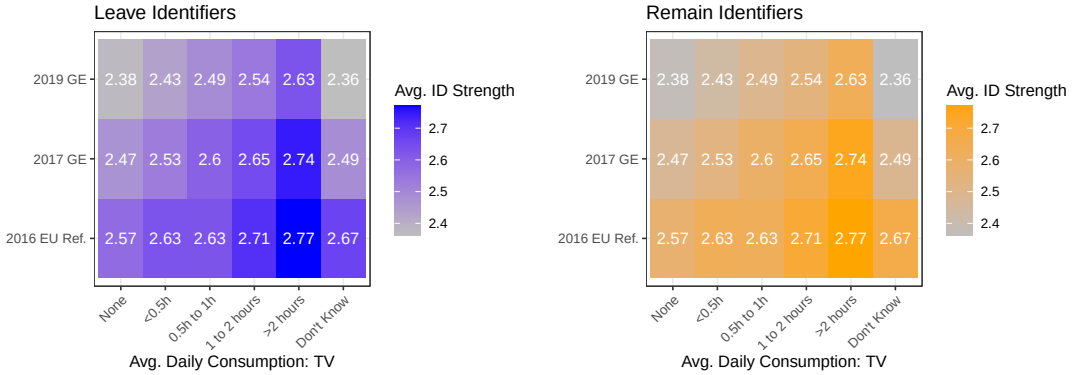


Figure A.36: Brexit Identity Strength Index (Average), and TV News Consumption

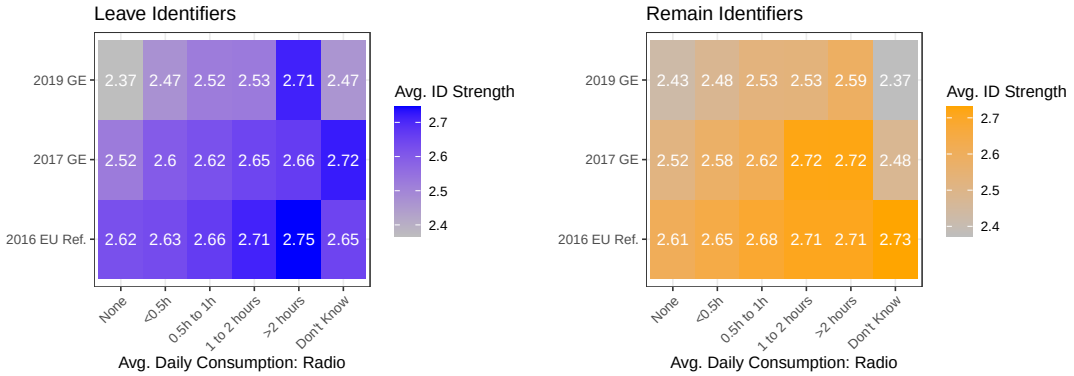


Figure A.37: Brexit Identity Strength Index (Average), and Radio News Consumption

A.5.3 EU Ref ID Grid Question Index

7215 "This Appendix displays individual plots for each question used to construct the EU Referendum Identity Index. Specifically, it includes plots for questions euID1, euID3, euID6, and euID7.

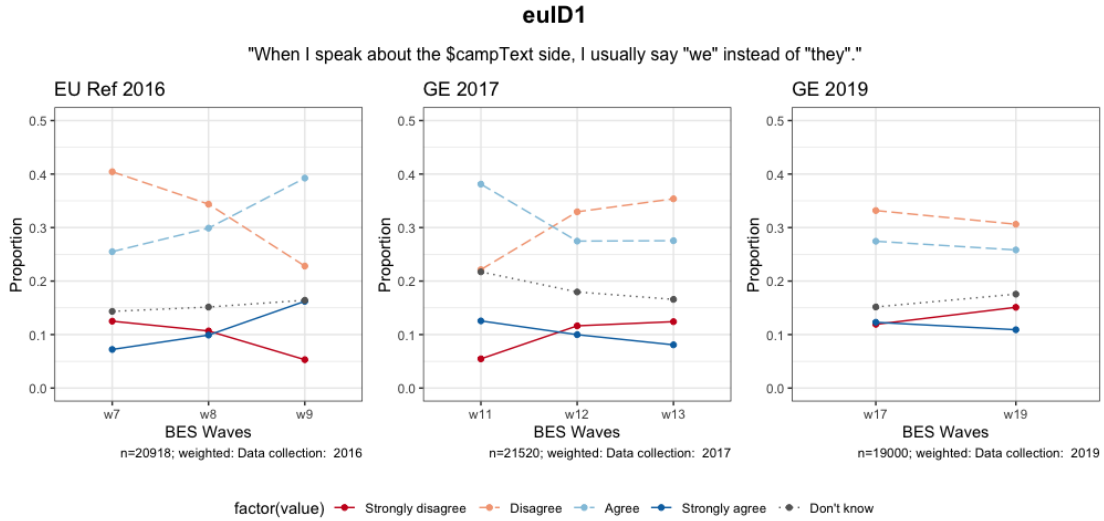


Figure A.38: BES Question euID1

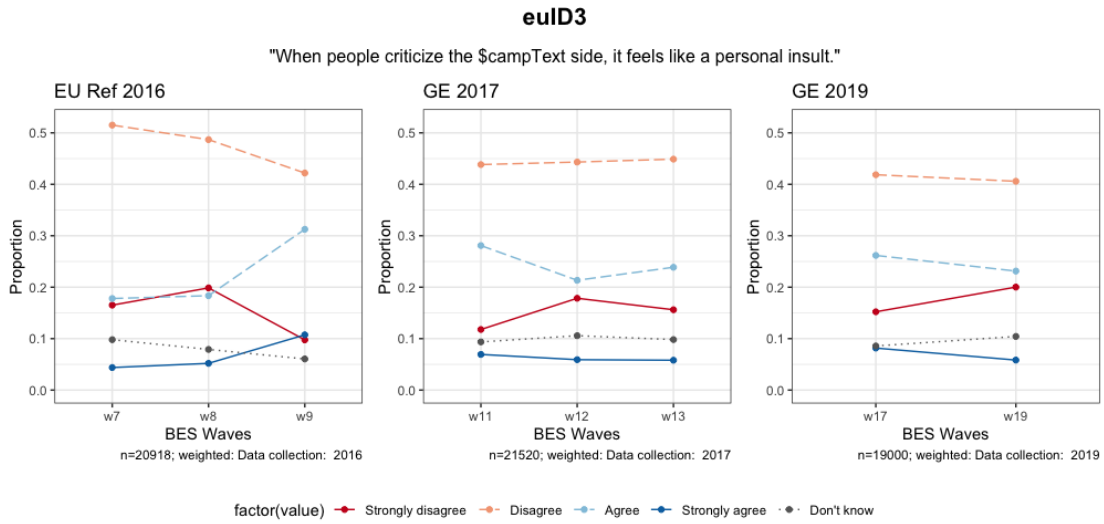


Figure A.39: BES Question euID3

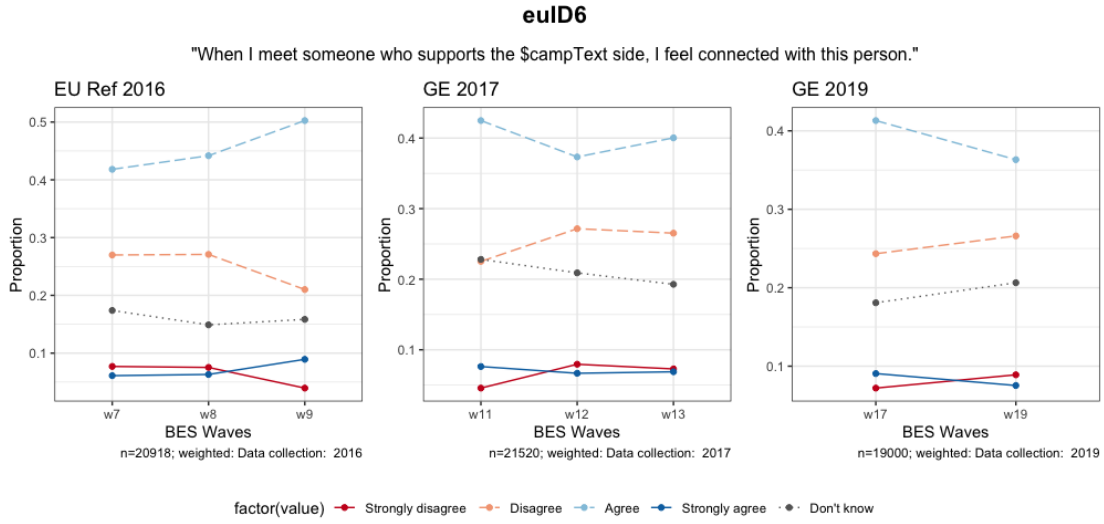


Figure A.40: BES Question euID6

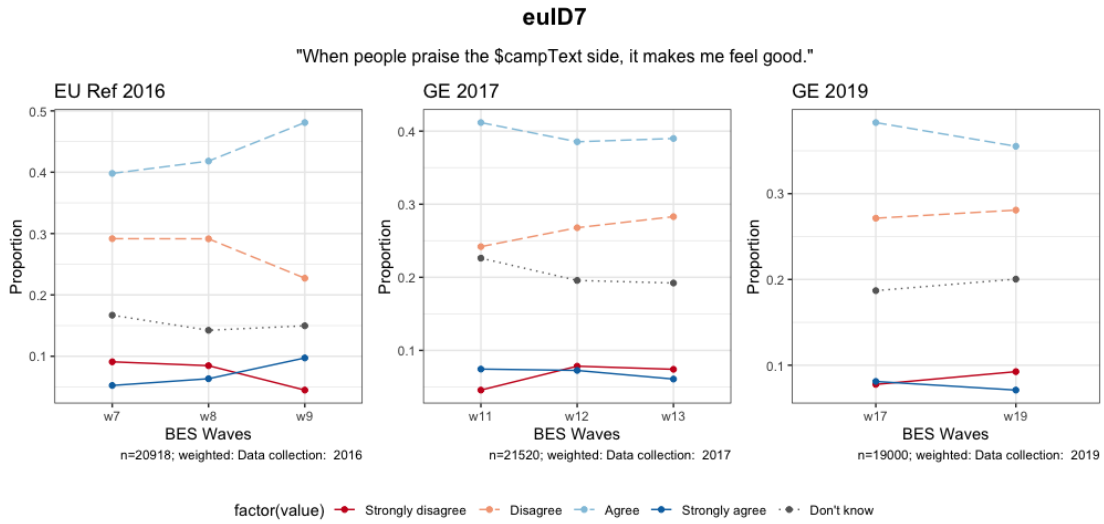


Figure A.41: BES Question euID7

A.5.4 Linear Mixed Effects Model of Strength of Brexit Identity

Table A.36: Change in Leave ID Strength - Linear Mixed Effects Model

	Dependent variable: Leave ID Strength		
	(1)	(2)	(3)
	2016 EU Ref.	2017 GE	2019 GE
FIXED EFFECTS			

Internet (ref. = None)			
Internet_0<1h	−0.008 (0.017)	0.017* (0.008)	0.010 (0.015)
Internet_>1h	−0.009 (0.024)	0.045*** (0.013)	−0.013 (0.022)
TV_0<1h	0.010 (0.029)	0.017 (0.010)	−0.001 (0.017)
TV_>1h	0.021 (0.031)	0.023 (0.012)	−0.003 (0.021)
Paper_0<1h	−0.128 (0.075)	−0.037 (0.035)	0.016 (0.069)
Paper_>1h	−0.104 (0.084)	0.048 (0.046)	0.076 (0.090)
paper_euRefStanceLeave	−0.126 (0.076)	−0.024 (0.030)	−0.021 (0.056)
paper_euRefStanceUnclassified	−0.175 (0.092)	−0.025 (0.034)	0.024 (0.064)
paper_euRefStanceN.A./NoPref.Paper	−0.145* (0.072)	−0.029 (0.029)	−0.002 (0.053)
Radio_0<1h	−0.020 (0.016)	−0.013 (0.008)	0.026 (0.015)
Radio_>1h	−0.006 (0.022)	−0.007 (0.014)	0.012 (0.024)
People_0<1h	0.069** (0.023)	0.038*** (0.009)	
People_>1h	0.128*** (0.030)	0.052*** (0.014)	
preTreat_euID_Index_continuous	0.743*** (0.012)	0.823*** (0.006)	0.861*** (0.010)
ageCat[35,45)	−0.023 (0.032)	−0.051** (0.016)	−0.008 (0.027)
ageCat[45,55)	−0.044 (0.030)	−0.057*** (0.015)	−0.042 (0.026)
ageCat[55,65)	−0.011 (0.029)	−0.051*** (0.015)	−0.070** (0.027)
ageCat[65,Inf)	−0.050 (0.034)	−0.036* (0.018)	−0.053 (0.031)
genderFemale	−0.017 (0.015)	0.008 (0.007)	−0.025 (0.013)
educationCatGCSE	−0.015 (0.025)	−0.011 (0.013)	−0.007 (0.024)
educationCatA-level	−0.011 (0.026)	−0.027* (0.013)	−0.024 (0.025)
educationCatDegree	−0.033 (0.028)	−0.029* (0.014)	−0.025 (0.026)
educationCatDK	−0.039 (0.046)	0.019 (0.023)	−0.045 (0.041)
workingStatusCatPartTime	0.048* (0.024)	0.013 (0.012)	0.029 (0.022)
workingStatusCatStudent	0.072 (0.059)	−0.050 (0.036)	0.058 (0.049)
workingStatusCatRetired	0.031 (0.024)	0.006 (0.013)	0.020 (0.023)
workingStatusCatUnemployed	0.032 (0.025)	−0.002 (0.013)	0.024 (0.023)
workingStatusCatOther	−0.019 (0.052)	0.003 (0.025)	0.061 (0.047)
incomeHouseholdCat£15k-£29k	−0.041 (0.023)	0.005 (0.012)	−0.011 (0.021)
incomeHouseholdCat£30k-£44k	−0.033 (0.023)	−0.008 (0.012)	−0.029 (0.022)
incomeHouseholdCat£50k-£69k	−0.040 (0.026)	−0.008 (0.013)	0.003 (0.024)
incomeHouseholdCat>£70k	−0.021 (0.038)	−0.023 (0.020)	−0.037 (0.032)
incomeHouseholdCatNoAnswer	−0.013 (0.023)	−0.003 (0.012)	0.012 (0.021)
incomeHouseholdCatDK	−0.038 (0.039)	0.007 (0.019)	−0.038 (0.036)
europeanness	−0.00000 (0.00001)	0.00001** (0.00000)	0.00001 (0.00001)
britishness	−0.00001 (0.00002)	0.00001 (0.00001)	0.00001 (0.00001)
partyIdLabour	−0.026 (0.020)	−0.012 (0.010)	−0.043* (0.021)
partyIdLib.Dem.	0.030 (0.037)	0.006 (0.023)	−0.049 (0.043)
partyIdSNP	−0.028 (0.054)	−0.061 (0.034)	0.002 (0.080)
partyIdUKIP	0.026 (0.021)	0.035** (0.012)	
partyIdUKIP/ReformUK			0.011 (0.022)
partyIdGreen	0.016 (0.101)	0.040 (0.047)	0.046 (0.080)
partyIdOther	−0.018 (0.065)	0.012 (0.037)	−0.064 (0.077)

partyIdNone	−0.104*** (0.021)	−0.029** (0.010)	−0.056*** (0.016)
partyIdDK	0.021 (0.040)	0.004 (0.020)	−0.027 (0.033)
electionInterestNot very	−0.059 (0.119)	−0.007 (0.018)	−0.038 (0.028)
electionInterestSomewhat	−0.033 (0.112)	−0.035* (0.018)	0.009 (0.027)
electionInterestVery	−0.042 (0.112)	−0.019 (0.019)	0.015 (0.029)
electionInterestDK	−0.139 (0.270)	0.014 (0.056)	−0.042 (0.102)
polAttentionCon	0.004 (0.004)	0.007*** (0.002)	0.003 (0.003)
wave8	0.087*** (0.012)		
wave9	0.029* (0.012)		
wave12		−0.057*** (0.010)	
wave13		−0.190*** (0.006)	
wave19			−0.072*** (0.011)
Paper_0<1h:paper_euRefStanceLeave	0.162* (0.081)	0.065 (0.037)	0.034 (0.073)
Paper_>1h:paper_euRefStanceLeave	0.132 (0.090)	−0.036 (0.048)	0.009 (0.094)
Paper_0<1h:paper_euRefStanceUnclassified	0.151 (0.100)	0.034 (0.042)	−0.052 (0.082)
Paper_>1h:paper_euRefStanceUnclassified	0.167 (0.110)	−0.024 (0.056)	−0.008 (0.106)
Paper_0<1h:paper_euRefStanceN.A./NoPref.Paper	0.137 (0.081)	0.062 (0.037)	−0.009 (0.072)
Paper_>1h:paper_euRefStanceN.A./NoPref.Paper	0.171 (0.095)	−0.060 (0.052)	0.001 (0.104)
Constant	0.756*** (0.143)	0.465*** (0.040)	0.376*** (0.068)
RANDOM EFFECTS Variance (Std.Dev.)			
Individual Intercept	0.029 (0.169)	0.020 (0.142)	0.008 (0.089)
Residual	0.115 (0.339)	0.107 (0.327)	0.102 (0.320)
Observations	5,312	14,845	3,708
R^2	0.71	0.74	0.81
Log Likelihood	−3,390.181	−7,898.518	−1,708.274
Akaike Inf. Crit.	6,900.362	15,917.040	3,530.548
Bayesian Inf. Crit.	7,295.025	16,373.360	3,884.988

Notes: *p<0.05; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel waves 7-9, 11-13, 17-19. Dependent variable: Leave Identity Strength Index; Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention, Pre Treatment Brexit Identity, and survey waves are included as time fixed effects.

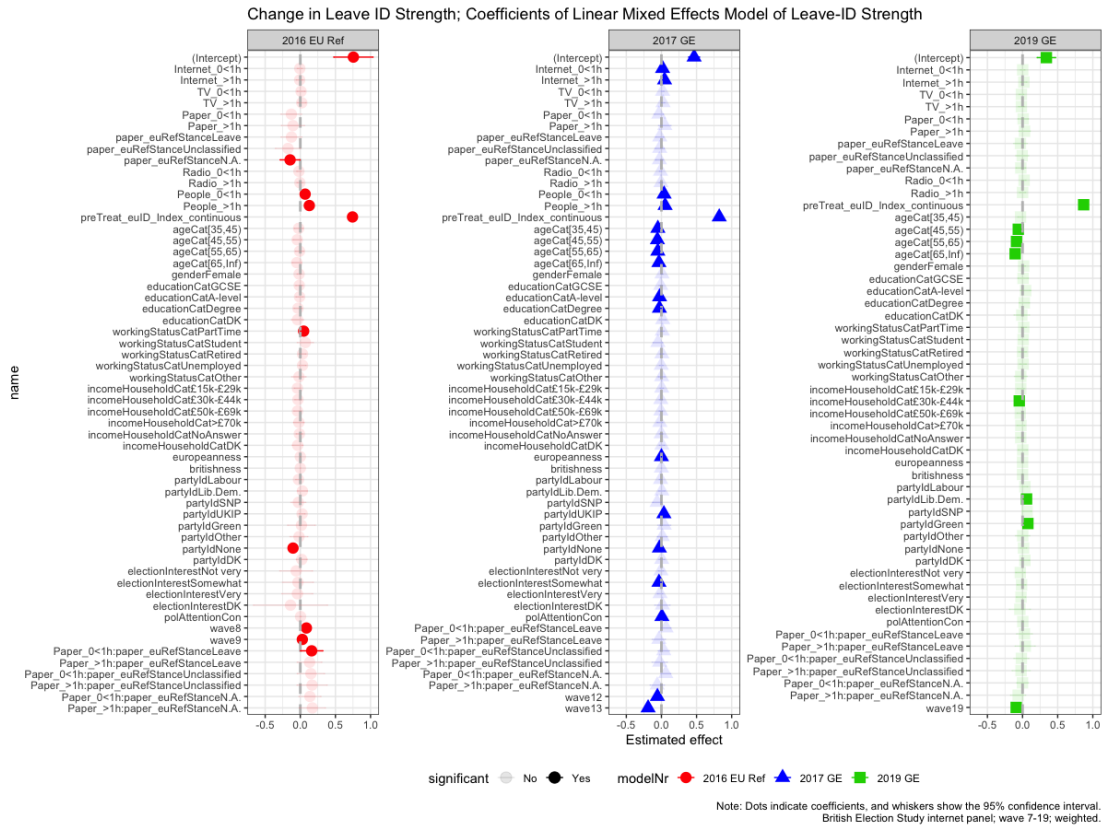


Figure A.42: Change in Leave ID Strength - Linear Mixed Effects Models

Table A.37: Change in Remain ID Strength - Linear Mixed Effects Model

	Dependent variable: Remain ID Strength		
	(1)	(2)	(3)
	2016 EU Ref.	2017 GE	2019 GE
FIXED EFFECTS			
Internet_0<1h	0.021 (0.022)	0.010 (0.009)	0.002 (0.016)
Internet_>1h	0.024 (0.028)	0.007 (0.011)	0.019 (0.022)
TV_0<1h	−0.003 (0.024)	−0.006 (0.009)	−0.017 (0.017)
TV_>1h	0.010 (0.027)	−0.005 (0.012)	−0.017 (0.021)
Paper_0<1h	0.056 (0.050)	0.018 (0.020)	0.009 (0.038)
Paper_>1h	0.009 (0.055)	0.017 (0.022)	0.028 (0.042)
paper_euRefStanceLeave	0.028 (0.064)	−0.055* (0.025)	−0.030 (0.050)
paper_euRefStanceUnclassified	0.063 (0.065)	0.002 (0.025)	−0.005 (0.048)
paper_euRefStanceN.A./NoPref.Paper	0.006 (0.049)	−0.023 (0.019)	−0.024 (0.036)
Radio_0<1h	0.015 (0.018)	0.022** (0.008)	0.022 (0.014)
Radio_>1h	−0.019 (0.026)	0.024* (0.012)	0.0001 (0.021)
People_0<1h	0.037 (0.024)	0.056*** (0.011)	
People_>1h	0.066* (0.033)	0.070*** (0.014)	
preTreat_euID_Index_continuous	0.756*** (0.013)	0.834*** (0.006)	0.870*** (0.009)
ageCat[35,45)	−0.047 (0.025)	−0.007 (0.011)	−0.029 (0.019)

ageCat[45,55)	−0.041 (0.026)	−0.010 (0.011)	−0.061** (0.020)
ageCat[55,65)	−0.050 (0.026)	−0.013 (0.013)	−0.086*** (0.022)
ageCat[65,Inf)	−0.070* (0.036)	−0.015 (0.017)	−0.106*** (0.030)
genderFemale	0.055*** (0.016)	0.009 (0.007)	0.016 (0.013)
educationCatGCSE	−0.082 (0.046)	−0.046* (0.021)	0.008 (0.039)
educationCatA-level	−0.042 (0.045)	−0.037 (0.021)	0.043 (0.038)
educationCatDegree	−0.024 (0.045)	−0.022 (0.021)	0.025 (0.038)
educationCatDK	0.026 (0.089)	−0.046 (0.033)	−0.011 (0.057)
workingStatusCatPartTime	−0.002 (0.025)	0.009 (0.011)	0.017 (0.019)
workingStatusCatStudent	0.003 (0.033)	0.002 (0.016)	0.008 (0.031)
workingStatusCatRetired	0.037 (0.030)	0.015 (0.015)	0.001 (0.026)
workingStatusCatUnemployed	−0.046 (0.030)	−0.005 (0.013)	0.008 (0.023)
workingStatusCatOther	0.028 (0.047)	−0.008 (0.022)	−0.025 (0.047)
incomeHouseholdCat£15k-£29k	−0.032 (0.029)	0.005 (0.013)	−0.025 (0.025)
incomeHouseholdCat£30k-£44k	−0.023 (0.028)	−0.011 (0.013)	−0.047* (0.023)
incomeHouseholdCat£50k-£69k	−0.023 (0.029)	−0.014 (0.013)	−0.032 (0.023)
incomeHouseholdCat>£70k	−0.003 (0.035)	−0.020 (0.016)	−0.024 (0.027)
incomeHouseholdCatNoAnswer	−0.059* (0.029)	−0.012 (0.013)	−0.026 (0.023)
incomeHouseholdCatDK	−0.057 (0.040)	0.002 (0.017)	0.003 (0.034)
europeanness	0.00001 (0.00001)	−0.00000 (0.00000)	0.00001 (0.00001)
britishness	0.00001 (0.00001)	0.00001 (0.00000)	−0.00001 (0.00001)
partyIdLabour	0.028 (0.021)	0.015 (0.010)	0.034 (0.021)
partyIdLib.Dem.	0.041 (0.026)	0.023 (0.013)	0.057* (0.024)
partyIdSNP	−0.060 (0.042)	−0.008 (0.020)	0.064 (0.033)
partyIdUKIP		−0.252* (0.111)	
partyIdGreen	−0.0001 (0.041)	0.010 (0.019)	0.076* (0.031)
partyIdOther	0.034 (0.067)	0.019 (0.032)	0.002 (0.052)
partyIdNone	−0.032 (0.027)	−0.022 (0.012)	0.014 (0.023)
partyIdDK	0.102* (0.051)	0.008 (0.020)	0.033 (0.032)
electionInterestNot very	−0.010 (0.090)	0.034 (0.020)	−0.032 (0.033)
electionInterestSomewhat	−0.012 (0.085)	0.025 (0.019)	−0.014 (0.031)
electionInterestVery	0.042 (0.086)	0.032 (0.020)	−0.022 (0.034)
electionInterestDK	−0.197 (0.218)	0.059 (0.053)	−0.038 (0.077)
polAttentionCon	0.012* (0.005)	0.008*** (0.002)	0.003 (0.004)
wave8	0.027* (0.013)		
wave9	0.343*** (0.013)		
wave12		−0.068*** (0.010)	
wave13		−0.120*** (0.006)	
wave19			−0.091*** (0.011)
Paper_0<1h:paper_euRefStanceLeave	−0.075 (0.070)	0.042 (0.029)	0.027 (0.057)
Paper_>1h:paper_euRefStanceLeave	−0.001 (0.085)	0.028 (0.038)	0.038 (0.073)
Paper_0<1h:paper_euRefStanceUnclassified	−0.084 (0.070)	−0.018 (0.028)	−0.017 (0.055)
Paper_>1h:paper_euRefStanceUnclassified	0.058 (0.077)	−0.006 (0.033)	−0.021 (0.065)
Paper_0<1h:paper_euRefStanceN.A./NoPref.Paper	0.005 (0.056)	0.017 (0.023)	−0.001 (0.043)

Paper_>1h:paper_euRefStanceN.A./NoPref.Paper	0.051 (0.074)	0.012 (0.031)	−0.062 (0.055)
Constant	0.412*** (0.113)	0.325*** (0.037)	0.339*** (0.066)
RANDOM EFFECTS Variance (Std.Dev.)			
Individual Intercept	0.028 (0.169)	0.020 (0.142)	0.010 (0.098)
Residual	0.128 (0.357)	0.095 (0.309)	0.095 (0.308)
Observations	4,977	15,292	3,451
R^2	0.69	0.77	0.81
Log Likelihood	−3,593.391	−8,041.462	−1,431.237
Akaike Inf. Crit.	7,304.781	16,202.920	2,974.474
Bayesian Inf. Crit.	7,689.023	16,661.030	3,318.673

Notes: *p<0.05; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel waves 7-9, 11-13, 17-19. Dependent variable: Leave Identity Strength Index; Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention, Pre Treatment Brexit Identity, and survey waves are included as time fixed effects.

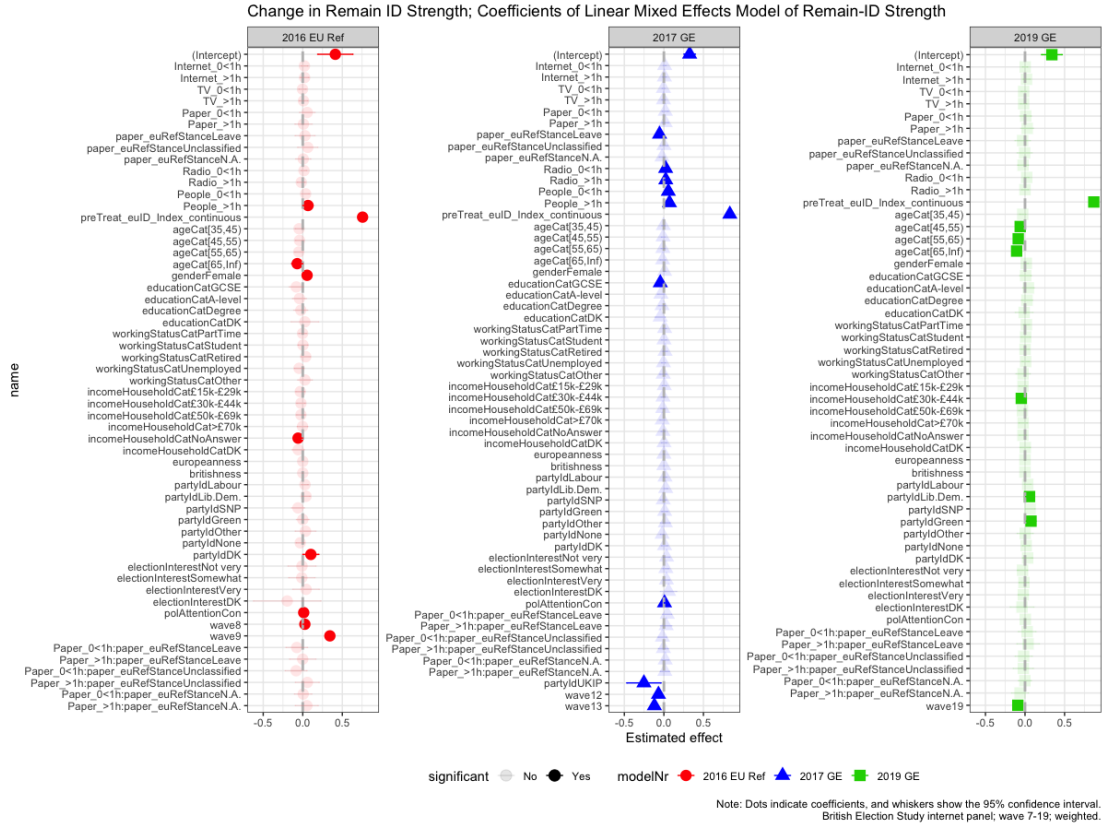


Figure A.43: Change in Remain ID Strength - Coefficients of Linear Mixed Effects Models

I employed a bootstrap procedure to assess the reliability of the 2017 General

Election regression model results by testing the results of 100 smaller, random subsets of the original dataset. This process involves repeatedly drawing random samples with replacement from the original data and fitting the model to each bootstrap sample. By summarising the distribution of model coefficients, stan-
7225 dard errors, and confidence intervals across the resamples, we can evaluate the robustness of the model's findings. The results for Leave and Remain identifiers are presented in Table A.38 and A.39 respectively.

Table A.38: Bootstrap Results for 2017 General Election Leave ID Strength Mixed Effects Model

			95% CI	
Selected Term	Estimate	Std.Error	Lower	Upper
FIXED EFFECTS				
(Intercept)	0.438	0.038	0.364	0.513
Internet (ref. = None)				
0<1h	0.018	0.007	0.003	0.033
>1h	0.049	0.011	0.027	0.071
TV (ref. = None)				
<1h	0.02	0.009	0.002	0.039
>1h	0.022	0.011	0.00	0.044
Newspaper (ref. = None)				
0<1h	−0.041	0.032	−0.103	0.021
>1h	−0.02	0.041	−0.1	0.059
Newspaper Stance				
(ref.= Remain)				
Leave	−0.032	0.028	−0.087	0.023
Unclassified	−0.026	0.032	−0.088	0.036
N.A./NoPref.Paper	−0.031	0.027	−0.084	0.022
Newspaper * Newspaper Stance				
(ref.= None*Remain)				
0<1h * Leave	0.065	0.034	−0.001	0.131
>1h * Leave	0.04	0.043	−0.044	0.123
0<1h * Unclassified	0.023	0.038	−0.051	0.098
>1h * Unclassified	0.016	0.049	−0.08	0.111
0<1h * N.A./NoPref.Paper	0.067	0.034	0.001	0.134
>1h * N.A./NoPref.Paper	0.012	0.045	−0.077	0.101
People (ref. = None)				
0<1h	0.035	0.008	0.019	0.052
>1h	0.052	0.012	0.029	0.076

Radio (ref. = None)				
0<1h	−0.01	0.007	−0.024	0.005
>1h	−0.005	0.012	−0.028	0.018
Nr of bootstrap samples	100			
Observations per sample	5,047			

Notes: Bootstrap results are based on 100 random bootstrap samples. The bootstrap samples are drawn at random from the original model dataset, representing one-third of its original size. Source: British Election Study Internet Panel waves 11-13. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention, Pre Treatment Brexit Identity, and survey waves are included as time fixed effects.

Table A.39: Bootstrap Results for 2017 General Election Remain ID Strength Mixed Effects Model

			95% CI	
Selected Term	Estimate	Std.Error	Lower	Upper
FIXED EFFECTS				
(Intercept)	0.32	0.036	0.25	0.389
Internet (ref. = None)				
0<1h	0.01	0.008	−0.006	0.025
>1h	0.008	0.01	−0.012	0.028
Newspaper (ref. = None)				
0<1h	0.026	0.019	−0.011	0.063
>1h	0.031	0.02	−0.007	0.07
Newspaper * Newspaper Stance				
(ref.= None*Remain)				
0<1h * Leave	0.032	0.028	−0.022	0.086
>1h * Leave	0.026	0.033	−0.04	0.091
0<1h * Unclassified	−0.017	0.026	−0.067	0.034
>1h * Unclassified	−0.017	0.028	−0.072	0.039
0<1h * N.A./NoPref.Paper	0.005	0.021	−0.037	0.046
>1h * N.A./NoPref.Paper	−0.003	0.027	−0.055	0.05
Newspaper Stance				
(ref.= Remain)				
Leave	−0.045	0.024	−0.093	0.002
Unclassified	0.003	0.023	−0.042	0.047
N.A./NoPref.Paper	−0.011	0.018	−0.046	0.023
People (ref. = None)				
0<1h	0.051	0.01	0.031	0.071
>1h	0.076	0.013	0.052	0.101

Radio (ref. = None)				
0<1h	0.023	0.007	0.009	0.037
>1h	0.028	0.01	0.009	0.048
TV (ref. = None)				
0<1h	−0.004	0.009	−0.021	0.013
>1h	−0.014	0.01	−0.034	0.006
Nr of bootstrap samples	100			
Observations per sample	5,199			

Notes: Bootstrap results are based on 100 random bootstrap samples. The bootstrap samples are drawn at random from the original model dataset, representing one-third of its original size. Source: British Election Study Internet Panel waves 11-13. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention, Pre Treatment Brexit Identity, and survey waves are included as time fixed effects.

A.5.5 Linear Mixed Effects Model of Strength of Brexit Identity - Mass Media and Interpersonal Communication

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Table A.40: Change in Brexit ID Strength - Linear Mixed Effects Model

	Dependent variable:			
	Leave ID Strength 2016 EU Ref.	Leave ID Strength 2017 GE	Remain ID Strength 2016 EU Ref.	Remain ID Strength 2017 GE
FIXED EFFECTS				
Political News Exposure through (ref. = None)				
Both_Interpersonal_MassMedia	0.130* (0.061)	0.060*** (0.014)	0.0004 (0.056)	0.068*** (0.017)
Only_MassMedia	0.058 (0.063)	0.019 (0.015)	−0.057 (0.058)	−0.004 (0.019)
Only_Interpersonal	0.015 (0.113)	0.038* (0.017)	0.060 (0.098)	0.017 (0.020)
preTreat_euID_Index_continuous	0.751*** (0.012)	0.823*** (0.006)	0.754*** (0.013)	0.834*** (0.006)
ageCat[35,45)	−0.030 (0.032)	−0.047** (0.016)	−0.049 (0.025)	−0.003 (0.011)
ageCat[45,55)	−0.048 (0.029)	−0.058*** (0.015)	−0.044 (0.026)	−0.008 (0.011)
ageCat[55,65)	−0.014 (0.029)	−0.053*** (0.015)	−0.050 (0.025)	−0.010 (0.012)
ageCat[65,Inf)	−0.042 (0.033)	−0.038* (0.017)	−0.067 (0.035)	−0.010 (0.016)

genderFemale	−0.015 (0.015)	0.004 (0.007)	0.052*** (0.015)	0.006 (0.007)
educationCatGCSE	−0.010 (0.025)	−0.009 (0.012)	−0.085 (0.045)	−0.047* (0.021)
educationCatA-level	−0.008 (0.026)	−0.026* (0.013)	−0.040 (0.044)	−0.032 (0.020)
educationCatDegree	−0.037 (0.028)	−0.029* (0.014)	−0.014 (0.044)	−0.011 (0.020)
educationCatDK	−0.033 (0.045)	0.030 (0.023)	0.023 (0.088)	−0.036 (0.032)
workingStatusCatPartTime	0.050* (0.023)	0.015 (0.012)	−0.004 (0.024)	0.010 (0.011)
workingStatusCatStudent	0.083 (0.059)	−0.038 (0.035)	0.009 (0.032)	0.001 (0.016)
workingStatusCatRetired	0.030 (0.024)	0.011 (0.013)	0.037 (0.030)	0.013 (0.015)
workingStatusCatUnemployed	0.039 (0.024)	0.004 (0.013)	−0.045 (0.029)	−0.009 (0.013)
workingStatusCatOther	−0.037 (0.051)	0.010 (0.024)	0.026 (0.047)	−0.019 (0.022)
incomeHouseholdCat£15k-£29k	−0.040 (0.023)	0.004 (0.012)	−0.035 (0.029)	0.008 (0.013)
incomeHouseholdCat£30k-£44k	−0.026 (0.023)	−0.005 (0.012)	−0.027 (0.027)	−0.013 (0.013)
incomeHouseholdCat£50k-£69k	−0.040 (0.026)	−0.004 (0.013)	−0.021 (0.028)	−0.015 (0.013)
incomeHouseholdCat>£70k	−0.016 (0.038)	−0.015 (0.020)	−0.007 (0.034)	−0.015 (0.016)
incomeHouseholdCatNoAnswer	−0.011 (0.023)	−0.003 (0.012)	−0.061* (0.029)	−0.011 (0.013)
incomeHouseholdCatDK	−0.027 (0.039)	0.016 (0.019)	−0.077* (0.039)	0.002 (0.016)
europeanness	−0.00000	0.00001*	0.00001	−0.00000
	(0.00001)	(0.00000)	(0.00001)	(0.00000)
britishness	−0.00001	0.00000	0.00000	0.00001*
	(0.00002)	(0.00001)	(0.00001)	(0.00000)
partyIdLabour	−0.032 (0.019)	−0.011 (0.010)	0.028 (0.020)	0.020 (0.010)
partyIdLib.Dem.	0.018 (0.036)	0.003 (0.023)	0.035 (0.026)	0.030* (0.013)
partyIdSNP	−0.023 (0.053)	−0.063 (0.033)	−0.064 (0.041)	−0.011 (0.019)
partyIdUKIP	0.021 (0.021)	0.037** (0.012)		−0.226* (0.112)
partyIdGreen	0.011 (0.099)	0.010 (0.046)	−0.011 (0.040)	0.013 (0.019)
partyIdOther	−0.013 (0.065)	0.015 (0.036)	0.031 (0.065)	0.028 (0.032)
partyIdNone	−0.108***	−0.033***	−0.030 (0.026)	−0.017 (0.012)
	(0.021)	(0.010)		
partyIdDK	0.0001 (0.039)	0.008 (0.020)	0.091 (0.051)	0.005 (0.019)
electionInterestNot very	−0.050 (0.118)	−0.006 (0.018)	0.019 (0.090)	0.031 (0.020)
electionInterestSomewhat	−0.042 (0.111)	−0.030 (0.017)	0.030 (0.085)	0.027 (0.019)
electionInterestVery	−0.047 (0.112)	−0.008 (0.019)	0.087 (0.086)	0.034 (0.020)
electionInterestDK	−0.193 (0.220)	−0.008 (0.051)	−0.146 (0.218)	0.063 (0.051)
polAttentionCon	0.006 (0.004)	0.008*** (0.002)	0.017*** (0.005)	0.010*** (0.002)
wave8	0.086*** (0.012)		0.025* (0.013)	
wave9	0.028* (0.012)		0.342*** (0.013)	
wave12		−0.058***		−0.072***
		(0.010)		(0.010)
wave13		−0.194***		−0.126***
		(0.006)		(0.006)
Intercept	0.563*** (0.126)	0.438*** (0.029)	0.440*** (0.108)	0.310*** (0.034)
RANDOM EFFECTS				
Variance (Std.Dev.)				

Individual Intercept	0.029 (0.170)	0.021 (0.142)	0.029 (0.170)	0.021 (0.144)
Residual	0.115 (0.340)	0.108 (0.328)	0.127 (0.357)	0.098 (0.314)
Observations	5,416	15,330	5,055	15,799
Log Likelihood	−3,432.074	−8,195.536	−3,617.386	−8,460.442
Akaike Inf. Crit.	6,952.147	16,479.070	7,320.772	17,008.880
Bayesian Inf. Crit.	7,242.420	16,815.120	7,601.481	17,346.260

Notes: *p<0.05; **p<0.01; ***p<0.001. Source: British Election Study Internet Panel waves 7-9, 11-13. Although the coefficients for some controls are not shown in this table, all models include controls for age, sex, education (No cert., GCSE, A-level, degree, DK), employment status (full-time, part-time, student, retired, unemployed, other), household income (as a factor variable with DK and and refusals as separate categories), seven-point British and European identity scales, party identity, and political attention, Pre Treatment Brexit Identity, and survey waves are included as time fixed effects.

A.5.6 Model Fit

The following plots are illustrating the central trend and spread of model predictions across levels of media use besides original data points.

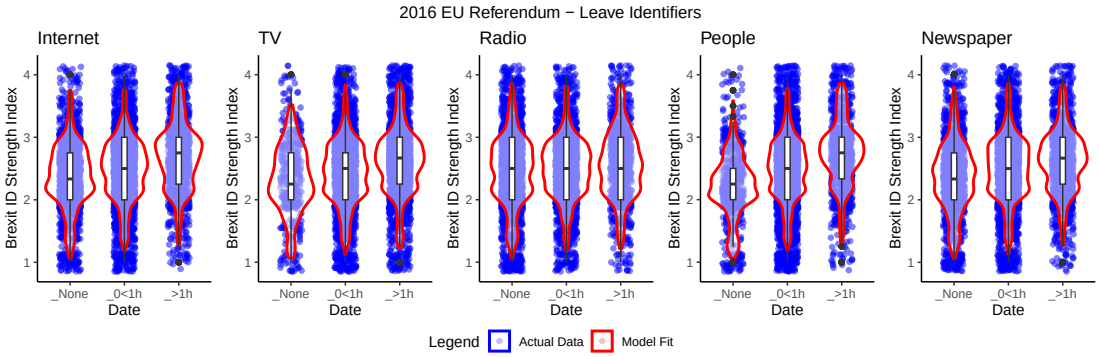


Figure A.44: Model fit of 2016 EU Ref. Leave Linear Mixed Effects Models

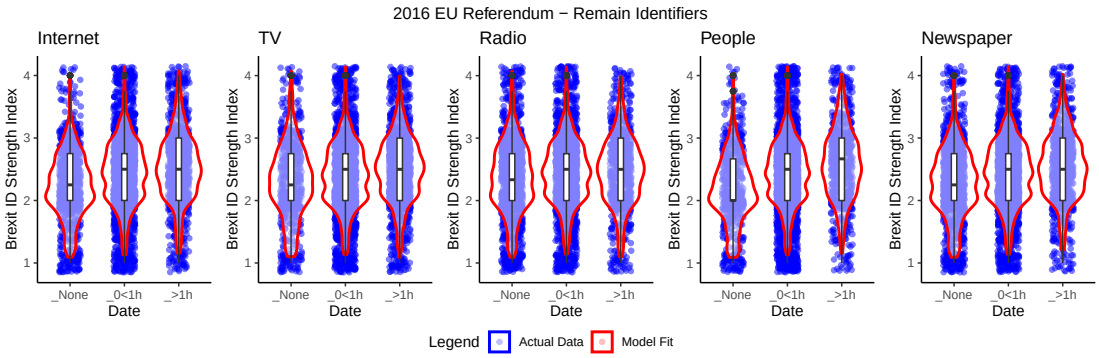


Figure A.45: Model fit of 2016 EU Ref. Remain Linear Mixed Effects Models

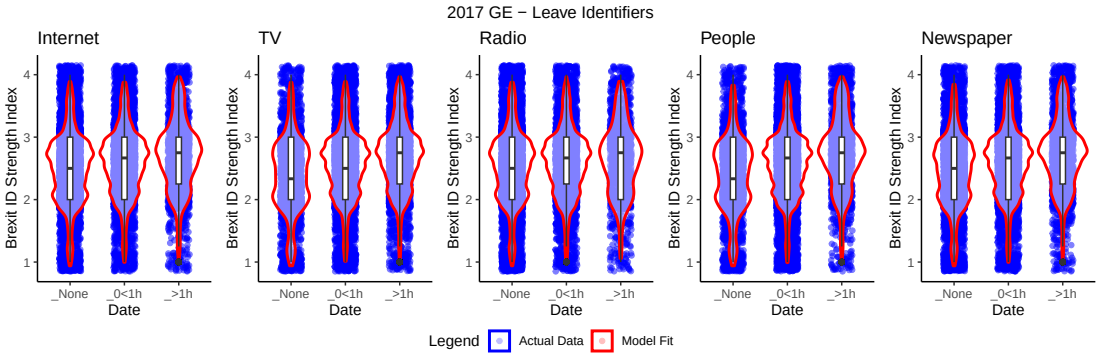


Figure A.46: Model fit of 2017 GE. Leave Linear Mixed Effects Models

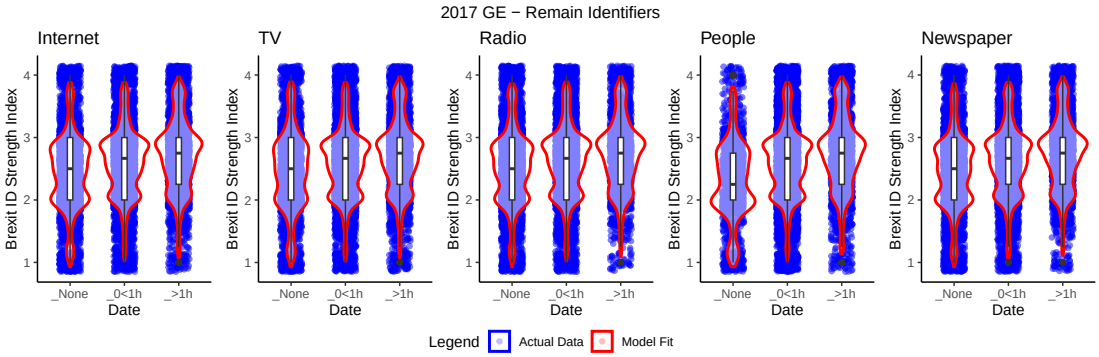


Figure A.47: Model fit of 2017 GE. Remain Linear Mixed Effects Models

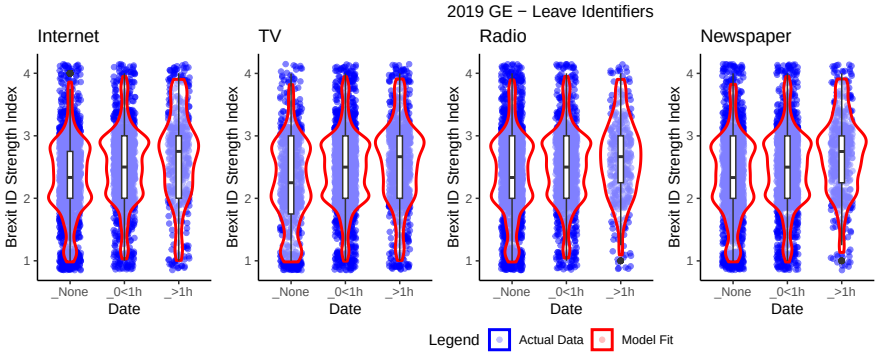


Figure A.48: Model fit of 2019 GE. Leave Linear Mixed Effects Models

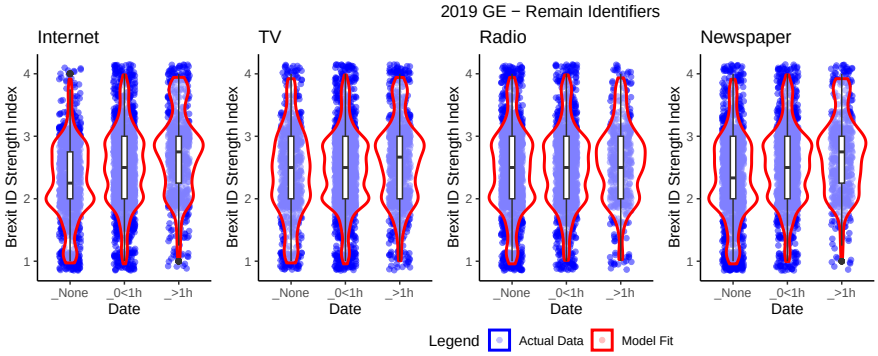


Figure A.49: Model fit of 2019 GE. Remain Linear Mixed Effects Models